APPENDIX C

Technical Memorandum #3:

Overnight Parking Analysis

1. Introduction

This technical memorandum documents parking occupancy during periods of high and low visitor parking to evaluate traffic congestion caused by motorists circulating, or "cruising," for on-street parking. Several parking studies in the United States estimate in urban areas, an average of 30% of traffic consists of cars circulating in search of a parking space. Reducing this cruising traffic in the Union Street Study Area (see Figure A) may improve conditions for all modes by alleviating congestion, as well as conflicts between cruising motorists and pedestrians, cyclists, or other motorists. This memorandum evaluates and makes recommendations for parking management strategies on Union Street and in the surrounding area to reduce cruising for parking along the Union Street corridor. The parking analysis area is bounded by Pendleton Street in the north, Washington Street in the west, the Capital Beltway (I-495 and I-95) in the south, and the Potomac River waterfront in the east, as shown in Figure B.

2. Background and Purpose

The 2010 Old Town Area Parking Study (OTAPS) documented parking conditions in Old Town, developed recommendations to resolve existing issues, and established the OTAPS Work Group (Work Group) to recommend and oversee implementation of parking management strategies and provide ongoing parking management analysis. The 2010 OTAPS found parking garages were underutilized and on-street parking availability was limited, especially during the evening and weekend periods studied. The 2010 OTAPS made several recommendations which the City has since implemented following approval of the Work Group, including installing multi-space meters, increasing parking meter prices, extending on-street meter hours, and implementing an area-wide parking wayfinding program. Recommendations not yet implemented include increasing parking enforcement, implementing a public valet parking program, decreasing allowable parking duration, and providing real-time parking information. This technical memorandum considers all recommendations of the OTAPS, whether implemented or not implemented, and ongoing discussions of the Work Group.

This technical memorandum also references Donald Shoup's 2005 book *The High Cost of Free Parking* to inform the evaluation of traffic congestion caused by cruising for on-street parking and the effects of parking pricing on motorist behavior. Numerous parking studies identified in Shoup's book investigate the nature and impact of cruising for parking and indicate the

availability of on-street parking is a significant factor affecting the time spent circulating for parking. To minimize unnecessary cruising traffic, most parking management strategies recommend maintaining about one open and available parking space per block face, or each side of the street per block. The OTAPS Work Group sought to maintain one to two available parking spaces per block. Shoup also contends pricing is the single most important factor impacting the decision to cruise for an on-street parking space or park in an off-street location.

When motorists cannot find on-street parking and there is no suitable alternative, whether due to lack of off-street parking facilities, higher prices in off-street garages or lots, or even factors like poor accessibility, location, education, or security of off-street facilities, motorists will continue to cruise for an on-street space. The time motorists are willing to cruise and the distance away from their destination they are willing to park depends on the available alternatives, previous experiences, and personal preferences, but is most significantly influenced by price.

Shoup illustrates how supply and demand govern private parking facilities, which maximize their revenue by charging an amount such that they are 50% occupied, while the lower, publicly optimal occupancy would maintain these facilities at 85% occupied. The OTAPS parking garage occupancy data supports this theory, showing that during times when on-street parking was fully occupied, most surrounding garages were only at 50-79% capacity. Shoup later asserts that cities can use two pricing strategies to make on-street parking and off-street parking competitive in price and discourage cruising: (1) charge the market price for on-street parking, or (2) reduce the price of off-street parking. Either way, if off-street and on-street parking are priced competitively, motorists have less motivation to cruise for an on-street space.

3. Data Collection

Block-by-block parking occupancy was collected from 7 to 9 PM on a Wednesday evening and Friday evening to determine the weekday and weekend parking occupancy during the highest visitor hours in May 2012. The following mornings from 3 to 5 AM, block-by-block parking occupancy was collected to capture the residential demand for parking at a time when only residents or overnight guests would be parked on the street.

Along each block, the total capacity for on-street parking was counted in addition to the number of spaces occupied. If capacity could not be determined in the field, it was calculated assuming 18-20 feet per parked car, mimicking the 2010 OTAPS methods for consistency.

4. Data Results and Analysis

The data collected, the 2010 OTAPS and associated data, and other resources support the following analysis of on-street and off-street parking.

4.1 On-Street Parking

Parking occupancy data collected is summarized in several different ways, each broken down by block face, or one side of the street per block. Figures C-F illustrate the percentage of parking spaces occupied based on the total number of spaces available. Figures G-J illustrate the number of parking spaces available on each block face in intervals of 0, 1, 2, 3-5, and 6 or more. Figures K and L illustrate the difference between the AM and PM parking occupancy.

Cars parked on Union Street

4.1.1 Percentage of Cars Parked and Number of Available Spaces

The percentages of cars parked were higher in the evening, particularly along Union Street and between Queen and Duke Streets, as shown by percentage of parking spaces occupied in Figures C-F.

The number of available spaces on each block further reveals the likelihood of cruising for parking. On blocks with zero spaces, as shown in red on Figures G-J, a car must continue cruising to find a parking space. Motorists looking for parking within one or two blocks of their destination on King Street may have to drive past several blocks on a weekday evening (Figure G), and even more on a weekend evening (Figure I), before finding an available parking space. Motorists desiring to park even closer to their destinations will struggle further, potentially circulating until a spot on a specific block empties. In Figures G-J, the yellow and orange blocks

indicate that parking demand and supply are balanced and follow the City's effort to maintain one to two available parking spaces per block.

In the morning (Figures H and J), fully occupied blocks indicate a high demand for residential parking. Residents who live on these blocks may not be able to find parking directly in front of their homes. In some cases, such as along Wolfe, Wilkes, and Gibbon Streets between Pitt and Union Streets or along Queen Street between St Asaph and Royal Streets, residents may have difficulty finding parking on their street within two blocks of their homes.

Many blocks in the King Street core do not meet the desired parking availability of one space per block face in the evening, especially on the weekend. Table A states the number and percentage of block faces with one or more available spaces. Of 38 metered block faces on and near King Street, 24 had an available space on the weekday and only 14 (fewer than 40% of block faces) had an available space on the weekend. During the study period, meter regulation ended at 7 PM, so on-street parking was effectively free at all metered locations.

Off-street parking location	total # of block faces	# of block faces w/ at least 1 open space		% of block faces w/ at least 1 open space	
		Weekday Evening	Weekend Evening	Weekday Evening	Weekend Evening
Metered spaces w/in 1 block of King (Cameron to Prince)	38	24	14	63%	37%
Non-metered spaces 0-2 blocks North of King (Queen to King)	31	22	18	71%	58%
Non-metered spaces 0-2 blocks South of King (King to Duke)	35	19	17	54%	49%
Non-metered spaces 2-3 blocks North of King (Princess to Queen)	28	18	16	64%	57%
Non-metered spaces 2-3 blocks South of King (Duke to Wolfe)	23	15	17	65%	74%
All non-metered spaces 0-3 blocks from King Street	117	74	68	63%	58%

Table A: Block faces with at least one available space by distance from King Street

4.1.2 PM Occupancy versus AM Occupancy

Figures K and L show the difference between parking occupancy in the morning and in the evening. Grey blocks have equivalent parking occupancy between 7 and 9 PM as between 3 and 5 AM give or take one parked car. The darker blue indicates more cars parked in the evening compared to the morning and the darker red indicates more cars parked in morning compared to the evening. The blue blocks likely indicate high visitor parking demand due to proximity to commercial destinations while the red blocks indicate high residential demand due to proximity to residences. To further reveal this relationship, the blue overlay represents areas

with commercial zoning, pink represents residential zoning, and purple represents mixed-use zoning. The blocks with higher evening parking (blue blocks) are typically in or bordering commercially zoned areas, while the blocks with higher residential parking (red blocks) are in residentially zoned areas. There are some residential blocks with higher parking occupancy in the evening, which may indicate spillover from nearby commercial areas such that residents may have difficulty parking near their homes.

4.1.3 OTAPS Work Group Parking Occupancy by Permit District

In July 2012, the OTAPS Work Group collected data on the parking occupancy in a sample of blocks in Residential Permit Parking (RPP) Districts 1-5 at 11:00 AM, 5:00 PM, and 10:00 PM. This data identified the cars parked on each block face by their Alexandria tax and RPP stickers. An Alexandria tax sticker indicates that the owner lives in the City of Alexandria and an RPP sticker indicates the owner's district. Each owner falls into one of four categories: (1) Alexandria resident, same district (2) Alexandria resident, different Old Town district, (3) Alexandria resident, non-Old Town, (4) non-Alexandria resident.

The OTAPS Work Group summarized the 2012 data by district. The study area of this technical memo is located within RPP Districts 1 and 2. The City is considering parking management strategies in RPP Districts with occupancy greater than 85%. In district 2, parking occupancy was lower than this threshold (59% to 74% occupied) during all hours studied. In district 1, parking occupancy is higher, with occupancy rates between 66% and 92%. Additionally, approximately 60%, 70%, and 90% of parked cars had district 1 permits in the midday, early evening, and night periods, respectively. Since most parking management regulations the Work Group considered do not apply to permit holders, the OTAPS Work Group determined that maintaining one space per block face in areas where most (up to 90%) of parked cars have permits would be extremely difficult. Thus, the Work Group felt there was little they could do to help manage parking in district 1.

Analyzing the district data more closely reveals different conditions in different areas. The Work Group collected data in two sections of this district: (1) from Prince to Duke Streets between Royal and Lee Streets, all within three blocks of King Street, and (2) from Gibbon to Franklin Streets between Fairfax and Union Streets and from Franklin to Jefferson Streets between Fairfax and Lee Streets, in a residential area several blocks south of King Street. The

proportion of district 1 permit holders parked on the blocks closer to King Street was consistently lower than on the blocks further from King Street, as shown in Table B.

		11:00 AM				5:00 PM				10:00 PM			
		Same Dist.	Diff. Dist.	Non-Old Town	Non-Alex	Same Dist.	Diff. Dist.	Non-Old Town	Non-Alex	Same Dist.	Diff. Dist.	Non-Old Town	Non-Alex
Weekday	Gibbon to Jefferson	59%	0%	8%	33%	93%	1%	1%	5%	90%	1%	2%	7%
	Prince to Wolfe	49%	1%	8%	42%	58%	2%	14%	26%	90%	0%	4%	5%
	All	53%	0%	9%	37%	71%	2%	8%	20%	90%	0%	3%	7%
Friday	Gibbon to Jefferson	76%	0%	4%	20%	87%	0%	5%	8%	90%	1%	4%	6%
	Prince to Wolfe	58%	1%	14%	27%	59%	2%	16%	24%	89%	0%	3%	8%
	All	67%	1%	8%	25%	70%	1%	10%	18%	88%	0%	5%	7%

Table B: On-street parking in residential permit parking district 1 by vehicle owner and location

At 10 PM, 90% of parked cars throughout the district have district 1 permits, but at 5 PM, fewer than 60% of cars near King Street have district 1 permits, compared to 90% in the residential area further from King Street. This indicates that parking management strategies recommended later in this memorandum and discussed by the Work Group could still help manage parking on the blocks near King Street and reduce cruising for parking during the early evening hours.

4.2 Off-Street Parking

As Shoup attests in *The High Cost of Free Parking*, competitive pricing of on-street and off-street parking facilities is key to maintaining one available space per block face and reducing cruising for parking. Based on the 2010 OTAPS data, off-street parking facilities on Union Street or The Strand during the weekday and weekend evening charge between $0.50 and $7 for the first hour, with maximum prices of $2 to $12. Figure M identifies the off-street parking facilities within the study area of this technical memorandum and cites their hours of operation and pricing structure on weekday and Saturday evenings, according to the OTAPS.

During meter-regulation hours on a Saturday evening in the study area of this technical memorandum, motorists parking for only two hours on Union Street could park on the street for $0 to $3.50 or in a garage for $4 to $12. With higher prices for off-street facilities, drivers have little motivation to park in a garage and will likely cruise for on-street parking. Prices are lower in City-owned garages than privately owned garages, with hourly rates as low as $0.50;

however, the number of publicly available hourly or daily spaces in these garages may be limited.

Motorists wishing to park for longer than two hours are more likely to park in the garage due to the two-hour time limit on most blocks, but some could park on the street if the two-hour limit for on-street parking is not actively enforced, as suggested in the 2010 OTAPS. Additionally, meter hours end at 7 PM, so the two-hour parking limit is no longer applicable after 5 PM. Thus, all drivers arriving after 5 PM are more likely to cruise for on-street parking than to park off street. During meter-regulation hours, even with the increased cost of on-street parking from $1.00 to $1.75 per hour after the 2010 OTAPS, the data collected for this technical memorandum indicates that pricing for on- and off-street parking in Old Town may be encouraging motorists to cruise for on-street parking.

The OTAPS showed that parking garages were generally under occupied, especially on the weekend and the weekday evenings, as shown in Attachment A. The City of Alexandria owns four garages within the study area of this technical memorandum. These garages have the following space allocation:

- Courthouse Garage – 289 total spaces, 196 monthly and 93 daily
- Market Square – 240 total spaces, 113 monthly, 106 daily, and 21 for City use
- Thompson Alley – 68 total spaces, 54 monthly and 14 daily
- N. Union Street – 175 total spaces, 130 monthly and 45 daily

Of the 772 parking spaces in City-owned garages, 258 are available for public use on an hourly or daily basis. The OTAPS did not distinguish between monthly and daily spaces in the parking garages when considering occupancy.

As shown in Figure M, the City-owned garages typically have later hours and lower rates of operation than privately owned off-street parking facilities. Privately owned garages often charge higher prices for parking to maximize revenue, resulting in lower occupancy, whereas publically owned garages charge lower prices to provide a socially optimal parking occupancy with lower total revenue, as illustrated in Chart A. Chart A charts parking demand (percentage of spaces occupied), price of parking ($/hour), and total revenue ($/hour). The price scale on this chart is for illustration purposes and does not reflect parking pricing in Old Town Alexandria. In this example, garage owners would need to charge $0.15 per hour to achieve the "socially optimal occupancy" of 85%, which results in a total revenue of approximately $15 per

hour, as shown by the leftmost dotted line. To maximize total revenue (approximately $25/hour), the garage could charge $0.50/hour, which corresponds to an occupancy of approximately 50%.

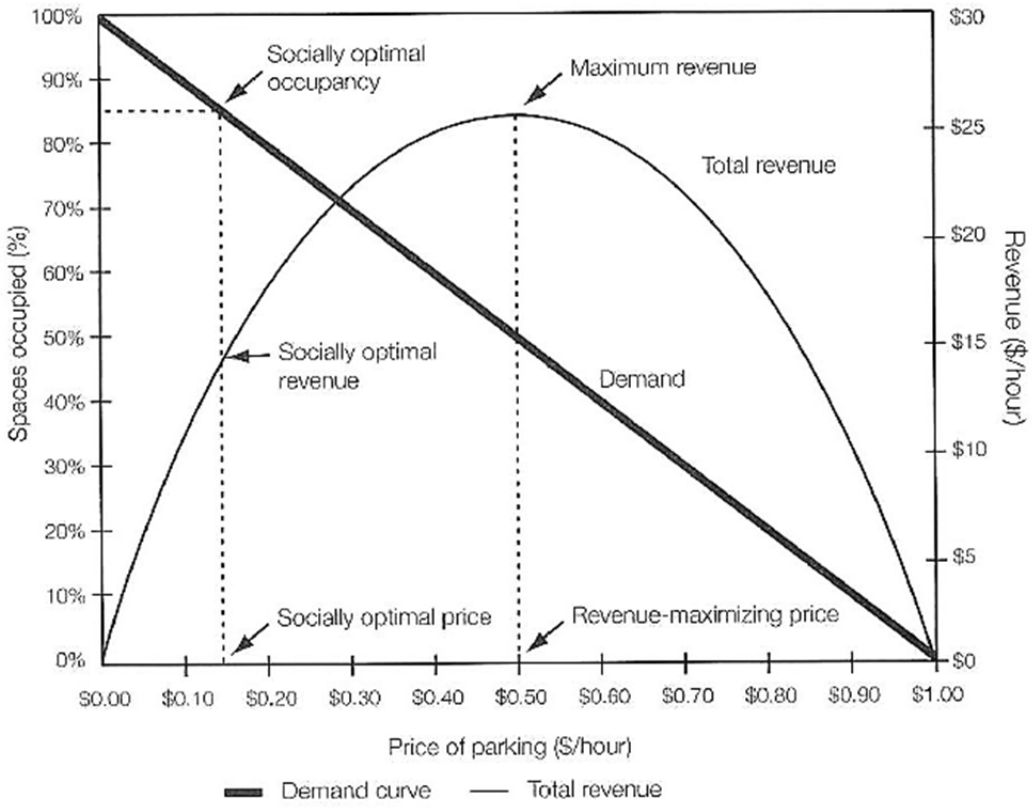


Chart A: Parking Prices, Occupancy, and Revenue (Source: Shoup, *The High Cost of Free Parking*)

5. Preliminary Recommendations

The following recommendations include both traditional strategies and innovative technologies for parking management to discourage cruising and improve parking conditions in Old Town Alexandria.

5.1 Enforcement

5.1.1 Increase enforcement of parking regulations

Illegal parking practices, particularly parking longer than the time restriction, can decrease the turnover of parking spaces, limit the residential parking available, and reduce the number of spaces available on a block. The City of Alexandria's parking enforcement resources are limited. Officers frequently get pulled off parking enforcement to handle other incidents. The City is testing a license-plate reader which could reduce five hours work to about 20 minutes of

work for a parking enforcement officer. Use of this technology should be prioritized because it could significantly improve parking enforcement and discourage illegal parking. This effort is critical because any further changes to the parking regulations in Old Town will likely be unsuccessful if not enforced.

5.2 Regulations and Operations

5.2.1 Make on-street and off-street parking pricing competitive

As mentioned earlier, Shoup's research contends that cities can use two pricing strategies to discourage cruising: (1) charge the market price for on-street parking, or (2) reduce the price of off-street parking.

Increase parking-meter fees

Presently, most metered parking in Old Town is $1.75 per hour, at a maximum of $3.50 for two hours. Compared to off-street facilities, on-street parking is still underpriced. The "sweet spot" for pricing would maintain one empty space per block face and encourage visitors to Old Town to park in under-capacity off-street facilities or take alternate modes of transportation. The City should increase pricing incrementally and study the effects of each increase to determine the optimal price.

Reduce costs of off-street parking

As shown in Chart A, privately owned parking garages structure pricing to maximize revenue, rather than to achieve socially optimal occupancy (85%). The City could consider working with garage owners to subsidize parking prices in these garages to make on- and off-street parking prices more competitive.

Additionally, the City should further study their off-street parking facilities to determine the garage occupancy by monthly and daily parking at different times of the day and week. The City could consider eliminating monthly parking spaces in favor of providing lower monthly prices with open parking for both monthly and daily users. With this structure, monthly parkers would not be guaranteed a specific parking space within the lot. Alexandria may also consider making monthly parking spaces open for daily parking on the evenings and weekends only. If the City is able to maximize the parking capacity of their garages, they could lower rates and still achieve socially optimal 85% occupancy.

5.2.2 Add meters in unmetered locations within three blocks of King Street

As shown on Figures G and I and in Table A, approximately 40% of block faces within three blocks of King Street do not have an available space between 7 and 9 PM on either a weekend and weekday. Three north/south blocks in Old Town are equivalent to approximately ¼ mile, which is a common estimate for acceptable walking distance. Presently, visitors unwilling to pay for parking might cruise for a space in the non-metered blocks within the ¼ mile radius of King Street. More motorists may consider doing the same if meter prices increase at the current meters. The City should consider adding meters between Princess and Wolfe Streets (three blocks to the north and south of King Street) so that occupancy on these block faces can also be managed to one available space per block through appropriate pricing and other methods mentioned in this section. Motorists who currently park on these blocks would then have to pay for parking within walking distance of King Street or take an alternate mode of transportation, though they may consider parking for free outside the ¼ mile radius. This strategy could reduce cruising and increase on-street parking availability for residents.

Current residential exceptions should be maintained and two-hour parking should remain in effect during the current hours, with the same meter regulation as along King Street. The City may consider a distance-based pricing structure with lower prices at these new meters than the prices within one block of King Street because parking further from King Street is less appealing and may not require such competitive pricing to achieve optimal occupancy.

5.2.3 Add meters in unmetered commercial locations

All blocks with commercial uses should be metered to increase turnover of parking spaces, which would help businesses on that block by increasing potential for customers. This change could also reduce cruising and increase revenue for the City. On blocks which also have residences, users with residential permits could be excluded from the time restriction and fee. Several blocks along commercial properties with higher parking occupancy in the evening than in the morning would be suitable for adding these multi-space meters. Such blocks include Pendleton Street from St Asaph Street to Washington Street, Queen Street from Fairfax Street to Lee Street, and Lee Street from Queen Street to Cameron Street. If meters are added within three blocks of King Street, some of these blocks will be included; however, commercial blocks should still be considered even if the previous recommendation is not implemented.

5.2.4 Consider extending meter operation through Sunday

The majority of meters in the Old Town are currently in operation Monday through Saturday. Almost all off-street parking facilities in Old Town charge the same price on Sunday as Saturday and none of these facilities provide parking for free on Sunday. The City should study the effects of enforcing meters on Sunday as a way to reduce cruising for parking.

Though neither the 2010 OTAPS nor this study collected parking data for Sunday, the vehicular volumes along the Union Street corridor indicate the potential demand for parking. Specifically, the daily traffic volumes on a Sunday are only slightly lower (approximately 10%) compared to Saturday. Based on these volumes, Sunday parking occupancy is likely comparable to parking occupancy during other days of the week.

The City should further study Sunday parking occupancy and consider implementing meter enforcement on Sunday.

5.2.5 Increase duration of parking meter hours until 10 PM.

Present meter hours are until 7 PM, which effectively ends the two-hour restriction at 5 PM because a motorist can park at 5 PM, pay for two hours of parking, then remain in that space until parking restrictions begin the following morning. If parking meter hours were extended until 10 PM, the City could collect three more hours of parking meter fees and improve turnover by extending the effective two-hour limit until 8 PM.

This study observed very high occupancy rates on metered blocks after meter enforcement hours ended at 7 PM. Of 38 metered block faces on and near King Street, 24 had an available space on the weekday and only 14 (fewer than 40% of block faces) had an available space on the weekend. This indicates that, without meter enforcement after 7 PM, the goal of one space per block face is not being met and it is very likely that motorists are cruising for parking.

Further, all parking garages and lots in the study area are open past 10 PM on weekends, with only two of the 15 garages/lots (12% of total spaces) closing before 10 PM on weekdays. With metered hours ending at 7 PM, on-street parking in Old Town is severely underpriced compared to off-street parking, which encourages cruising for parking.

Therefore, all metered spaces in Old Town should remain in operation with the two-hour time limit and fees in place until 10 PM on weekday and weekend evenings.

5.2.6 Increase duration of two- or three-hour restriction in residential permit parking districts

Presently, two- and three-hour restrictions in RPP Districts begin at 8 AM Monday through Saturday and at 11 AM on Sunday. These restrictions end at varying times of the evening from 5 PM to 2 AM, with most ending at 11 PM or 2 AM. All two-hour restrictions in Old Town should hold for the same hours from 8 AM to 2 AM daily. This will increase consistency throughout Old Town and reduce non-resident parking in RPP districts.

5.2.7 Implement valet parking

The May 2, 2012 OTAPS memorandum recommends implementing a systematic valet parking program in the next two years.

Business-operated valet parking

On evenings and weekends, restaurants and other suitable businesses should be allowed to use three or four parking spaces outside their storefront for valet parking. Valet parking provides customers who are willing to pay an additional fee with the ideal parking location, just outside their destination and may reduce cruising for a parking space. The City would need to work with businesses and owners of under-capacity garages and lots to arrange an appropriate fee for businesses to utilize the on-street pick-up/drop-off and off-street parking spaces and customers. A small number of businesses currently operate valet parking on King Street at limited times.

City-operated valet parking

The October 2010 OTAPS Work Group Report recommends that the City implement a valet parking program using the eight City-owned parking lots and garages in Old Town. In this option, the City would manage a valet program for a larger coverage area. The 2012 OTAPS Work Group recommended that City staff investigate the feasibility of a valet parking program for Old Town. The group recommended that a pilot valet program be implemented if deemed feasible.

5.3 Communications and New Technologies

5.3.1 Continue wayfinding efforts

The City should continue to install the new parking wayfinding signs and remove inconsistent signage to parking garages and lots in Old Town. These signs help visitors identify off-street facilities and reduce sign clutter. The City could also implement smart technologies such as dynamic signage to improve wayfinding and provide motorists with more detailed parking information as described later in this section.

5.3.2 Improve the City's parking website

Residents, regular visitors, and first-time visitors could benefit from increased quality and quantity of parking information online. Additional knowledge about parking would help visitors asses the cost and benefits of on-street parking, off-street parking, and alternative modes for accessing Old Town. Real-time information, which will be discussed later in more detail, could significantly reduce cruising for residents and visitors alike. The City of Alexandria could improve their website with an interactive map with pricing, occupancy, and access information, which would allow users to make more informed decisions based on their personal preferences before arriving in Old Town. The City should also create a mobile version of the website to simplify communications to users on smart phones. This item was listed as a short-term implementation task in the May 2, 2012 OTAPS memorandum.

Provide pricing, regulation, and access information through an interactive map

At a minimum, an interactive map illustrating on-street and off-street parking facilities should be developed and provided on the City's website. This map should include accurate pricing information, parking regulations, and hours of operation, where applicable. For parking garages, this map should also identify vehicular and pedestrian access points to improve efficiency for motorists accessing the garage and to encourage garage use by showing proximity to destinations. The Georgetown neighborhood in Washington, DC uses a simple, interactive map to illustrate pricing and hours of operations at garages in the area at www.georgetowndc.com/parking/

The website should also include information on the consequences of violating parking regulations and on the effectiveness of new enforcement technology, once employed, to emphasize to users that illegal parking is not tolerated in Old Town. Hoboken, New Jersey's

parking website effectively explains their on-street parking regulations, including one page on "How to (Almost) Never Get a Parking Ticket in Hoboken" at www.hobokennj.org/departments/transportation-parking/

Provide information on alternative transportation options

Two additional maps to encourage alternative transportation should be developed. A bicycling map should illustrate on-street and off-street bicycle facilities, bicycle parking locations, and bikeshare stations. A transit map should show bus and trolley lines with cost information. Include links to Capital Bikeshare, DASH, the King Street Trolley, WMATA, and other relevant websites. This could be implemented via Alexandria's Local Motion website where information on non-motorized transportation options is available today.

5.3.3 Provide real-time occupancy information

The May 2, 2012 OTAPS memorandum listed managing and monitoring parking capacity through technology such as smart-phone applications as a long-term implementation task. Real-time parking information is extremely useful to users and would make cruising for parking unnecessary. Both San Francisco (www.sfpark.org) and Los Angeles (www.laexpresspark.org) have recently implemented this technology in pilot study areas.

Motorists could use real-time parking occupancy information to determine where to park, whether on-or off-street, without cruising for a parking space. The City could also use this data to monitor parking occupancy and for future parking studies.

Data Collection

Collecting real-time data for off-street parking would require adding in-pavement sensors to monitor the occupancy along each block. Off-street facilities could initially be equipped with sensors to count vehicles entering and exiting the garage and determine the number of available spaces. Long term, sensors and red/green lights over each spot in garages could notify users which spaces are empty with a quick glance down a parking aisle. This technology may be more suitable to certain garage layouts and sizes, so this should be further researched prior to implementation.

Data Dissemination

Both on-street and off-street real-time occupancy and pricing data should be on the City's website via the interactive parking map and on a smart-phone application, which will be described in detail in another recommendation. Dynamic signs at major gateways and garage entrances could also communicate real-time occupancy and pricing information for off-street facilities. Signs can be small or large and can be selected to fit in with the historic character of Old Town. Los Angeles is currently installing dynamic signs with pricing and occupancy information for off-street and on-street parking facilities. The University of Rochester (www.rochester.edu/parking) has real-time garage/lot availability, on a much smaller scale, on their mobile website and on variable message signs outside off-street parking facilities.

A dynamic sign shows real-time parking availability in garages/lots (photo credit: www.transportation-tech.com)

Open-Source Data

Open sourcing this parking data would encourage independent developers to create smart-phone applications and visualizations to improve access to parking information and advance parking knowledge in Old Town.

5.3.4 Develop smart-phone applications

Smart-phone applications would allow users to get parking information on-the-go. A smart-phone application is more advanced than a mobile website, allowing users faster access to more dynamic information. This tool would be particularly useful to communicate real-time parking information regarding occupancy and pricing, if available, via an interactive map. Both Los Angeles' LA Express Park (www.laexpresspark.org) and San Francisco have advanced

A smart-phone application with parking information (photo credit: www.sfpark.com)

smart-phone applications with real-time parking and pricing information. The City should also create a mobile version of the website to simplify communications to users on smart phones. This item was listed as a short-term implementation task in the May 2, 2012 OTAPS memorandum.

Consider implementing performance parking or variable pricing

Performance parking means that parking prices vary based on occupancy. Parking prices can vary by block and by time of day, but should be clearly communicated so that users can see the price before parking in the space. Performance parking requires real-time occupancy data as described in an earlier recommendation. Performance parking prices can vary frequently, for instance every 30 minutes and are typically constrained to minimum and maximum price boundaries. The District of Columbia implemented a performance parking pilot program in 2008 to protect resident parking, protect businesses, promote non-automotive transportation, and reduce congestion.

Alternatively, the City could use historic occupancy data to establish variable pricing, which typically change no more than every one to two hours on a timetable. This could be implemented as a more conservative approach or an intermediate step to performance parking with or without real-time occupancy data. When real-time occupancy data is available, the timetable could be changed as more data is collected. In August 2012, Downtown Los Angeles began "time-of-day pricing" in which pricing rates vary based on demand at different times of day, with monthly updates to pricing rates based on previous occupancy data. San Francisco also utilizes parking occupancy data to determine pricing structures for performance parking by time of day and location, with on-street pricing structures changing no more than once a month and off-street pricing structures no more than once a quarter.

5.4 Community Benefits

5.4.1 Create a parking enterprise fund and dedicate additional funds raised to community endeavors

In cooperating with local businesses, a portion of the additional money raised from performance parking, variable pricing, or parking-meter fee increases should go directly back to the community to make improvements on the streets, sidewalks, tree boxes, etc. Improving the

pedestrian and bicycle environment from the money raised through the parking program can help attract customers using other modes of travel.

5.5 Recommendations Summary

The following table provides recommendations on the priority for implementing the recommendations detailed above. The City should continue to work with the OTAPS Work Group on the implementation of parking strategies in Old Town.

Recommendations	Recommended Priority
Increase enforcement of parking regulations	very high
Make on-street and off-street parking pricing competitive	very high
Add meters in unmetered locations within three blocks of King Street	high
Continue wayfinding efforts	high
Improve the City's parking website	high
Develop smart-phone applications	high
Increase duration of parking meter hours until 10PM.	high
Add meters in unmetered commercial locations	medium
Consider extending meter operation through Sunday	medium
Increase duration of two- or three-hour restriction RPP districts until 2 AM	low
Implement valet parking	medium
Provide real-time occupancy information	low
Consider implementing performance parking or variable pricing	low
Dedicate additional funds raised to community endeavors	low

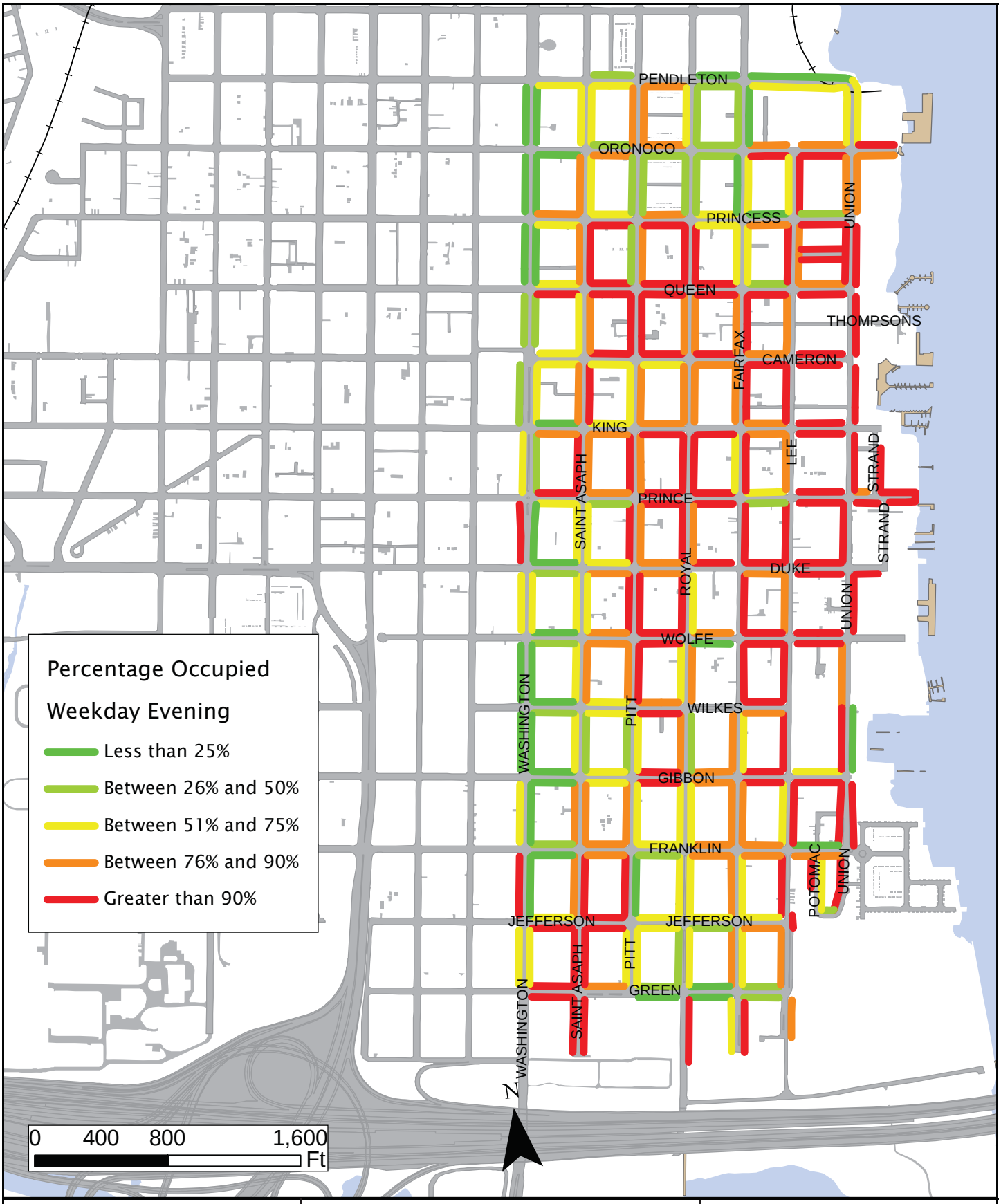
Toole Design Group

Union Street Corridor Study
City of Alexandria
Alexandria, VA

Figure A: Project Location Map

Union Street Corridor Study
City of Alexandria
Alexandria, VA

Figure B: Data Collection Location Map



Union Street Corridor Study
City of Alexandria
Alexandria, VA

Figure C: Weekday Evening (7-9 PM) Parking Occupancy

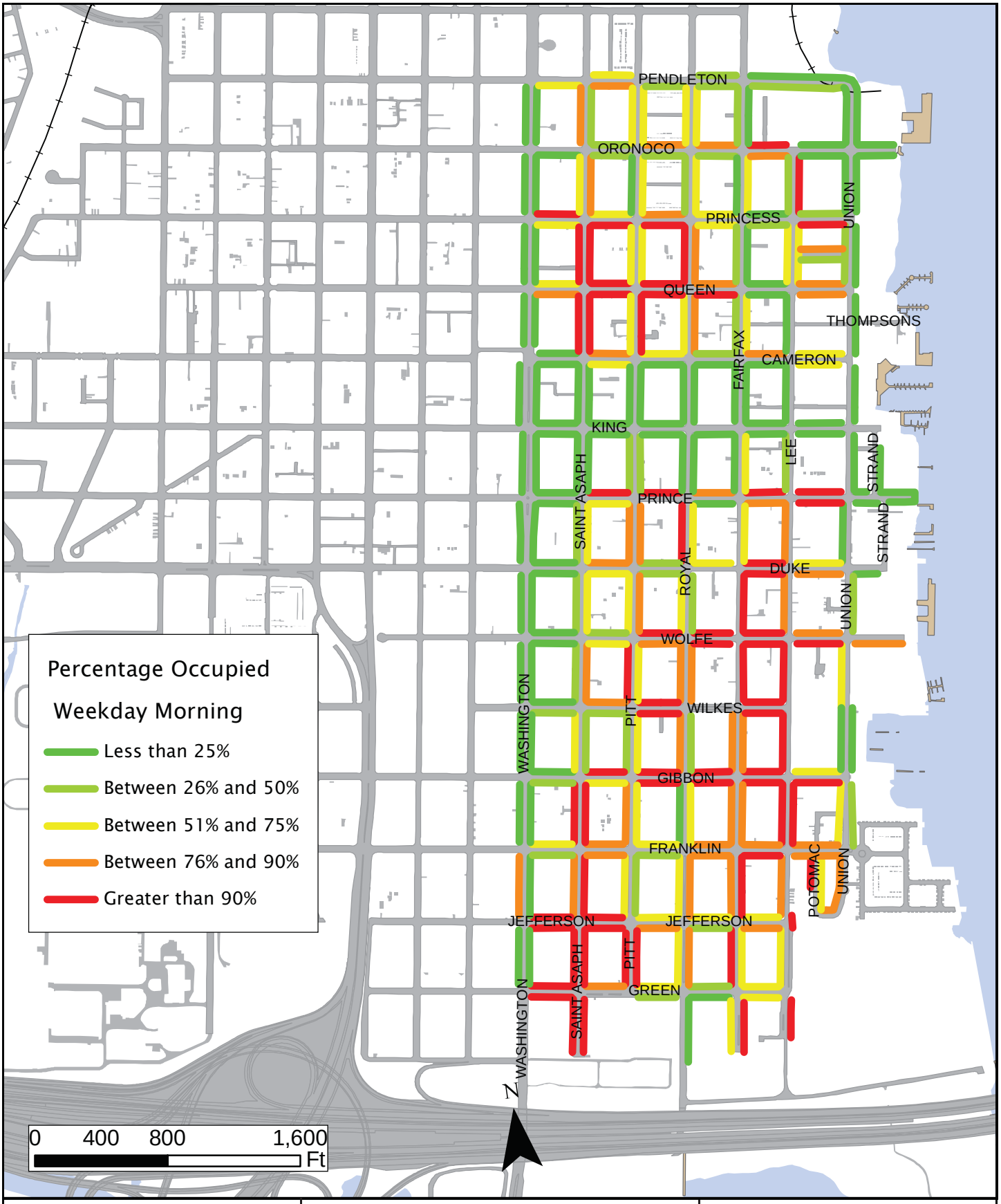


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Figure D: Weekday Morning (3-5 AM) Parking Occupancy

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Figure E: Weekend Evening (7-9 PM) Parking Occupancy

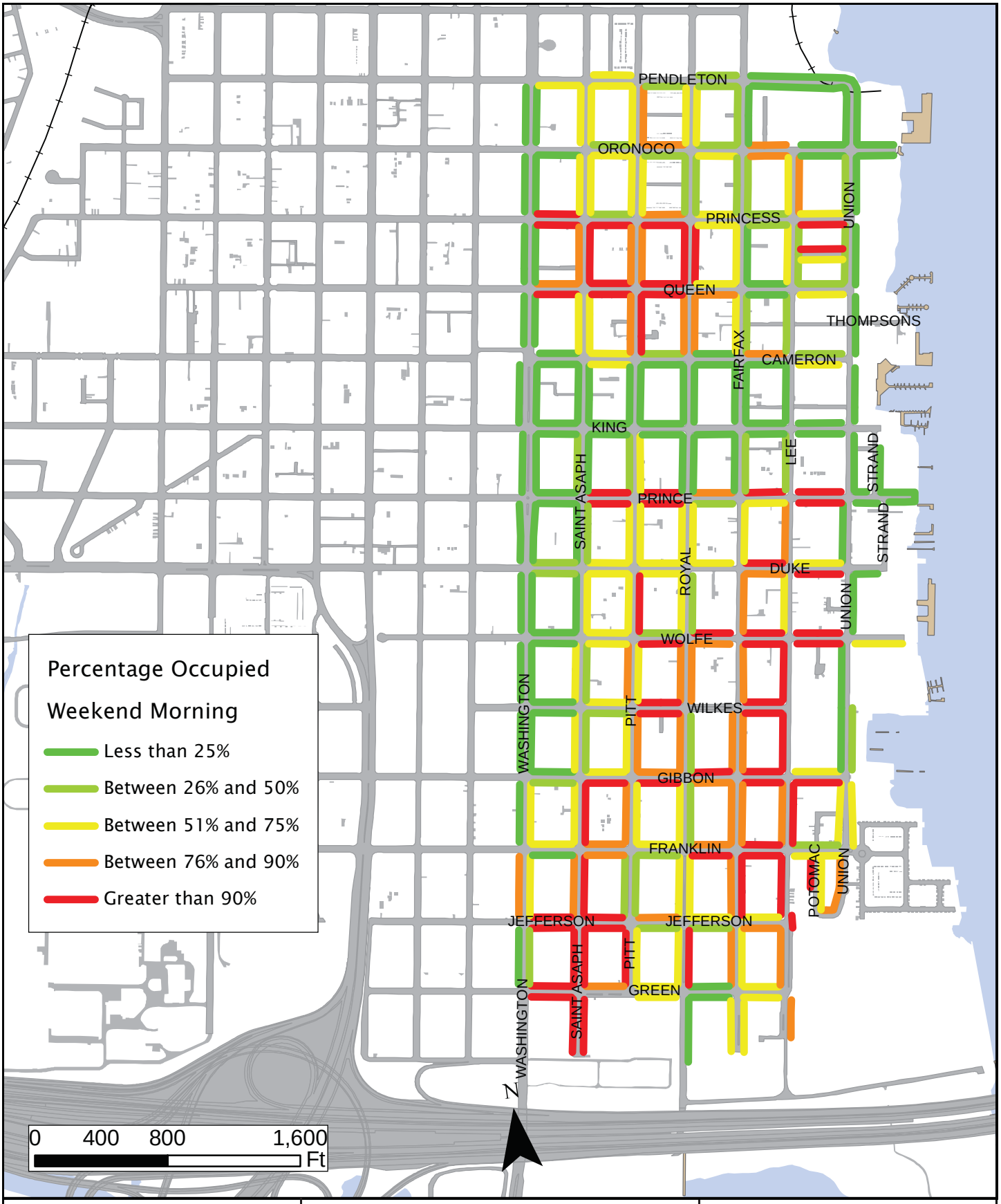

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Figure F: Weekend Morning (3-5 AM) Parking Occupancy

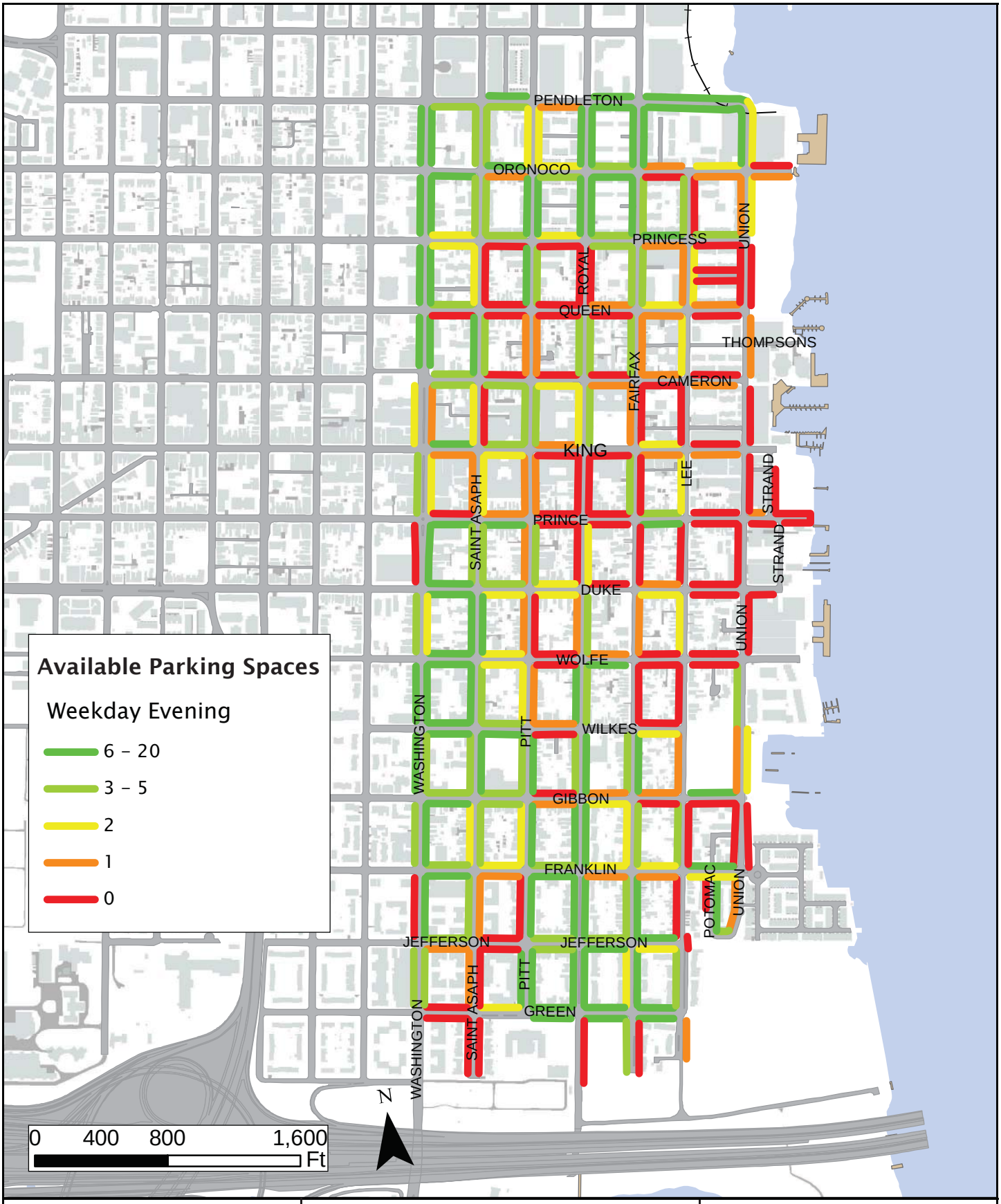

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Figure G: Weekday Evening (7-9 PM) Parking Availability

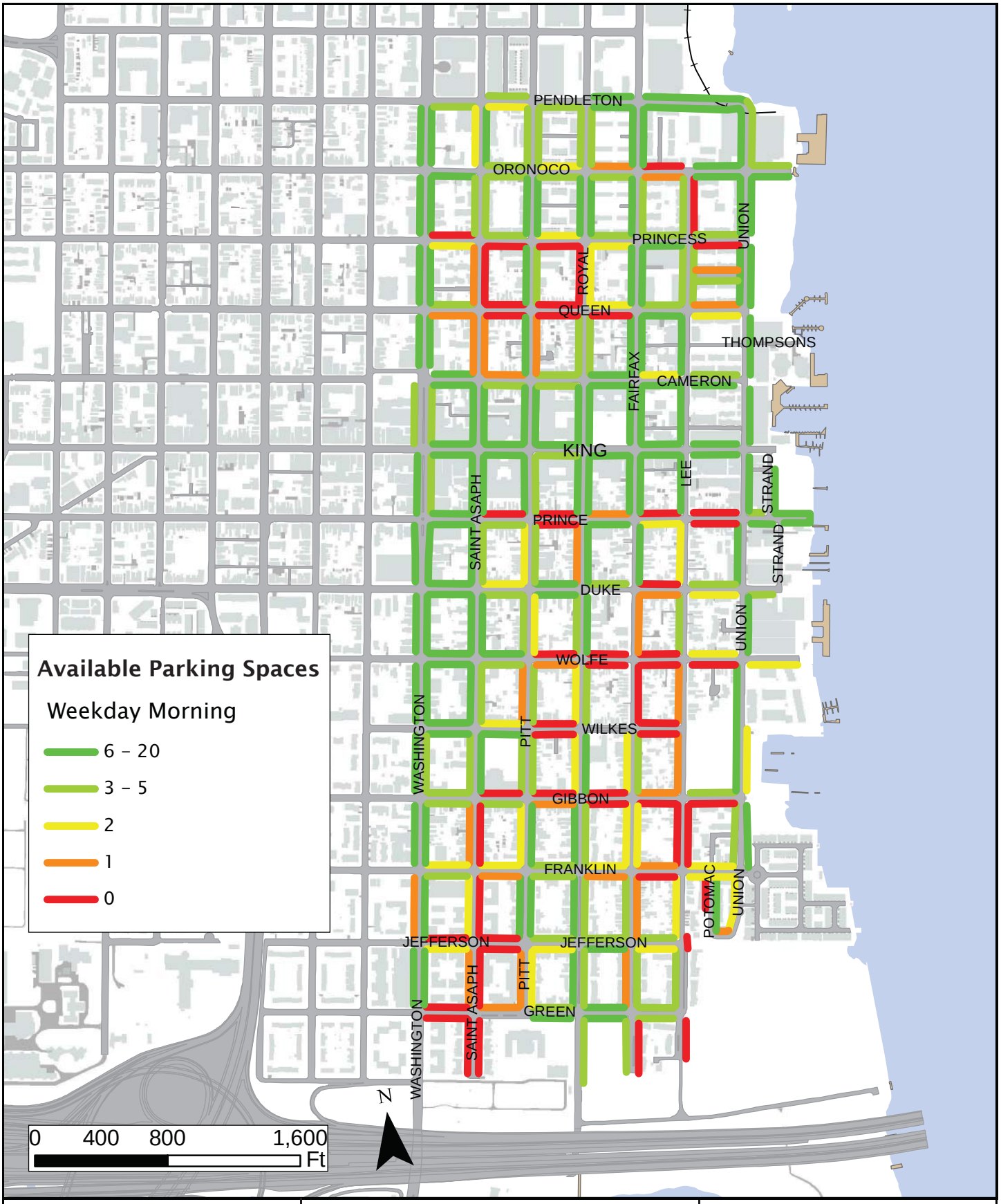

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Figure H: Weekday Morning (3-5 AM) Parking Availability

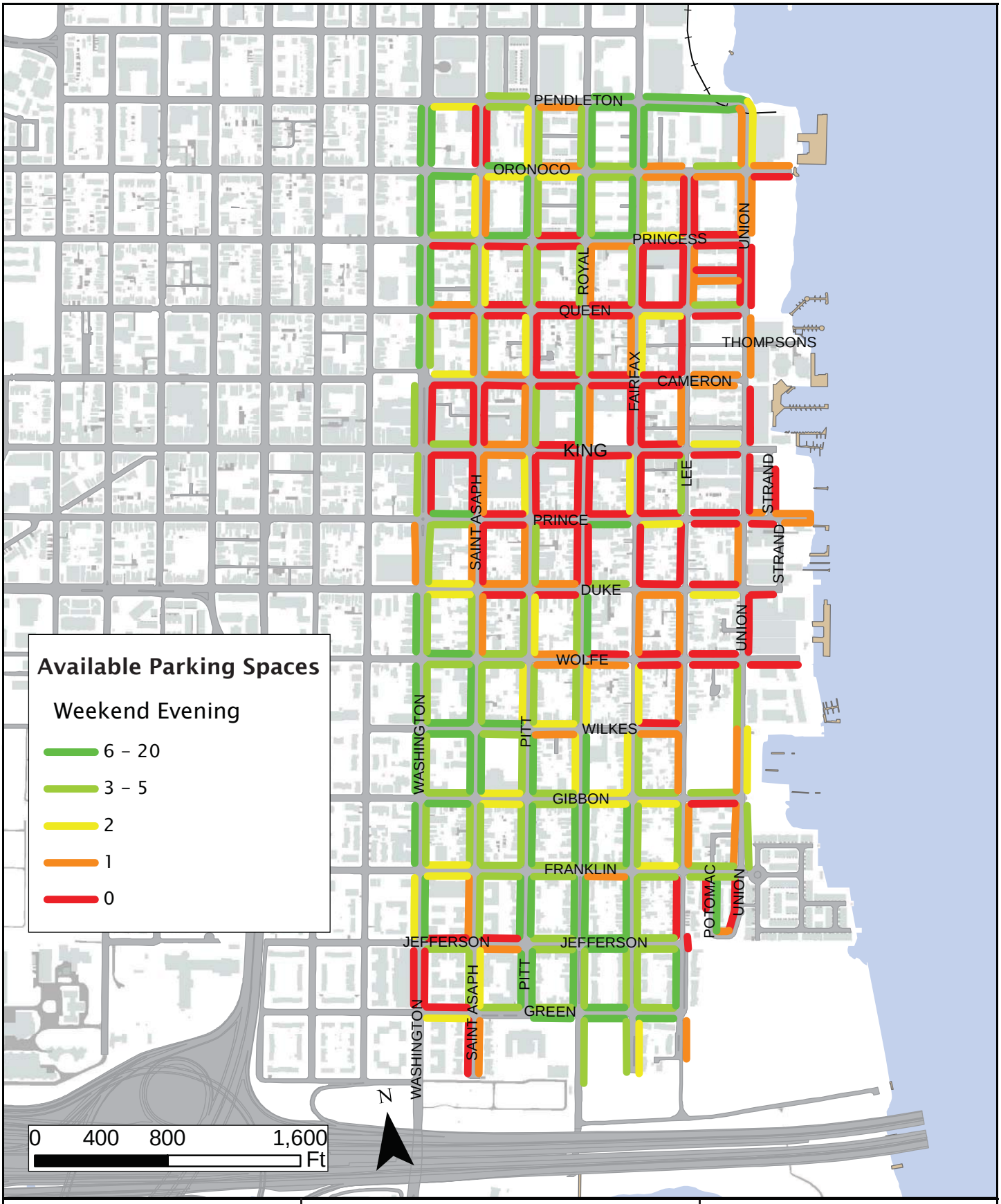

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Figure I: Weekend Evening (7-9 PM) Parking Availability

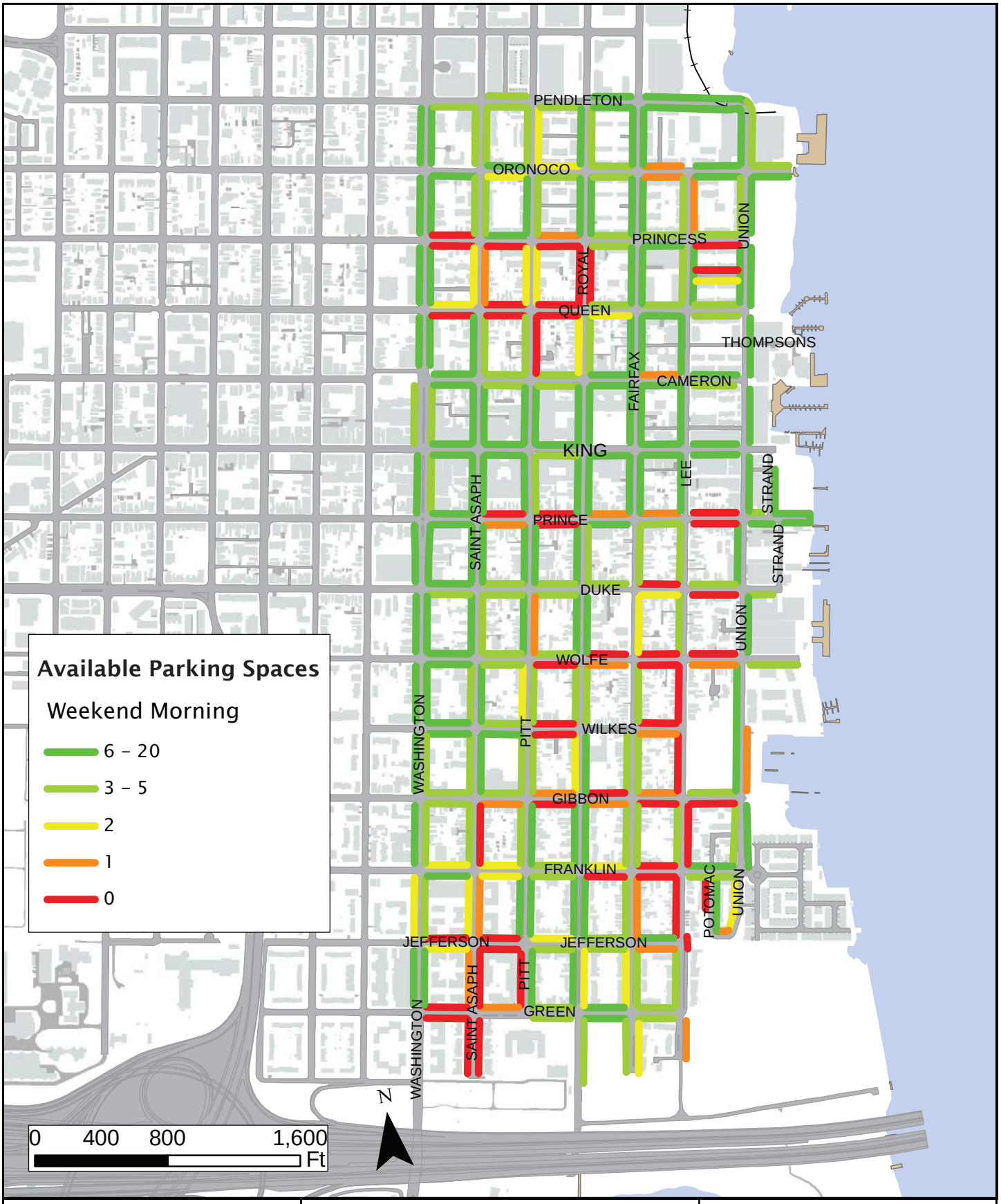

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Figure J: Weekend Morning (3-5 AM) Parking Availability

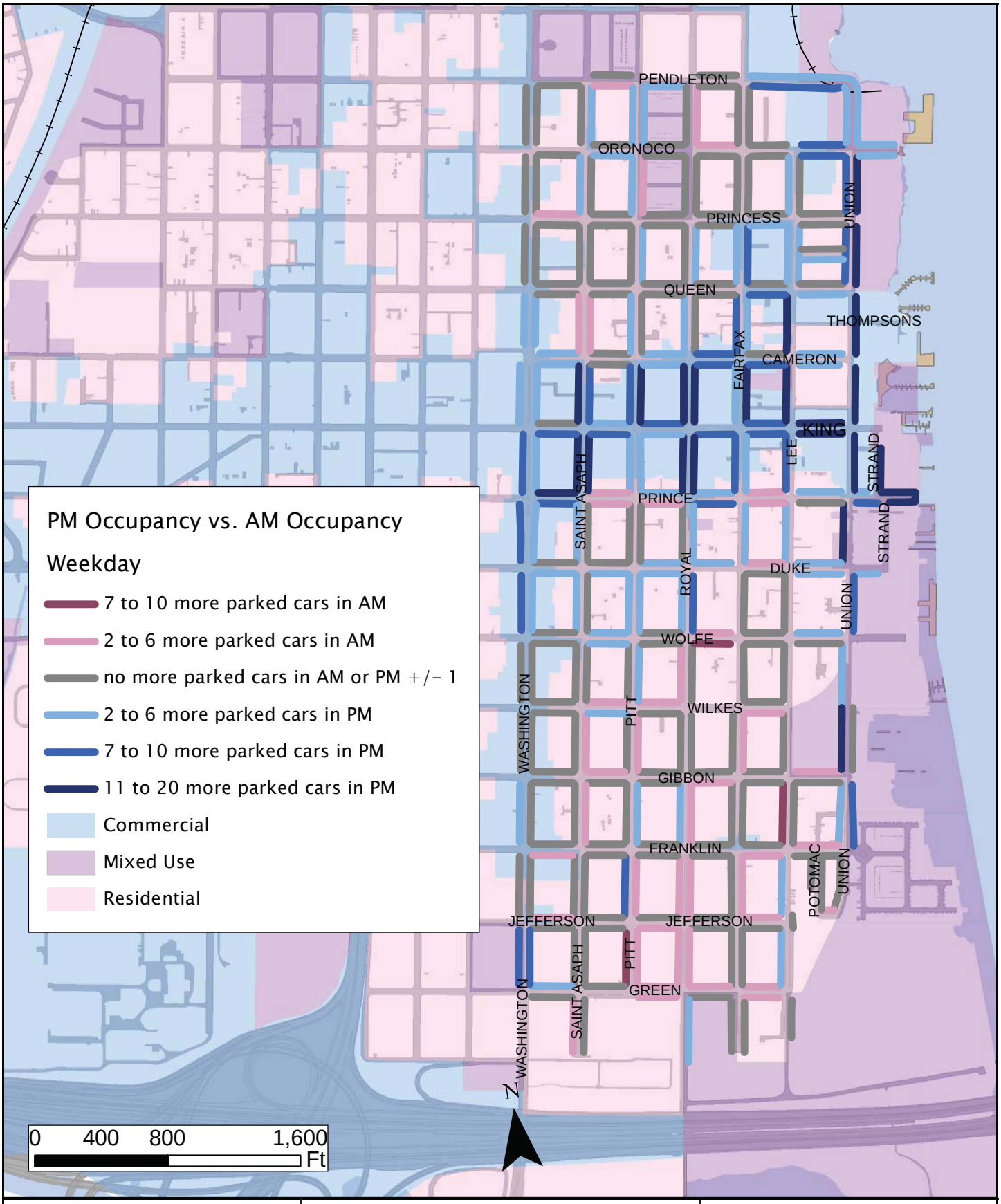

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Figure K: Weekday Evening (7-9 PM) vs Morning (3-5 AM) Occupancy

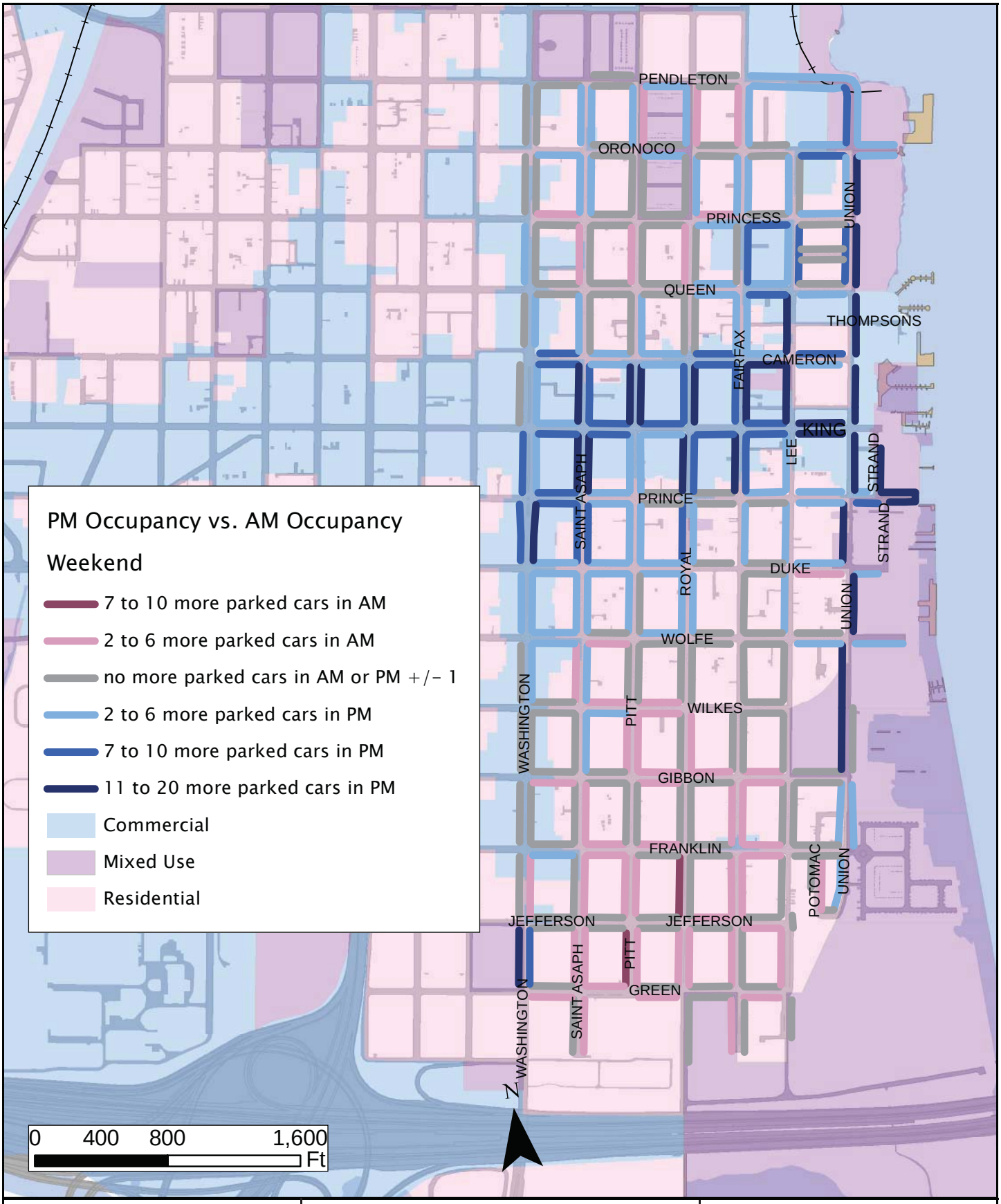

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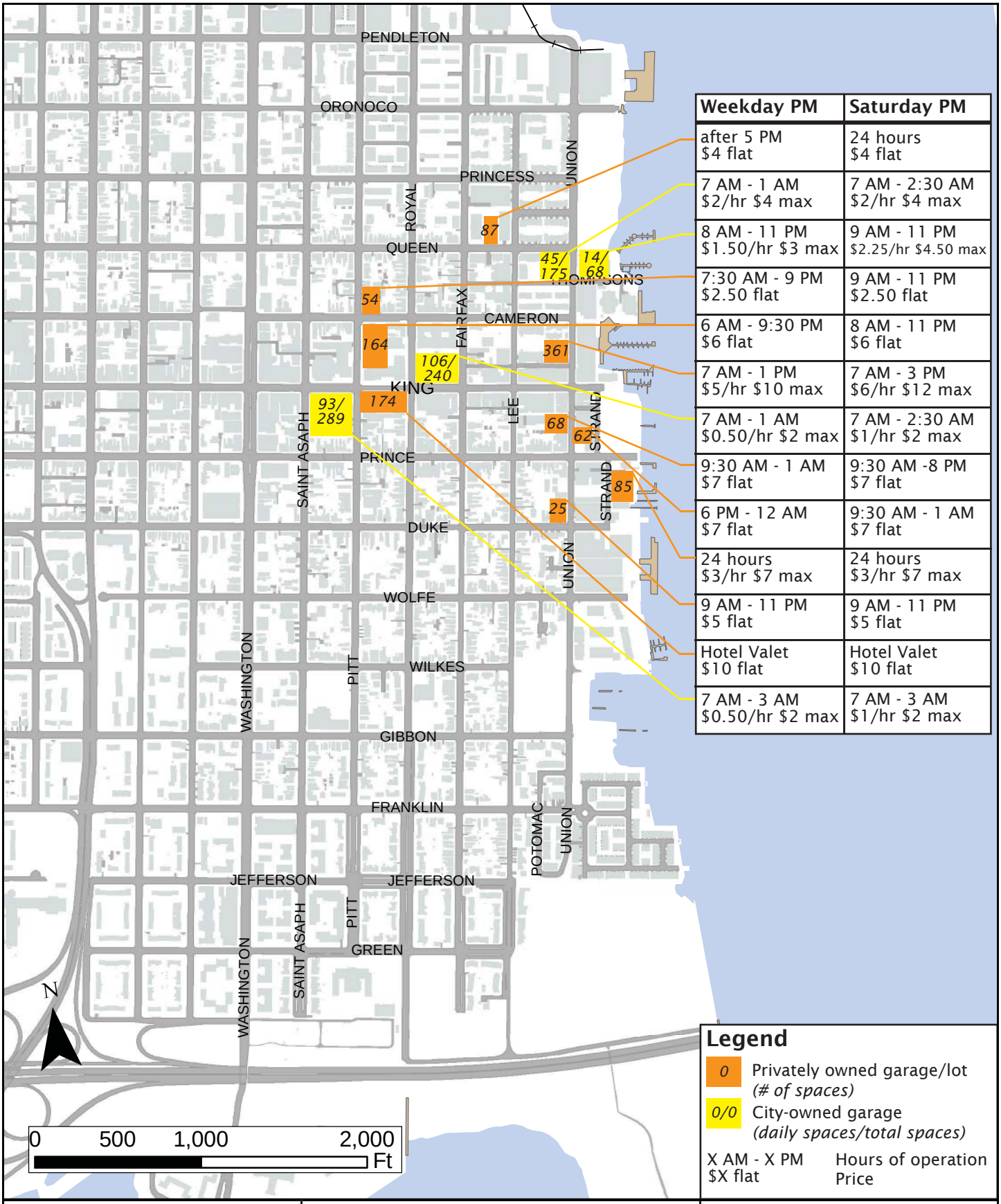
Figure L: Weekend Evening (7-9 PM) vs Morning (3-5 AM) Occupancy



Weekday PM	Saturday PM
after 5 PM $4 flat	24 hours $4 flat
7 AM - 1 AM $2/hr $4 max	7 AM - 2:30 AM $2/hr $4 max
8 AM - 11 PM $1.50/hr $3 max	9 AM - 11 PM $2.25/hr $4.50 max
7:30 AM - 9 PM $2.50 flat	9 AM - 11 PM $2.50 flat
6 AM - 9:30 PM $6 flat	8 AM - 11 PM $6 flat
7 AM - 1 PM $5/hr $10 max	7 AM - 3 PM $6/hr $12 max
7 AM - 1 AM $0.50/hr $2 max	7 AM - 2:30 AM $1/hr $2 max
9:30 AM - 1 AM $7 flat	9:30 AM -8 PM $7 flat
6 PM - 12 AM $7 flat	9:30 AM - 1 AM $7 flat
24 hours $3/hr $7 max	24 hours $3/hr $7 max
9 AM - 11 PM $5 flat	9 AM - 11 PM $5 flat
Hotel Valet $10 flat	Hotel Valet $10 flat
7 AM - 3 AM $0.50/hr $2 max	7 AM - 3 AM $1/hr $2 max

Legend

0 Privately owned garage/lot *(# of spaces)*

0/0 City-owned garage *(daily spaces/total spaces)*

X AM - X PM — Hours of operation

$X flat — Price

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Figure M: Parking Garage Capacity, Hours, & Pricing

Attachment A: OTAPS Parking Utilization Charts for the Weekday and Weekend Evenings

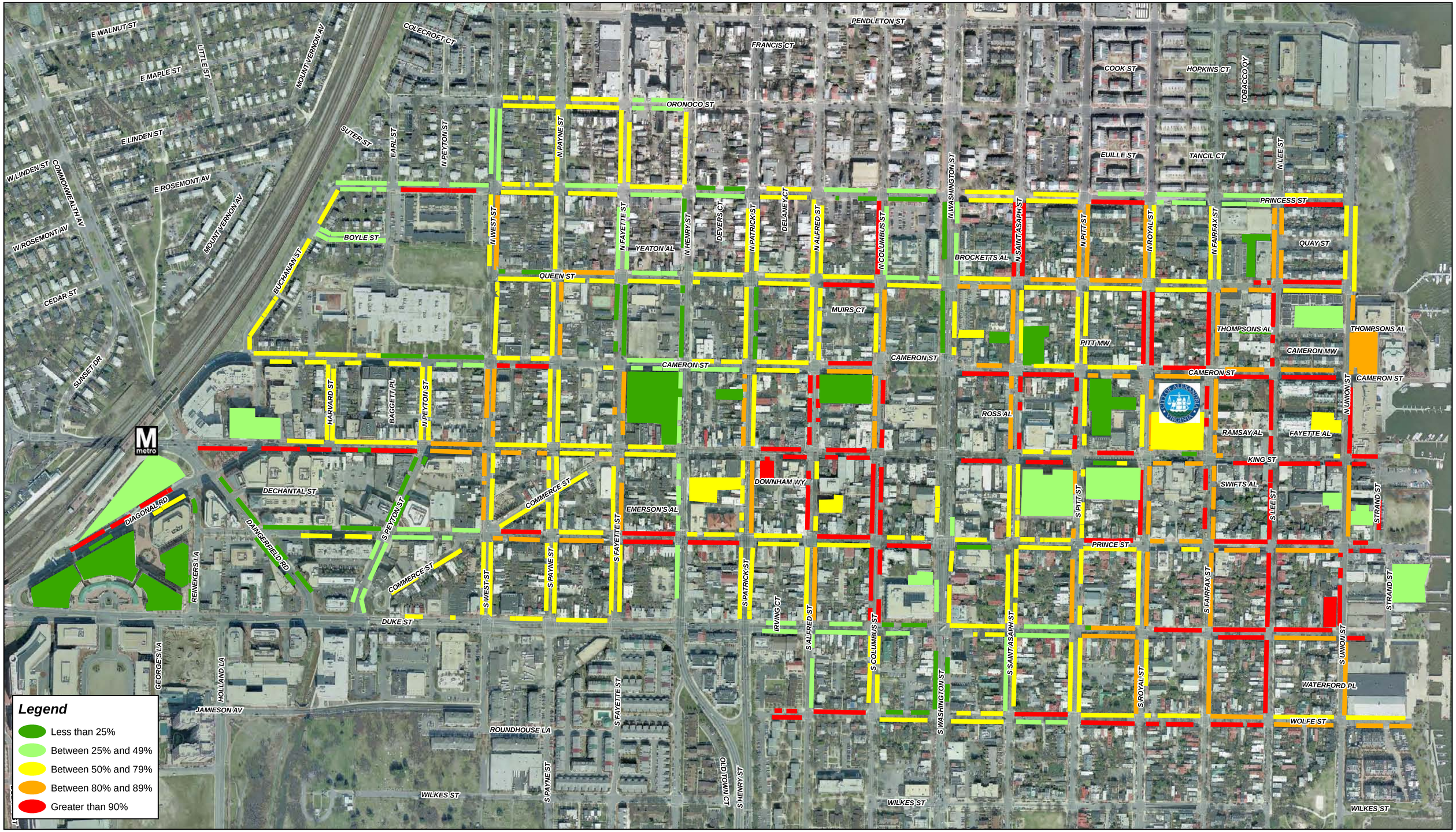

Figure 2-14:
Parking Utilization
During Weekday Evening

Kimley-Horn and Associates, Inc.

0 100 200 400 600 800 1,000 Feet

FIGURE
2-14

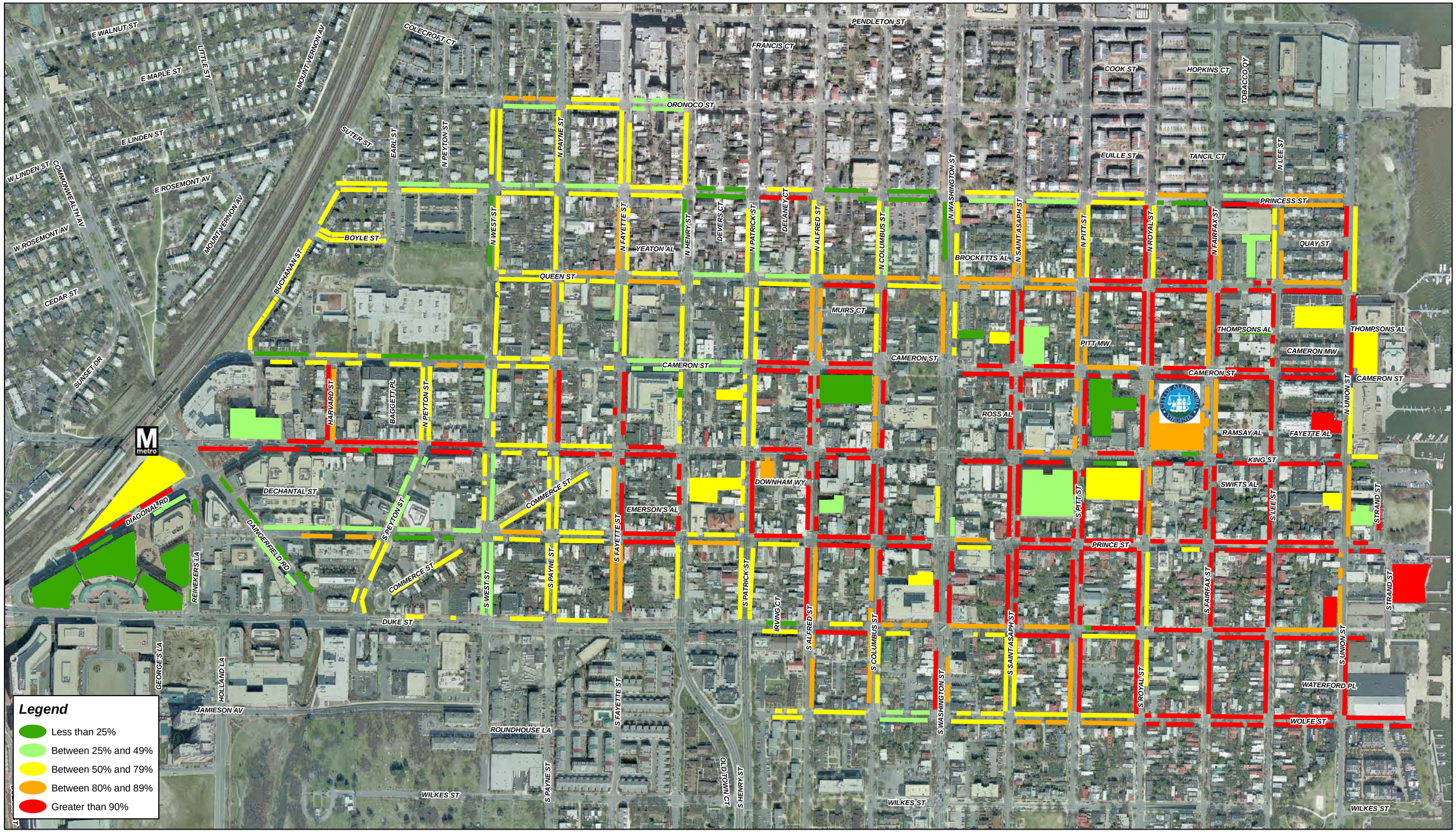

Figure 2-18:
Parking Utilization
During Saturday Evening

Kimley-Horn and Associates, Inc.

0 100 200 400 600 800 1,000 Feet

FIGURE
2-18