



# RIGHT SIZE PARKING

## Final Report

AUGUST 2015



## Project partners

U.S. Department  
of Transportation  
**Federal Highway  
Administration**



## Consultant team



### Project contact information:

Daniel Rowe, Transportation Planner  
King County Metro Transit  
Daniel.Rowe@kingcounty.gov

### Report prepared by VIA Architecture

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## What is the “right size” for parking?

**Right-sizing parking** means striking a balance between parking supply and demand.

## Why does Right Size Parking matter?

**Parking is expensive to build.** Construction of parking in multi-family projects costs between \$20,000 - \$40,000 per stall, which has an impact on rent charged to tenants.

**King County is over-parked.** The Right Size Parking study found that on average, multi-family buildings in King County supply 40% more parking than is actually utilized.

**Excess parking has negative effects on communities.** Oversupply of parking leads to increased automobile ownership, vehicle miles traveled, congestion and housing costs.

The **Right Size Parking** project was designed to address the issues surrounding multi-family residential parking supply in King County, assembling local information on parking demand to guide parking supply and management decisions in the future.



[www.rightsizeparking.org](http://www.rightsizeparking.org)



## Project overview

The Right Size Parking (RSP) project is an innovative, data-driven research and outreach effort focused on helping local jurisdictions and developers to balance parking supply and demand for multi-family buildings. Led by King County Metro, the public transit authority for King County, WA, the project advances the state of parking demand and pricing research by presenting up-to-date parking data in context.

Research has shown that multi-family parking is oversupplied. Based on parking utilization and pricing data gathered from over 200 multi-family properties in King County, WA, the RSP project determined that existing multi-family parking capacity exceeded utilization by an average of 0.4 spaces per housing unit — a 40% oversupply.

## **The RSP project determined that existing multi-family parking capacity exceeded utilization by an average of 0.4 spaces per housing unit — a 40% oversupply.**

Excess parking presents significant barriers to smart growth and efficient transit service operations. Too much parking at residential properties is associated with more automobile ownership, vehicle miles traveled, and congestion as well as higher housing costs. On the other hand, too little parking can have negative impacts on the real estate marketability of multi-family housing projects in addition to on-street parking spillover impacts when on-street parking is not sufficiently managed and priced. Finding the balance of parking supply and demand supports transportation choice and walkable, more affordable neighborhoods.

The RSP project provides locally credible and context-sensitive data on parking demand, providing stakeholders with the information they need to make decisions that:

- Support economic development by reducing barriers to building mixed-use multi-family residential developments in urban centers near transit infrastructure
- Reduce housing costs as well as household monthly expenditures, allowing a larger demographic to participate in the urban and suburban infill housing markets
- Encourage transit use, ridesharing, biking and walking
- Reduce traffic congestion, vehicle miles traveled, and the amount of greenhouse gases (GHG) produced

## Who benefits from RSP?

Developers, public decision makers, and communities all have the potential to benefit from the outcomes of this project. With updated context-sensitive information on parking demand, cities can regulate development in ways that meet local and regional goals. Developers can build more housing near transit and sell it for less.

This information is relevant to a wide variety of potential user groups, including jurisdictions, developers, and communities.

## Sharing the research

A key goal of the RSP project is making the research available to and usable by the public. The data resources and tools created by the RSP project support a wide range of community and policy goals, such as providing a range of transportation choices (including transit), affordable housing, smart growth, and economic development. RSP tools have been designed for ease of use and adaptability.

## Project background

The RSP project was funded through a grant from the Federal Highway Administration's (FHWA's) Value Pricing Pilot Program to address the issues around multi-family residential parking supply in King County. Initial data collection began in 2011, and the final RSP pilot projects were completed in 2015. The project directly addresses FHWA's call to action to develop policy that builds more livable communities. The project assembled local information on multi-family residential parking demand to guide future decisions regarding parking supply and management, therefore enabling the reduction of excess parking supply at multi-family housing developments in urban and suburban infill environments.

## Why does right-sizing parking matter to affordability?

The high cost of parking construction and maintenance drives up the cost of housing and reduces the supply of affordable housing. Unless parking costs are separated from the cost of housing — “unbundled” — households are forced to pay for parking regardless of their needs. Even when parking costs are unbundled, developers often cannot

charge the full cost-recovery price for parking due to the required oversupply typical in zoning codes and ‘sticker shock’ concerns of their customers.

In King County, WA, parking makes up 10-20% of the cost to construct multi-family buildings, but only 6% is recovered through parking charges, meaning that the remainder must be accounted for through rent prices. This cross-subsidization, or recovering part of the parking investment through higher rental rates, causes a distorted market for parking and reduces the opportunity to use pricing as a tool to manage parking demand. Lower-income households are especially burdened by this distortion as they typically have lower rates of auto ownership and spend a larger percentage of their income on housing.

However, providing too little parking also can pose risks for real estate marketability and cause on-street parking impacts nearby, such as parking spillover, especially when on-street parking is not sufficiently managed and priced. These problems suggest that there is a “right size” to providing parking that strikes a delicate supply-to-demand balance, ensuring real estate marketability while meeting community goals.

## Why King County Metro?

The RSP project is aligned with the mission of King County Metro Transit. King County Metro’s Strategic Plan calls for supporting the integration of transit and land use to create compact, healthy communities. Communities that are compact and friendly to pedestrians and bicycles are most easily served by transit. Such communities foster healthier, more active lifestyles while reducing auto-dependency and associated road investments. By the same token, transit service can support and encourage development that is more compact.

Public transit is often most successful in markets in which parking is priced and supplied to reflect actual demand. As a transit agency, King County Metro has an interest in encouraging land uses and policies that prevent overbuilding of parking supply. Too much parking leads to increased automobile ownership, vehicle miles traveled, congestion and housing costs. In addition, it presents barriers to smart growth and efficient transit service. Right-sizing parking in locations where an oversupply of parking exists can be expected to help promote transit ridership and service efficiency.

## RSP Project Approach

### 1. Get the Data

- Scientific approach
- Field counts collect local, up-to-date data
- Statistical analysis

### 2. Provide New Tools

- Web tools, model code, best practices

### 3. Check the Code

- Find gaps and make changes

### 4. Engage Partners

- Implement public and private demonstration projects

## Project scope

In order to address the project need for up-to-date, context-sensitive data and user-friendly tools for understanding parking supply and demand, the RSP team engaged a diverse set of stakeholders, including developers, financiers and public-sector decision makers. In collaboration with this assemblage of multidisciplinary advisors, the team worked to develop technical policy best practices aimed at overcoming barriers to right-sizing parking supply.

The RSP project was structured around an interdisciplinary approach to developing innovative research and tools, as well as providing best practices on policy reform and parking management. These tools were implemented and tested through demonstration pilot projects with local partners.

Through the coordinated work efforts of the project team, the RSP project was able to achieve the following objectives:

- Provide context-sensitive multi-family residential parking demand information on a dynamic website to guide stakeholder decisions about building new parking and managing existing parking
- Offer tools and incentives to jurisdictions and developers to test pricing and right-sizing of parking supply in residential and commercial developments
- Engage the development community through professional forums to utilize new parking demand information and implement pricing and management techniques



At the project outset, the RSP team conducted an audit of principal technical policy issues pertinent to achieving right-sized parking in multi-family residential buildings. From this assessment, the team compiled a Technical Policy Memorandum summarizing the known barriers and potential solutions for RSP in addition to a set of policy and action recommendations that set the stage for the project research. The Technical Policy Memorandum can be found at:

<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-technical-policy-memo-final-09-17-12.pdf>

## RSP research and modeling

The primary goals of the project research were to bring clarity to the existing lack of consensus on the factors that influence parking demand and to make the findings easily accessible to a broad audience. Despite a recent surge in research, a lack of consensus still exists on the factors that drive demand for parking in multi-family buildings across a variety of urban and suburban contexts. While socio-demographic, housing, and built environment variables have all been shown to have an impact on residential parking and vehicle availability, their relative influence is a source of debate.

The RSP research identified independent variables to be tested in a regression analysis of parking utilization within 208 multi-family housing developments in King County, WA, which was conducted in 2012. Parking utilization was correlated to building characteristics as well as to neighborhood characteristics where the building resides. The final model derived from this regression analysis incorporated seven variables – five pertaining to the property or development characteristics and two to the built environment – and has a high R-square value of 0.81, meaning that the model has very substantial explanatory power.

## Web calculator

The King County Multi-Family Residential Parking Calculator is a map-based web tool that enables users to estimate parking use for multi-family developments in the context of specific building and site/neighborhood characteristics. The website tool condenses the research findings and RSP model into a simple interactive calculator format accessible to a wide variety of stakeholders. The web calculator can help analysts, planners, developers, and community members weigh factors that will affect parking use at multi-

family housing sites, including consideration of how much parking is “just enough” when making economic, regulatory, and community decisions about development.

Users are able to create custom multi-family parking scenarios and adjust them using variables related to the building and its location, including proximity to transit, unit and parking pricing, jobs and population. Understanding the influence of these variables helps determine how much parking is “just enough” for a particular site.

More detailed information about the web calculator can be found in Chapter 3. Try out the calculator online at:

[www.rightsizeparking.org](http://www.rightsizeparking.org)

## Project partners and potential users

King County Metro applied for the FHWA grant in partnership with the Center for Neighborhood Technology (CNT) and the Urban Land Institute (ULI). As the leader of the RSP effort, King County Metro provided project administration and management as well as technical support for the project team. Recognizing that the issues addressed in the RSP project span multiple disciplines, Metro assembled a multidisciplinary team in order to ensure that the appropriate resources and expertise would be available to support the wide-ranging needs of the project.



## What's in this document?

This document describes the RSP project goals, research methodology, and the results of the RSP pilot projects; provides an overview of stakeholder outreach efforts; and outlines next steps for RSP applications and research. In addition, this report introduces the tools and strategies created by the project for those interested in implementing RSP practices in other jurisdictions or communities. These tools can help analysts, planners, developers, and community members weigh factors that will affect parking use at multi-family housing sites.

Throughout this document, look for the RSP toolkit icon (above) to learn more about RSP tools and products. Links to additional project resources can be found in the Appendix.



## Research scope and context

Today, multi-family residential buildings often provide too much automobile parking, which can be an impediment to achieving a wide range of community goals. An oversupply of parking can have deleterious effects on economic development, consumers, the community at large and the environment.

Excess parking consumes valuable urban real estate, which contributes to sprawl, lower-density development, and greater distances between buildings. Those outcomes can deter walking, transit use and efficient transit service operations. An oversupply of parking can also damage natural landscapes through urban sprawl, increase impervious surfaces and add to greenhouse gas emissions. These considerations pose challenges for communities that want to encourage multi-modal transportation options and promote smart growth land use planning strategies.

In auto-dominated suburban developments with little transit service, parking decisions are relatively straightforward; planners or developers can apply findings from parking generation studies conducted in similar communities across the country found in the Institute of Transportation Engineers (ITE) Parking Generation Manual. However, parking supply decisions become more complicated as suburban communities introduce more compact development, mixed uses, and new multimodal transportation options in addition to welcoming a more diverse demographic of multi-family housing users. Current suburban parking generation studies do not meet the objectives of these settings, nor do they account for factors that may influence parking demand. They also do not serve as an adequate model to guide parking provision in urban areas.

Despite a recent surge in research, a lack of consensus still exists on the factors that drive demand for parking and account for the variation in auto ownership in multi-family buildings across a variety of urban and suburban contexts. While socio-demographic, housing, and built environment variables have all been shown to have an impact on residential parking and vehicle availability, their relative influence is a source of debate.

Academics and practitioners have responded to this gap in research through a growing body of studies showing how the oversupply of parking can lead to increased auto ownership, vehicle miles traveled, congestion and housing costs. In addition, studies have shown that misaligned parking policies present barriers to smart growth and efficient transit service. There is some agreement that parking supply and pricing have a significant impact on parking demand and auto ownership, but these variables have been understudied.

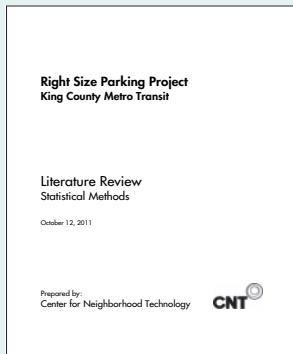
The Right Size Parking research applies extensive data collection and analysis to provide clarity on the factors that influence parking demand in multi-family developments. Specifically, the objective of this research was to identify independent variables to be tested in regression analysis of parking utilization within 208 multi-family housing developments which were surveyed in King County, Washington in 2012.

## The RSP research question: What are the contextual factors that influence parking demand for multi-family buildings?

Drawing upon an extensive literature review of existing parking standards and studies, the RSP team used regression analysis to develop a model of parking utilization. Where other studies have stopped at modeling parking demand based upon the utilization of existing parking supply, the RSP project went further to develop a robust statistical model that describes parking demand as a complex equation composed of strongly correlated independent and context-sensitive variables.

It is the goal of the RSP team that the new data, research, and tools developed by the project provide the information needed to help developers, financiers, jurisdictions, and neighborhood groups better estimate the optimum amount of parking for new multi-family developments across a wide variety of development contexts. The results are intended for use by practitioners and are made easily accessible through an interactive website tool.

## Literature Review of Statistical Methods



The project team worked with the Center for Neighborhood Technology (CNT) to conduct a thorough literature review of parking supply standards and studies in order to determine the current state of knowledge and inquiry surrounding the balance of parking supply and demand. This initial

survey of accepted standards most often used to guide parking supply indicates that they are typically based on a single independent variable — unit count — and do not account for independent variables such as building type, transit and land use factors.

The incorrect application of existing parking data has been criticized both locally and nationally and has been identified as a major barrier to successful transit-oriented development. As a case in point, the ITE manual continues to be used as a standard for determining parking supply. However, these guidelines consider only the number of units in a building in its parking supply calculation and draw from mainly suburban data gathered in the 1980s.

The RSP team compiled an overview of current statistical methods for estimating parking demand and studied new models aimed at linking contextual factors, such as sociodemographic characteristics, to parking demand. The literature review included many studies that begin to address and model the relationships between parking demand and contextual variables such as household characteristics, housing type, qualities of the built environment, and parking price. Additionally, data sources that assess auto ownership or vehicle availability were reviewed to ascertain the extent to which vehicle ownership could serve as a proxy measure for estimating parking demand.

The RSP Literature Review can be found at:

[http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-litreview\\_11-2011.pdf](http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-litreview_11-2011.pdf)

## Background research findings

The RSP team laid the foundation for the development of the research methodology by conducting a thorough literature review (see sidebar) to determine the current state of the industry methods for estimating parking demand. The findings of the literature review indicated that parking supply requirements and guidelines are typically not tied to demand and that there is currently no clear understanding of the factors contributing to parking demand.

The team reviewed multiple studies indicating that there is often a measurable oversupply of parking in multi-family buildings. This phenomenon is often caused by a combination of factors: developer overestimation, financier requirements, and/or jurisdictional parking requirements. The review of these studies clarified that the importance of considering parking demand is widely recognized while the impacts of contextual factors, although documented in many cases, are still debated. The two largest identified gaps were 1) a lack of consensus on factors that influence demand for parking; and 2) omission of data on parking availability, cost and pricing.

It was clear to the team that the tools and methods that have informed parking supply regulations in the past are often not appropriate for guiding parking supply decisions for new development in King County today. The literature review included several studies that have begun to establish a meaningful link between parking demand and a range of building and site characteristics. These initial findings served as the basis for the development of the RSP model.

## RSP Research Guiding Principles

- Scientific approach
- Based on data and statistical analysis
- Local data with hyper-local applicability
- Relevant to community goals
- Actionable
- Support policy change, informed participation in project review and investment/development decisions
- Designed to support creation of interactive web tool

## Methodology development

The RSP team set out to design the research to address the gaps in understanding regarding parking demand and vehicle availability uncovered during the literature review. A primary goal of the RSP study is to provide clarity on these issues in the form of practical tools for use in development and policy discussions. The literature review served as the basis for drafting the research methodology, which was vetted by a Methods Review Committee.

### Methods Review Committee

The RSP team assembled a Methods Review Committee to assist with developing and vetting the research methodology. The committee consisted of a panel of parking experts, including national and local academics, practicing professionals, leaders of the urban planning and engineering fields, and ITE members.

## Methods Review Committee

**Cynthia Chen**, University of Washington

**Donald Shoup**, University of California Los Angeles

**John Holtzclaw**, Sierra Club

**John McIlwain**, Urban Land Institute

**Jeffrey Tumlin**, Nelson\Nygaard

**Robert Cervero**, University of California Berkeley

**Ransford McCourt**, DKS Associates

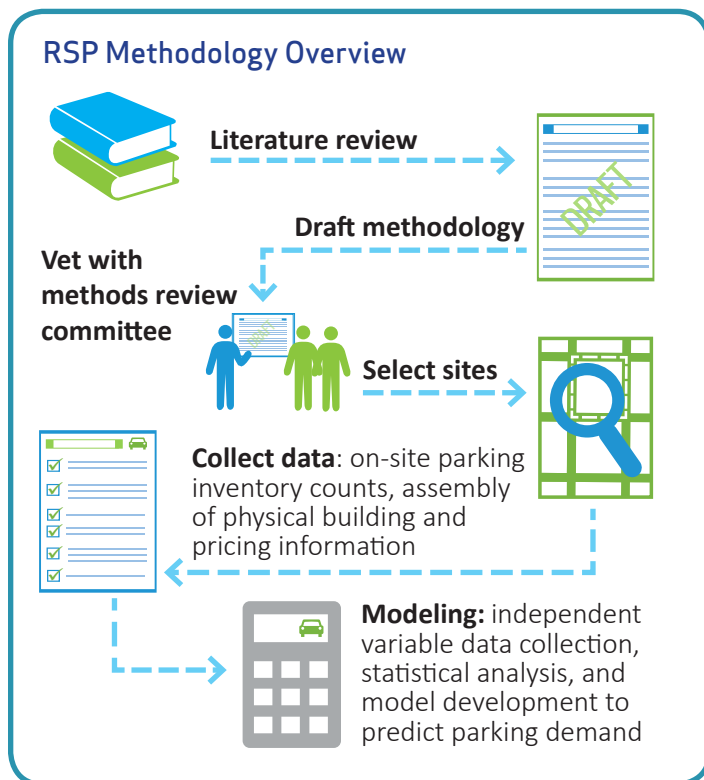
**Rachel Weinberger**, University of Pennsylvania

**Richard Willson**, California State Polytechnic University

**Steffen Turoff**, Walker Parking Consultants

The Methods Committee worked to ensure that the RSP research methodology met the highest academic and industry standards, honored the budget allocation, and provided statistically significant and replicable results.

Comments and input from the Methods Review Committee were integrated into the final research methodology documents, which documented background research, outlined the research objectives, and provided a road map for project development.



## Site selection and data collection

### Site selection process

Convenience and quota sampling techniques were used to assemble a total of 223 multi-family sites representing various types of multi-family development around King County, Washington. Study sites were chosen to provide a well-distributed sample of the dependent variable and many of the site-specific independent variables used to generate the RSP model.

The geographic location of eligible properties was defined to ensure that the sample was focused in areas where future multi-family residential development could potentially occur. Within the defined boundary, eligible sites included multi-family residential properties with a minimum of ten units either leased as apartments or sold as condominiums. For properties that contained a mix of uses, only the residential portion of the parking supply was studied.

Numerous developers, property owners, and property management companies were asked to participate in the data collection effort. Targets to ensure a representative sample were established based on transit connectivity, employment access, average medium gross rent, and average median household income.

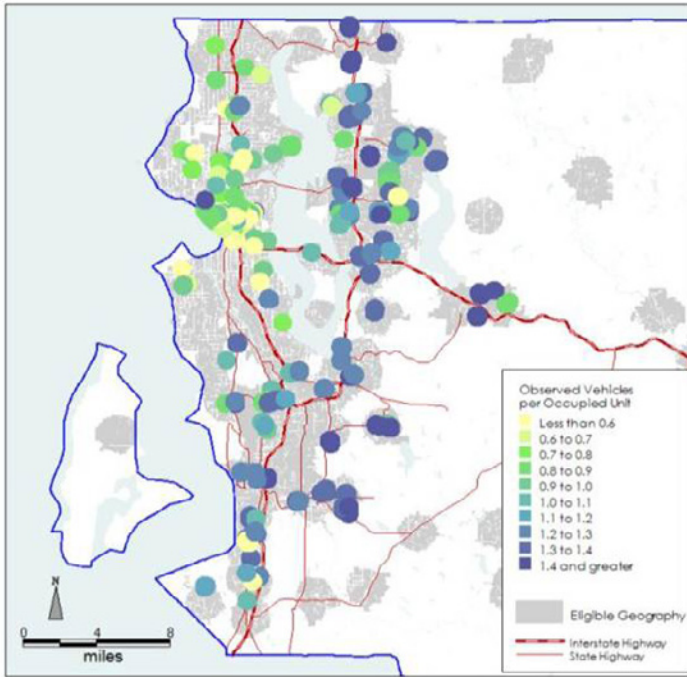


Fig. 1: Observed Vehicles per Occupied Unit.

### Field counts

The RSP team collected data for 33,166 occupied apartment units throughout King County accompanied by 46,420 residential parking stalls (32,608 of which were observed to be occupied with vehicles). The field counts required at least two visits to the site: an initial visit to meet with the property manager and discuss data needs, and a second to perform the parking utilization count. The parking utilization count followed the Institute of Transportation Engineer’s Parking Generation Manual method of counting between the parking peak hours of 12:00 a.m. and 5:00 a.m. on weekdays only for multi-family land uses.

The sample represented a range of parking types but included all residential parking, including visitor parking, identified by the property manager at each multi-family development. Parking was generally provided in off-street garages or lots located on the multi-family parcel, but some parking was located in dedicated on-street stalls or satellite garages.

Sites selected for the study were screened for building age and available parking supply to control for potential under-supplied parking where constrained supply made actual demand unknowable. The end result was the identification of 223 sites for which parking utilization could be measured via parking counts, and the exclusion of sites for which undefined off-site, on-street parking may have resulted in underrepresentation of parking use. The initial 223 sites were cut to 208 sites, as explained later in this document, in order to eliminate statistical outliers.

## RSP data collection summary

### What did we find?

The RSP team found that, on average, parking is supplied at 1.4 spaces per dwelling unit but is only used at about 1 space/unit.



### What does this imbalance mean?

When these average supply and utilization findings are applied to a typical suburban project with 150 units, roughly \$800,000 would be wasted on unused parking. This estimate assumes a conservative construction cost of \$15,000/stall .

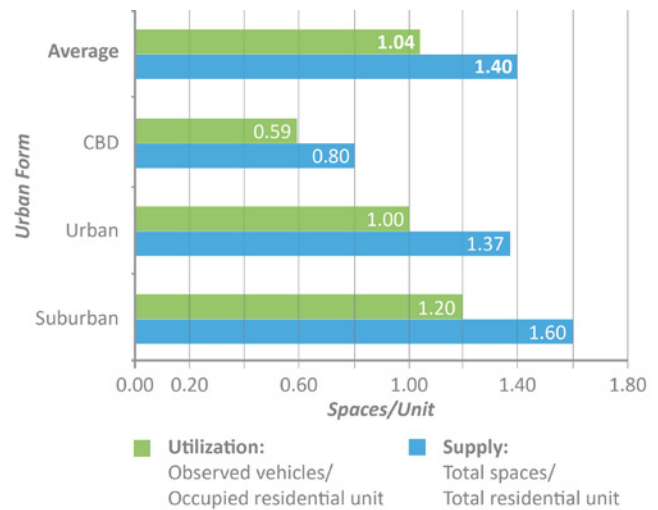


Fig. 2: Observed Vehicles per Occupied Unit as a function of urban form. Both parking utilization and the gap between parking supply and demand tend to be greater in suburban areas on average.

### Parking oversupply by the numbers:

Oversupply of parking adds unnecessary cost to project development and inefficient use of land:

- Excess surface parking can add \$2 per foot to annual unit leasing cost (@ \$8,000 per stall)
- Excess garage parking can add \$6.00- \$7.00 per foot to annual unit leasing cost (@ \$30,000 per stall)
- For a typical affordable housing development, adding one space per unit increases leasing costs by about 12.5%; adding two parking spaces increases leasing costs by about 25%



## Data modeling

### Modeling parking utilization, dependent variable

The dependent variable used in the model estimating parking utilization was “observed vehicles per occupied residential unit” collected from the field data. This dependent variable analysis was comparable to the approach of some of the studies included in the literature review. However, the RSP study sought to determine the effect of contextual factors on parking demand in addition to the much more basic number of housing units.

### Modeling parking utilization, independent variables

The RSP project went beyond modeling parking demand based on the utilization of existing supply per each unit of housing by also considering the effects of a host of other potential independent variables. The collection of the primary parking utilization data enabled a unique statistical analysis and the development of a model for predicting parking utilization at multi-family residential developments. Based on the field data, the Center for Neighborhood Technology used regression analysis to test a set of independent variables and to create a statistical model that would identify the building and environmental characteristics that best described the relationship between parking utilization and demand.

During the regression analysis and model development process, over 100 distinct potential independent variables grouped into five categories—parking supply and price, property/development characteristics, neighborhood household characteristics, accessibility, and built form characteristics — were analyzed, enabling the consideration of the greatest number of possible variables to create a complete picture of the primary factors contributing to parking demand. These external data were collected from a variety of sources, including the American Community Survey, the King County GIS Center, Zipcar, and Walkscore.

Because one variable can be represented in many different formats using different metrics, an extensive list of potential explanatory variables was analyzed. For example, while it was expected that transit access would correlate with parking utilization rates, the best measure of transit access to explain utilization rates was unknown, so several different kinds of transit access measurements were included in the study.

### Parking supply as a variable

Parking supply is often cited as one of the most important variables in determining demand, and many past studies have found a high correlation between the two factors. A similarly high correlation was found in the RSP research data, indicating that it should be included in the model.

However, estimating parking utilization for the purposes of informing supply decisions should not be a function of supply. Parking supply was ultimately excluded from the model because its inclusion addresses a different research goal. The RSP research objective was to estimate the full quantity of parking that would be demanded at a given property in order to help inform a decision on the amount of parking that should be supplied at that location. Therefore, it was not desirable for the model to take into account situations for which parking utilization was low because of inadequate supply rather than low demand.

If supply were to be included in the regression model, its coefficient would indicate the effect of parking supply on usage, conditional on the other observable characteristics included in the model. Therefore, parking supply was excluded as an independent variable from the model.

### Regression analysis

Because the regression analysis began with the presumption that the ordinary least squares (OLS) transformation would provide the optimal approach, a simple linear regression model was used at the outset of the modeling effort. However, because relationships between the dependent and independent variables were not all assumed to be linear, all variables were tested using various transformations (e.g. natural log, inverse, square root, etc.). Variables were tested for their correlation with the dependent variable as well as for the form that provided the best and most logical fit.

To construct the regression analysis, many approaches were tested to find the best method of including, removing, and ultimately assembling the best set of variables. In the end, the goal was to find the set of variables that provided the most robust theoretical framework while remaining relevant from a practical development and planning standpoint, keeping in mind that the resulting formula must ultimately be applied and made accessible via an online tool.

## RSP Technical Research Memo



The RSP Technical Research Memo outlines the RSP research objectives and explains the project research methodology and model development in detail. The report identifies the key variables that describe parking demand in King County according to the RSP research. It also discusses the connection between characteristics of multi-family buildings and the parking and transportation needs of residents. The RSP Technical Research Memo can be found at:

[http://www.rightsizeparking.org/Right\\_Size\\_Parking\\_Technical\\_Memo.pdf](http://www.rightsizeparking.org/Right_Size_Parking_Technical_Memo.pdf)

Maintaining the criteria that all variables be significant (the probability that the coefficient is non-zero, or  $p < 0.05$ ) and all multicollinearity be low (as assessed through variance inflation factors, or VIF values, less than 5) was considered throughout the modeling process. Because each factor or characteristic was represented using many independent variables (as well as multiple transformations of each), multicollinearity, or a high level of correlation between independent variables, was an important consideration.

The most effective modeling approach identified, which served as the basis for the parking utilization model, began with a set of variables that appeared in the highest-scoring results of multiple approaches. A stepwise method was used, with an entry criterion of 0.05 and a removal criterion of 0.10.

Variables were then considered based on their logical candidacy from a planning or development context. For example, for a case in which a variable representing the count of three-bedroom units was included in the final set of variables in the absence of any other count or average number of bedrooms, the three-bedroom unit count was removed and variables pertaining to average bedroom counts were added and tested in a stepwise method. Or, if two variables had high collinearity, such as block size and the transit connectivity index, one was removed and various variables were tested to replace the other.

Throughout the modeling process, outlying cases were tested to ensure that no single property was significantly influencing the fit. Sample properties, or cases, with high leverage values (approximately  $> 0.5$ ) or outlying residuals (as identified through separated tails in a residual histogram) were removed from the sample. In the end, 15 cases were removed based on these criteria, resulting in a final sample size of 208 properties.

Further details on the regression analysis can be found in the RSP Technical Memo (see sidebar to left).

### Results and summary of findings

The final model derived from the regression analysis incorporated seven variables – five pertaining to the property or development characteristics and two describing the built environment (these variables are described in further detail on p. 12). The final equation for the model is:

$$P_u = b + \sum_{i=1}^7 C_i X_i$$

where  $P_u$  is the modeled value of the parking utilization,  $b$  is a constant term,  $C_i$  is the coefficient for the “ $i$ th” variable (derived from the regression equation), and  $X_i$  is the value of the “ $i$ th” variable representing a location or building characteristic.

Parking utilization was found to be correlated to individual building characteristics as well as to the neighborhood in which the building resides. In other words, parking utilization cannot be determined from the characteristics of the building alone, nor from the setting alone. To understand and accurately assess parking needs, both building type and location must be considered in tandem.



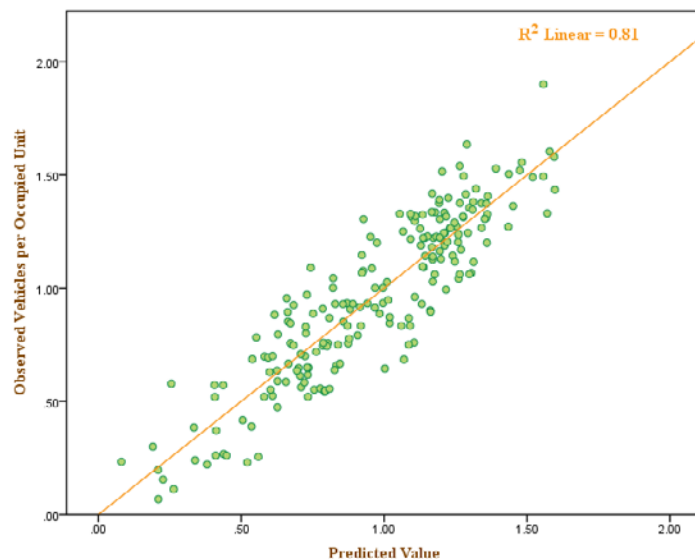
## RSP independent variables

CNT identified seven variables that produce a combined R-square value of 81.0%, an adjusted R-square of 80.3%, and a standard error of 0.16: Table 1 identifies the seven independent variables as well as their individual R-square and stepwise R-square values. Individual R-square values represent the correlations between the given variable and the dependent variable. The stepwise R-square values represent the improved R-square value as each variable is added to the final model.

Independent variable	Individual R Square	Stepwise R Square
Gravity measure of transit frequency	55.5%	55.5%
Percent of units designated affordable	27.6%	67.1%
Average occupied bedroom count	34.3%	73.7%
Gravity measure of intensity (population + jobs)	53.3%	76.2%
Units per residential square feet	17.1%	78.7%
Average rent	6.7%	80.0%
Parking price as a fraction of average rent	18.1%	81.0%

**Table 1:** Independent Variables and Summary of Regression Results.

Figure 3 illustrates the final fit of the observed or measured data as compared to the predicted model results.



**Fig. 3:** Observed vehicles per occupied unit versus modeled value.

## Limitations

The final model resulting from the RSP regression analysis can help to support and guide decisions about parking supply and management. However, it cannot provide definitive answers about specific future policies or developments. Rather, the model is intended to serve as a resource to inform discussions as users weigh the factors affecting parking use and consider how much parking is needed.

## Model estimates and data collection

Although the final model is statistically very strong, it is important to keep in mind that it represents an estimate, which by definition has inherent limitations. Real-world parking use can and will vary from RSP estimates for many reasons. For example, some property managers provide transit passes to building residents as a transit demand management (TDM) strategy, which is likely to reduce the demand for parking in those buildings beyond what the RSP model estimates.

Limitations on data collection also affect the model's accuracy. For the most part, observed parking included supply that was on-site and off-street, unless additional resident parking was noted by property managers. The sites selected for the study were screened based on building age and available parking supply to control for potential under-supplied parking that could result in spillover and unmet on-site parking demand. The result was that the sites studied were those for which parking could be measured through parking counts rather than those for which undefined off-site parking would have resulted in an underrepresentation of parking demand.

Due to a lack of on-street parking data and limitations on scope, this research was not able to fully account for on-street parking supply, occupancy, and pricing in the modeling of off-street multi-family parking. Using neighborhood on-street parking counts and resident surveys, future research opportunities exist to establish a more comprehensive understanding of multi-family parking demand.

Additionally, the data collected and utilized in the model represents a single point in time. As factors related to both the built environment and parking usage change (e.g. expanded transit service), the independent variables may need to be updated and their relationships to the dependent variable (parking utilization) reassessed.

## RSP Independent Variables

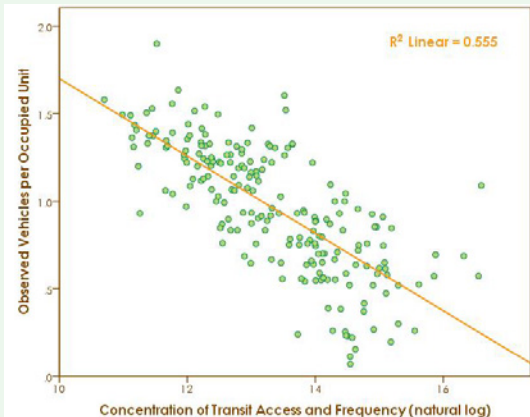


Fig. 4: Gravity measure of transit frequency.

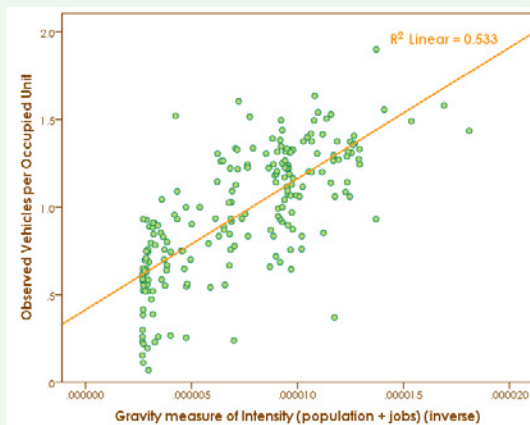


Fig. 5: Gravity measure of intensity (jobs + population).

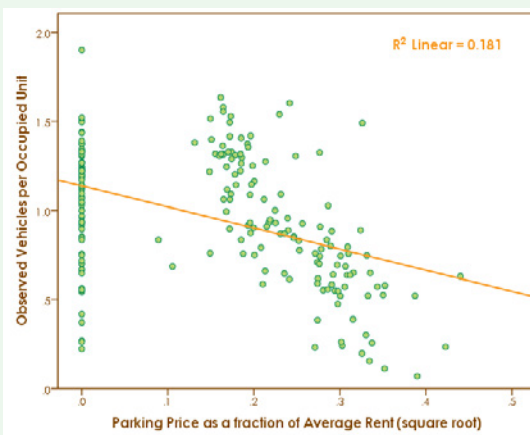


Fig. 6: Parking price as a fraction of average rent.

### 1. Gravity measure of Transit Frequency

Gravity measures take into account both the quantity and proximity of the factor being measured. RSP data indicated a strong correlation between concentration of transit frequency and observed vehicles per occupied unit. Transit concentration was able to serve as a proxy for many other built environment factors.

### 2. Percent of Units Designated Affordable

This variable includes all units identified as affordable by any designation as a percent of all units (regardless of occupancy). RSP data indicated that as the percent of affordable units increases, parking utilization decreases.

### 3. Average Occupied Bedroom Count

Average occupied bedroom count is the average number of bedrooms in all occupied units. To calculate this average, studio units were assumed to have a bedroom count of one. RSP data indicates that the average count of bedrooms has a positive correlation with parking utilization: as average bedroom count increases, parking utilization increases.

### 4. Gravity measure of Intensity (Population + Jobs)

Previous research often found a strong correlation between both residential density and job access with auto ownership. The strong correlation of the gravity measure of intensity and observed vehicles per occupied unit observed in the RSP data supports these findings.

### 5. Units per Residential Square Feet

Obtained from the property managers, units per residential square feet is calculated as total residential units divided by the residential square feet of the development. RSP data indicates that as units per residential square feet increase, or as average unit size decreases, parking utilization decreases.

### 6. Average Rent

Average rent (measured in dollars) represents the average monthly cost of all residential units in the building. RSP data indicates that observed parking utilization increases as average rent increases.

### 7. Parking Price as a Fraction of Average Rent

Parking price as a fraction of average rent is calculated as the monthly price of parking per stall divided by the average monthly rent. RSP data indicates a negative trend, revealing that as parking price increases, parking utilization decreases.

## Model coverage

To ensure confidence in the model estimates, limits were established for the coverage area. The sample utilized for data collection covered a wide range of built environment characteristics and land uses, but it did not cover the full spectrum found throughout the county. Therefore, the coverage for which model estimates were calculated was limited to the range of built environment characteristics found in the data collection sample. In other words, areas of the county that had lower transit service, population, or job concentrations than those found within the RSP research sample were removed from the coverage area.

## Applications

A principal goal of the RSP project is to provide stakeholder access to the research. The King County Multi-family Residential Parking Calculator, which is described in detail in the following chapter, condenses the project's complex research findings into a simple map-based format accessible to a wide variety of stakeholders. Using the RSP model to estimate parking utilization, resulting outputs for most developable parcels in King County, Washington are clearly illustrated on this interactive, mapping website.

## Conclusions

The RSP project provides analysts with new tools to consider the proper provision of parking, given several land use, transit and walk factors. Block size, population and job density, and walk and transit access to trip destinations influence parking utilization, in some cases by as much as 50 percent. They provide clear indication of where parking for low auto ownership characteristics can be applied. CBD multi-family parking utilization of 0.51 vehicles per occupied dwelling unit in the sites studied, compared with suburban 1.18 vehicles per occupied dwelling unit, indicates that accommodations and environments conducive to low- and zero-auto-ownership households correlate with reduced need for parking. Economic and pricing considerations were also found to matter, including average rent units, the share of units that are affordable, and the price charged for parking.



## Background and goals

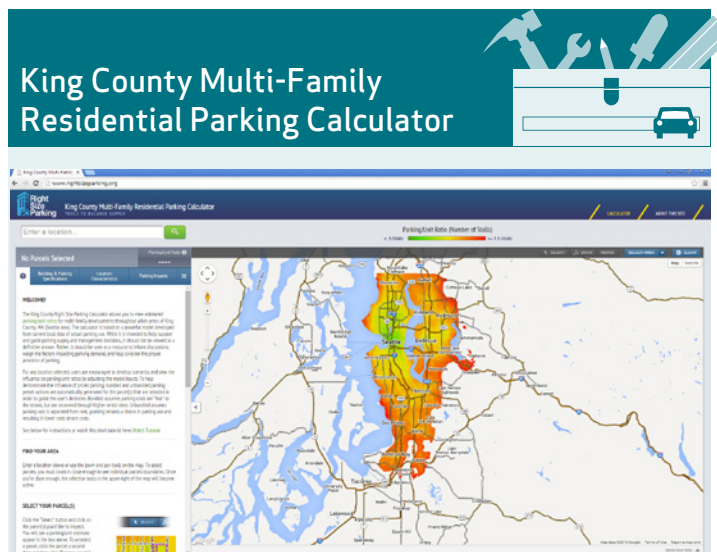
A principal goal of the RSP project is to provide stakeholder access to the project research. To achieve this goal, the RSP team used the project data and conclusions to design and build an easy-to-use web calculator tool that can provide useful information and guidance for the broad spectrum of RSP stakeholders and potential users. The web calculator is a map-based tool that provides place-specific estimates of parking demand at the parcel level. The web tool has been designed to demonstrate RSP research findings, illustrate the influence of the identified predictive factors, and present data that multiple stakeholders will find valuable in their efforts to right-size parking supply.

## Design and function

In order to achieve the project outreach goals, King County Metro partnered with the Center for Neighborhood Technology (CNT) to create a dynamic website with the ability to estimate multi-family residential parking demand across King County. The multi-family residential parking demand information provided by the calculator can be used for both policy guidance and market research.

### Data-based

The calculator is based on the RSP model developed during the research phase of the project, which was created using local data of actual parking use collected in 2012 at over 200 developments in urban and suburban localities across King County, Washington. The interactive calculator tool uses the RSP statistical model to estimate parking use for multi-family developments throughout King County in the context of specific sites. The parking use data is correlated with factors related to the observed building, its occupants, and its surroundings - particularly concentrations of transit, residents and jobs, as well as the price charged directly to the users of parking. Using best available research findings and industry-accepted rule of thumb assumptions, additional impacts were estimated to highlight the associated 'costs' of parking, which are displayed as part of the web calculator interface.



**Figure 7.** Screenshot of the King County Multi-Family Residential Parking Calculator.

To highlight the importance of parking price and presence of affordable units on parking utilization, the calculator automatically calculates and displays the different parking utilization estimates for two scenarios: a given parcel and building with 1) parking pricing bundled with or unbundled from rent, and 2) 100% affordable units or no affordable units. Additional calculator functions include:

- Viewing estimated parking/unit ratios for multi-family developments in urban King County, WA
- Creating scenarios for a specific parcel or custom area by inputting variables particular to a proposed development (instead of relying on default values representing development averages), such as number of units, unit type and size, and average rent
- Adjusting scenarios for contextual factors such as concentration of population, jobs and transit service to estimate parking use if neighborhood characteristics were to change in the future
- Comparing the impacts of alternative parking scenarios, including information about cost, greenhouse gas (GHG) emissions and estimated vehicle miles traveled (VMT) of building users

See the following pages for step-by-step instructions on how to use the web calculator tool. The King County Multi-family Residential Parking Calculator is online at:

<http://www.rightsizeparking.org/>





# Web Calculator Overview

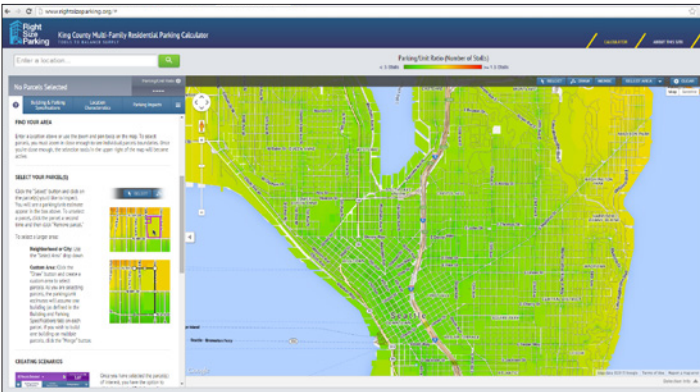
## Calculator basics

The King County Multi-Family Residential Parking Calculator is a map-based web tool that helps users estimate parking demand for multi-family developments at specific sites. The calculator can help analysts, planners, developers, and community members weigh factors that will affect parking use at multi-family housing sites and determine how much parking is “just enough” when making economic, regulatory, and community decisions about development.



The RSP web calculator can be accessed online at: [www.rightsizeparking.org](http://www.rightsizeparking.org)

## How to use the King County Multi-Family Residential Parking Calculator:



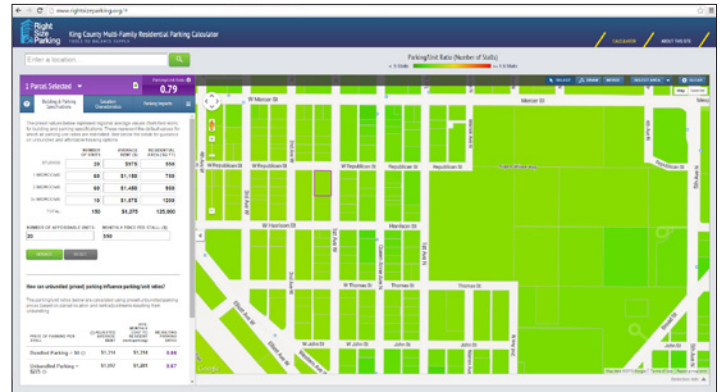
Enter an address or use the zoom tool to find an area of interest.

### 1 Find your area

Enter a location or use the zoom and pan tools on the map to zoom in to the area of interest. When zoomed in close enough, individual parcels boundaries will become visible and the selection tools in the upper right of the map will become active.

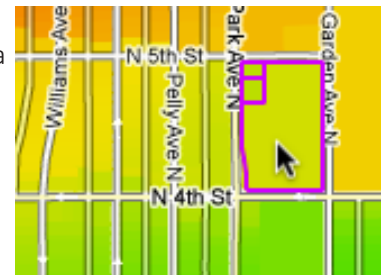
### 2 Select your parcels

Click the “Select” button and then click on the parcel(s) of interest. A parking/unit estimate will appear in the calculator box. Parcels can be added to or subtracted from a selection using the “Select” tool. A larger area, such as an entire neighborhood or city, can be selected using the “Select Area” drop down menu.



Select an individual parcel using the “Select” arrow tool.

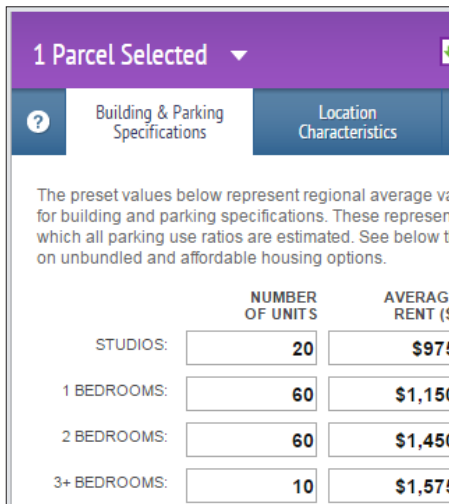
Parking demand can be estimated for a custom area by using the “Draw” tool to select multiple parcels. In a custom calculation, the parking/unit estimates assume that one building will be assigned to each parcel. The “Merge” tool allows users to assign one building to multiple parcels.



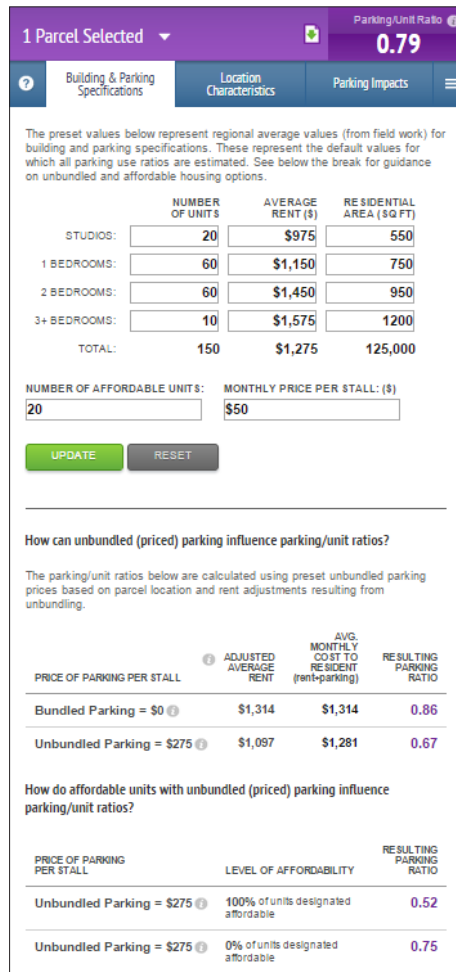
Select multiple parcels or draw a custom area if desired.

### 3 Create scenarios

Once the parcel(s) of interest have been selected, the default inputs are shown and can be adjusted using the “Building and Parking Specifications” and “Location Characteristics” tabs. Two preset scenario options (unbundled parking and affordable housing) are provided on the “Building and Parking Specifications” tab to provide a starting point for developing custom scenarios.



Adjust default inputs under the first two tabs.



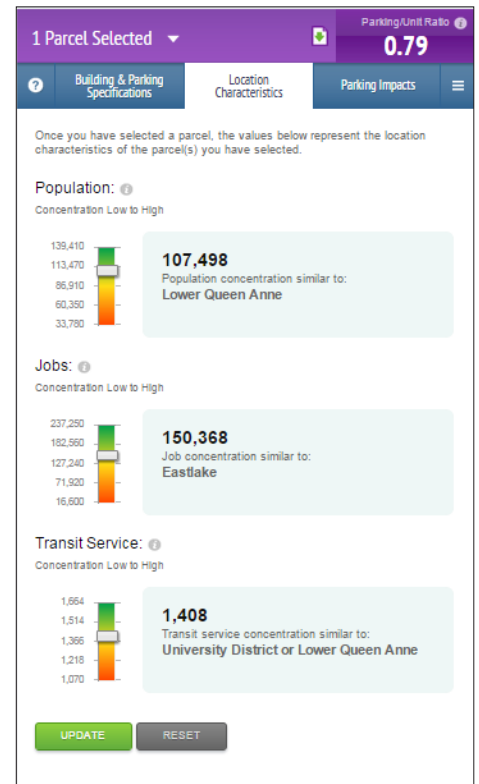
Enter building and parking specifications.

### 4 View results

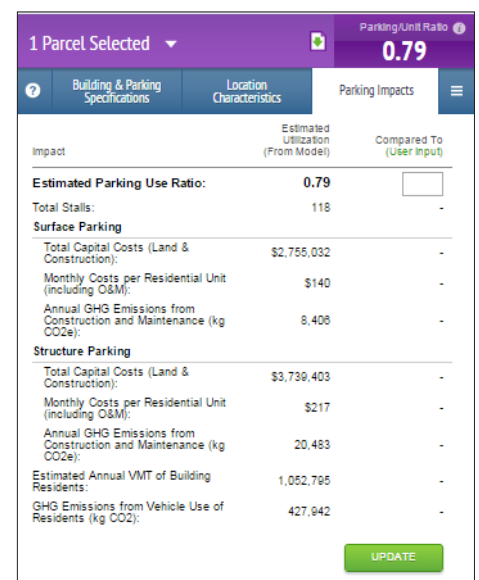
**Parking/Unit Ratio:** The calculator tool displays the estimated parking spaces per residential unit for the selected building(s), or the parking/unit ratio. When multiple parcels are selected, an average is displayed. The calculator also provides additional information about the selection, such as parcel data and the estimated parking use ratio for the selected parcel(s).

**Parking Impacts:** This tab provides average parking construction costs and estimated vehicle miles traveled (VMT) as well as greenhouse gas (GHG) emissions based on the amount of parking supplied.

**Selection Info:** Click the up arrow in the bottom right of the map screen for trip generation reduction estimates and Census data on average commute distance and journey to work mode split.



Make adjustments for location characteristics.



View parking use estimates and impacts.

## User interface

The RSP web calculator condenses complex research findings into a user-friendly, map-based format accessible to a wide variety of stakeholders. The tool allows users to apply the RSP statistical model to real-world scenarios, whether it be planning at the neighborhood level or designing and financing a building at the parcel level.

Outputs for most developable parcels in King County, Washington are illustrated on this interactive website calculator. Users have the ability to select a parcel, input details specific to a proposed development (replacing the default values that represent development averages), adjust factors of the built environment, and view the resultant parking utilization estimate. Users can also adjust scenarios using variables related to a specific site and its location, including proximity to transit, jobs and/or population.

This ability to adjust variables enables users to compare the impacts of alternative scenarios in order to weigh factors that will affect parking use at multi-family housing sites when making economic, regulatory, and community decisions about development.

When variables are entered, the calculator displays the impacts of creating the stated amount of parking, including: total capital costs of parking, monthly costs per residential unit, annual vehicle miles traveled (VMT) of building residents, and greenhouse gas (GHG) emissions from building construction and maintenance as well as from the vehicle use of residents. Understanding the variables influencing parking supply and demand helps users to determine how much parking is “just enough” for a particular site.

## Built-in scenarios

RSP research found that parking pricing and the presence of affordable units are two factors that have a pronounced effect on parking utilization. In order to highlight these findings, the website includes two “built-in” scenarios that automatically calculate and display the different parking utilization estimates for a given parcel and building with:

- Parking pricing bundled with or unbundled from rent, and
- 100% affordable units or no affordable units

## Who benefits and how?

Developers, public decision makers, and communities will all benefit from the King County Multi-family Residential Parking Calculator.

**Developers and financiers:** Decreased costs of housing development, ownership, rental and operation

**Action:** Right-size new developments; build more housing near transit and sell it for less

**Jurisdictions:** Improved pedestrian environment, walkable neighborhoods, and transportation choices

**Action:** Adjust code to reflect findings

**Neighborhoods:** Improved pedestrian environment, transit operations and efficiency; decreased housing costs

**Action:** Community participation in the development process

## Users and intended applications

Calculating parking use at multi-family developments can help provide information to users that can guide and inform decisions on building and managing parking. The calculator can help analysts, planners, developers, and community members weigh factors that will affect parking use.

The calculator can also be used as a resource to inform discussions and help consider the proper provision of parking. With updated context-sensitive information on parking demand, the calculator allows communities to regulate development in a way that meets both local and regional goals.

This new approach provides public and private sector practitioners with information and tools to better align parking supply with demand, preserving resources and supporting a range of community goals including transit-oriented development and housing affordability. The tool also facilitates developers in building more housing, especially affordable housing, in areas well-served by transit.

While the web calculator tool is intended to help support and guide parking supply and management decisions, it should not be viewed as providing a definitive answer on parking provision. Rather, it should be seen as a resource for informing discussions and weighing the factors impacting parking demand.





## USER TESTIMONIALS RSP WEB CALCULATOR

Web calculator users representing both municipal and developer stakeholder groups provided the RSP team with feedback on the utility of the interactive RSP tool:

### City of Kirkland

“The City of Kirkland used the King County Multi-Family Residential Parking Calculator to help draft new parking requirements for multi-family zoning districts within the City. The parking calculator was fundamental in establishing a baseline parking requirement, which we then modified based on additional parking information and policy direction from City officials.”

**- Jon Regala, Senior Planner, City of Kirkland  
Department of Planning and Community Development**

### William Popp Associates

“The tool has been very helpful in our parking demand studies for predicting demands for multi-family apartments in urban settings with abundant public transportation and nearby shop, restaurant, and socio-recreational opportunities. We have found the tool very useful in that we can narrow down our study area to a parcel specific condition or expand out to a larger block area or neighborhood community when predicting demand. Previous data sources for parking demand are often all-encompassing, and they are often only stratified into urban and suburban areas. In general, the tool has been very useful in our recent parking analysis endeavors, particularly in urban settings.”

**- William Popp Jr., Transportation Engineer**

### Beacon Development Group

“As a development consultant to non-profits building affordable housing, Beacon used the Right Size Parking calculator to help one of our clients plan for the amount of parking needed by their new mixed-use project. The tool is very easy to use, and it gave us a firm number to start from so that our client could formulate a parking plan during project development rather than simply react to parking needs after the project was completed.”

**- Boting Zhang, Housing Developer**

### Capitol Hill Housing

“The King County Multi-Family Residential Parking Calculator web tool has been a great resource for advocacy about parking in our neighborhood of Capitol Hill. Capitol Hill is a dense urban neighborhood in which many residents do not own a car and large households only own one car. Many developers, new to the neighborhood, are skeptical of the low parking demand or need hard evidence to show during their financing negotiations.

King County’s parking calculator, and the research behind it, has provided that evidence. We can sit down with developers and pull up recommendations for their specific site, mix of unit sizes, levels of affordability, and the price they are planning to charge. Working with the parking calculator results in lower, more realistic parking ratios in new buildings. Increasingly, new developers have already consulted the parking calculator before we meet with them.

The calculator is also helpful for assuaging neighborhood fears about parking spillover. The tool allows everyone to easily access accurate information about parking demand and make informed decisions.”

**- Alex Brennan, Senior Planner**

### City of Renton

“The ability to compare the City’s regulations with RSP findings allowed City staff to verify that the adopted City parking regulations were appropriate. The ability to compare our regulations to such an extensive study instead of simply comparing to neighboring jurisdictions gave City staff the confidence that our parking numbers were appropriate for the development patterns in Renton.”

**- Vanessa Dolbee, Current Planning Manager,  
Community & Economic Development Department**

## Usage cases and stakeholder input

During its initial two years of use, the calculator website has seen constant use, with visits originating from across the country. The most frequently performed actions by visitors to the RSP web calculator include running the model and viewing the information tabs that allow for user scenario adjustments and display information about parking impacts. Of these tabs, the Building and Parking Specifications tab has been most highly utilized.

### King County Multi-Family Residential Parking Calculator usage statistics (Feb 1, 2013 - Feb 1, 2015)

#### Total Events & Unique Events by Event Category

Run Model	40,017	2,834
View Tab	27,856	10,104
Update	5,667	1,412
Location Search	2,233	926

#### Total & Unique Events by Event Action

Building/Parking Specs	4,152	1,174
Location Specs	758	331
Parking Impacts	757	383

## Introduction

The final stage of the RSP project consisted of the development and implementation of pilot demonstration projects with local partners. The project team engaged seven demonstration pilot project partners, including both local jurisdictions and property owners, to put RSP research into practice through policy and management pilots. Pilot project partners were selected through a competitive bid process.

The **policy-based pilots** were designed to align jurisdiction parking regulations with regional goals for vehicle miles traveled (VMT), housing affordability, and greenhouse gas (GHG) emissions. Four King County cities - Kent, Kirkland, Seattle, and Tukwila - were selected as partners and worked with the RSP team to analyze potential policy changes.

The **management-based pilots** utilized innovative Transportation Demand Management (TDM) strategies, including parking pricing and incentive strategies, to test parking management scenarios. The partners for the management pilots included Capitol Hill Housing, an affordable housing provider; El Centro de la Raza, a community-based civil rights organization and housing provider; and Hopelink, an emergency services center.

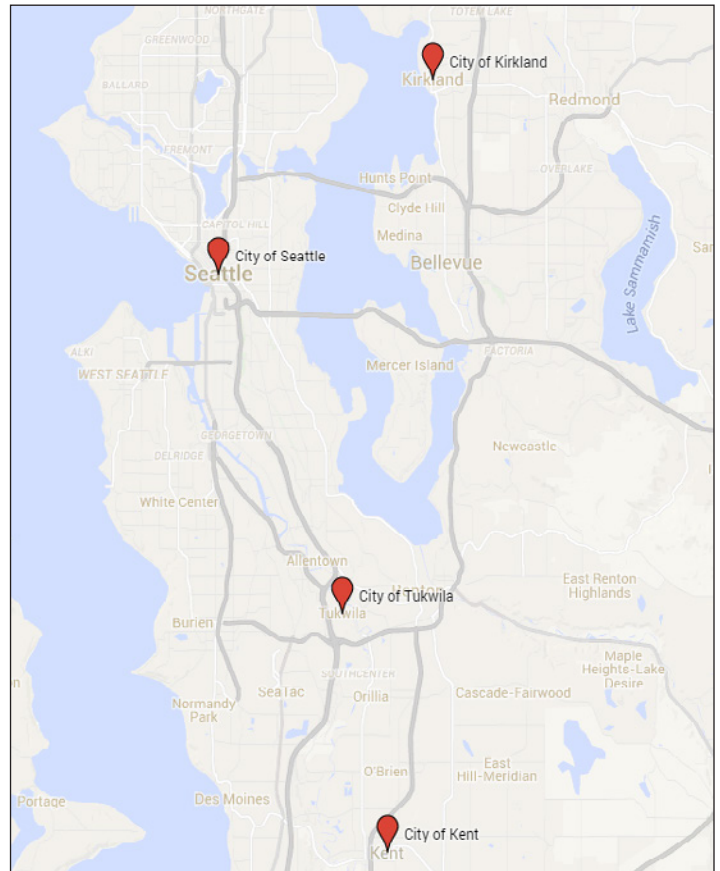
In order to best support and empower these pilot projects, the RSP team developed a set of tools to assist policy makers and developers in understanding the market demand for parking based on location-specific characteristics. These tools, which include the Right Size Parking Model Code, a Parking Requirements and Utilization Gap Analysis, and a Multi-Family Parking Strategies Toolkit, are described in more detail in the following sections of this chapter.

## Policy pilots

Pilot funding and technical support to test innovative parking policy approaches were awarded to four partner King County cities: Seattle, Kent, Kirkland, and Tukwila. These pilot projects began in 2014.

The intent of the policy pilot projects was to apply the RSP research findings in order to achieve better alignment between jurisdiction parking regulations and regional goals, such as increased transit ridership and provision of affordable housing.

Policy changes considered by the partner municipalities ranged from reductions in parking minimums for development to parking management strategies, including shared parking and residential parking program reform.



**Fig. 8:** A map of the Right Size Parking Policy Pilot Project partner locations.

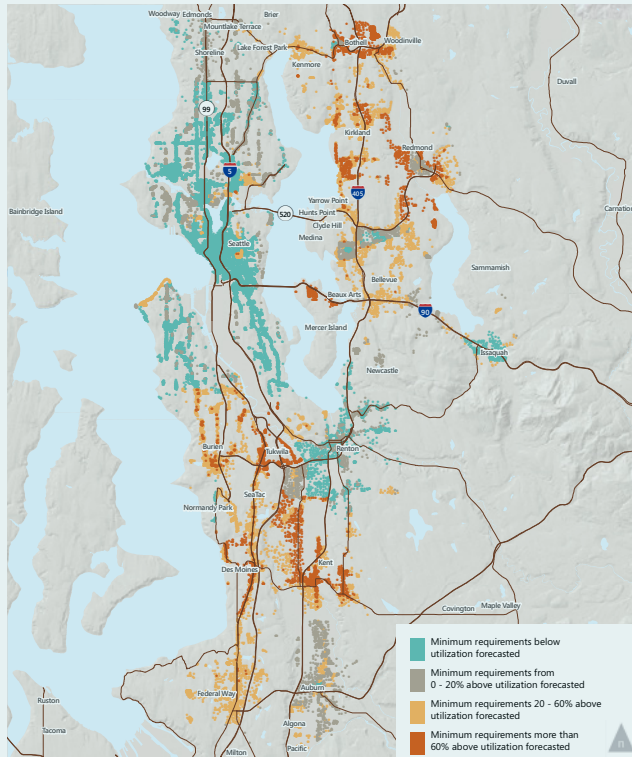
## Policy pilot partners

The selected pilot partners worked with RSP staff and consultants to analyze potential policy changes using the RSP web calculator. Both the RSP Model Code and the Parking Requirements and Utilization Gap Analysis were used to provide guidance for the recommendations for each partner city.

Each pilot project had a unique focus based on local issues and context:

- **Kent:** Identify best code and management strategies for mixed-use areas in a suburban context
- **Kirkland:** Establish parking requirements that reflect market demand and prevent spillover
- **Seattle:** Evaluate existing parking policies and programs and explore private shared parking opportunities
- **Tukwila:** Identify parking strategies for the Tukwila International Boulevard Station area; explore the potential for implementing private shared parking

## Parking Requirements & Utilization Gap Analysis



**Fig. 9:** Data map illustrating the gap between minimum parking requirements and observed parking utilization in King County.

The **Parking Requirements and Utilization Gap Analysis** provides a comparison of local municipal code minimum parking requirements with multi-family off-street parking utilization forecast by the RSP web calculator. The motivation behind this research is that misaligned parking requirements may spur new development to supply more parking than necessary, leading to oversupply and increased housing costs. They can also make it difficult to unbundle the price of parking from rent as it would only lead to a higher parking vacancy rate, but no cost savings.

The analysis indicates that in most King County locations, parking requirements are higher than forecast parking utilization, often by around 50%. More than 82% of King County parcels outside the City of Seattle have minimum parking requirements that are greater than the RSP model utilization. For more information, see:

<http://metro.kingcounty.gov/up/projects/right-size-parking/pdf/gap-analysis-7-12-13.pdf>

## Right Size Parking Model Code



The RSP study found that many parts of King County have established minimum parking requirements that exceed modeled utilization. In many King County municipalities, parking codes may not be up to date with changes in land use, demographics and consumer preferences that

have already reduced – and could potentially further reduce – the demand for parking. In some municipalities, parking minimums do not take into account the fact that demand for parking varies based on unit type, occupant income, proximity to transit, or other contextual factors.

In order to address this gap, the RSP team developed the **Right Size Parking Model Code** to help local jurisdictions implement policies that more accurately reflect their stated goals, such as housing affordability and neighborhood walkability. The model code document provides policy options and model code for cities looking to better match their local parking supply with demand using an adaptable, customizable menu of options with an explanation of each policy choice.

The purpose of the model code is to provide a resource for municipalities that are interested in implementing code changes to help right-size local parking supply. The model code draws from several other components of the RSP project, including best practices research, the RSP Technical Policy Memo, multi-family utilization surveys, parking code gap analysis, the RSP calculator, and stakeholder input.

The primary recommendation of the model code is for a market-based approach to parking supply in multi-family buildings and for spillover to be controlled by on-street parking pricing in lieu of parking minimums. The document also provides, as a second best alternative, recommendations for a context-based regulatory approach in which minimums are set based on a comprehensive assessment of neighborhood and project-specific conditions.

<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/140110-rsp-model-code.pdf>





# CITY OF KENT POLICY PILOT

## PILOT FOCUS

### Parking code adjustments and parking management strategies

## CONTEXT

The Kent Downtown area is experiencing tensions as it urbanizes from a suburban retail center to a mixed-use transit node. Large surface parking lots provide public parking free of charge throughout the Downtown, and several arterials traversing the area do not currently accommodate on-street parking.

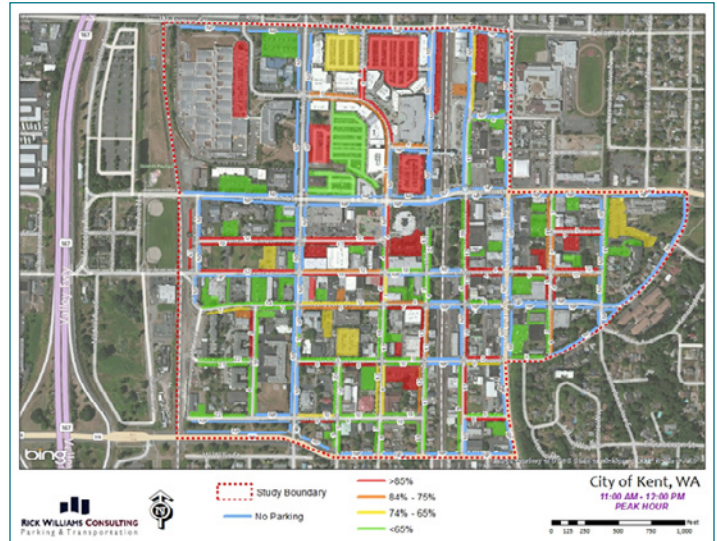
As new multi-family development integrates with the existing urban fabric, the City of Kent desires to ensure that parking is managed as a valuable resource for livability and economic development within the Downtown area. In order to provide the City with tools for achieving this goal and addressing the transitional tensions affecting Downtown Kent, the RSP team worked to identify parking code and parking management strategies appropriate for this urbanizing, mixed-use area located within a broader suburban region.

## RSP FINDINGS

A multi-family parking utilization survey conducted by the RSP team indicated that in Kent actual parking demand is less than what is required by the City's parking codes. When presented with this information, both the City and other project stakeholders expressed interest in exploring strategies for right-sizing the parking supply in Downtown Kent.

## RSP RECOMMENDATIONS

The pilot project consisted of the creation of a parking code and parking management strategy that recognize the economic value and cost of parking stalls and support the appropriate prioritization of parking users within a mixed-use context. In general, the project team found the need

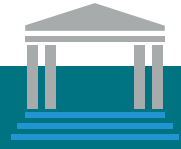


**Fig. 10:** Combined On and Off-Street Peak Hour Occupancies.

for consistent and user-friendly communication of parking expectations and regulations to different user types as well as a need for focused enforcement and management of surface parking, including dedicated employee parking.

Project deliverables included:

- Documentation of existing parking conditions and identification of parking challenges and barriers
- A policy technical memo with code alternatives that are right-sized for Kent's development context
- Prioritized recommendations for parking code adjustments
- A context-specific parking management strategy that supports RSP standards while directly addressing and responding to stakeholder concerns



# CITY OF KIRKLAND POLICY PILOT

## PILOT FOCUS

**Establish parking requirements based on actual parking demand**

## CONTEXT

The Kirkland Planning Commission and Houghton Community Council expressed interest in gaining a better understanding of how the RSP calculator tool results compared with observed multi-family parking utilization in Kirkland. To address this issue, the RSP team compared the results obtained by using the web calculator to observed parking utilization rates collected at 24 multi-family developments across the City of Kirkland.

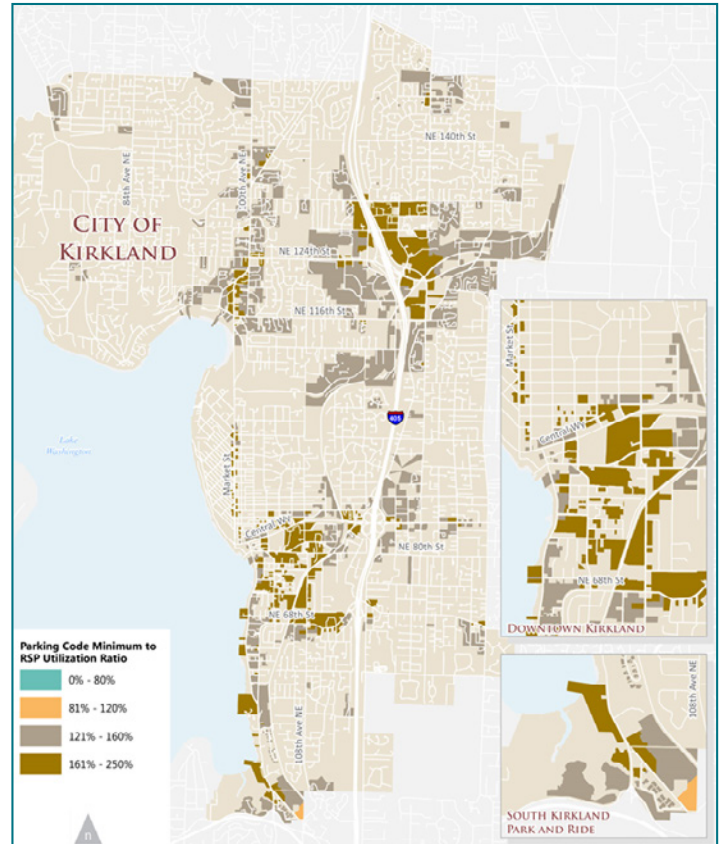
## RSP FINDINGS

The team found that the RSP web calculator generally predicts parking utilization in the City of Kirkland accurately, with most sites within +/-15 percent of the observed value. Using the results of this analysis, the team compiled a technical memo that included recommendations for adjustments in parking requirements that reflect documented parking demand and prevent parking spillover.

The team also found that in certain transit-rich environments, the calculator may overestimate parking utilization due to the sensitivity of the transit score to relatively small differences in walking distances to transit. They determined that it was reasonable to manually adjust the RSP web model accordingly to more accurately consider the availability of high quality transit service in portions of Kirkland.

## RSP RECOMMENDATIONS

- Use a unit-based approach to developing parking standards



**Fig. 11:** RSP comparison of Kirkland parking code minimum requirements to RSP utilization ratio.

- Set minimum requirements at or just below utilization rates (may warrant additional on-street parking management)
- Supplement adjustments for parking requirements that respond to transit service with additional on-street parking management strategies



# CITY OF SEATTLE POLICY PILOT

## PILOT FOCUS

### Parking Code Review, Shared Parking Strategies, and Residential Parking Zone (RPZ) Review

## CONTEXT

The City of Seattle participated in the RSP pilot to identify methods, including code and policy changes, for better balancing on and off-street parking supply and pricing. This pilot included an evaluation of existing parking codes and policies, an assessment of the existing Restricted Parking Zone (RPZ) program, and identification of opportunities to expand the feasibility of private shared parking. The goal of the project was to develop key revisions to the parking management process, tying together RSP goals of off-street requirements with effective on-street management.

## RSP FINDINGS

**Parking Code Review:** Seattle parking standards are extremely varied, with distinct separations by use types, making it difficult to “right size” parking requirements.

**Shared Parking Strategies:** Building design can facilitate shared use parking by bringing the parker to a plaza connected to both the street and the building’s private space. Signage and wayfinding systems are also important to supporting successful shared use parking.

**Residential Parking Zone Review:** The number of parking permits issued exceeds the actual supply of parking. The relationship between the cost of on-street and off-street parking is skewed to favor on-street parking, particularly where off-street parking is unbundled from rent.

## RSP RECOMMENDATIONS

The RSP team researched each of these issues and produced reports focused on each of the three analytical tasks. It is hoped that these preliminary recommendations will spur discussion around clarifying issues and strategies for making adjustments to the City of Seattle’s parking management practices:

### Minimum and Maximum Requirements Recommendations

- Consider the context of vision goals for unique areas of the City and develop an encompassing policy



Fig. 12: Signage regulating Seattle’s Restricted Parking Zones (RPZs).



Fig. 13: RPZ locations in Seattle.

foundation to “right size” parking everywhere for consistency

- Simplify the parking code by creating broader land use categories

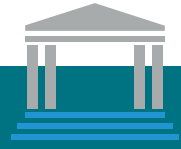
### Shared Parking Recommendations

- Research and understand the range of shared use options that could be met within existing parking surpluses
- Establish consensus on those types of shared parking that are acceptable to the City
- Develop communication and facilitation strategies that bring potential shared use partners together

### Residential Parking Zone Review Recommendations

- Increase the base price of residential parking permits and shift to monthly permit billing
- Graduate the price of residential parking permits in high-demand neighborhoods
- Modify institutional agreements
- Tie permit eligibility to off-street parking availability





# CITY OF TUKWILA POLICY PILOT

## PILOT FOCUS

### Private shared parking strategies and on-street parking user prioritization

## CONTEXT

The RSP team partnered with the City of Tukwila to perform an “audit” of the RSP web calculator tool to determine how accurately it reflected parking utilization and demand in the Tukwila International Boulevard (TIB) light rail station area. The City also sought parking policy recommendations that would support a walkable, affordable, transit-oriented neighborhood around the TIB station.

## RSP FINDINGS

The team found that the RSP model estimates parking utilization accurately for the majority of the selected sites: 15 of 18 sites fell within a 20 percent level of error. On average, apartments in the study area do not share as strong a link between good transit service and lower parking utilization as elsewhere in the County. This relationship is not very strong because current levels of transit service in Tukwila do not vary enough to make a meaningful impact on parking use.

The team found that many businesses actively take measures to prevent non-patron parking in their lots to eliminate spillover. They also found that Tukwila enforces more regulations for non-residential parking than other cities, making shared parking difficult to implement.

## RSP RECOMMENDATIONS

Based on the data gathered through the RSP audit, the team worked to identify parking strategies for the TIB station area, including an exploration of private shared parking. The RSP team proposed recommendations and strategies that would enable the City of Tukwila to achieve its vision of creating a welcoming place, supporting equity, and preserving affordability. RSP recommendations included:

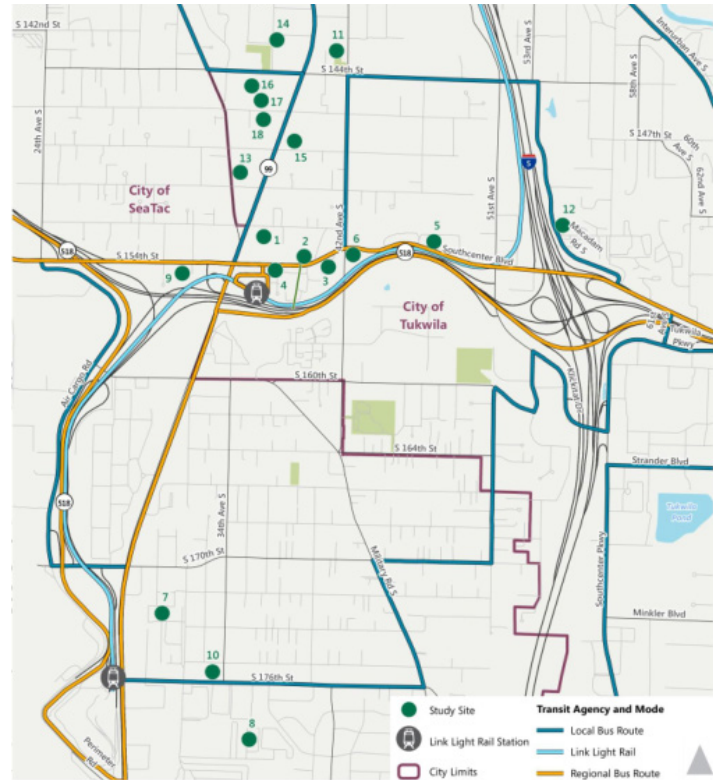


Fig. 14: Tukwila and SeaTac Study Site Locations

- Reduce multi-family parking minimums
- Develop clear policy language about the purpose and intent of on-street parking
- More directly facilitate the use of shared parking agreements between commercial and/or residential lots for off-street parking
- Create design standards that include on-street parking for new and improved streets
- Continue to monitor occupancy levels at the TIB station and transition the area to transit-oriented development



## Management pilots

Pilots to test innovations in parking management, pricing, and transportation demand management to reduce parking demand were awarded to three non-profit partners at multi-family properties in King County: Capitol Hill Housing, Hopelink, and El Centro de la Raza.

The intent of the management pilots is to generate data and case studies that reflect the impact of implementing innovative parking pricing and TDM strategies. In some cases, the RSP team took various approaches to address financial incentives that would support future pricing initiatives. Strategies explored by the partner municipalities included developing shared parking strategies at multiple scales, identifying TDM strategies for affordable housing projects, and applying RSP strategies at multi-family properties with unique federal constraints and requirements. Additional support and funding for the management pilot projects was provided by the Federal Transit Administration.

In response to stakeholder input received during the course of the pilot projects, the RSP team developed both a Multi-family Parking Toolkit and a Multi-family Development Passport transit product for use by multi-family property owners and managers. More information on these tools can be found on the following pages.

### Management pilot partners

The management pilots were selected to test RSP concepts aimed at supporting regional smart growth goals of dense, compact development that leads to non-auto mode share growth, thereby promoting affordable housing, transit and other travel alternatives. Three partners were selected through a competitive bid process:

- **Capitol Hill Housing:** Test district shared parking strategies; identify a business model to coordinate shared parking at the neighborhood level
- **El Centro de la Raza:** Identify TDM and parking management tools for a planned affordable housing project using the RSP web calculator
- **Hopelink:** Implement TDM and parking management strategies at senior and low-income properties with unique needs and constraints, including federal restrictions on pricing parking

## Multi-family Parking Strategies Toolkit



The **RSP Multi-family Parking Strategies Toolkit** is a guide that presents a set of tools for developers and property managers to use for managing parking supply in multi-family buildings. The toolkit addresses pricing, transportation demand management (TDM) strategies, design, and

parking management as well as providing a case study and additional RSP resources.

Some of the tools presented can reduce the amount of parking needed to serve residential demand, resulting in a significant positive impact on project bottom line in terms of both construction costs and rent. Others can increase parking utilization and create new revenue streams.

By encouraging alternatives to driving, these parking strategies can help facilitate transit-oriented development, protect the environment, reduce congestion, and support local businesses. Reduced parking can also earn points in green building ratings systems such as LEED.

The tools in this guide address pricing, transportation demand management, design, and parking management. They can be applied to new developments or existing buildings, and many work best when combined in a multi-pronged approach. A case study that employed some of the recommended tools is included at the end of the document.

The “toolkit” is intended only as an overview of the best tools. Further details on implementation can be obtained from widely available publications or from a parking or transportation demand management expert.

The Multi-Family Parking Strategies Toolkit can be found online:

<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/multifamily-parking-toolkit.pdf>

# CAPITOL HILL HOUSING MANAGEMENT PILOT



## PILOT FOCUS

### District shared parking strategies and business model

#### CONTEXT

Capitol Hill Housing (CHH), an affordable housing provider, engaged the RSP team to develop district shared parking strategies in the Pike/Pine corridor of Seattle’s Capitol Hill neighborhood as a means of managing oversupply. Shared parking fits strongly within Capitol Hill’s EcoDistrict program and supports neighborhood goals of developing neighborhood-scale strategies that benefit the environment while increasing housing affordability. The RSP team analyzed current Pike/Pine parking practices and economics, reviewed best practices case studies, and provided next steps toward the creation of a district parking system. The team identified a business model that could be used to coordinate shared parking at the neighborhood level.

#### RSP FINDINGS

CHH carried out the bulk of the data collection and research, drawing upon its long-standing neighborhood relationships to identify and recruit initial participants for pilot leases. The team conducted focus groups with residents as well as with owners and property managers to help develop and test the pilot lease agreements. The team generally found that neighborhood stakeholders

strongly support transitioning to a shared parking system. Stakeholder interviews revealed the following findings:

- Developers supply excess parking to reduce risk of a shortage; if that risk could be mitigated through shared parking strategies, parking ratios could be reduced
- Employers are concerned about the cost of employee time spent searching for parking
- Residents parking on the street tend to base parking decisions on price rather than on time spent looking for or walking to and from a more distant location

#### RSP RECOMMENDATIONS

The RSP team developed a four-step approach toward creating a district parking system in the Pike/Pine corridor. The progressive process, which describes an evolution from a relatively simple “Broker” model to a more complex and dynamic “Internet of Parking” model, would allow CHH to make adjustments gradually and minimize risk (see Fig. 15). Specific recommendations were made at each step regarding operations, responsibilities, and technologies.

The final report for this pilot can be accessed online:

<https://capitolhillecodistrict.org/projects/pike-pine-shared-parking/>

<b>DISTRICT SHARED PARKING BUSINESS MODEL PROGRESSION</b>				
	<b>Broker</b>	<b>Smart Broker</b>	<b>Intranet of Parking</b>	<b>Internet of Parking</b>
<b>Buyers</b>	Residents, Buildings	Broker Plus Businesses	Same as Smart Broker	Smart Broker Plus Visitors
<b>Data Collection Method</b>	N/A	Automated	Same as Smart Broker	Same as Smart Broker
<b>Data Collection Times</b>	N/A	Real Time	Same as Smart Broker	Same as Smart Broker
<b>Space Assignment</b>	Assigned	Unassigned	Same as Smart Broker	Same as Smart Broker
<b>Garage Assignment</b>	Assigned	Same as Broker	Unassigned	Same as Intranet
<b>Notification Incentives</b>	No	Yes	Yes	Yes
<b>Peak Demand Incentives</b>	No	Yes	Yes	Yes
<b>Valet Service</b>	No	Yes	Yes	Yes
<b>Equipment Changes</b>	None	Occupancy Tracking	Smart Broker Plus Card Readers	Same as Intranet
<b>Garage Communication</b>	None	One-Way	Two-Way	Same as Intranet
<b>Rental Period Length</b>	Monthly	Same as Broker	Same as Broker	Broker Plus Daily, Hourly
<b>Time Restrictions For</b>	Businesses	Same as Broker	Same as Broker	Broker Plus Individuals
<b>Target Occupancy</b>	Low	Medium	Medium-High	High
<b>Cost</b>	Low	Low-Medium	Medium-High	High
<b>Revenue</b>	Low-Medium	Medium	Medium-High	High

**Fig. 15:** The recommended business model for progression toward shared parking in Pike/Pine. Table from final report, *District Shared Parking: Program, Policy and Technology - Strategies for a More Resilient Parking System in Pike Pine*. Link to complete report provided above.



## PILOT FOCUS

### Assistance with parking demand management and improving affordable housing resident mobility

## CONTEXT

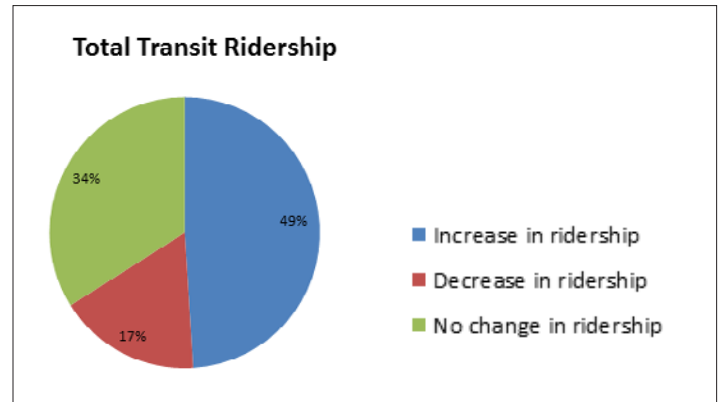
Hopelink is a non-profit community action agency that provides mobility management services in King County. Hopelink proposed implementing TDM and parking management strategies at senior and low-income properties in King County, including an exploration of parking pricing options.

In partnership with Senior Housing Assistance Group (SHAG) and Catholic Housing Services (CHS), Hopelink's Mobility Management team created Existing Conditions Reports for three SHAG properties and two CHS properties. Parking management plans were created for four of the five properties. The plans incorporated TDM best practices with site-specific factors to prioritize implementation strategies.

During the second half of 2014, prioritized strategies determined by project partners to be most feasible within the constraints of each property were implemented. Strategies specific to each study site were selected, which included shared and/or remote parking, nonmotorized infrastructure improvements, mobility management strategies, financial incentives, and parking regulation and enforcement, among others. A parking utilization assessment was conducted to gauge the relative success of the implemented strategies, and the team followed up with household surveys and staff interviews.

## RSP FINDINGS

One of the primary pilot implementation strategies was the facilitation of a Transit Incentive Program (TIP) to encourage use of public transit by residents. The program, implemented across all of the study properties, was designed to reduce dependence on private automobiles, allowing residents to consider giving up vehicles or ensuring that additional vehicles are not purchased. The TIP gave participants a fully-loaded ORCA card for four months during 2014. As a result, an overall increase in resident mobility and comfort with use of transit was observed. A



**Fig. 16** A Transit Incentive Program implemented during the pilot project resulted in increased total transit ridership.

majority of participant survey respondents reported an increase in weekly transit use (see Fig. 16). Data collected on parking utilization showed a slight decrease in parking utilization at all properties.

Additional implementation strategies included pedestrian safety enhancements, a Car2Go waiver for SHAG residents, and clarification of existing parking policies and operations practices.

## RSP RECOMMENDATIONS

Due to the regulatory framework governing facilities built using low income tax credits, the team recognized that unbundling parking, a potential strategy explored during the course of the project, would require a policy change at the federal level.

As an outcome of the pilot project, SHAG staff expressed interest in self-funding a parking utilization assessment of a nearby park-and-ride lot as well as implementing a community rideshare program for group trips.

Hopelink is currently exploring opportunities to help partner agencies develop mobility plans for residents, develop tools to explain cost differentials between gas and transit for certain trips, and facilitate financial workshops for CHS residents who are burdened by high-interest car loans.

# EL CENTRO DE LA RAZA MANAGEMENT PILOT



## PILOT FOCUS

### Traffic study and TDM plan

#### CONTEXT

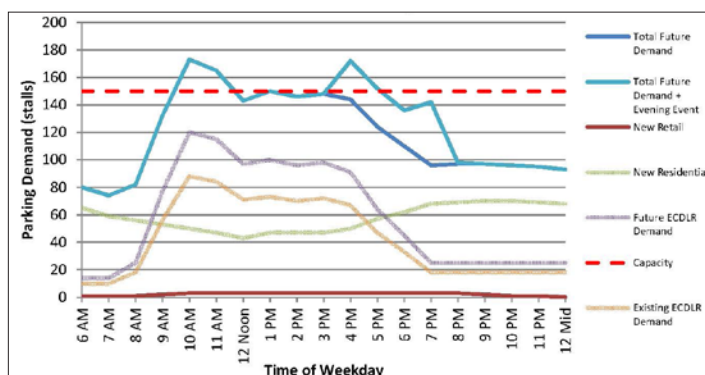
El Centro de la Raza (ECDLR), a social services organization and housing provider, sought to explore and select TDM and parking management tools for application at a planned affordable housing project, Plaza Roberto Maestas. The mixed-use project and auxiliary garage would replace existing parking lots, keeping total parking in the campus context at approximately 150 stalls while bringing new residents and businesses to the site. The team was charged with determining the parking and traffic needs on the campus after completion of the project.

The RSP team worked together with ECDLR, Beacon Development Group, the project developer, and the City of Seattle's Department of Transportation to balance parking supply and demand for the entire campus. The project began with a community meeting to gather feedback about the design of the proposed parking garage. Needed parking supply was determined using the RSP web calculator. The team conducted a parking and traffic study, which included consideration of construction parking and staging as well as recommended project-related outreach efforts.

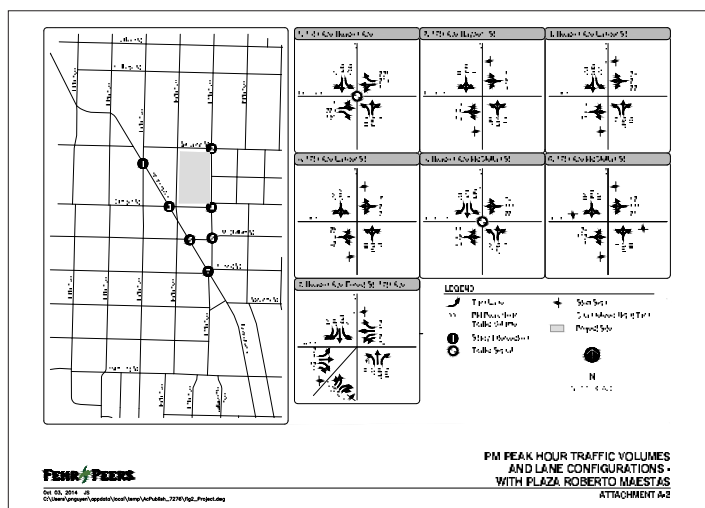
#### RSP FINDINGS

During the course of the project, the team learned that the Columbia City Station Apartments (CCSA), a 52-unit low-income 1- and 2-bedroom apartment building adjacent to the Columbia City Light Rail Station, has nearly filled its 23 rentable stalls while being situated in a similar restricted parking zone. Recognizing that paid parking could help the project and ECDLR in a number of ways, including inducing and underwriting transit ridership, ECDLR is exploring the possibility of charging households for parking with pricing scaled to reflect a percentage of tenant rent.

Though not an initial focus of the project, it became clear during the study that office-related parking demand will also influence parking demand in the completed ECDLR campus. To address ECDLR's office parking uses, the RSP team explored a TDM strategy that included layered parking uses throughout the day, establishing an organizational



**Fig. 18:** Future on-site parking demand compiled for the Plaza Roberto Maestas Traffic Study.



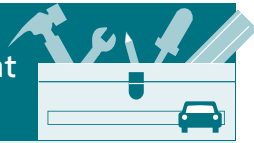
**Fig. 19:** Projected future peak hour traffic volumes and lane configurations from the Plaza Roberto Maestas Traffic Study.

account with ZipCar for ECDLR staff members, and providing 50% subsidies for employee ORCA passes.

#### RSP RECOMMENDATIONS

The calculator projections were used to identify TDM strategies for the completed project. The final RSP deliverable was an operating plan for TDM at the completed project that outlined guiding principles for implementing TDM and provided detailed recommendations regarding residential parking, alternative transportation, office and shared daytime parking, and event parking.

## ORCA Multi-family Development Passport Pilot Program



The **ORCA Multi-family Development Passport** pilot program provides an ORCA card that is an annual transportation pass for multi-family property owners or managers to offer to

residents. Participating multi-family property owners and managers purchase the ORCA cards to offer to their residents. In exchange for a substantial discount, the program requires that the ORCA card be offered to every residential unit in the building; however, participation by residents is not mandatory.

The program benefits multi-family property owners and managers by providing an amenity for residents that encourages transit use, in turn reducing traffic congestion around buildings, lessening neighborhood parking impacts, and facilitating easier building parking management. Offering this product to residents can also give building owners and managers a competitive edge in a crowded rental and real estate market and contribute to more sustainable building and transportation management practices.

Residents benefit from receiving a single card to access comprehensive transit services throughout Seattle and beyond, ensuring a convenient, flexible, and affordable transportation option for choosing how to get to work, run errands, or visit family and friends.

The cost of the passport varies depending on property location and existing transit use. After the first year of the program, the cost is adjusted based on resident participation and use from the previous year. Property owners and managers may elect for residents to co-pay up to 50% of the cost of the product.

More information on the ORCA Multi-family Development Passport program and other transportation programs available to multi-family property owners and managers can be found here:

<http://www.seattle.gov/waytogo/navSeattle.htm>





# Stakeholder Involvement & Project Outreach 5

## Telling the RSP story

Though rooted in academically-rigorous statistical analysis, it was Metro's intention that the RSP story not be solely an academic exercise. RSP's goal is to put data in the hands of those who make parking decisions in order to have a direct impact on communities, both within King County and beyond.

It was critical for the RSP project to create a call-to-action among stakeholders in order to spread the word about RSP research and to affect meaningful change in parking pricing behavior. The RSP findings tell a compelling story about the dynamics surrounding parking supply and the necessity for taking action to implement change in order to support community and regional goals.

## RSP tools and education

RSP interfaces and products have been designed with ease of use and flexibility of application in mind. The primary means by which RSP research and data have been made easily accessible to stakeholders — including policymakers, project planners and developers, and the general public — is via the RSP web calculator. In order to best leverage the research and web tool products, the RSP project also developed guidelines for parking best practices that address both regulatory and property development topics.

These products, which include the RSP Model Code, the Parking Requirements and Utilization Gap Analysis, and the Multi-family Parking Strategies Toolkit, provide hands-on guidance for decision-makers and practitioners seeking to meet organizational goals through parking reform.

## Stakeholder involvement

The RSP team recognized at the outset of the project that stakeholder outreach and involvement would be an essential component of sharing the RSP message and research. To that end, the RSP project sought an interdisciplinary approach, soliciting input from a wide array of parking stakeholders, developing innovative research and tools, providing best practices on policy reform and parking management, and implementing demonstration pilot projects with local partners. Stakeholder input came

from a variety of forums, including focus groups as well as a methods committee of national academics and practicing professionals that guided the development of the research.

The RSP team has made a concerted and comprehensive effort to spread the word about RSP findings and tools via outreach through publications, conference presentations, and meetings with interested stakeholder groups.

The project team presented the RSP research and findings at conferences focused on issues of transportation, parking management, smart growth, real estate, land use, and urban planning. The team also presented to municipal, agency, and organizational audiences that were interested in potential applications of the RSP tools and research. RSP presentations were a feature of multiple FHWA-sponsored parking pricing and management workshops throughout the country. In addition, the RSP project was shared with student audiences at the University of Washington and the University of Oregon.

The realization and implementation of the pilot projects are also a testament to the success of the RSP outreach efforts. The project team partnered with seven developer and jurisdictional partners to successfully complete pilot projects focused on parking management and policy reform.

## RSP project outreach goals and audiences

Primary RSP outreach goals included the following:

- Educate a broad range of stakeholders regarding the availability and utility of RSP tools and products
- Increase stakeholder understanding of the impacts of building too much or little parking
- Raise awareness of individual stakeholder perspectives and concerns between and among the broader stakeholder group
- Promote the website tool and other RSP products; Explain how to use the tool
- Create momentum around RSP concepts and actions within relevant industries and professions (for example, use of the web calculator by developers or policy changes on the part of jurisdictions)
- Identify new partners for RSP implementation and continued research

## “Supply & Demand: A Balanced Approach to Parking” Presentation and Panel



**Fig. 20:** Professor Donald Shoup presents on parking supply and demand at a Right Size Parking event. Photo courtesy ULI.

In February 2013, the Urban Land Institute Northwest partnered with King County Metro to present a lunch event entitled ‘**Supply & Demand: A Balanced Approach to Parking**’. The event featured opening remarks from King County Executive Dow Constantine, a keynote presentation by Donald Shoup, Professor of Urban Planning at UCLA, and a panel of local industry experts. The discussion focused on issues surrounding the art and science of parking and the presentation of groundbreaking data from the Right Size Parking Project.

Key points presented by Shoup, a highly-regarded expert in balancing parking supply and demand, included the observation that municipal land use codes have a tendency to require the provision of quantities of parking that exceed actual demand. In Shoup’s experience, city codes that keep street parking free or cheap and that seek to prevent spillover parking effects actually have the effect of distorting the parking market.

Shoup presented three potential solutions: implementing variable pricing for street parking that targets 85% parking space occupancy, returning parking meter revenue directly to the district in which it is generated, and removing off-street parking requirements for buildings in coordination with changes in land use.

A video of the full presentation can be found at:

<https://vimeo.com/65086043>

Audiences include:

- Developers of multi-family and mixed-use projects
- Financiers of multi-family and mixed-use developments
- Local government staff and decision-makers (transportation, land use/permitting, neighborhoods, economic development)
- Local, regional, national levels of public sector, industry/professional organizations
- Urban planning and architecture consultants
- Neighborhood groups with an interest in parking supply issues
- Advocacy groups with interest in the environment, smart growth, transit, health, and active transportation
- Chambers of commerce and business groups
- Academics
- Media

## Project team partners

The RSP team, which included agency, private and non-profit sector partners, worked to balance issues of parking supply with competing interests while creating tools that support economic development and community goals alike. Project outreach included the range of user types and multidisciplinary experts necessary to assure a relevant and accurate product.

Within the RSP project team, several committees were organized that helped to provide guidance for the various initiatives of the RSP project, including a **Jurisdictional/Technical Committee**, a **ULI Development Committee**, a **Methods Committee**, and an **Education Outreach Committee**. The following is a list of the key partners in the RSP project:

### Federal Highway Administration (FHWA)

The FHWA provided project funding, grant oversight, and technical review of deliverables.



## Washington State Department of Transportation (WSDOT)

WSDOT provided project management, grant oversight and progress review.

## Center for Neighborhood Technology

Metro engaged the Center for Neighborhood Technology (CNT), a non-profit organization and leader in the promotion of livable and sustainable urban communities, to assist in the development of the project research methodology. CNT worked with Metro staff and project partners to design the research to meet RSP project goals. CNT also supported the analysis and reporting of the RSP data and produced statistical models to enable the development of data-driven tools for informing and influencing development and parking supply decisions. In addition, CNT supported the production of the website calculator tool to help disseminate project information to a broad audience of potential users.

## Urban Land Institute

Metro collaborated with the Urban Land Institute (ULI) to structure the community engagement and outreach component of the RSP project. ULI reviewed the project research, explored concepts and strategies, and helped to develop and recommend guidelines and incentives to be advanced by the RSP project.

In addition, ULI established a committee to engage multi-family development professionals to support the overall program development and implementation of the RSP project. ULI was also charged with marketing and communicating the RSP work products and concepts to existing and potential project stakeholders as well as to the broader public.

## Consultant team

In addition to the project partners listed above, Metro enlisted a consultant team to provide technical expertise in the various disciplines engaged by the RSP project:

- **VIA Architecture:** Urban design and planning consultants
- **Rick Williams Consulting:** Parking and Transportation Demand Management consultants

- **Fehr & Peers:** Transportation consultants
- **Kidder Mathews:** Commercial real estate consultants

The consultant team conducted local parking demand research and data collection. The team used this information to develop guidelines for best practices and strategies for addressing parking issues in complex, mixed-use urban environments. In addition, the consultant team facilitated the stakeholder committee meetings and gathered feedback from participants.

The consultant team identified potential barriers and challenges to achieving RSP goals and collaborated to provide solutions. They also developed guidelines for implementing incentive program pilot projects.

## Pilot partners

The RSP project engaged several municipal and developer partners to participate in seven policy and management pilot projects to test the RSP model and findings. See Chapter 4 for more information on the RSP pilot projects.

## Stakeholder committees

The RSP project organized two stakeholder committees to provide valuable input and feedback to project deliverables: the **ULI Development Committee** and a **Jurisdiction Technical Committee**. These two committees were developed to provide unique skills and experience that are necessary for effectively addressing residential multi-family parking issues in King County. The two groups met together several times throughout the course of the project to ensure efficient review and input on project concepts and deliverables, including:

- Developing a common understanding of project parameters, assumptions, and outcomes
- Discussion of public/private conflicts, finding common ground, and identifying project opportunities
- Developing ideas about function, content and target audience for the RSP website and web calculator

## ULI Development Committee

The ULI Development Committee comprised a broadly representational stakeholder group consisting of ULI members representing the multi-family development community, financiers, property managers, engineers, and city planning managers.

This committee was convened to serve as a sounding board to the larger RSP project team by supporting the overall program development and implementation. The ULI Development Committee was tasked with advocating for the outcomes and solutions developed through the project and serving as a liaison to the real estate community during project implementation. In addition, the committee provided targeted support to the following RSP project efforts:

- Identification of barriers and solutions to RSP development in multi-family and mixed-use properties within King County
- Development of a list of monitoring and measurement metrics, including identification of gaps in information
- Creation of technical program guidelines, model code language and development of incentives
- Oversight of RSP community engagement and outreach, including development of a project implementation plan

## Jurisdiction Technical Committee

The Jurisdiction Technical Committee was composed of members familiar with the technical issues surrounding parking demand and its implications for urban development and transportation. Committee members included jurisdiction technical staff members from cities throughout King County, with a representative mix of expertise in permit review, long range planning, code writing, traffic demand management, and traffic engineering.

The Jurisdiction Technical Committee provided public sector stakeholder review and input on technical aspects of the RSP project, such as new methods to assess multi-family residential parking demand, and suggested policy and zoning regulations to allow a reduction in parking supply when appropriate. The committee provided additional support to the RSP project in the following ways:

- Identification of barriers to RSP and the corresponding development of innovative but practical solutions that could be implemented locally
- Contribution to the creation of products that help jurisdictions and developers build successful transit-oriented communities
- Review, revision, and testing of RSP products
- Provision of advice and feedback for the development of technical program guidelines and incentives necessary for the implementation of a new approach to parking

The RSP project has attracted national attention. Several regions and cities around the country are currently working to replicate the RSP study and web calculator concept for their own planning purposes, including the San Francisco Bay Area, Washington, D.C., Boston, and Chicago. Many regions are reexamining parking requirements in support of pedestrian-oriented design, transit access, and a compact mix of uses to increase transportation choices. Such priorities demonstrate a long-term commitment to RSP principles such as lowering reliance on cars, and they provide justification for reductions in or elimination of requirements for off-street parking in multi-family developments.

The strategies and tools created by the RSP project offer a model to jurisdictions aiming to base parking decisions on local data and sound scientific methods, as well as to developers seeking to determine how much parking to supply in a multi-family building. In particular, the web calculator tool advanced the parking industry by developing a context-sensitive approach to predicting multi-family residential parking utilization.

## Overall challenges and successes

### Challenges

The primary challenges faced by the RSP team during the course of the project involved questioning and challenging institutionally-entrenched “status quo” assumptions about parking utilization and demand. These assumptions influence public perception of parking supply and demand dynamics. They provide the foundation for developer and financier decisions regarding the building of new parking in multi-family projects and are not necessarily aligned with the realities of current conditions in many urban contexts, as the RSP research revealed.

Another challenge faced by the team was ensuring property manager follow-through with research assistance during the data collection stage of the project.

### Successes

RSP has significantly advanced the industry’s understanding of residential parking dynamics through its high-quality, comprehensive research, originality, and transferability to other regions. RSP presentations were a feature of multiple FHWA-sponsored parking pricing and management workshops throughout the country. The RSP study was also recently featured by both ITE and the Transportation Research Board, and it has received national attention for its innovative data-driven process, strategies of public engagement, and best practice policy development.

The pilot projects have demonstrated that the results of the RSP research can help to successfully support and guide decisions about parking supply and management. RSP tools and strategies can serve as resources to inform discussions as users weigh the factors affecting parking use and consider how much parking to provide or how much to reduce parking requirements.

### Top Tips for Implementing RSP



Following are the top recommendations from the project team to other cities looking to implement RSP:

- **Good communication is important.** Maintain good relationships between real estate and jurisdictional communities.
- **Data collection takes time.** Develop strong methods that can be implemented efficiently and consistently.
- **Consider your audience.** Create tools and products that are audience-specific, context-relevant and user-friendly.
- **Improve upon the research.** The RSP project is one approach to understanding the relationship between parking supply and demand, and it lays the groundwork for future research efforts. The RSP team would like to see future efforts continue to develop and improve the research methodology. This might include conducting resident surveys, analyzing vehicle licensing information, and including on-street parking counts in the project data.

## Next steps for RSP

RSP data and methodologies are currently being shared with ITE and other interested parties beyond King County, leading to subsequent projects in other regions and potential inclusion in the next edition of the *ITE Parking Generation Manual*. RSP has garnered national attention, spurring initiatives in other regions, and many communities are examining the project to identify how RSP concepts can be implemented in their area.

One of the most important aspects of the RSP project is its up-to-date and context-specific data. Because many of the areas included in the RSP data collection sample continue to experience rapid development that results in an ever-changing context, it is important that data collection and database updates remain an ongoing piece of the

RSP effort. The RSP team is analyzing options for regularly updating RSP data and the website calculator to ensure the continued accuracy of the model estimates.

Current RSP goals include continuing to gather momentum on data-driven parking allocations and securing additional partnerships for pilot projects. The RSP team also plans to develop a monitoring evaluation program to measure the effectiveness of the incentive program pilot projects.

See the project website for more information on the Right Size Parking Project: <http://metro.kingcounty.gov/programs-projects/right-size-parking/>



## GREENTRIP PARKING DATABASE CASE STUDY

The GreenTRIP Parking Database provides data from more than 65 multi-family residential sites around the San Francisco Bay Area, a region that has shown a trend in decreased car ownership in recent years.

The GreenTRIP Parking Database project built upon the research methods developed by the King County Multi-family Residential Parking Calculator. Although not a predictive model like the RSP calculator, the GreenTRIP Parking Database takes into account many similar factors, such as income and access to transit.

Working together with CNT, the GreenTRIP team used lessons learned from RSP to optimize data collection, resulting in a wider range of data for each site. The database also incorporated more about depth of affordability than the RSP data set.

The parking database can be used to search for specific sites and to view actual total parking used at a particular location or for a particular building type. Reports can be printed and shared freely with developers and decision-makers.

The Metropolitan Transportation Commission (MTC) partially funded the research that served as the basis for

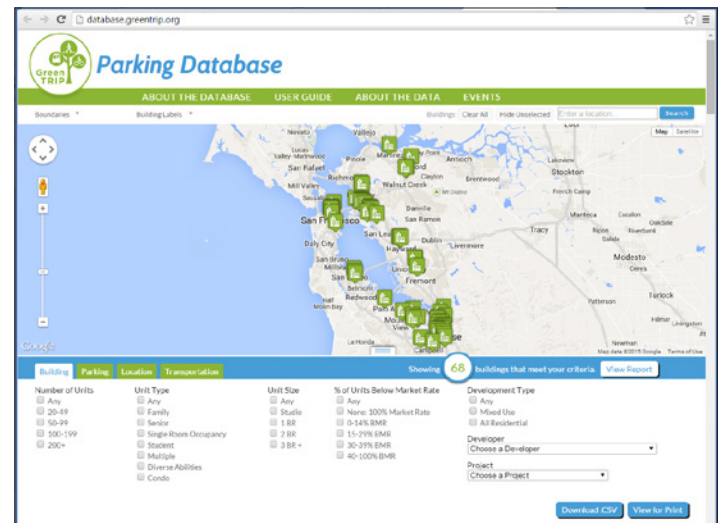


Fig. 21: The GreenTRIP user interface.

the GreenTRIP database, with additional support from a U.S. Department of Housing and Urban Development grant.

The GreenTRIP Parking Database can be found at:

<http://database.greentrip.org/>

## Right Size Parking products and tools King County Metro web resources

In an effort to ensure that the project data and findings continue to be easily accessible and usable by the full spectrum of stakeholders, the team created a set of technical memoranda, RSP “toolkit” documents, and a multifaceted web calculator tool to aid users in determining how much parking is “just enough” for a specific site. These tools, listed below, are described in further detail throughout this report (look for the RSP tool icon below) and can also be accessed online:



- **Right Size Parking Literature Review**  
Review of existing parking supply standards and studies  
[http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-litreview\\_11-2011.pdf](http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-litreview_11-2011.pdf)
- **King County Multi-family Residential Parking Calculator**  
Interactive map-based RSP web calculator  
<http://www.rightsizeparking.org/>
- **Right Size Parking Technical Research Memo**  
A summary of the RSP research findings  
[http://www.rightsizeparking.org/Right\\_Size\\_Parking\\_Technical\\_Memo.pdf](http://www.rightsizeparking.org/Right_Size_Parking_Technical_Memo.pdf)
- **Right Size Parking Technical Policy Memo**  
Provides policy-based solutions to identified RSP barriers  
<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-technical-policy-memo-final-09-17-12.pdf>
- **Right Size Parking Model Code**  
A menu of RSP model code language for jurisdictions  
<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/140110-rsp-model-code.pdf>
- **Parking Requirements and Utilization Gap Analysis**  
Comparison of code requirements and actual utilization  
<http://metro.kingcounty.gov/up/projects/right-size-parking/pdf/gap-analysis-7-12-13.pdf>
- **Multi-family Parking Strategies Toolkit**  
RSP parking management toolkit for property owners  
<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/multifamily-parking-toolkit.pdf>

### King County Metro Right Size Parking website

The **King County Metro Right Size Parking website** includes an introduction to the RSP project and web tool, an overview of the project objectives, and links to project deliverables and additional resources.

<http://metro.kingcounty.gov/programs-projects/right-size-parking/>

### King County Multi-family Residential Parking Calculator

The **King County Multi-family Residential Parking Calculator** is the interactive web tool that enables a wide variety of audiences to interact with the RSP data and apply the project research and findings to specific projects or areas.

<http://www.rightsizeparking.org/>

### Right Size Parking Glossary

The **Right Size Parking Glossary** provides definitions for project-related terminology and further describes key project concepts and variables.

<http://www.rightsizeparking.org/glossary.php>



## Additional resources & related research:

- Minimum Efforts: How a City Successfully Addressed Minimum Parking Requirements for Multi-family Properties, Daniel Rowe, *Parking Professional Magazine*, November 2013. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/parking-professional-article-nov-2013-drowe.pdf>
- Do Land Use, Transit, and Walk Access Affect Residential Parking Demand?, Daniel Rowe, Ransford S. McCourt, P.E., PTOE, Stephanie Morse, and Peter Haas, Ph.D., *ITE Journal*, February 2013. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/ite-journal-feb-2013-drowe.pdf>
- Contemporary Approaches to Parking Pricing: A Primer, U.S. Department of Transportation, Federal Highway Administration, May 2012. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/fhwa-parking-pricing-primer.pdf>
- Getting the Parking Right for Transit-Oriented Development, Ming Zhang, Katie Mulholland, Jane Zhang, and Ana J. Gomez-Sanchez, Center for Transportation Research, University of Texas at Austin, March 2012. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/getting-the-parking-right-transit-oriented-development.pdf>
- Searching for the Right Spot: Minimum Parking Requirements and Housing Affordability in New York City, Furman Center for Real Estate & Urban Policy, New York University, March 2012. [http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/furman-parking-requirements-policy-brief\\_3-21-12-final.pdf](http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/furman-parking-requirements-policy-brief_3-21-12-final.pdf)
- Evaluating the Impact of Transit Service on Parking Demand and Requirements, Daniel H. Rowe, C.-H. Christine Bae, and Qing Shen, *Transportation Research Record 2245*, December 2011. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/trb-rowe-transit-service-impacts-parking.pdf>
- San Diego Affordable Housing Parking Study, Wilbur Smith Associates, December 2011. <http://www.sandiego.gov/planning/programs/transportation/mobility/pdf/111231sdafhfinal.pdf>
- Parking Evaluation: Evaluating Parking Problems, Solutions, Costs, and Benefits, Victoria Transport Policy Institute, October 2011. <http://www.vtpi.org/tdm/tdm73.htm>
- Parking Pricing Implementation Guidelines, Todd Litman, Victoria Transport Policy Institute, March 2011. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/park-pricing.pdf>
- Parking Demand and Zoning Requirements for Suburban multi-family Housing, Richard Willson and Michael Roberts, 90th Annual Meeting of the Transportation Research Board, January 2011. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/willson-parking-demand-suburban.pdf>
- A Parking Utilization Survey of Transit-Oriented Development Residential Properties in Santa Clara County, San Jose State University and Santa Clara Valley Transportation Authority, December 2010. <http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/vta-tod-parking-survey-report-vol2.pdf>
- The Trouble With Minimum Parking Requirements, Donald Shoup, December 1999. <http://www.vtpi.org/shoup.pdf>
- Smart Growth Alternatives to Minimum Parking Requirements, Christopher V. Forinash, Adam Millard-Ball, Charlotte Dougherty and Jeffrey Tumlin. [http://www.urbanstreet.info/2nd\\_sym\\_proceedings/Volume%202/Forinash\\_session\\_7.pdf](http://www.urbanstreet.info/2nd_sym_proceedings/Volume%202/Forinash_session_7.pdf)



