



Technical Report A - Parking Demand Analysis

Downtown Parking Strategy for Stratford
Ontario



D Sorbara Parking & Systems Consulting
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Project Methodology

In the course of this parking management study, three data collection tasks are conducted. They are: Parking Demand Analysis, Parking Supply Response¹ [to the demand] and the Market Potential Identification. The results of these three tasks feed into a fourth task: Policy Development and Analysis and then into a fifth task: Parking Management Strategy.

This report speaks to Task 1: Parking Demand Analysis and informs:

- **what** is attracting people to the downtown;
- **when** are they in need of parking spaces;
- **how long** do they typically need parking; and,
- **What** factors are important to visitors to the downtown in **choosing their parking space?**



Technical Approach to Parking Demand Analysis

The essence of parking demand analysis is to capture, interpret and understand the profile of the **parking market**. Parking space is considered as a **product to sell to the public**. The parking demand analyses are specifically geared towards identifying the **share** of the parking market that can be expected to "**buy**" the product.

The extent and the nature of the "market" guide the decision to **locate** a new facility, or expand an existing one. The parking user profile will dictate the operational method, the parking rates (if applicable) and the capacity of each facility.

The specific **objectives** of this process are:

- Develop a set of peak hour parking demand rates for visitors and employees relating to land uses;
- Identify and summarize the trip characteristics specific to certain land uses (duration of stay, rhythm of trips over the course of the day, week and season, number of stores visited, etc.); and
- Determine the range of walking distances (how far people are willing to walk to and from a parking stall) relating to visitor and employee trips.

The **process** to meet these objectives involved the following:

- Build a profile of the land uses that attract visitors, employees to the downtown study area.

¹ The concept of *parking supply response* surveys is synonymous with the terms: parking utilization studies, Licence plate surveys, turnover and duration of stay surveys.

- Present an on-line survey to capture travel demand characteristics from the larger community of interested persons.
- Research other comparable studies to provide a measure of performance against which we can compare and contrast the Stratford experience.

The **result of the demand analysis process** is included in this report and covers:

- A summary of **current land uses** (floor spaces);
- A set of survey-derived “made in Stratford”

visitor and employee peak hour parking demand rates (expressed as 1 space for every “x” amount of square metres of a specified land use – retail, office, etc. A general set of such ratios are also discussed in this report for comparative purposes);

- A discussion of trends in land use activities in the study area that will enhance our understanding of emerging characteristics of the future;
- Insights into the current experience with the public parking service offered through the analysis of the internet survey responses;
- A **walking distance distribution** (between parked vehicle and primary or first destination) for different trip purposed customers that serves the process of marking the level of customer service; and,
- **Spatial** analysis of the nature and amount of land use in the study area will provide a notion of **sub-areas** and the interaction of these sub-areas with one another. Such level of analysis is required since people walk from parking supply on one block to a destination on another block. The relationship between “where people park” and “where they wish to go” cannot be accommodated satisfactorily in an **overall** view within each study area, but rather on a more market-based and sub-area view.



Figure 1: Sample of Online Form

Spatial market analysis will provide the framework for answering questions related to the displacement of current parking space in one area and its impact on another.

This chart serves to provide you with a map of the process through this report. We have identified five factors that impact the parking demand as:

- The Physical Environment
- Trip Characteristics
- Parking Supply
- Parking Operations, and

- The impact that Customer Experience may have on parking demand.

Figure 2: Illustration of Parking Demand Analysis Process

Parking Demand Analysis Process



From a planning point of view these factors measure the extent and type of parking demand and assist in the evaluation of the **level of service** that is currently delivered by the municipal parking service. Specifically, the study examines:

- Land uses that draw customers on a consistent basis – personal services such as hair care/drug stores,

medical services, entertainment venues, recreation facilities, grocery stores for example;

- Land uses that interact off each other – entertainment use such as the Theatres, special (seasonal) events in the commercial area and pre- or post-theatre activities such as restaurants or dessert cafes;
- Land uses that exhibit **temporal** variation of their demand over the course of the day (uses that attract customers at different times of the day serve to make efficient use of parking supply)- from coffee shops in the morning and afternoon to dessert/pastry shops, luncheon dining to formal sit-down dining in the evenings;
- Land uses that provide a **multi-destination** experience and therefore stretch the time spent in the downtown and promote the "collective" role of public parking space²;
- The geography between the attraction (the land use) and the parking supply service – the **walking distance**;
- The physical landscape of the commercial land use – how compactness and density play key roles in parking space allocation and in level of ambience in the study areas; and,
- The competitive commercial market that draws customers to and away from the downtown.

The next sections elaborate on each factor on Figure 2. Each factor is shown and discussed as discrete, but the reality is – as represented by the two-way arrow on Figure 2 –there is a significant amount of interaction among these factors.

² Collective parking space refers to space that serves a broader area versus a parking space that restricts its use to a specific site.

Analysis of Factors that Shape the Parking Demand Profile

Factor 1: The Physical Environment

A familiarity with the land use activity is a necessary input to our understanding of the relationship between parking demand and parking supply. Floor areas were obtained from the field, visual and internet inspection of the downtown and through a comparison with previous studies³. Land use classified by type of activity is a critical input because different types of land use exhibit different:

- Peak hour parking demand rates;
- Patterns of parking demand over the course of a day;
- Patterns of parking demand over seasons of the year; and different
- Peak demand days of the week.

Current Land Use Profile

The **geographic scope** and the quantities of land use for the investigation of the parking demand are on **Table 1**.

These land use data are **estimates** of space and type of use. Table 1 is an extract of only those land uses that have an impact on public parking demand in the study area. Typical for many downtowns, primary land use activity is comprised of commercial offices and retail. The service and financial investment services as well as banking represents a small proportionate share of the total space, but as will be discussed in greater detail, these activities generate a significant number of customers each day. They represent a vital component to the characterization of the customer market - one that returns to the study area on a daily or weekly basis thus creating a core of the transient community in the downtown. The uniqueness of Stratford's downtown land uses is reflected in the **theatre** component and in the geographic layout of the roads that are non-traditional (triangular and block faces that are longer than other more traditional urban designs found in downtowns).

Table 1: Estimated Quantity of Floor Space by Land Use Type (Sq. Meters)

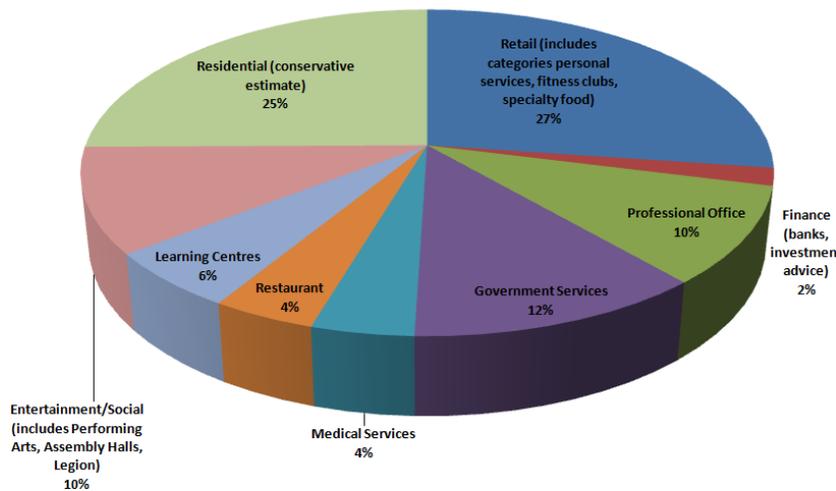
Table 1: Estimated Quantity of Floor Space by Land Use Type (Sq. Meters) - Downtown -	
Land Use Activity	Quantity (Sq. Meters)
Retail (includes categories personal services, fitness clubs, specialty food)	38 920
Finance (banks, investment advice)	2 496
Professional Office	13 819
Government Services (Courts, Library, City Hall, Police services, etc)	19 982

³ City of Stratford Cooper Site Building: Community Workshop & Recommendations, Malone Given Parsons LTD, October 2013. As well, City of Stratford: Assessment of Structured Parking on Erie Parking Lot, Read Voorhees and Associates, September 1988.



Table 1: Estimated Quantity of Floor Space by Land Use Type (Sq. Meters) - Downtown -

Medical Services	5 874
Restaurant (Fast Food, Sit-down, Cafes, etc)	5 937
Learning Centres	8 149
Entertainment/Social (includes Theatres, Assembly Halls, Legion)	14 870
Residential (conservative estimate)	35 982
Estimated Total Space	143 029



The intensification of the residential land uses in the downtown means that the market for entertainment, and daily goods (food) and services (financial, personal care) will continue to expand. The development of a resident community will require some parking space for storage but in term will reduce the number of parking spaces required to service visitor parking.

Figures 3 to 6 - drawn from the BIA's website - serve to give some spatial context and a notion of the quantity of commercial services in the Stratford downtown.

Technical Report A - Parking Demand Analysis



Figure 3: Location of Food Related Land Uses [from BIA website]



Figure 4: Location of Professional Services [from BIA website]



Figure 5: Distribution of Retail Land Uses [from BIA website]



Figure 6: Distribution of Services [from BIA website]

Reflecting on the above the following salient findings are offered:

- There are over 55 food services (fast/take out, sit-down etc)
- There are over 70 professional services that include: accountants, lawyers, health care, financial investment advisors, real estate etc.
- Over 100 retail (19 Fashion Ladies, 13 Specialty and 3 gift shops, etc)
- Over 90 service outlets that include hairstylists (18 of them), health care (7) and fitness centers (5). This classification on the BIA site includes the University of Waterloo as well.
- The general breakdown of the floor space in the study area is primarily **residential, retail** and **office** in nature with close to half of the total surveyed buildings.
- While the categories of **banks** and **restaurants** are relatively small in comparison to others, they nonetheless represent a significant impact on the volume and - as we shall see later - on the pattern of parking activity over the course of the day.

1. Services such as finance and medical and hair care establishments are critical to the draw of visitors over the course of the day. Such uses serve to parlay into multi-destination trips in the downtown area which in turn increase duration of stay. Such uses also tend to attract visitors on a more regular basis – weekly or monthly for example. In terms of parking demand then, these particular land use categories provide a set of sustained visitors to the downtown – they provide a pivotal base for our parking supply user market.
2. The quantity of the various land uses is important to know, but from a parking demand analysis point of view, it is the **spatial distribution** of that land use that drives **where** we need to provide support parking spaces.
3. Lastly, from a building-by-building perspective the commercial space is concentrated in a dense building form. The facades of the buildings along Ontario, Wellington and Downie form a solid unified commercial visual address along the horizontal, and residential, service and offices that sit on top of the grade level commercial use along the vertical. This urban form serves the following important input to the study of parking demand:
 - People driving along Ontario, Wellington and Downie can more easily see the shops as the solid urban facade presents a “billboard” of sorts;
 - Once the motorist finds the intended primary destination point, the focus of the motorist turns to reading the signs that direct them to parking space – be it along Ontario, Wellington or Downie in an on-street space or directed to an off-street parking space; and
 - The transportation network of streets provides the various channels that allow the motorist to safely park their vehicle or negotiate movement in and around the downtown.

This range of uses will play into the computation of parking demand as a number of different land use types attract parking demand at varying peak hours of the day, varying days of the week, and at varying magnitudes. The interplay of these factors will provide an estimate of the potential size of the parking demand. **Walking distance** to and from parking space and these land uses will help distribute that parking demand to the parking supply.

Shaped by the analysis of walking distance to and from parking space and primary destination, we chose to view how key land use types, (retail, office, medical and personal services) are served by the key parking facilities in the study area. In this way, these two study deliverables were formed: the *identification of where potential parking supply opportunities exist*, and the measurement of a **customer level of service**.

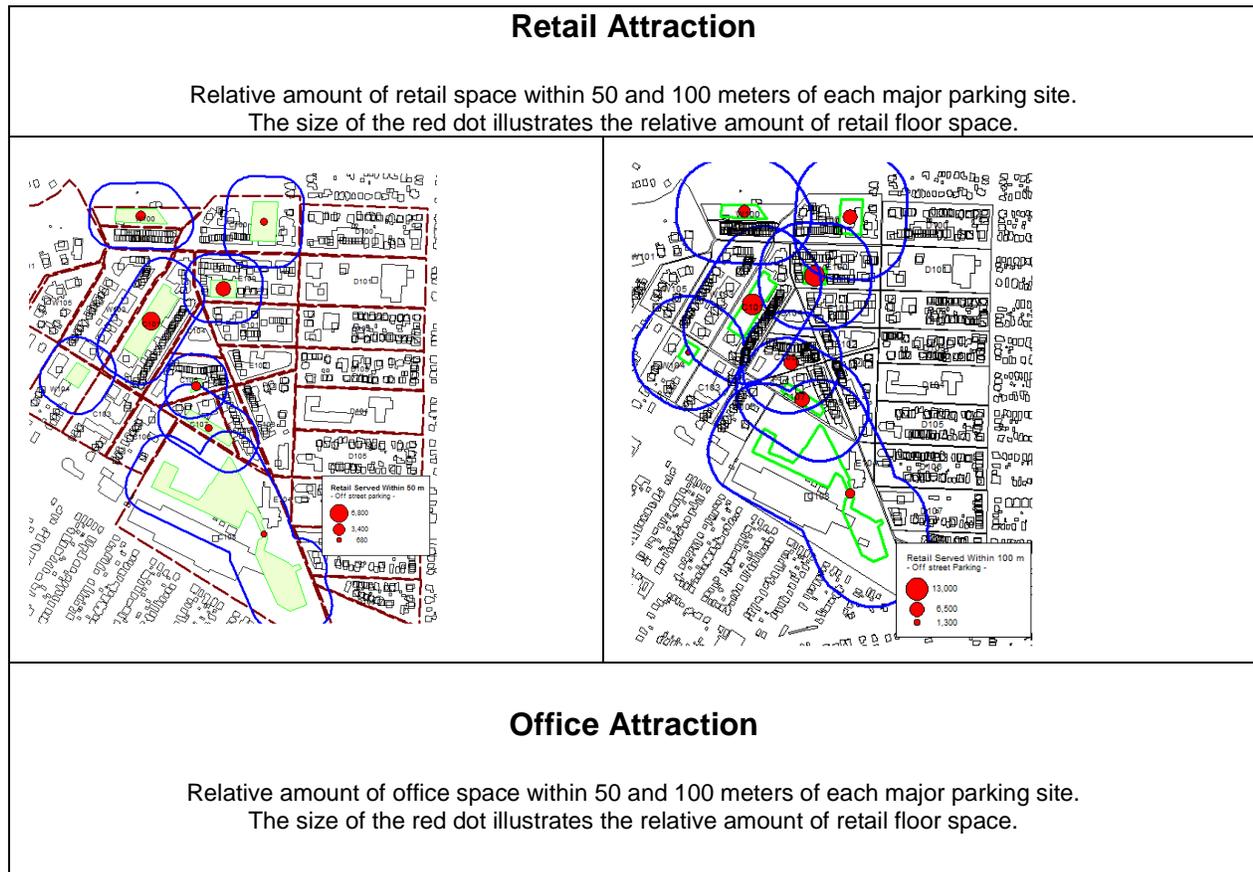
Current and Potential Level of Market Service

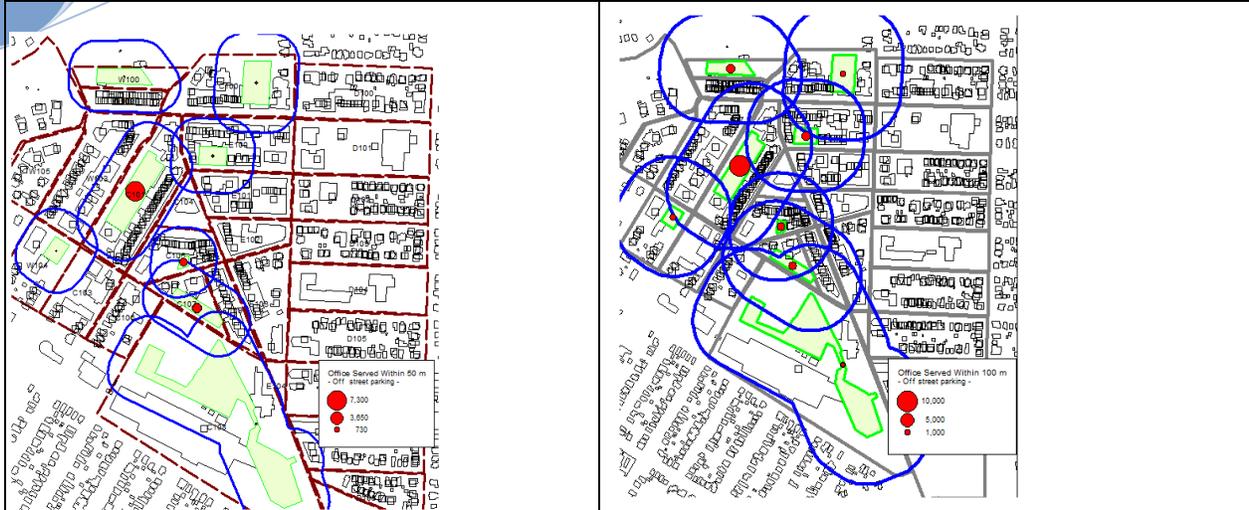
Table 2 describes the distribution of various key land uses relative to the off street parking facilities provided by the municipality. Here the geographic scope is 50 and 100 meters from the center of each off street parking facility. The online survey results point to this as a walking threshold for shorter stay trips to the downtown.

The size of the relative red dot serves to indicate visually the physical relationship between the potential parking demand generator (the land use) and the major parking infrastructure (the off street carpark). Important relationships to maintain it seems are:

- Erie
- Albert
- Cobourg, and
- Perhaps surprising the opportunity that the St Patrick Street lot has.

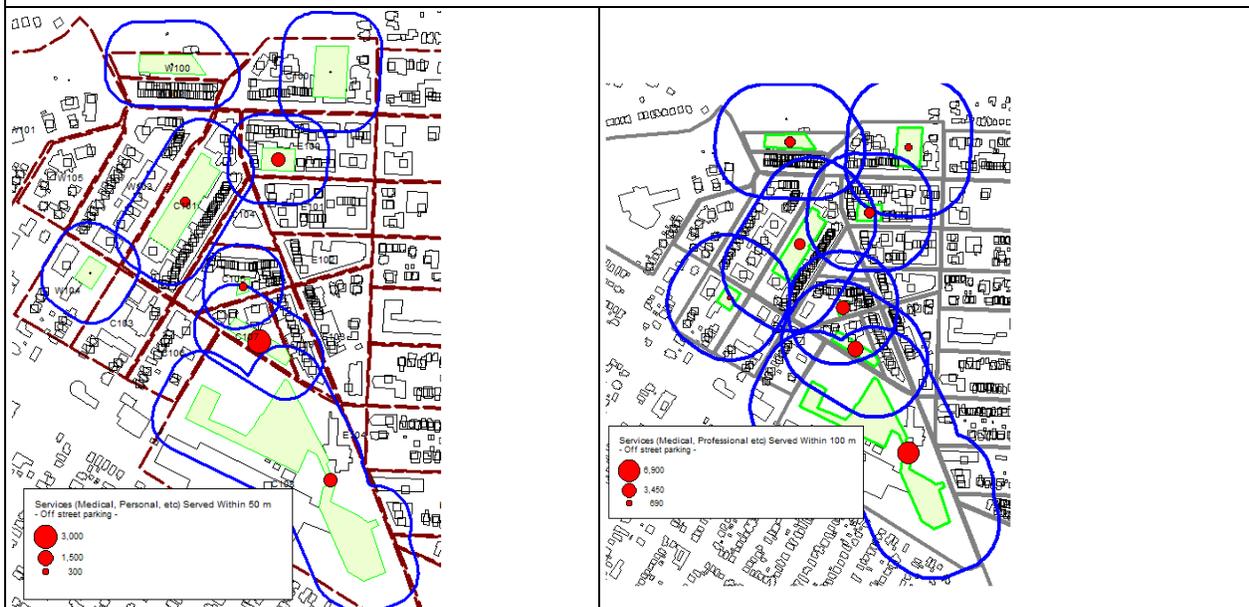
Table 2: Proximity of key sources of attraction within 50 and 100 Meters of Municipal Off-street Facilities





Service Attraction

Relative amount of service space within 50 and 100 meters of each major parking site.
The size of the red dot illustrates the relative amount of retail floor space.



Restaurant/ Food Attraction

Relative amount of restaurant space within 50 and 100 meters of each major parking site.
The size of the red dot illustrates the relative amount of retail floor space.



One measure of the level of service provided by the public parking supply in downtown Stratford is to extract from the maps above the quantity of various key land use activities and determine how much of that quantity is within 50 or 100 meters of a major off street public parking facility. As will be discussed later in this section 100 meters is the measure of a very high level of service as it represents not only the average walking distance from a parked space to a primary destination point as determined from the online surveys but also reflects approximately a 2 to 2:30 minute walk.

Table 3 below shows retail, office and restaurant land uses that are within that 100 meter threshold walking distance. The above 100 percent figure is indicative of overlap of two or more off street parking facilities that can service the demand within that threshold.

The "Personal Services" land use activity category is shown to be under-served. There might be an explanation for this under-service (represented by the below 100 percent value in the right-most column) as these uses tend to be spread over a larger area than retail for example. As well, some of the buildings that are used for personal services (hair salons, some medical, lawyers, accounts etc) may be conversions from residential to these uses and as such may be located away from the core of the downtown itself.

The current parking supply system is in excellent **position** to service the parking demands attracted by retail, office and restaurants for certain. Note that the major attraction of summer time volume- the Avon Theatre - is not within 100 meters of any of our off street municipal parking facilities.

Table 3: Current Level of Service

General Land Uses	Quantity of Use Within 100 m of all off street carparks	Quantity of Use Estimated within the Study Area	Quantity within 100 m divided by total Quantity of the use in the downtown
Retail	51879 sq. Meters	38920 sq. meters	133%
Office	21532	13819	156%
Food/ Restaurants	8967	5937	151%
Personal/Professional Services	20906	25532	82%
Note	Over 100 percent means that the use is serviced by a number of overlapping market capture areas;		

Potential Changes to the Physical Environment and Nature of the Downtown

Over the course of this parking study a number of potential physical changes to the land use have been brought to the forefront. In addition to those physical changes that may occur in the downtown there are broader operational initiatives in mobility and its integration with current and future technology that will impact how we move to and from our homes and businesses in Stratford. The changes in the physical and operational environments will inform and shape the way in which we deliver parking services.

Physical Changes to the Downtown

The project team informed this parking study with the following potential developments in the downtown that should be considered:

- Expansion of the University of Waterloo campus located at the southern fringe of our study area; and its subsequent impact on the student demand for accommodation in the downtown.
- The re-purpose and re-development of the Cooper's Site building industrial site located also on the southern fringe of our study area where our free parking is currently serving downtown parking demands.
- The re-purpose and re-design of the area known locally as "Market Square" that envelopes City Hall.

These changes directly impact the **quantity** of parking demand that we need to consider in our long term planning strategy and the **character** of the downtown that in turn begins to shape the type of parking markets that will emerge in time. Specifically consider:

- A resident population requires a set of services that satisfy the day to day living requirements (food and personal/medical services).

- A resident population grows into a community. This community becomes more engaged in its surroundings by protecting it from invasive traffic and demanding a set of urban design standards that encourages a more pedestrian environment.
- A resident population requires parking space on-site for their own vehicles and more likely to face a conflict with their visitors and people who are shopping, dining and engaging in commercial activities.
- A year-round entertainment and community focus point such as Market Square generates pedestrian traffic that needs to be woven safely into the existing urban transportation network.
- Both Cooper and Market Square redevelopment areas currently provide critical parking inventory that serves current downtown visitors and employees.
- Market Square redevelopment concepts to date have had to consider the temporary re-location of the town's transit hub.

Within the scope of this parking strategy study, we want to be able to inform this planning process with a framework that allows us to manage the parking services effectively. We want to be able to provide evidence that serves to find suitable alternatives to parking infrastructure that will still provide the expected level of service to our customers. Within this study's scope we want to indicate clear alternatives.

Technological Changes and their Impact on Future Parking Services

Technological changes have and will have an impact on our mobility means, on the quantity and ultimately the need for parking. This parking strategy needs to acknowledge that changes in the way we move around town will impact the urban landscape. The technologies are:

- Driverless vehicles;
- Shared economy or "dial-up" service;
- Continuation of internet based shopping for and purchase of services and products from the comforts of your home or office, and
- Technology that finds and directs to vacant parking space for you.

Ontario will be the first province in Canada to allow road tests of automated vehicles, according to Ontario Transportation Minister Steven Del Duca.

"For Ontario, the benefits of being part of automated vehicle innovation," said Del Duca in a speech at the University of Waterloo on Monday. "In order to compete, Ontario needs to be consistent with U.S. jurisdictions."

On Monday, Stratford Mayor Dan Mathieson told CBC Radio's *Midday Morning* that because of that decision, they can now use the network for these types of test projects.

Mathieson says these cars will eventually use the network to speak with lights and signals, adhering to instructions on how to proceed. They'll also connect to data collectors, providing data to city management on road conditions, such as the exact co-ordinates of a pothole.

Mathieson says the city will ensure a smooth transition to automated vehicles as early as this fall.

Driverless Vehicles and Shared Economy

Stratford stands out a major player in this technological development. Mayor Mathieson discussed the testing program now underway in Stratford. The Province of Ontario also made it clear that it is investing in the provision of infrastructure to service automated vehicle innovation. The technology is fairly clear to most so there is no need to describe it in any great detail here. Important to our study is

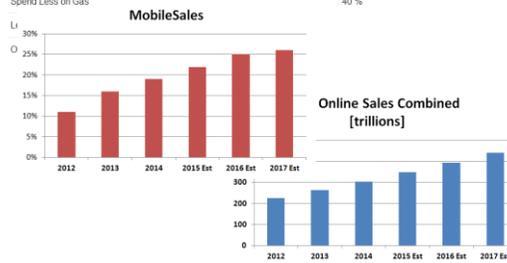
the potential impact on the way in which we think about parking. A scan of commentary on this technology finds the following key points:

- Combining the driverless vehicle with the "shared economy" technology, the on-demand service will not require a vehicle to rest in a parking space. Circulating around the block looking for a vacant parking space is not necessary as a driverless vehicle need only to pick up or drop off its passengers. Remember that a vehicle spends 96 percent of its time parked.
- Infrastructure changes are required so that this technology works - from clear network sensors, availability of charging stations to broadband wireless network that allows for communication between vehicles and that infrastructure.
- Most analysts believe that this technology will provide a safer and more efficient mobility service to us. It will also promise a cleaner environment as it is based on non-fossil fuel technology.
- Industry is well into the development of vehicles that can operate as such.
- Dialing up the service will be economical when compared to the outright purchase of your own vehicle.
- The technology will likely not reduced road congestion, however it will reduce the traffic that circulates looking for parking spaces (estimated to be of the order of 35 to 45 percent of the total volume)

Internet Shopping

A second change is the growing use of the Internet in the conduct of shopping. (See <http://www.statisticbrain.com/total-online-sales/> for more detail. The statistics shown in this section are from this site). The extracted figures (USA figures) underscores the growth in the value of online sales but more interesting to our study is the range of reasons for shopping online. The internet presents time savings and the ability to broaden the scope of potential stores that sell the item, and easier to compare prices. Each reason has an element of physical travel time, and inferences to the process of driving and parking a vehicle. Reasons related to travel are of course not exclusive to downtowns but shopping in general. The impact of the internet then is broader in its scope as it has changed the process of purchasing consumer goods and services. Perhaps the impact of the internet directly on downtowns is that it supports a modified vision of the role of the downtown – will the downtown become a centre of cultural and civic activity.

Top Consumer Reasons For Shopping Online	Percent of Survey Citing Reason
Time Saving	73 %
More Variety	67 %
Easy to Compare Prices	59 %
No Crowd	58 %
Lower Prices	55 %
Spend Less on Gas	40 %



Online Shopping Statistics	Percent
Percent of online user who have made an internet purchase	87 %
Percent of online user who have made a purchase multiple times	59 %
Percent of retail sales that are made online	9 %

John Winter of Winters Associations describes the internet sales being more specific to electronics, books and music. Winter in a radio interview (Wei Chan, Ontario Morning on Saturday April 6th 2013 on CBC)

noted that the sectors that are most vulnerable to both internet sales and the influx of the “big box” stores are: small “mom and pop” stores and **downtowns!** The discount stores are continuing to dominate the retail landscape. Winter suggests that price and shopping in a climate controlled environment are the key reasons for the big box success.

Within a dynamic market place that features the aforementioned "big box" destinations, how do citizens define the downtown and its linear, compact and specialty store landscape? How do citizens define the role of their downtown in their business, cultural and community experience in Stratford? Is that role changing over time?

Physical changes to the downtown may occur through new developments, re-developments and changes to the infrastructure that will impact the attraction of parking demand to the downtown. Potential developments are discussed and woven into the computation of future parking demands below. At this point, these developments are limited in details of quantity and type of use changes but their discussion serve to form the potential opportunities that may arise in the near and longer term planning horizon.

Factor 2: The Dynamic between Land Use Type and Trip Characteristic

We now turn our attention to the inherent differences that arise among different land uses in terms of trip characteristics, namely:–**patterns** of parking demand over the course of the day, week and season; **magnitude** of parking attracted per land use type and other trip characteristics that assist in defining the parking demand.

Parking Demands by Land Use Type

While feedback from visitors and employees, and employers regarding the state of balance between the parking demand and the parking supply is important, a solid unbiased computation needs to be presented as well. This metric is expressed typically as the peak number of parking spaces demanded for every 100 square metres of land use. The magnitude of the parking ratio is the result of the cumulative effect of a number of trip characteristics, such as:

- The type of land use (retail, office, restaurant, and services, etc);
- Each land use may peak at different times of the day;
- Each land use may peak at different days of the week;
- Each land use may peak on different months of the year;
- Observed work trip parking demand is impacted by:
 - Compressed work week,
 - Holidays,

Parking Demand Analysis Process



Figure 7: Parking Demand Analysis Process - Trip Characteristics

- Absenteeism,
- Work from home, and those who
- Leave the work place during the day as part of the work.
- Each land use may attract volume of traffic that is already parked in the area for other purposes – in other words, there is an element of “market synergy”; and,
- The effect of parking once and having multiple places to visit.

Detailed computation will be presented in the section: Current and Future Market Opportunities. Suffice to say at this point that although the major land use categories had some empirical data to back up the parking demand ratio used for the generation of parking demands over the study areas, some land uses required some estimation based on previous land use type specific analysis.

Temporal Variation of Parking Demand Makes Efficient Use of Supply

The *parking characteristics* of the downtown are driven by the land use mix and the temporal (time of day) variation in business activity. This temporal variation forms a rhythm of parking requirement and provides the opportunity for parking spaces throughout the downtown to be *time-shared*. For example, morning parking demand is generated by a number of medical and commercial offices,

personal service and coffee shops

throughout the commercial area. Within

the mid-morning to late afternoon, incoming traffic is related to the attraction of general and specialty retail stores, financial institutions as well as the lunch time restaurants. Evening or matinee attractions at the Avon, Studio and Tom Patterson (1800, 260 and 410 respectively) provide significant traffic to the downtown but also provide a market for quality sit-down restaurants. The parking supply as such is constantly used and re-used by many different clients throughout the day.

The temporal variation of parking demand by land use type is a crucial concept because people who observe specific developments in an area of the downtown often over react to their impact on the balance between parking demand and supply. It is important then to understand that different land uses generate different patterns of demand over the course of the day. And often, these differing individual patterns complement one another to make efficient use of the same parking supply. Further, as will be developed later, these characteristically different patterns of individual parking demands, come together to form an overall pattern of parking demand over the course of a weekday or weekend. It is the resulting peak or set of peak points on this collective view of parking demand that becomes the focus of comparison of parking supply to parking demand.

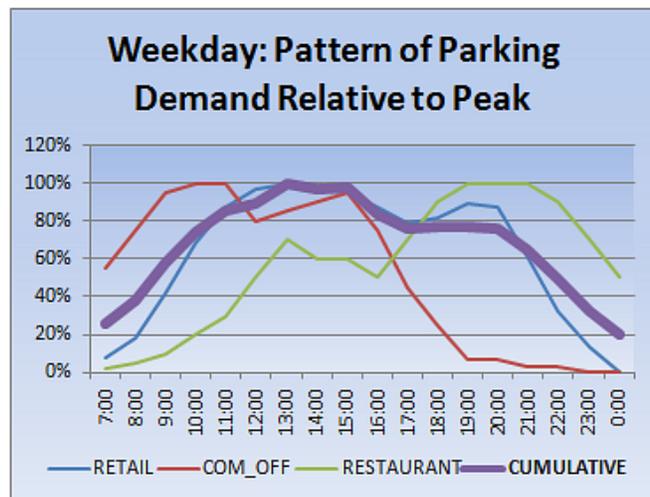


Figure 8: Theoretical Temporal Patterns of Parking Demand for Typical Land Uses

Figure 14 shows the interplay of sample land uses – each curve represents the pattern of parking demand over the course of a typical weekday. The thicker “Cumulative” line on each chart represents the aggregate pattern of parking demand that would be formed by these individual land uses. Thus, while individual land uses form different patterns of parking demand -peak demand occur at different times of the day, the cumulative overall demand pattern shows that parking space can be shared among these different land uses.

In determining peak parking space requirements in a downtown or commercial strip setting, their calculation is not a matter of adding individual peak parking demands, but rather to construct a model of these individual peak parking demands over the course of a day – the peak parking space requirements then becomes the aggregated cumulative effect of the individual land uses.⁴

The process also requires an iterative approach. While best practice review, empirical evidence provided by the online surveys, and consultant’s experience are valuable inputs to the calibration of these temporal factors, the ultimate test is to match what was observed in the field through the use of the parking supply. The way in which the *supply* responds to the parking demand is the subject of the next technical report, but presented here are the results.

Table 4: Temporal Variation Factors for Selected Land Uses

Estimated Temporal Variation Factors for Selected Land Use Activities for a Typical Weekday			
Land Use Type	Morning	Afternoon	Evening
Retail	25% (see note)	100%	75%
Office	100%	75%	10%
Restaurant	25%	75%	100%
Entertainment – Theatre	5%	90%	100%
Social	75%	75%	100%
Recreation	80%	80%	100%
Note: 25 percent of the peak retail parking demand occurs in the morning time period			

Multiple Destinations for a Trip

The interplay of for example, coffee shops with offices, restaurants with retail and office, and theatrical performances with restaurants, serve to remind us that parking demand based on a specific set of land uses must account for *sharing* of a trip. On one trip to the Downtown by car, on average, one parking space served 2.2 destinations (online internet survey results indicated 67 percent of the respondents had 2, 3 or more destinations). This is a key factor that serves to reflect the parking demand generated by a specific land use in a more collective and interactive downtown context.

⁴ When we conduct a parking supply response study we are evidencing the cumulative or aggregated result of the myriad of different patterns of parking demand that are generated by the wide variety of land use types in the downtown. What we are observing then is the resulting composite view of varying parking demand patterns expressed over the course of the day.

The impact of this factor is a downward pressure on the parking supply requirement - as one parking item is shared among a number of different destinations, different trip purposes, and different trip durations. Municipal parking space is characterized by the use of its product - parking space - by a number of different sources of demand. The municipal parking system does not work in an environment where one space serves only one destination - that would make the system oversupplied, inefficient and unsustainable in the long term.

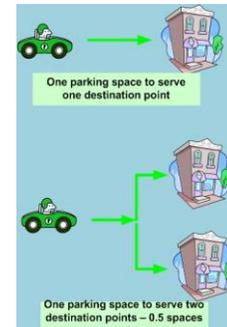
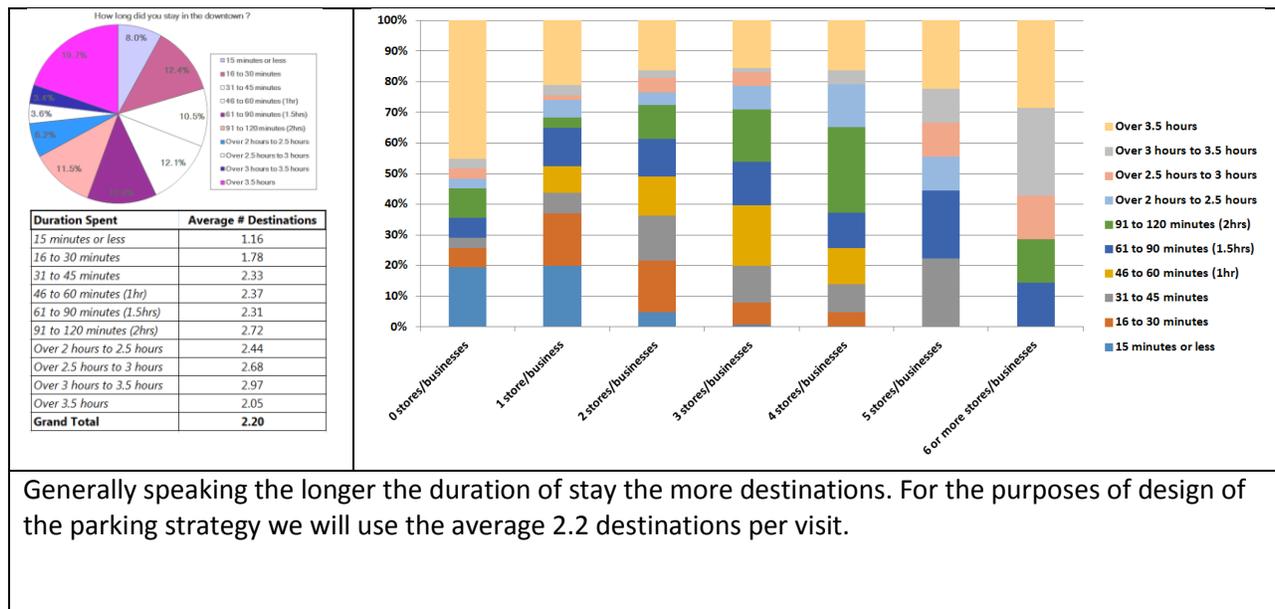


Figure 9: Sketch of multiple destinations associated with one parking location

Table 5: Customer Durations of Stay and Number of Destinations



Generally speaking the longer the duration of stay the more destinations. For the purposes of design of the parking strategy we will use the average 2.2 destinations per visit.

The effects of multiple-destinations that are served by one parking space have been incorporated in the parking demand ratios that are described in the section: Determination of Current Parking Demand.

Market Synergy – Walk-ins [Captive Market Effects]

The downtown is not only a central shopping destination point, but it also draws employees each day. These employees create a "built-in" and readily serviceable market for linked commercial services throughout the course of a day. An office worker for example drives to the downtown and parks their vehicle. Their prime destination is the workplace. However, over the course of the work day, that employee may walk over to a coffee shop; may visit a bank; and, may visit a restaurant over lunch break. **All of these linked destinations were serviced in most cases by one parking space.**

This *market synergy* serves to reduce the quantity of parking spaces required in such a setting. Parking space serves the primary trip to the downtown and subsequently a number of non-work trips may be generated – all of whom do not necessarily require another parking space. The online survey indicates

that **12 percent** of the trips within the downtown start from a work place within the downtown. Relative to other downtown studies that the consultant has reported on this level of walk-in is about half the number.

Parking Demand Analysis Process

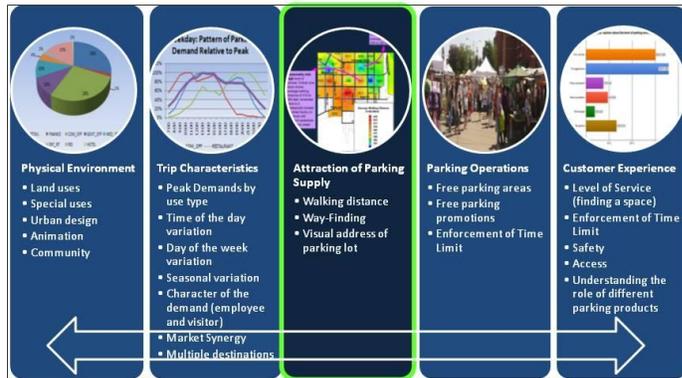


Figure 10: Parking Demand Analysis - Attraction of Parking Supply

Factor 3: The Dynamic between Parking Demand and Parking Supply

The graphic serves to help navigate the discussion of the potential impacts that spatial distribution of public parking supply has on parking demand.

As part of the study of parking demand that would be attracted by a number of different land uses, it is important to account for the difference between *demand for parking* and *demand for parking within a convenient distance from one's primary destination*.

As such, it is critical to determine if a parking problem is a result of not finding an available space immediately in front of the primary destination or a result of not finding an available space within a reasonable walking distance of that primary destination. As well, it is important to determine if the parking problem that customers speak of refers to on-street or the off-street parking products or both.

Role of Walking Distance to the Definition of a Parking Problem

Walking distance impacts the process of selection of the parking product, and serves to form the notion that parking supply is either over- or under-supplied in an area. Similar to other retail or service products – accessibility to the consumer is a critical factor in achieving the optimal delivery of the

The potential impacts of not finding a convenient parking space:

- Parking illegally and taking a chance that they will not be caught by enforcement officers;
- Choosing to park in free un-regulated areas of the downtown;
- Choosing to park on spaces that are offered by business owners on site;
- Choosing not to pay for the use of parking space that is perceived to be inconvenient relative to trip destination or purpose;
- Increasing the traffic in the area due to motorists circulating the transportation network looking for parking space;
- Increasing the stress related to finding that perfect parking space;
- Lowering the customer experience with driving downtown for other-than-necessary trip purposes

service. Contemporary retail and service enterprises make use of advertisement, the Internet, and word-of-mouth techniques to draw their consumers. Parking is no different in that it needs to respond to and cultivate its consumers.

Parking has a significant challenge in that its response to the market demand is constrained by the physical environment. On-street parking supply is by and large fixed capacity. Off-street parking “franchises” may present opportunities for expansion – from surface to multi-tiered structures, but not only at a significant cost but also is constrained by the geometry of the site. Not every surface lot can be converted to a parking structure without serious investigation from traffic, aesthetic, economics and operational points of view.

The act of parking a vehicle in a particular location is a synthesis of a number of customer decisions. The process entails an investigation of:

- How far are people willing to walk to and from a parking space to primary destination?
- What factors influence the selection of a parking space?
- Does the customer know what the municipal parking system is selling in terms of its location, its cost, condition of sale (time restrictions, for example) and level of service (what kind of access control, payment options, secured environment)?
- From a transportation network point of view, how is the product (parking space) integrated (street access and pedestrian connections after one parks their vehicle)? and,
- How is the product (parking space) advertised to the customer – signage, pedestrian routes and safety look and feel?

The **amount of time** it takes to find a parking space forms the consumer’s perception of whether or not there is a “parking problem”. Finding an available parking space that meets the consumer’s value of time, distance and cost serves to paint the picture of parking demand versus parking supply differently than the situation where a consumer has to circulate the streets to find an available space. The study provides this kind of data through the online survey tool, as well as, research conducted by the consultant helps to assess how well the parking supply is positioned to service the demands of a number of different market segments (customers).

As previously stated, the theory is that a municipal parking service provider “sells” its product to those within a specific geography; the **extent of that geography** is impacted by a number of factors, such as:

- Expected duration of stay (theory is the shorter the duration, the less distance to and from parking space);
- The cost of the parking service (theory is the higher the cost, the less distance to and from the parking space – value of convenience is therefore expressed in terms of cost and location);
- The availability of parking supply/service relative to one’s primary destination;
- The weather plays a factor in determining how close or far that key distance should be;
- The time of day the trip takes place (security during the evening);
- The urgency of the trip – medical service that is site- and time-specific versus a shopping trip that may be multiple destinations and without a specific time;
- The physical link between parking space and destination (direct link, circuitous, getting there and back safely); and
- How well customers know of the location of parking space and how well the service provider makes it known to the customer where their service is located

The **purpose of the trip** impacts the perception of whether or not there is a parking problem. For example if the purpose of the trip was to make a medical appointment, then one might be expecting to find an available parking space immediately in front of the medical office. On the other hand, if the trip purpose was not site-specific or time-constrained such as a stroll, window-shopping, having a coffee; then one would expect that the visitor would spend more time looking for spaces available within a larger geographic scope.

The analysis of walking distance serves to identify parking space that is **marketable** to various types of customers and as such it does impact **where** and what **type** of parking services are in demand.

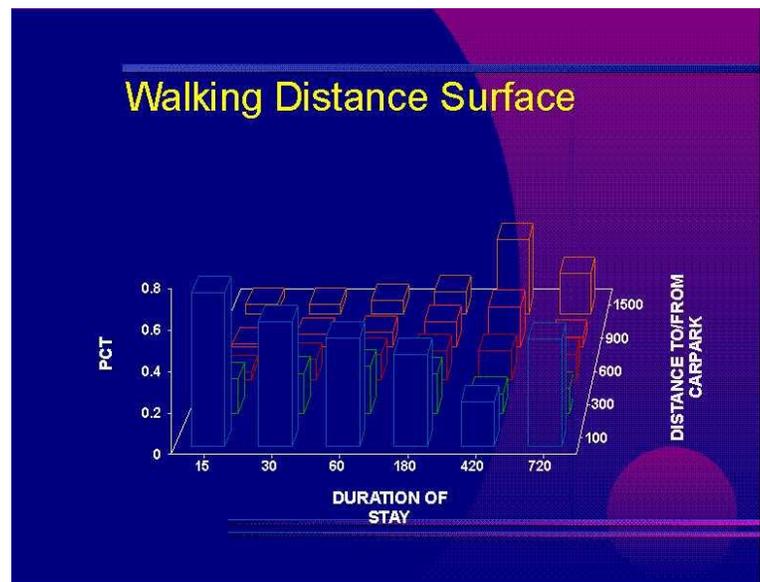


Figure 11: Library Evidence of Walking Distance by Duration of Stay

Figure 11 helps to visualize the impact of duration of stay, cost of parking and walking distance derived from many downtown parking studies over the years. As walking distance is a product of many factors: trip's duration of stay; cost of parking and availability of parking space, the ultimate selection of parking space may result in actions that may not be so predictable or rational.

The online survey responses provided insight into the walking thresholds that currently are exhibited in the downtown. This walking pattern will be critical in the estimation of parking demand/parking supply response at the block level. The value of knowing this threshold in our parking investigation is to help to determine the market for on- and off-street parking space.

With the discussion above as a background, the results of the analysis of walking distances, walking times and implied levels of service are presented in the sections that follow.

The snippet to the right shows the number of online respondents who found parking space on the block that also contained their primary destination point. For example, 52 percent of those whose primary destination was on block C100 found a parking space to serve that trip on the same block.

Where I Parked	Primary Destination Within Same Block
C100 - Cobourg	52%
C101 - Erie lot	67%
C103	33%
C104 - Market	66%
C105	28%
C106	83%
C107	60%
C108 - Free Parking	12%
C109	20%
D101	57%
D102	100%
D103	67%
D105	0%
E100 - Albert	71%
E101	75%
E102	47%
E103	50%
E104	100%
W100 - Library block	100%
W101	0%
W102	100%
W103	69%
W104	0%
AVG	55%

We offer these observations:

1. Fifty-five (55) percent of respondents parked their vehicles and had their primary destinations on the very same block.
- For those who parked on a **municipal off street** parking facility, surveys indicated that **83 percent** were able to find a space within 5 minutes, while those who parked on an **on-street**

parking space **63 percent** were able to do so. This is not unusual as on-street space is clearly a preferred choice and clearly much more restrictive in terms of inventory. As well, **73 percent** of those survey takers who chose to park on a **private customer** only parking facility were able to find space within 5 minutes!

Duration	11 to 15 minutes	6 to 10 minutes	Less than 5 minutes
15 minutes or less	2.38%	9.52%	83.33%
16 to 30 minutes	5.36%	23.21%	69.64%
31 to 45 minutes	8.89%	24.44%	62.22%
46 to 60 minutes (1hr)	10.53%	19.30%	70.18%
61 to 90 minutes (1.5hrs)	10.34%	22.41%	56.90%
91 to 120 minutes (2hrs)	7.69%	25.00%	63.46%
Over 2 hours to 2.5 hours	6.67%	13.33%	73.33%
Over 2.5 hours to 3 hours	12.50%	25.00%	56.25%
Over 3 hours to 3.5 hours	9.09%	27.27%	54.55%
Over 3.5 hours	5.56%	14.44%	74.44%
Grand Total	7.44%	19.47%	68.27%

Figure 12: Duration of Stay versus Search Time [Off-street Users]

- Often the perception that parking supply is deficient to the needs of customers is based on the **relative amount of time it takes to find a vacant parking space against the amount of time that they wish to stay in the downtown.** **Figure 12** shows on average 68 percent of the survey takers who found space within 5 minutes those who had durations of 15 minutes or less a significant portion (83%) found that space within 15 minutes. Closer to the average duration of stay of customers in the downtown - just under two hours, the average 5 minutes or less service delivery was of the order **63 percent** with a significant 25 percent of 1:30 to 2:00 hrs duration needing 6 to 10 minutes to find a space. So we are still able to deliver the service within ten percent of the total time a customer wants to spend in the downtown.

- Market Square (C104) and Erie lot's Block C101 represent 46 percent of the total online destinations. The facilities on these prime blocks serve two-thirds of the parking demand attracted by its uses. Be mindful that the Market Square block offers 68 on-street parking spaces while the Erie block provides 227 spaces including a 136 off-street parking facility. The 66% - 67% capture rate is an indicator of a high level of customer service.

- The market capture area for those with destinations on the **Albert St** lot is shown on Figure 14. We have established that this block like many other primarily serve demand attracted by land use activities on the block itself, but note that there are indications that demand generated across Ontario St and on the south side of Albert is being serviced as well. Our field crew indicated that virtually on every observation period on the Wednesday of both the July and December surveys, there were vehicles circulating the Albert St municipal parking lot looking for space. Clearly this is a key parking infrastructure investment.

- The shape of the service area for parking space within the Market Square (Figure 13) block is very focussed on that block's demand generators but we can

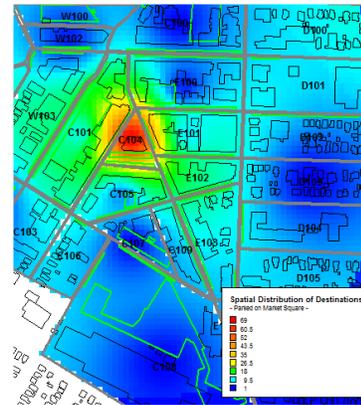


Figure 13: Spatial Distribution of Destinations from Market Square Block (C104)

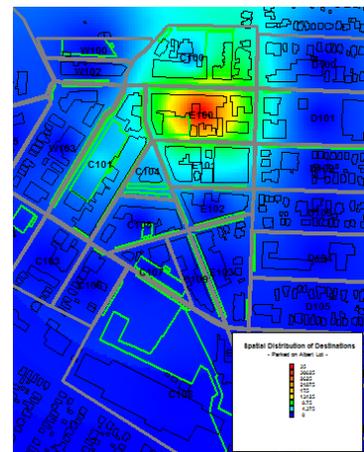


Figure 14: Spatial Distribution of Destinations from Albert Block (E100)

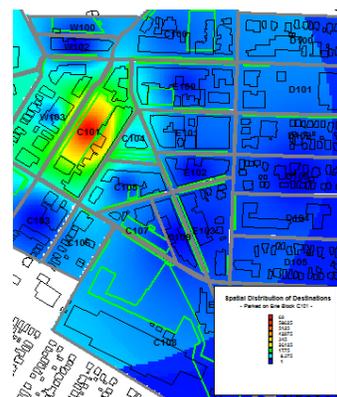


Figure 15: Spatial Distribution of Destination from Erie Block (C101)

see the green hue beginning to show up in blocks east and south.

- The parking spaces here served parking demands generated by 9 other blocks in the downtown showing its relative strength and importance to the delivery of service to demands attracted outside of its own block boundaries.
- The third key block - Erie lot C101 - continues the theme of serving largely the demand generated on its own block

location (Figure 15). In addition the market capture area is spreading to the block immediately west and east of it. The latter is of course where the City Hall Annex building is situated. Pertinent to current "buzz" regarding the Market Square re-development it was found through our online surveys that this block's parking space inventory serves **12** other block areas in the downtown.

- The distribution of destinations of those who are parked on the "free" Cooper lot on our Block C108 located at the very bottom of the downtown (Figure 16) serves to remind us of how parking location, level of service and price of that service interplay.

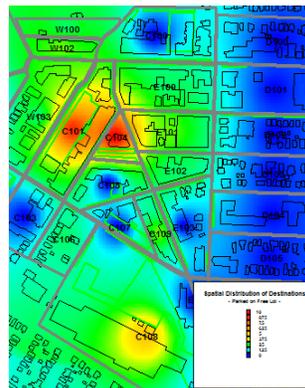


Figure 16: Spatial Distribution of Destinations from Free Lot (C108)

The 280 spaces serve block activities - University of Waterloo and the Community Centre (recreational activities). In addition however, customers of this free service will walk 520 meters to/from the City Hall Annex building (W103) or 430 meters to the Market Square or City Hall block.

This block's spatial coverage is just one block short of the Erie lot block with 11 different block

destinations reported in the online surveys.

Walking Distance - To/from Demand and Supply

Table 6 summarizes total distance, average distance, standard error (plus/minus) and a statistical range formed by the 95th confidence limits. The distance measurements are those from blocks where people parked to blocks where the primary destination was located.

Table 6: Walking statistics derived from surveys

Total Distance	Average	STD	Lo95	Hi95	Blocks
2526	101	4	99	103	C100 - Cobourg
6930	69	3	68	69	C101 - Erie
1055	176	28	154	198	C103
6031	58	4	57	59	C104 - Market
2088	116	10	111	121	C105
366	61	14	50	72	C106
329	66	11	56	75	C107 - St Patrick
16372	381	30	372	390	C108 - Free Parking Areas
826	165	30	139	191	C109
1673	239	21	223	255	D101
184	92	0	92	92	D102
569	190	42	142	237	D103
232	232	0	232	232	D105
17105	349	87	325	373	E100 - Albert
7070	354	96	312	396	E101
6644	391	45	369	412	E102
5004	417	44	392	442	E103
260	260	0	260	260	E104
6429	918	0	450	918	W100 - Library block
328	164	29	124	204	W101 - York
1359	272	0	272	272	W102
3506	270	76	228	311	W103
689	344	12	328	361	W104 - Kalbfleisch

The spatial distribution of the average block walking distance shown on Figure 17 again illustrates that shorter walking distances [Blue] are currently found on the core blocks.

Walking Distance - Time Taken

The walking distance results also indicate not only physical distance to and from parking space and destination but also the range of 123 to 154 meters for visitors in the downtown translates to roughly a walk of 2 minutes and 45 seconds to 3 minutes and 25 seconds. Physical distances to and from parking space and primary destination can be traversed in varying times. The paths presented by the free lot block's parking to the City Hall/Market Square block are ones that save time over distance through laneways, and other short-cuts that are present. The mid-block pathway connection

directly through the Wellington St building face to the Erie parking lot provides time-saving and weather protected pathway to destinations east of the parking lot. Thus time taken to reach primary destination and not necessarily the physical distance plays a significant role in defining the coverage that various parking facilities have in the downtown.

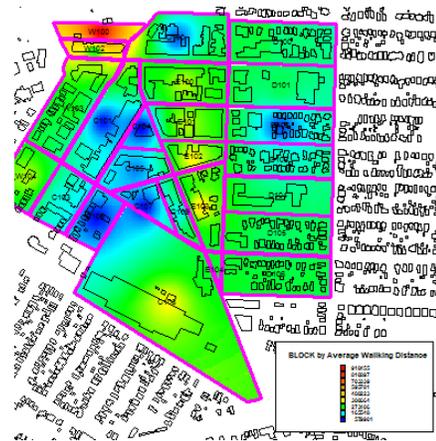


Figure 17: Field Surveyed Spatial Distribution of Average Walking Distance

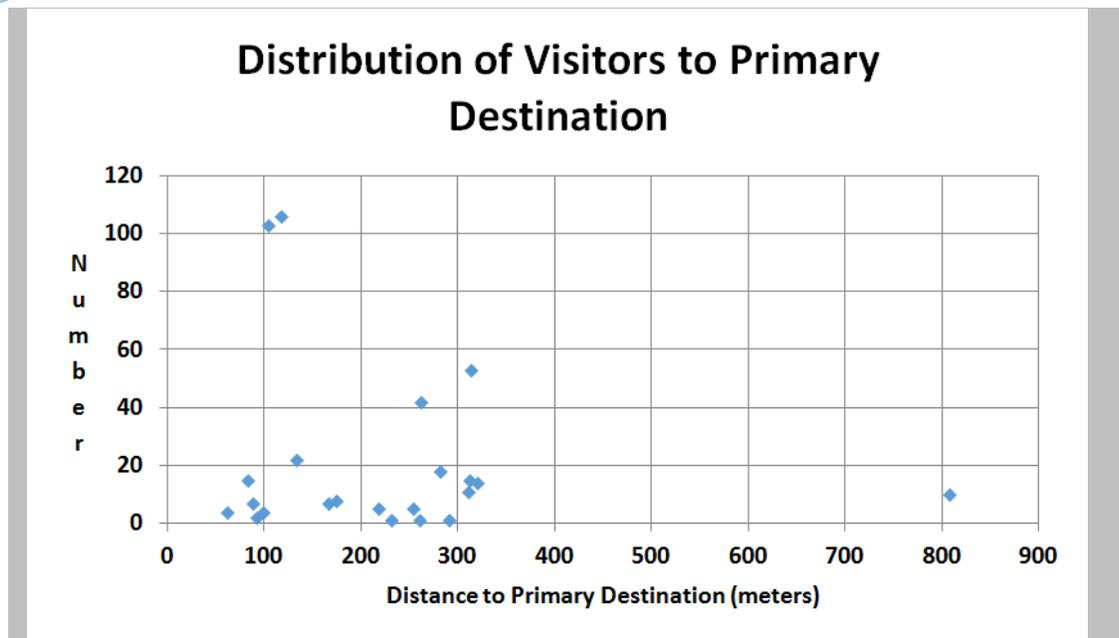
Walking Distance – Implied Level of Service

Table 7 illustrates the **distribution** of walking distances that emerged from the online survey responses with distance in meters along the horizontal axis and number of responses along the vertical axis. The illustration gives a visual cue to the general high level of service that currently exists. A typical measure of the level of customer service as it relates to the location of parking space to the primary *destination is the magnitude of that service for 90 percent of the customer* demand. In other words, at what distance from primary destination do at least 90 percent of our customers find their parking space?

Based on the results of the downtown customer surveys, 90 percent are served by parking space that is located 300 to 315 meters from their primary destination (or about 6 minutes). More impressive is that **46 percent** of those surveyed walk about 100 to 105 meters (or 2 minutes) to their primary destination! Compared to other downtowns that the consultant has studied Stratford's distribution of walking distance is consistent. The distribution that we found here points to a very high level of customer service currently. That level of service presents one of the targets that customers are now used to seeing met, and it also serves to form a challenge to the parking service delivery as physical changes occur in the parking supply due to developments in and around the downtown.

In the next two sections let's talk about walking distance and the customer service expectations of two major customer types: work-related customers and shorter stay visitors to the downtown and how the expectations of each type impacts the parking service delivery model.

Table 7: Graphic Showing a Measure of the Level of Customer Service



Work Trip Market Segment

Public parking managers rely on the judicious allocation of off-street parking space to work market segment through the sale of monthly permits. The number of permits is limited as it would be prudent to make enough parking inventory for the service of higher volume, broader customer base short stay visitors. In contrast to parking space that is marketed to the shorter stay – first-come first-served group, the allocation of monthly parking permits is most often done through subscription, or a lottery approach.

As such, the designation of specific parking areas to specific employees/employers distorts the spatial distribution. Market forces are skewed to operations - that is, only to those locations that sell permits.

Parking space for the work trip is limited – not only in physical terms, but also by the need to provide enough of that limited inventory to meet shorter stay customer needs. Further, the temporal difference between the two markets presents a challenge. The work market arrives earlier to the area and has first “pick” of the parking spaces while the shoppers, visitors arrive to the area some time later. The municipal parking system is forever trying to balance these two markets for its limited products.

The municipality is not always the sole provider of employee parking space. Depending on local zoning requirements, urban design and planning standards, private development sites within the downtown can also provide parking exclusively for their employees –on-site or on a collective privately operated off-street parking facility. In terms of walking distance the factors that influence *where* employers and their employees park their vehicle during the day are as follows:

- Reasonable price and the acceptance that parking in the downtown has a monetary value;

- Relationship of cost of parking and the distance to and from their destination (again the theory is this: the consumer would balance cheaper (or in Stratford's case: free) parking rates against longer walking distance);
- Availability of private space either on-site or in a shared private off-street lot; and,
- Requirement for work-related parking space very close to work place of employment is directly related to the type of work done during the day (one may require vehicle to load and unload goods, for example).

We recognize the challenge of finding a parking space for those workers that are either part-time employees or have afternoon shifts. The schedule presents a challenge because they would have to compete with transient visitors to the downtown.

Visitor Trip Market Segment

Visitors to the downtown exhibit different decision process when choosing where to park relative to their primary destination. Firstly, in some cases, there is no primary destination as people may choose to travel downtown to browse shops rather than specific stores. Because of this their parking decision may be largely a result of:

- How they approached the study area (from which streets);
- The cost of parking; and the level of, and
- Prior knowledge of where the available spaces are in the area.

Depending on their anticipated duration of stay in the downtown, convenience plays a significant role in their decision. As addressed by the comments received from respondents, the role of the on-street parking supply is crucial to this type of customer.

The configuration of the municipal off-street lots in the downtown features pedestrian links that directly bring a parking customer to the core street of Wellington and Ontario streets. This is the case with municipal lot on Erie and to a lesser extent for Cobourg and Albert.

Factor 4: The Dynamic between Parking Demand and Parking Operations

Figure 18 serves to focus our discussion in this section on the potential impacts that our public parking operations may have on parking demand in general and the whole customer parking experience specifically.

Potential Impact of Free Parking Supply on Non-commercial Areas - Downtown

In the downtown there are few streets that provide free parking⁵ and of course the major surface lot (280 spaces) on the southern fringe of the downtown. A perusal of the online survey responses

however did not indicate any reflection on the possible conflict that arises when commercial activity spills over into residential areas. This lack of concern may be an expression that there is little in the way of impinging on residential and that supply within the commercial area manages the demand adequately.

The use of this un-controlled⁶ parking supply is only managed through the enforcement of the time restriction (72 hours in the case of the Cooper lot). Enforcement of un-controlled parking space is labour intensive and time consuming practice. There may be an opportunity to implement the more contemporary technique of License Plate Recognition technology to reduce the investment of time in maintaining time restrictions.

The provision of free parking and its impact on walking distances is documented in prior sections of this report. The walking threshold for both longer and shorter stay customers (250 and 100 meters respectively) is completely shattered with recorded distances of 300 to 350 meters to/from that Cooper lot. Thus the traditional relationship of duration of stay and walking distance is shattered when price of parking is taken into account. From a parking planning point of view, if cost recovery for the parking service is not a business requirement for the municipality, then all parking can be distributed to the fringe areas of the downtown, producing a very different landscape in terms of service and land use.

The other potential policy action may be to begin to think about the acceptance of "re-parking" in the downtown. This concept allows a customer to pay for parking within time restrictions as today, but to be

⁵ On-street areas such as Church St, Erie St south of St Patrick, Wellington St south of St Patrick, and some areas east of Waterloo St South.

⁶ Un-controlled as in there is no pay and display machine or meter.

Parking Demand Analysis Process



Figure 18: Parking Demand Analysis - Impact of Parking Operations

allowed to move their vehicle to any space within the study area within that time restriction. More simply this technique asks the customer to pay once and park anywhere within the defined commercial area without having to pay again.

Impact on Parking Demand of Municipal Parking Promotions

Many municipalities have incentive programs that feature free parking. While it is difficult to determine if this feature directly contributes to the decision to drive a vehicle or not, such programs show some community spirit. Notices of such events on the pay and display machines help to create a unified event that serves to bring the community together.

Examples of promotional programs currently available to customers are:

- Free Sunday parking
- Free Saturday parking December 1st to April 30th
- Car free Fridays in June, July and August

Other municipalities offer of value-card or Smart-card to customers is an example of a current "coupon" type of promotion. Pay and Display units can accept and thereby discount the purchase of time on the unit. Customers can "top-up" or purchase more time on the card through online interaction with the sponsor of the card. Combine this "electronic purse" concept with a cell phone link to its sponsor to either update or purchase and the customer will more easily be able to pay for parking.

As the public parking program is a support service to the commercial areas, it will become involved in discussions on "special events" or promotions. The mandate of the public parking organization is to remain self-sustaining – that is, to be supported only through its revenues and not a draw on the town's general revenue base but it also accepts the role that it can play in fitting into the commercial and community fabric of the area that it serves.

Potential Impact of the Enforcement of Time Restriction

In all parking operations, large and small, parking enforcement has an important role to play in parking management by optimizing the limited supply (i.e. increased vehicle turnover) of parking spaces provided to the public. Regular enforcement officer patrols are necessary for the following reasons:

- to deter and discourage abuse by motorists that over-stay the time limits or refuse to pay the metered rate;
- to improve pedestrian safety (i.e. vehicles parking on sidewalks or creating obstacles or blocking intersections)
- to promote community safety by ticketing vehicles parking illegally near fire hydrants, fire routes or stalls reserved for motorists with disabilities; and,



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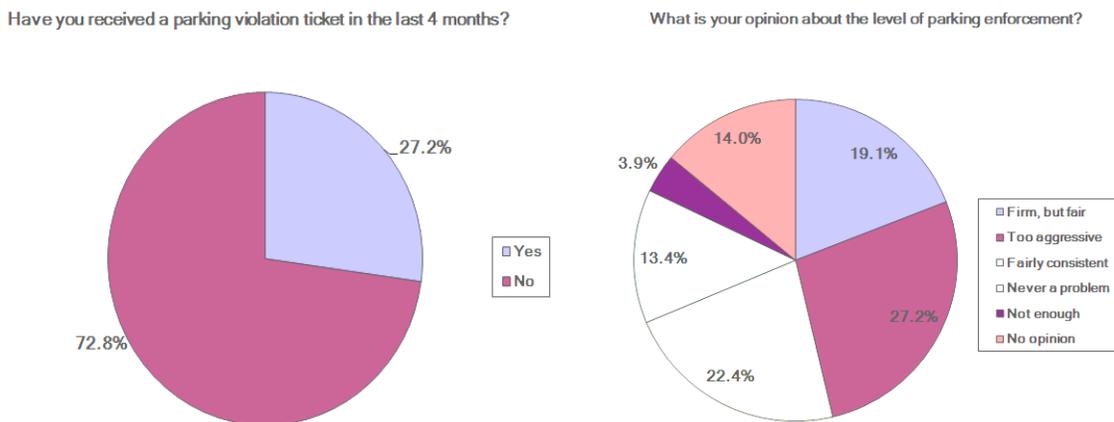
Grab those walking shoes ...
Jump on your bike ...
Hop on the bus!

Find us at the corner of *George St & Downie St*

- To ensure the efficient delivery and exchange of goods and services to businesses by enforcing loading zones.

It is recognized that parking enforcement has grown in controversy and no one likes getting parking tickets. The public and motorists should realize that enforcement is required for their own safety and broader benefit of the community. Public awareness programs that explain to motorists what to look for when they park and why the various restrictions are in place will help foster improved understanding of enforcement practices.

Table 8: Customer Responses to Online Enforcement Questions



A necessary component of parking management is the enforcement of parking regulations, particularly as they relate to the restriction of time spent on parking spaces. Certain types of parking space are obviously more attractive than others for one hour parkers, two hours or more parkers and all-day employee parkers and so on. Clearly, on street space is critical to the service of the very short stay customer parking market. This space is convenient and self-advertising. Since a significant proportion of people visiting are of the short stay type, such spaces need to turn over at a rapid rate to provide a high probability of servicing that market.⁷

Multi-space pay and display units and/or single metered space controls the duration of use through the concept of maximum amount of time one can purchase. Enforcement of on-street space in the downtown commercial areas provides the necessary mechanism to ensure that convenient and self-advertising on-street parking space presents opportunity for a number of different customers. Over use of time-restricted on-street space impacts the volume of traffic on residential and side streets by those customers who are forced to circulate to find available parking space. Herein is the challenge to the parking program: market the role of the **off-street parking** resource as an attraction to longer stay customers' needs through its advertisement and priced in order to draw customers to it.

⁷ On street parking plays a role in slowing down traffic and providing a buffer between pedestrians on a sidewalk and vehicles on the street.

The following analysis serves to demonstrate the "unintended" impacts of over-staying on a parking space. One of the key underlying elements of this parking study is to highlight the reasons enforcement is needed as well as to measure of current effectiveness of the enforcement practices in the downtown. And just how important is it to manage the duration of stay on a parking space?

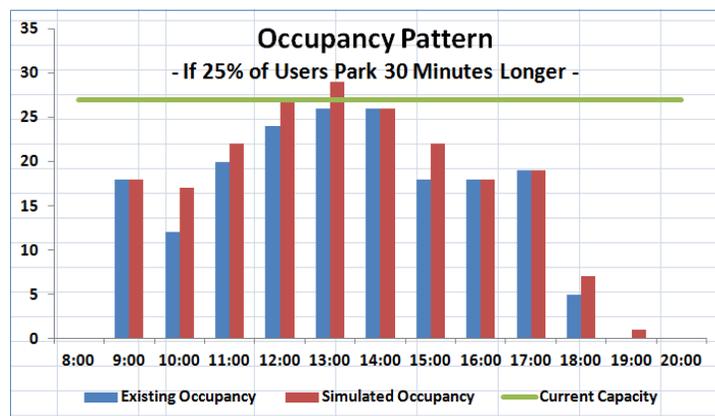
We wanted to illustrate the effect of staying 15, 30 or 60 minutes more on a metered or pay and display parking space than is currently the case. For the purposes of investigation of the impact of staying longer on the limited on-street parking spaces, we constructed the following laboratory:

- Pooled all of the visitors that parked on the 27 spaces on the south side of Market Square;
- Through our parking space utilization surveys we are able to construct vehicles arriving, departing and accumulating over the course of a typical high volume December survey day;
- We then made an assumption in order to **isolate the impact of staying longer**, namely: that for the purposes of this analysis we would assume that we do NOT attract any new volume or customers to the area; and,
- Projected the impact on the use of these on-street parking spaces if say 25 percent of the current volume stays 30 minutes longer than today.

This results in a higher occupancy of space –beyond practical capacity. The scenarios here make the assumption that volume and patterns of arrival of customers is held constant and only the duration of stay changes.

The impacts of the above changes to average duration of stay are:

- If everyone stays 30 minutes longer, the occupancy of space would increase by 14% on average over the course of the day;
- The increase in occupancy would result in periods of over capacity between noon and 13:00 in the after.



So, the price we pay for not enforcing the time limit is severe in terms of the pressure on limited space resources. The impact therefore of increasing the time restriction is to create a chronic high occupancy of parking space resulting in more frustration in finding an available space (since those spaces are not turning over as often). Typically, a standard used in the parking industry is that at least 15 percent of the capacity should be made available at all times over the course of the day to enable shorter times looking

for available parking space. The longer people stay on this critical on-street parking resource, the greater the difficulty in making space available to others.

Another industry standard is that to maintain this 15 percent of capacity available, the **pricing** mechanism is applied. Typically, when occupancy reaches and exceeds 85 percent of capacity, parking operators raise the parking rates to push customers to the off-street parking facilities thereby freeing up spaces for the shorter stay, higher turnover business customers.

This is not to say that staying in the downtown is not a good idea, but underscores that critical and very time sensitive on-street parking space should remain for very short stay visitors. **It is the expressed role of the off-street parking product to serve the longer stay customer.**

Factor 5: The Customer Experience

This section serves to provide valuable information regarding customer experience with public parking in the downtown. As was the case with the other four factors the graphic below serves to provide the map for the analysis.

The results of online survey form the core of the discussion that follows. A copy of the online questionnaire is shown in **Appendix A – Online Survey 2016**.

The public was engaged and definitely interested in parking (over 500 responses), as exhibited by the many thoughtful comments received. The fact that people not only answered the questions, but took the time to provide extensive commentary, shows a community that is concerned about the parking services provided by their municipality.

Customer Profile

Flowing from the surveys, the downtown attracts this typical customer:

1. Eight-three percent of our responses were from customers who visited the downtown on a weekday.
2. Thirty-seven percent of our responses were from customers who visited the downtown in the morning (8 am to 11 am).
3. Thirty percent of our responses were from customers who are in the downtown for work-related or business meeting purposes.
4. Seventy-seven percent came to the downtown from their place of residence.
5. Eighty-three percent came by car or truck, with a significant 12.5% who walked from their residence.
6. Sixty-five percent of those who drove to the downtown parked on-street, and 23% in a municipal off-street facility.

Parking Demand Analysis Process

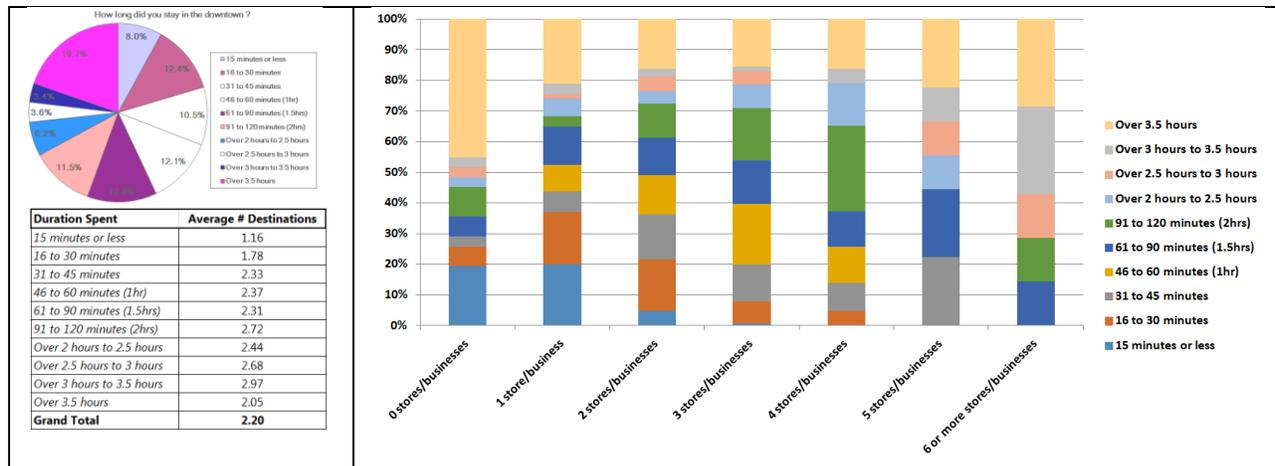


Figure 19: Parking Demand Analysis - Impact of Customer Experience

Trip Destinations and Time Spent in the Downtown

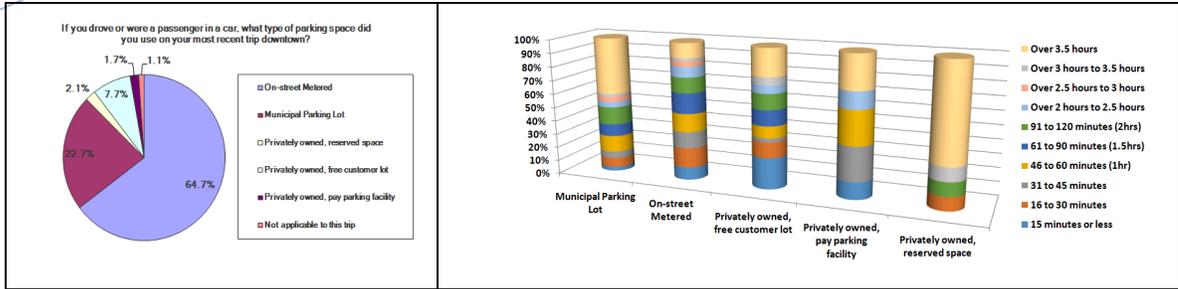
7. On average each visitor had 2.2 destination points in the downtown on their trip.
8. Top draws for visitor's primary destination are shown in red on the snippet table to the right.
9. Pulling out just those who drove their vehicles and had indicated that either dining, shopping or entertainment was their primary trip purpose, the average duration of stay is 1:53 hr.
10. Generally speaking the longer the duration of stay the more destinations.
11. About 32% of respondents stay for more than two hours. The duration of stay category – 1 to 1.5 hours – serves the broadest range of stores visited.

Destination is outside of the boundaries shown	Frequency	Pct Distribution
C100 - Pazzo Taverna	27	4.8%
C101 - Rene's Bistro, The Butcher The Baker	134	23.7%
C103 - Convenience Plaza	5	0.9%
C104 - City Hall / Market Square	127	22.5%
C105 - Cora, Pizza Pizza, Carrie's K9 Cuts	16	2.8%
C106 - Parlour Inn	8	1.4%
C107 - Police Station	6	1.1%
C108 - Waterloo Stratford Campus	7	1.2%
C109 - Black Swan	8	1.4%
D100 - Tim Horton's	3	0.5%
D101 - Shoppers Drug Mart	11	1.9%
D102 - The Prune, Post Office	2	0.4%
D103 - Gentle Rain, Marley And Me	6	1.1%
D104 - Jeanne Sauve, Romeo Public School	0	0.0%
D105 - St John's United	1	0.2%
D106 - St Paul's	0	0.0%
E100 - Bentley's, Armoury	65	11.5%
E101 - TD Bank, Albert St Inn	49	8.7%
E102 - Avon & Studio Theatres	17	3.0%
E103 - Downie Street Burgers	16	2.8%
E104 - Parkette	1	0.2%
W100 - Library	14	2.5%
W101 - Park activities along river	0	0.0%
W102 - York & Ontario St shops	18	3.2%
W103 - United Way, City Hall Annex	22	3.9%
W104 - Royal Canadian Legion, Home Appliance	1	0.2%
Response Count	565	

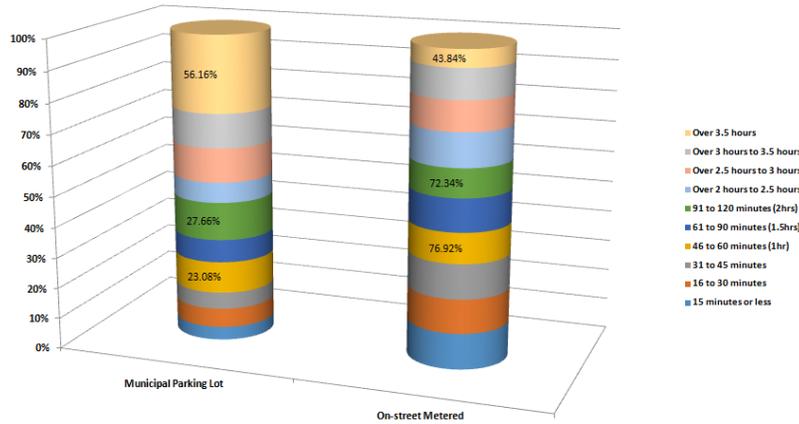


Customer Use of Different Parking Products

12. Parking Space Choice and parking space type by customer duration of stay is shown in the graphics below. Note the wide coverage of durations that the on-street service. The private customer lots (free of charge) also provide that same wide range of customer durations. The municipal off-street facilities seem to be more attractive to not only less numbers of customers but also those with longer durations of stay.



13. Looking at the parking type choice from another perspective. The on-street parking space here in the downtown has a very wide customer stay market range. The off-street space is continuing to attract customers with slightly longer durations of stay, but in most of the other durations of stay categories on-street space provides a very high level of service.



We are now prepared to define current and future emerging parking market opportunities armed with the analysis of five parking demand factors:

- The physical environment (land uses)
- The trip characteristics (duration of stay, choice of parking space type, time of arrival/departure)
- The attraction of parking demand (walking distances)
- The effect of parking operations on parking demand (pay or free), and
- Customer experience with the parking service.

Evaluation of Current Parking Demand and Supply

Having built a body of evidence to assist in characterizing current parking demand attracted by the quantity and type of land uses in the downtown, this section quantifies the volume of parking demand, distributes that demand to the various blocks in the downtown and then evaluates the balance between that demand to the supply on those blocks. The outcomes from this task feed into the Market Potential Identification which is the subject of the next major chapter of this report.

Overview of Methodology

Against a back drop of calibration of parking supply usage observed in the field against customer trip characteristics and a library of downtown studies, the following five steps were followed in order to provide a framework for the discussion of where new service areas might emerge in Stratford.

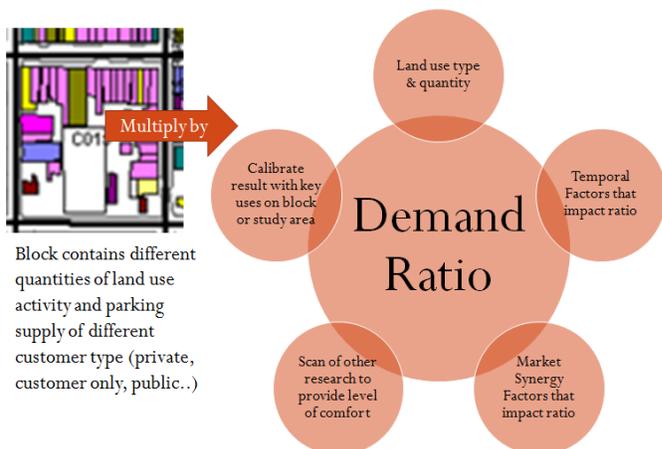


Figure 20: Generate Peak Hour Demand Ratios and Apply to Block Land Uses

of this process is a set of block specific quantities of long stay (employee) and shorter stay (visitor) parking demand.

1. Compute the **peak hour parking demand** attracted by the **quantity and type of land use** found in the downtown. These demand ratios make use of a number of factors as shown on **Figure 20**. The outcome

of this process is a set of block specific quantities of long stay (employee) and shorter stay (visitor) parking demand.

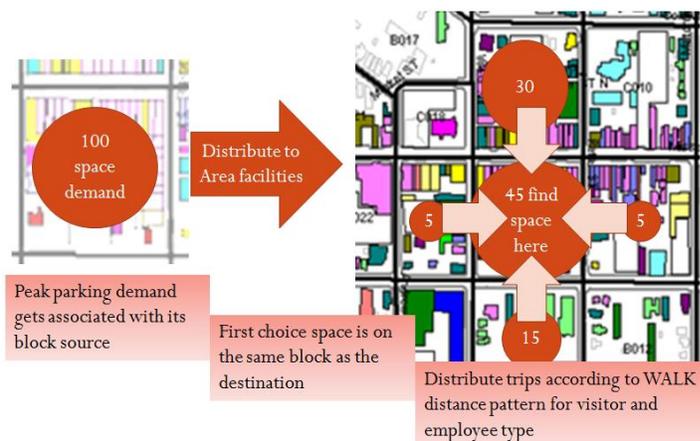


Figure 21: Distribute Block Parking Demands to Block Supply by Walking Distance

2. **Spatially distribute** that parking demand to the blocks in the downtown by applying the peak hour ratios computed in step 1 to land use quantities in each block

3. Compare the block distributed parking demands (step 2) to the block parking supply.

4. Refine the capture of parking demand by introducing walking distance.

Figure 21 illustrates this key step.

5. Through the understanding of current parking supply, and the current

walking distance profile of both customers and workers, **optimize** where parking supply should be located with respect to its demand.

Step 1: Calculate Peak Hour Parking Demand

The computation of peak hour parking demands in the downtown is a result of the following:

- Peak hour demand for parking attracted by workers taking note of the effects of:
 - absenteeism;
 - density (floor space per employee);
 - mode of travel;
 - vehicle occupancy, and estimates of the number of employees present at peak hours of the day; and
- Peak hour demand for visitors taking note of the effects of:
 - multi-destinations,
 - market synergy,
 - Effect of temporal variation in the demand profile.

The computed peak hour parking ratios are adjusted to reflect a number of land use characteristics such as:

- different land uses peak at different times of the day;
- different land uses peak on different days of the week;
- different land uses exhibit seasonal variation in their peak demand; and
- The amount of walk-in trips (that is, trips that originate from people already working in each study area.

Employee and Visitor Peak Hour Parking Demand Ratios

The peak hour demands attracted by employee trips to the downtown shown on Figure 22 are based on the evidence:

- the results of the parking demand surveys (online);
- travel characteristics as described in the text box on previous page;
- the process of calibrating what was observed in the field (through parking activity surveys) and the computed peak hour demands generated in this section; and,
- What theoretically should be attracted by the quantity and type of land use based on industry standards and consulting experience for comparable study areas.

Based on parking demand surveys, and research from other studies, here are some of the values for each of these factors that impact parking demand ratios for employee:

DENSITY – ranges from 1 to 4.2 employees per 1000 square feet depending on land use type

AUTO DRIVERS – average across land use types is about 80 to 85 percent drivers

DAYTIME DEMAND – ranges from 70 to 100 percent

ABSENTEEISM/OFF SITE – ranges from 5 to 7 percent of the total employed

Land Use Activity	Employee	Visitor	Total
Retail	0.72	0.62	1.34
Services	0.72	0.80	1.52
Financial Services	0.72	1.11	1.83
Commercial Office	0.72	0.13	0.85
Government Services	0.77	0.39	1.16
Medical Services	0.67	1.14	1.81
Restaurants	0.72	1.08	1.80
Entertainment	0.58	4.12	4.69
Residential	1.16	0.10	1.26
General (ndustry, institutional, etc)	0.41	0.51	0.92

Figure 22: Typical Peak Hour Parking Demand Ratios (Spaces per 100 Sq. M of Land Use)

Applying the employee ratios to the estimated quantity and types of land use within the downtown generated an overall **employee** parking demand for about **750** spaces at the peak time of the day (between 11 am to 2 pm period)⁸.

As for **visitor** trips to the downtown, individual land uses exhibit different peak hours over the course of the day. Some uses peak in the evening hours, some in the morning and retail generally peaks over the 11 am to 2 pm period. When different land uses come together in a downtown, one peak hour in time over the course of the day is formed. It is this composite pattern of parking demand that is the centre of the analysis of peak hour visitor parking demand ratios. [Refer back to Table 4 for temporal variation factors by land use type.]

Applying the visitor ratios shown on Figure 22 to the quantity of land use in the downtown generates a peak hour composite demand for approximately **1000** spaces.

Total Downtown Peak Hour Parking Demand

The peak hour of the day parking demand as calibrated by these parking demand ratios and by matching what we saw over the course of our field data collection, the range of peak hour trips to the downtown range from **1640 to 1840** vehicles with the mid-range target of **1740**. The range is a result of applying the 95th statistical confidence calculation to our sampled field data and therefore accounts for the seasonal difference in the data.

At this point if the demand estimates show a need for 1640 to 1840 spaces and our parking supply (including private spaces) was approximately 2140 spaces then one could conclude that there is no numeric deficiency in the demand/supply system.

⁸ This is not to say that there are work related parkers who choose to park outside of the downtown study area boundaries.

However, the numerical comparison of parking supply to demand over the landscape of a study area is counter to the dynamic characteristic of parking demand and supply. That dynamic is that people walk from one block's parking supply to another block's destination point. The fluid nature then makes this overall peak use of space discussion useful only in that it provides a ready-made, easy to understand metric that gives an overall indication of the balance of parking demand and its supply.

The next steps will provide more of a market approach to the service of block parking demand by parking supply that is within comfortable walking distance. But before we can do that let us generate peak hour parking demand by block by building on the results here.

Step 2: Compute Block Level Peak Hour Demands

Figure 23 displays the product of multiplying peak hour **work** ratios by land use quantity (by type of use) for each block in the study area. The yellow to red colour represents relatively higher number of longer stay customers.

Figure 24 displays the product of multiplying peak hour **visitor** ratios by land use quantity (by type of use) for each block in the study area. The yellow to red colour represents relatively higher number of block visitor parking demand.

Finally Figure 25 displays the sum of long and short stay demand by block.

Analysis of Spatial Patterns of Demand

Step 2 results show only the product of peak parking ratios and quantity of land use. That product to repeat is the peak hour parking demand attracted by land uses on that block. The current parking supply on each block does not come into play at this point of the process – we are simply determining the extent and distribution of trips.

The result highlights are summarized here:

- Solid demand for long and short parking east of Downie north of George and well as an intense

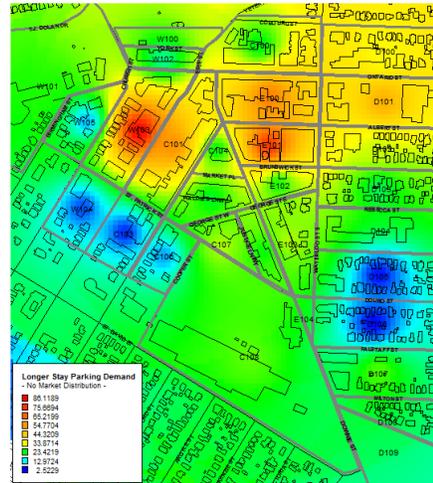


Figure 23: Work Parking Demand by Block

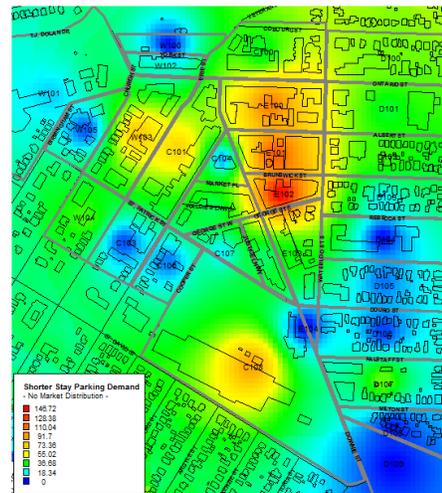


Figure 24: Visitor Parking Demand by Block

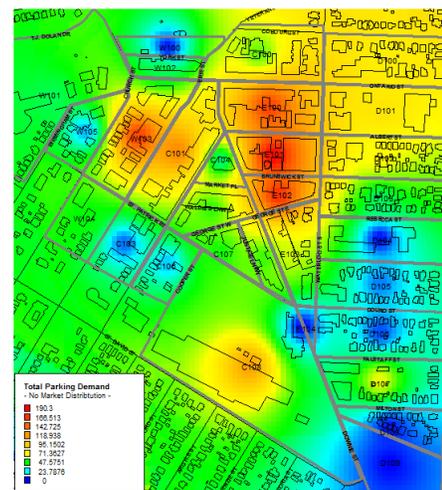


Figure 25: Total Parking Demand by Block

demand generated by uses just west of Wellington north of St Patrick;

- Longer stay parking demand focus points are: west of Erie Street (annex City Hall), central corridor blocks formed by Brunswick and Ontario on the south and north and by Waterloo / Downie on the east and west;
- Short stay parking demand distribution opens up two new blocks: E100 (Ontario /Waterloo/ Albert and Downie) and C108 where the Cooper site is located;
- Major generators of longer stay parking demand are: public services as the courts, city hall and a pocket of personal service professional offices; and
- Major generators of shorter stay visitor parking demand are: theatre, retail and restaurants along Ontario corridor as well as Downie and Waterloo.

The next step is to explore the deficits/surpluses that occur when the parking demand attracted by each block is compared to the parking supply on each block.

Step 3: Compare Block Parking Demands to Block Parking Supply

Two figures in this section illustrate the result of comparing block parking demand (long and short stay customer demand) to block parking supply (long and short stay customer supply). In this way, areas in the downtown where parking supply compared to block demands are in deficit (demand is greater than supply).

Figure 26 is an illustration of the numeric comparison of parking demand and parking supply for our **longer** stay customers. Red or lighter colours represent numeric surplus when block supply is greater than computed demand.

Figure 27 is an illustration of the numeric comparison of parking demand and parking supply for our **shorter** stay customers. Blue or darker colours represent numeric deficits when block supply is lower than computed demand.

Both figures show the numeric surplus or deficiency of parking space would be if all demand generated on a block was to be serviced by supply on that block - in other words under a condition that no customer would walk from supply on Block A to their destination on Block B.

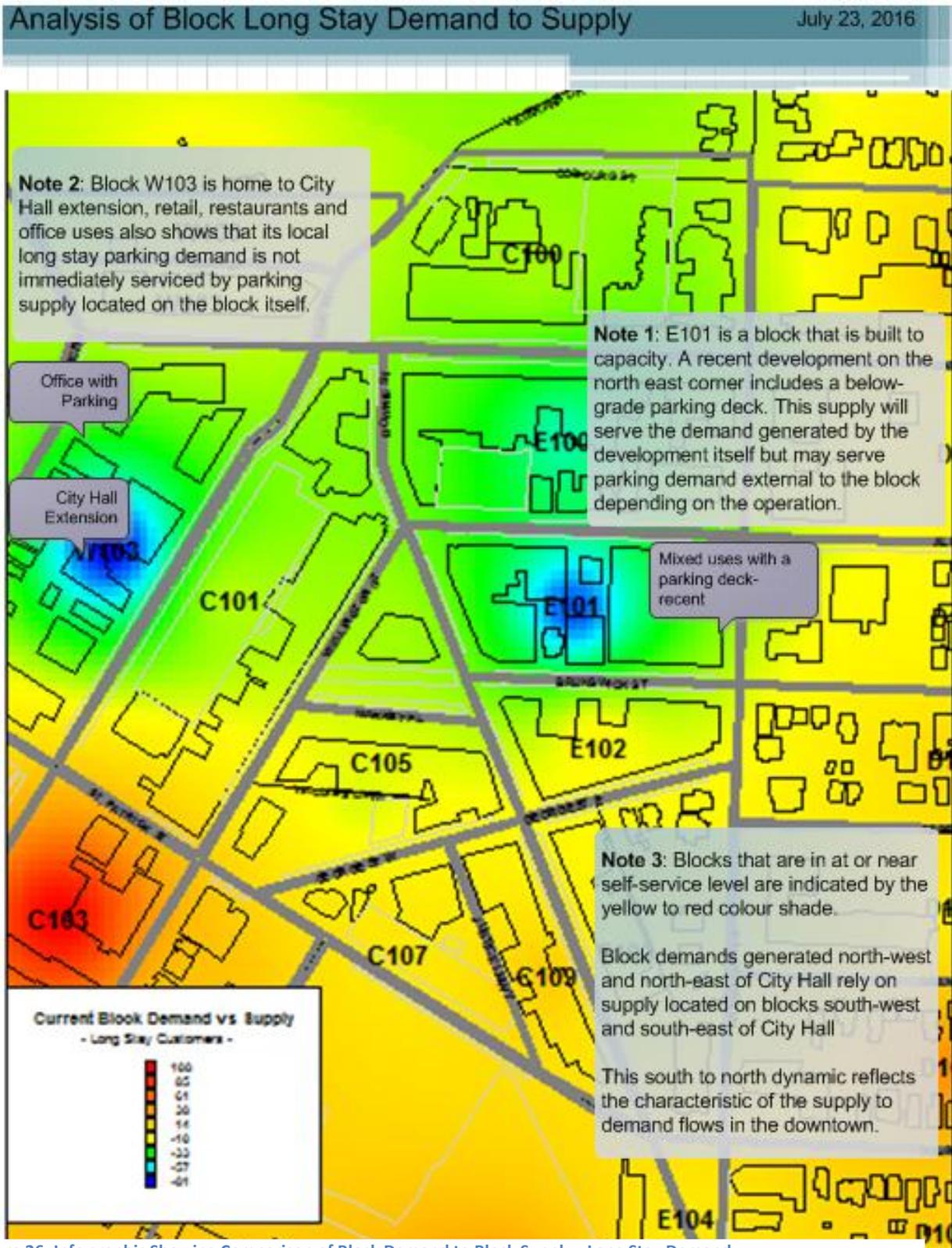


Figure 26: Info graphic Showing Comparison of Block Demand to Block Supply - Long Stay Demand

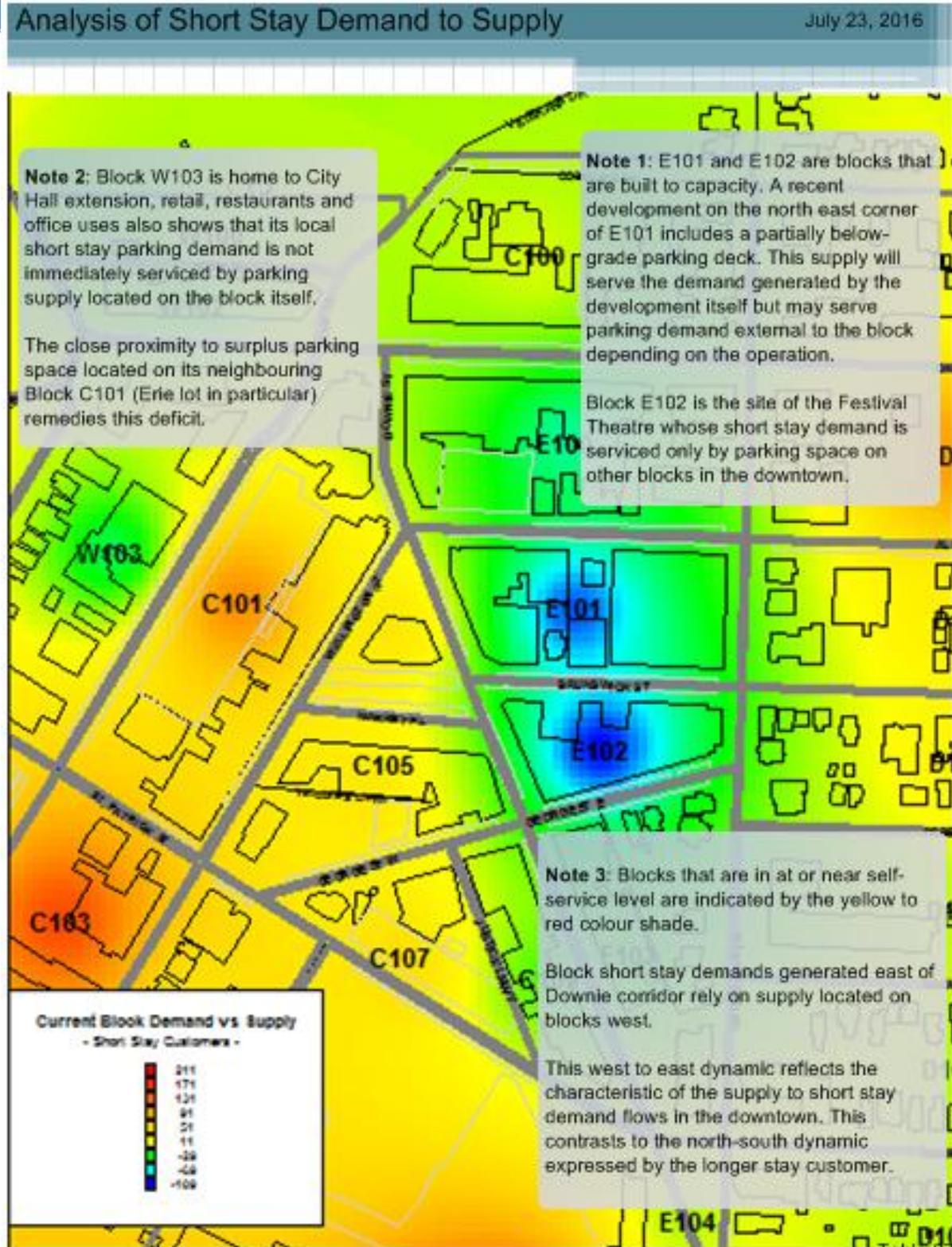
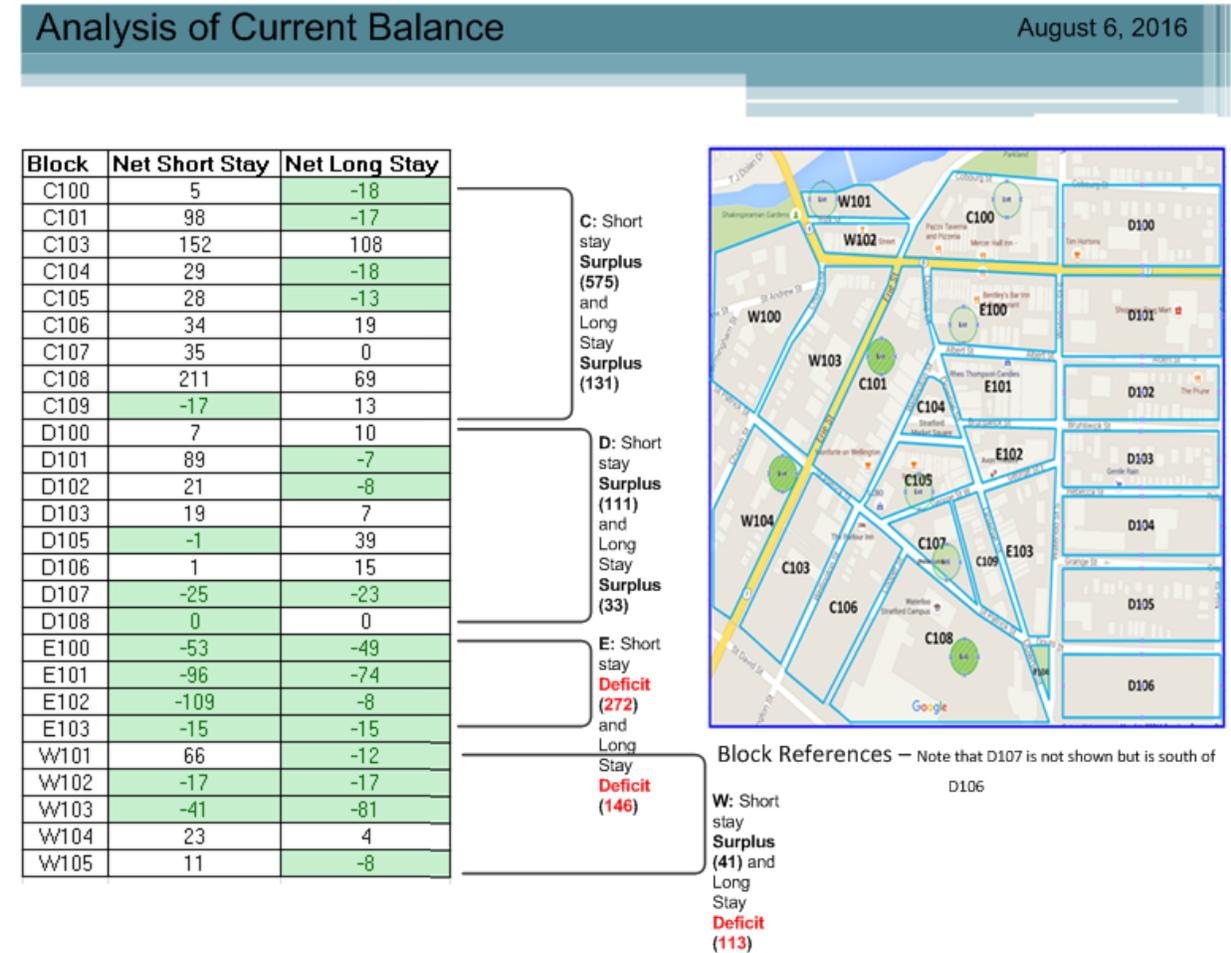


Figure 27: Info graphic Showing Comparison of Block Demand to Block Supply - Short Stay Demand

Analysis of Current Balance of Parking Demands and Parking Supply

The salient findings of the analysis of the balance between current demand and supply are annotated on info graphic Figure 28.

Figure 28: Info graphic Showing Analysis of Current Demand to Supply Balance



The E-corridor and W-corridor show numerical deficits where parking demand is greater than the parking supply. Specifically E-corridor formed by four blocks bounded by Ontario / Waterloo / St Patrick and Downie does not have enough parking supply on the blocks to provide the highest level of customer service. Looking at the table within Figure 28 shows us that every block within the E corridor show demand greater than supply without exception. However, the supply found on the blocks that form the C corridor are clearly within easy walking distance of that demand.

The W-corridor on the west side of our downtown study area also shows numerical deficit for longer stay parking demand. As described in the land use sections of this report, the W-corridor has a number

of public institutions that draw higher number of employees. The Court, the Library and a number of financial offices draw employees and visitors alike.

If the business objective then was to provide the highest possible level of customer service - where block demand is served by block supply - then the deficits shown on Figure 28 would provide block level targets. The reality is that:

1. The physical opportunity to provide a parking space on each block is limited.
2. The cost of provision of parking supply on each block to service estimated block parking demand is prohibitive, and would require a program of property acquisition or a series of joint partnerships with current and future property owners.
3. And finally, this business target does not reflect the dynamic nature of where people park and where their primary destination is located. The Parking Management Strategy for the downtown needs to embrace quality of service, innovation of service delivery to the customer, and sustainability (economic and within the family of transportation strategies).

The next step provides a way in which we incorporate the dynamic nature of parking demand and current supply in order to formulate a parking strategy that fulfills the aforementioned strategic ideals.

Step 4: Apply Walking Distance Characteristics to Parking Demand

In the previous section, the number of block-level trips was estimated using the peak hour attraction ratios. Now we **distribute** those block-level demands to blocks within walking distance. This dynamic provides some fluidity to the parking demand and where the parking supply can be located to service that demand. The geographic distribution of the parking demands attracted by long and shorter stay visitor trips uncover areas where parking supply needs to be in proximity in order to more effectively service those demands.

The outcomes of this step build on these processes:

- Distribute the quantity of peak hour trips expected on each block given its profile of land use types [**Demand**] to surrounding blocks according to observed walking distances for long and short stay trips to the downtown;
- Compare this distribution of demand to the parking supply on each block in the downtown; and
- Determine where parking supply or its operation type might change in order to respond to the distributed parking demand [**Potential**].

Distribution of Block Level Trips Applying Walking Distance

The three figures in this section illustrate the distribution of the individual block parking demand to blocks within observed walking distances to and from parking space and primary destination.

Figures 29 (Long stay or work trips), 30 (Short stay or visitor trips) and 31 (total long and short stay trips) were examined and the following salient findings drive the direction of our parking management strategy:

- Based on its location - central to parking demand and within the local characteristic walking distance - **Block E101** is in position to serve significant portion of shorter stay parking demand. This block is bounded by Albert / Waterloo / Brunswick and Downie streets.
- **Block W103** - west of the Erie lot block - also is strategic to serve both long and short stay parking demand.
- The triangle formed by Blocks C108, Block E101 and Block W103 is in strategic position to provide parking service when walking distances are taken into account.
- A cautionary note is that the significant draw that Block C108 (Cooper site) shows is a result of a walking distance profile that results from a somewhat distorted market coverage; this block presents parking service at no charge; this operation characteristic lengthens the walking distance threshold for both long and short stay trip types;

What we have not done is examined the current parking supply on these key areas to see if there is a deficiency or an opportunity to raise the level of customer service.

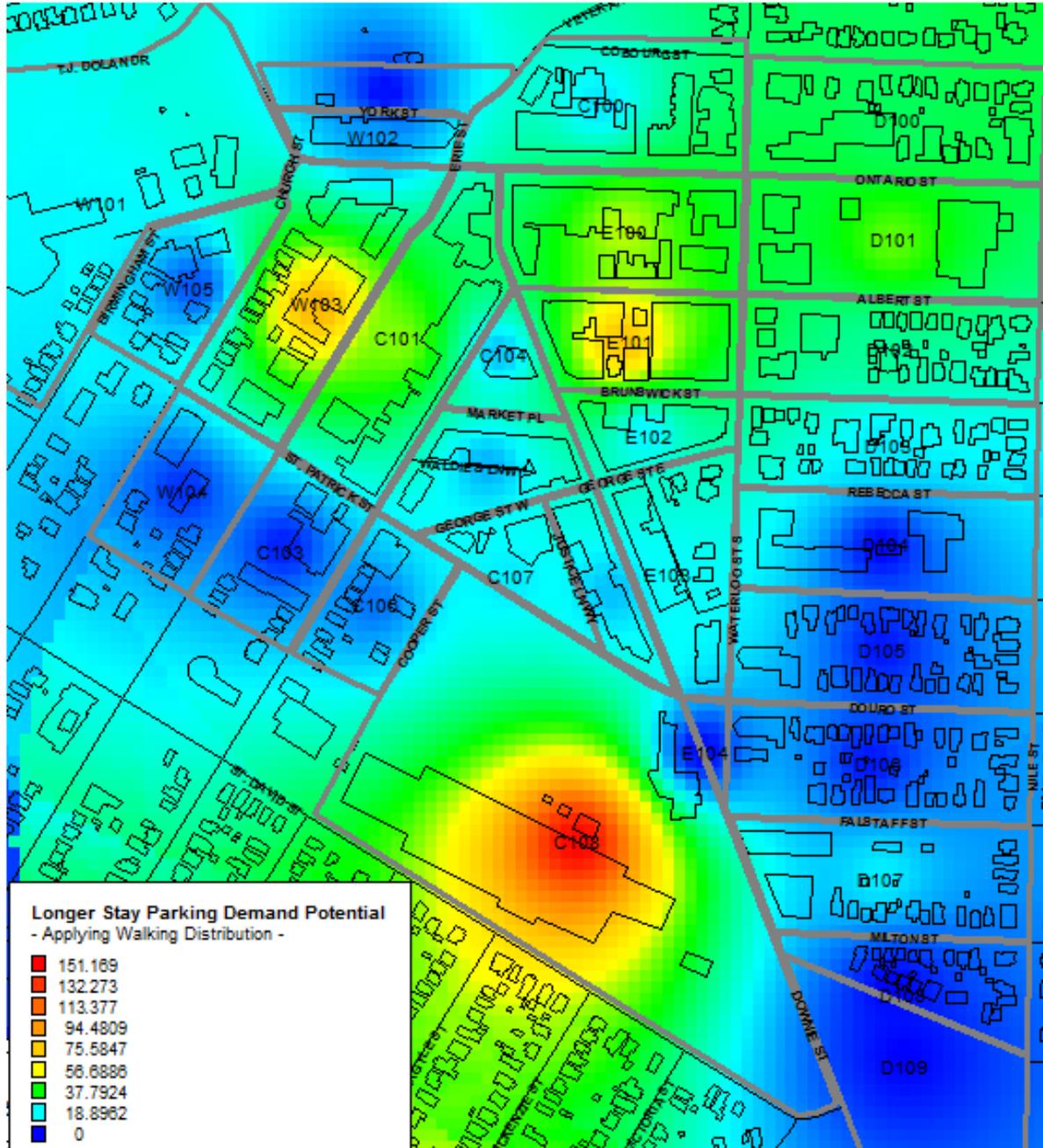


Figure 29: Long Stay (Work) Parking Demand Applying Walking Distance

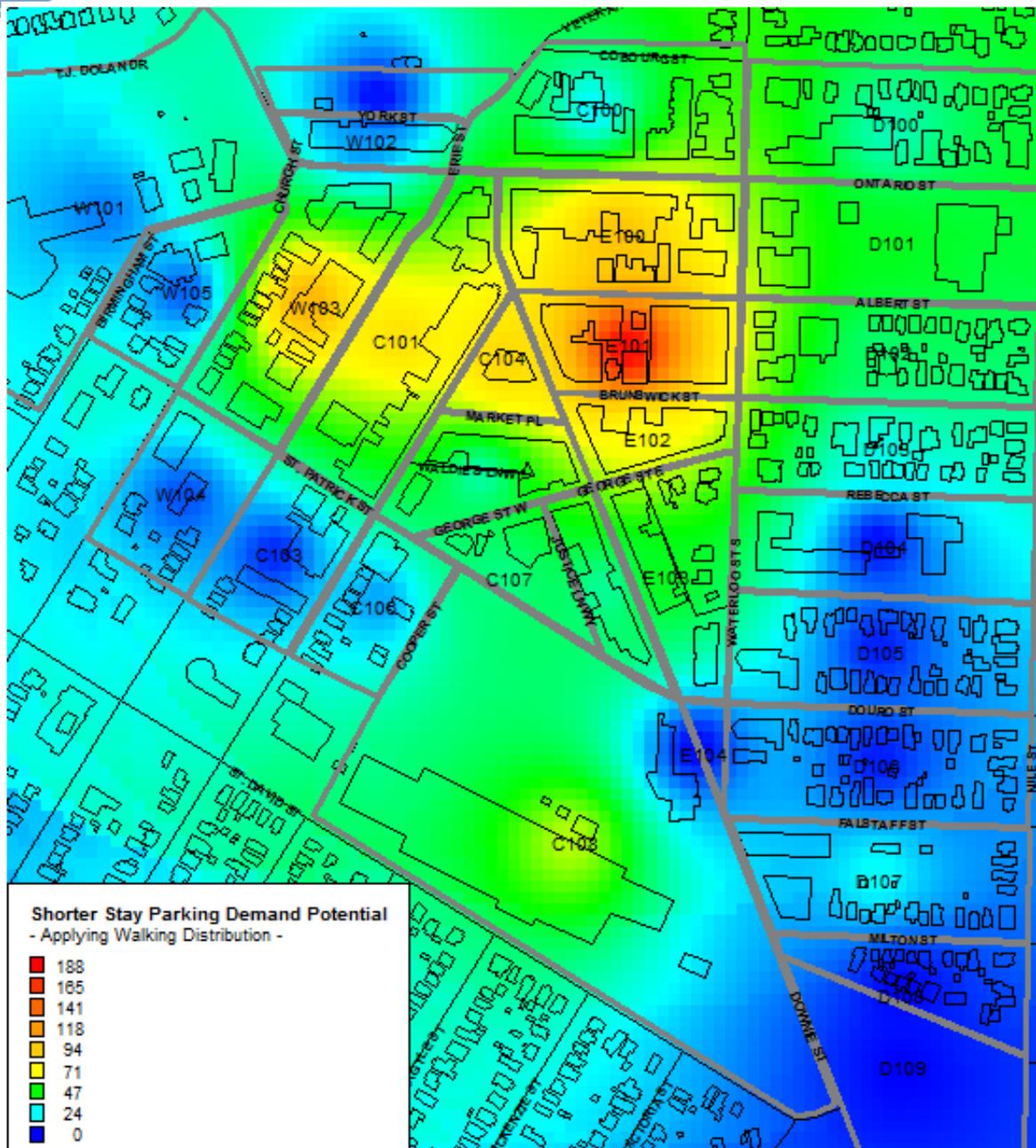


Figure 30: Short Stay (Visitor) Parking Demand Applying Walking Distance

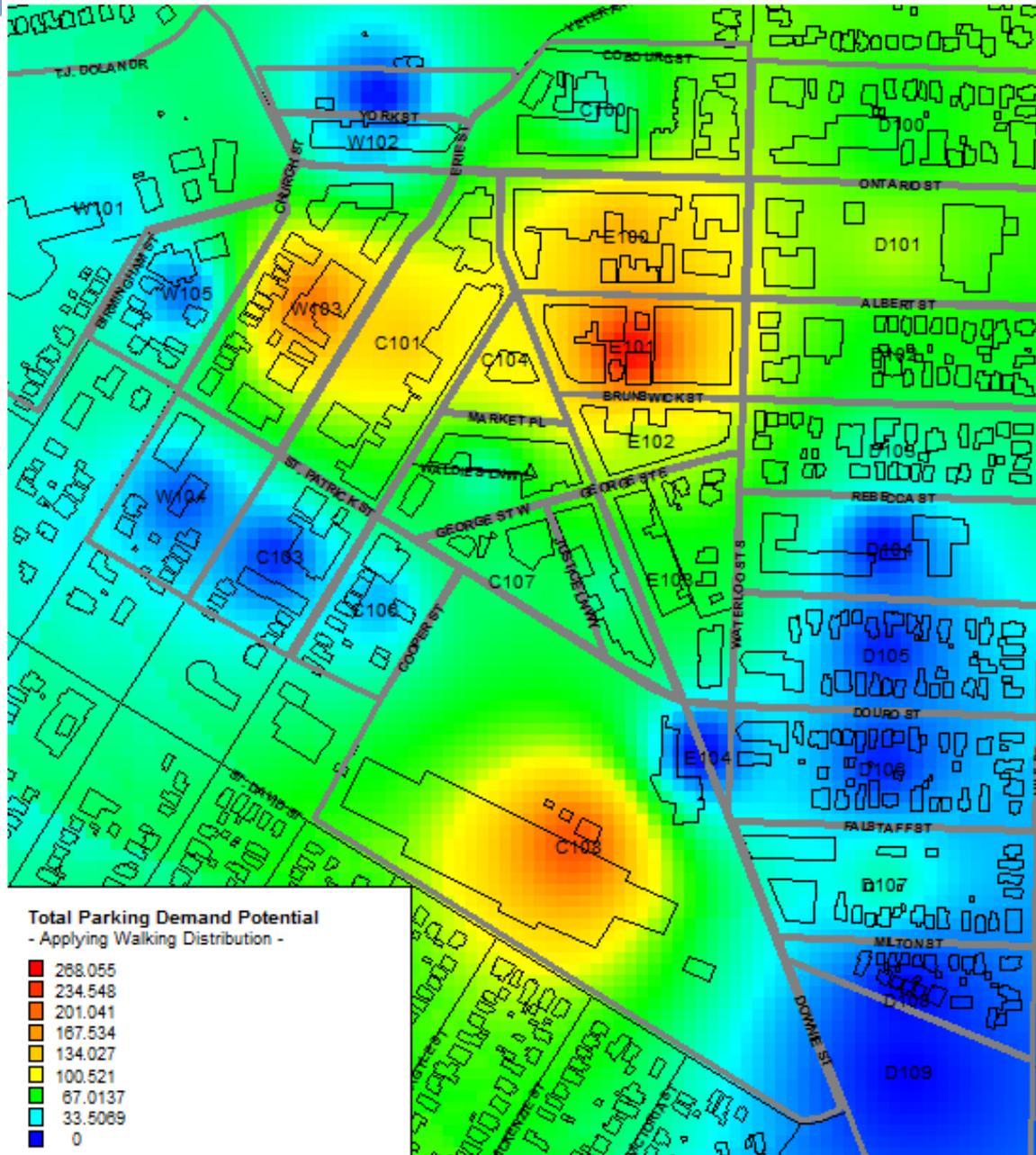


Figure 31: Total Parking Demand Applying Walking Distance

Analysis of Block Demand Distributed by Applying Walking Distance

The salient findings of the analysis of the distributed current demand are annotated on info graphic Figure 32.

Analysis of Parking Demand Distributed by Walking Distance

August 7, 2016

Block	Step 4: Short Stay	Step 4: Long Stay
C100	23	17
C101	84	48
C103	3	2
C104	89	14
C105	32	13
C106	15	8
C107	35	18
C108	64	151
C109	33	14
D100	31	31
D101	45	45
D102	38	27
D103	26	18
D105	2	1
D106	2	1
D107	25	18
D108	0	0
E100	99	52
E101	188	80
E102	71	18
E103	45	19
W101	12	19
W102	14	12
W103	106	85
W104	7	3
W105	9	6

C: 35% of Short stay demand and 40% Long Stay

D: 15% of Short stay demand and 20% Long Stay

E: 37% of Short stay demand and 23% Long Stay



Block References – Note that D107 is not shown but is south of D106

W: 14% of Short stay demand and 17% Long Stay

Figure 32: Info graphic Showing Distributed Parking Demand as per Walking Distances

The key areas of the downtown whose parking supply is marketable to short stay customers are the C-corridor and E-corridor. The ranking of blocks that are within acceptable walking distance for a shorter stay customer are: Block E101, W103, C101 and C108. Take note that the top two blocks that are in better location for customer service do not have municipal parking facilities.

The key areas of the downtown whose parking supply is marketable to long stay customers are C-corridor and E-corridor as well. The ranking of blocks that are within acceptable walking distance for longer stay customers are: C108 (free Cooper site), W103, E101 and E100. Take note that the C108 block contains a significant quantity of free parking which distorts the more typical user pay decision process of choosing where to park. In addition note that two blocks within our E-corridor are within walking distance to best serve longer stay parking demands.

Step 5: Compare Distributed Parking Demand to Parking Supply

The computed distributed parking demand is now compared to block parking supply – being careful to ownership of parking space (private versus public). The info graphic illustrates and frames a discussion of possible marketing opportunities regarding municipal parking supply and operation.

The key outcomes of this step are:

- It is understood that corridor E generates a significant portion of the downtown's long and short stay parking demands. Corridor E is home to one of the busiest off-street parking facility on Albert Street.
- While the demand to supply comparison shows an extraordinary deficit in both long and short stay parking space deficit, the opportunity for expansion of parking inventory within the corridor is limited.
- The parking supply within this corridor is currently at capacity in its response to this demand. Technical Report B will elaborate but important at this point is that the supply is optimally used by customers. There does not appear to be abuse in terms of customers parking beyond the three hour time limits that would mean other customers cannot share the limited parking space.
- We need to look at how the parking supply in reality is responding to the demand. Our field surveys of parking space use will provide insights into how well the parking inventory is performing.
- The most common way of expressing the balance between parking demand and supply is to quote the occupancy or peak utilization of its supply (75 percent occupancy at 14:00 hrs for example). In practical terms however, this particular metric is not very helpful because it contradicts what we have been saying throughout steps 1 to 5: the walking distance to and from primary destination and parking space provides a broader spatial perspective on the balance of supply and its demand.
- The outcome of step five (5) serves to provide the study with a spatial focus of where opportunity theoretically emerges. It does not point to specific properties within the downtown where supply can be changed in order to more effectively respond to its market.
- The balance of parking demand and supply is beyond their numerical differences. The state of balance – surplus or deficit – can and does point to potential operational opportunities. For example, note that the longer stay parking demand customer is consistently in an imbalance. Overall that customer market is in deficit position. The free parking operation at Cooper's site



however demonstrates how the parking management strategy can manipulate the parking space choice decision by selling its service free of user charges. This operational characteristic serves to manipulate customers' acceptance of longer walking distance by off-setting its cost to the customer.

- Building on the walking distance and the impact of operational characteristic, the outcome of steps 1 to 5 point to the need to measure how stable the parking space inventory is over the short and longer term planning horizon.

The next section tests the balance between parking demand and supply under scenarios of change in that parking supply infrastructure.

Analysis of Net Demand to Supply – Current Planning Horizon

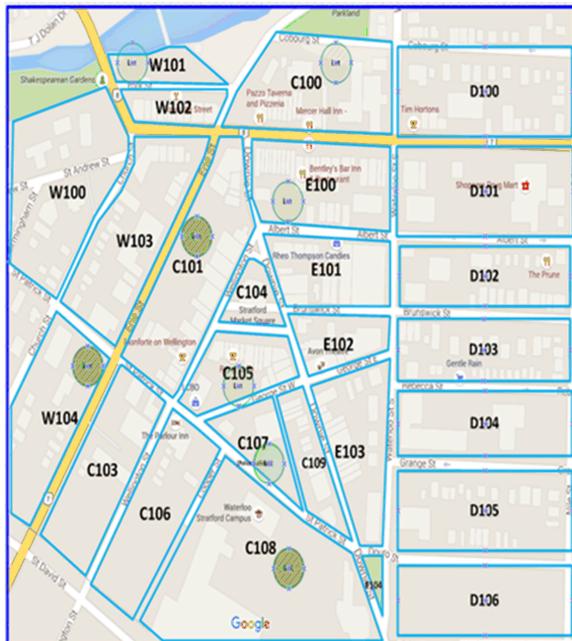
Block	Short Stay Supply	Long Stay Supply	Step 5: Net Short Stay	Step 5: Net Long Stay
C100	39	4	15	-13
C101	168	40	85	-8
C103	157	113	154	111
C104	41	5	-48	-10
C105	58	9	26	-4
C106	43	28	28	20
C107	53	31	18	13
C108	297	97	233	-55
C109	12	36	-21	22
D100	52	45	21	14
D101	123	42	78	-2
D102	62	23	24	-4
D103	38	27	12	10
D105	8	43	5	41
D106	5	17	3	16
D107	19	3	-6	-15
D108	2	0	2	0
E100	48	10	-51	-41
E101	19	2	-169	-78
E102	38	16	-33	-2
E103	22	16	-23	-4
W101	81	13	69	-6
W102	5	1	-9	-11
W103	34	5	-73	-80
W104	64	10	56	7
W105	17	2	8	-4

C: 489 space surplus of Short stay supply and 77 space surplus of Long Stay

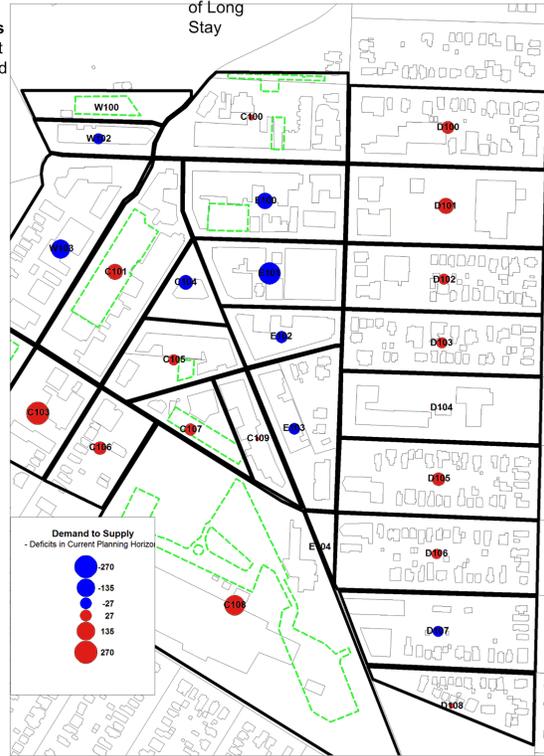
D: 139 space surplus of Short Stay and 60 space surplus of Long Stay

E: 275 space deficit of Short stay and 125 space deficit of Long Stay

W: 52 space surplus of Short stay and 94 space deficit Long Stay



Block References – Note that D107 is not shown but is south of D106



Demand to Supply – Blue represents condition where demand exceeds supply on that block; Red represents condition where supply exceeds demand

Figure 33: Info graphic Showing Current Parking Demand to Parking Supply

Market Potential Opportunities Resulting from Changes

The state of balance between parking demand and supply is sensitive to the stability of the underlying conditions that determine demand and supply. Over time there will be changes to the **physical** environment that will impact the nature and quantity of trips to the downtown, and there will likely be changes to the physical environment in terms of properties that currently supply parking space that may not continue to do so. In addition that balance is affected by changes in **operations** that can impact the level of customer service and then in turn impact customer demand for space. And finally the balance can and will be impacted by the effects of **technology** on the demand for and delivery of parking service.

Assessment of the Impact of Changes

Background Analytic Framework

The downtown parking strategy study collected data that serves to identify parking demand characteristics, such as:

- **what** is attracting people to the downtown;
- **when** are they in need of parking spaces;
- an assessment of current parking operations;
- **how long** do they typically need parking; and,
- **What** factors are important to visitors to the downtown in **choosing where they park - how far are people willing to walk to and from destination and parking space?**

The downtown parking strategy study has also collected data that serves to measure how the current parking supply (public spaces) responds to that parking demand identified above⁹. A number of metrics served to identify the customer level of service on each facility, block or collection of blocks:

- volume of users;
- durations of stay;
- accumulation of vehicles parked over the course of the day;
- peak hour(s) and average usage of our parking service;
- turnover of space (volume divided by number of spaces) to indicate level of intensity;
- the number of consecutive time periods when facility has reached 90 percent or more of its capacity; and
- A number of other metrics.

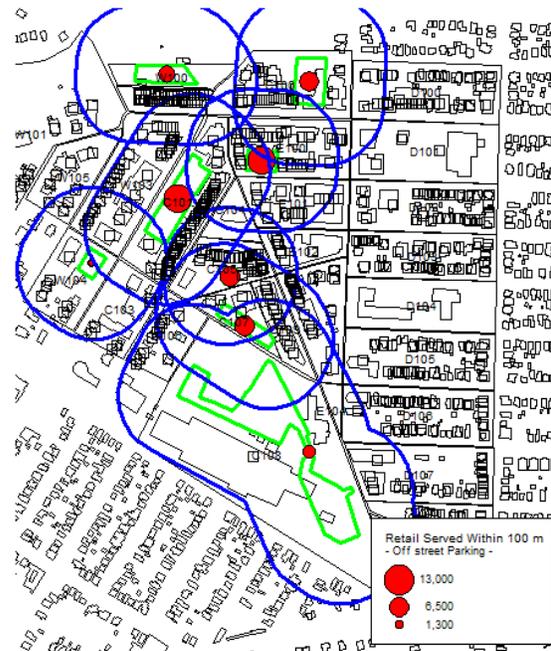


Figure 34: Retail Space within 100 Meters of Municipal Lots

⁹ Technical Report B will detail these results.

Based on the above set of data, we know the following:

1. The current off-street parking supply system is in excellent **position** to service the parking demands attracted by retail, office and restaurants for certain.
2. Figure 34 extracted from the more detailed report shows that **retail** space for example within 100 meters¹⁰ of each off-street municipal facility. Similar assessment was done for office, personal services, medical and restaurant uses in the downtown.
3. The size of the relative red dot serves to indicate visually the physical relationship between the potential parking demand generator (the land use) and the major parking infrastructure (the off street carpark). Important infrastructure to maintain are:
 - a. Erie
 - b. Albert
 - c. Cobourg, and
 - d. Perhaps surprising the St Patrick Street lot¹¹.
4. The online customer survey responses provided insight into the walking thresholds that currently are exhibited in the downtown. These walking patterns will be critical in the estimation of parking demand/parking supply response at the block level. In particular they will assist in determining what the impact might be of changes to the parking space infrastructure.
5. Fifty-five (55) percent of respondents parked their vehicles and had their primary destinations on the very same block.

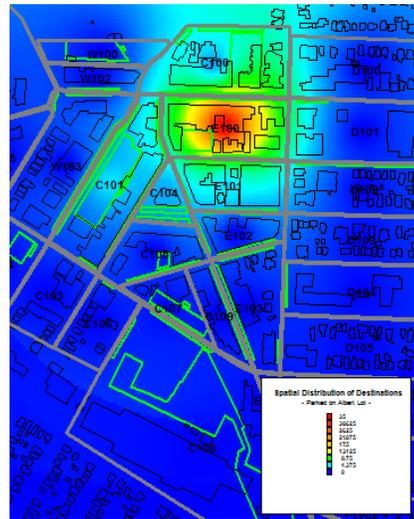


Figure 35: Spatial Distribution of Primary Destinations for Users of Albert St Lot

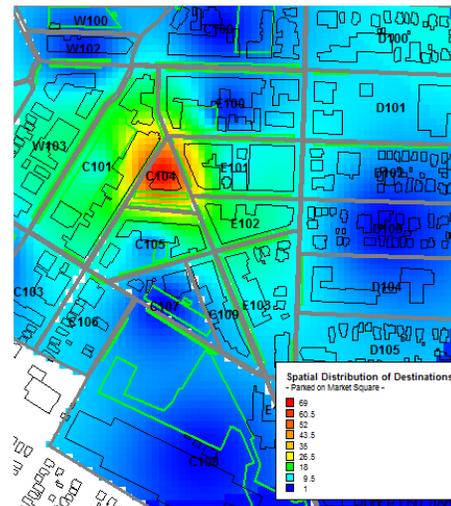


Figure 36: Spatial Distribution of Primary Destinations of Users of Market Square On-street Spaces

¹⁰ The online survey results point to this as a walking threshold for shorter stay trips to the downtown. It represents not only the average walking distance from a parked space to a primary destination point as determined from the online surveys but also reflects approximately a 2 to 2:30 minute walk.

¹¹ Surprising in that field observations of the parking space users indicated that this particular facility served largely the court and police station parking demands. The facility seemed to be very site specific in scope.

6. For those who parked on a **municipal off street** parking facility, surveys indicated that **83 percent** were able to find a space within 5 minutes, while those who parked on an **on-street** parking space **63 percent** were able to do so. This is not unusual as on-street space is clearly a preferred choice and clearly much more restrictive in terms of inventory. As well, **73 percent** of those survey takers who chose to park on a **private customer** only parking facility were able to find space within 5 minutes!
7. Often the perception that parking supply is deficient to the needs of customers is based on the **relative amount of time it takes to find a vacant parking space against the amount of time that they wish to stay in the downtown**. The study shows on average 68 percent of the survey takers who found space within 5 minutes those who had durations of 15 minutes or less a significant portion (83%) found that space within 15 minutes. Closer to the average duration of stay of customers in the downtown - just under two hours, the average 5 minutes or less service delivery was of the order **63 percent** with a significant 25 percent of 1:30 to 2:00 hrs duration needing 6 to 10 minutes to find a space. So we are still able to deliver the service within ten percent of the total time a customer wants to spend in the downtown.
8. Market Square (C104) and Erie lot's Block C101 represent 46 percent of the total online destinations. The facilities on these prime blocks serve two-thirds of the parking demand attracted by its uses. Be mindful that the Market Square block offers 68 on-street parking spaces while the Erie block provides 227 spaces including a 136 off-street parking facility. The 66% - 67% capture rate is an indicator of a high level of customer service.
9. The market capture area for those with destinations on the **Albert St** lot is shown. We have established that this block like many other primarily serve demand attracted by land use activities on the block itself, but note that there are indications that demand generated across Ontario St and on the south side of Albert is being serviced as well. Our field crew indicated that virtually on every observation period on the Wednesday of both the July and December surveys, there were vehicles circulating the Albert St municipal parking lot looking for space. Clearly this is a key parking infrastructure investment.
10. The shape of the service area for parking space within the Market Square block is very focussed on that block's demand generators but we can see the green hue beginning to show up in blocks east and south.

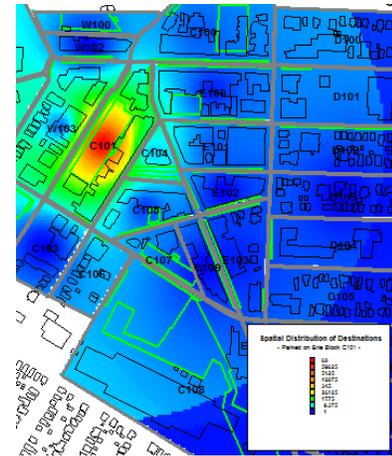


Figure 37: Spatial Distribution of Primary Destinations of Erie Lot Users

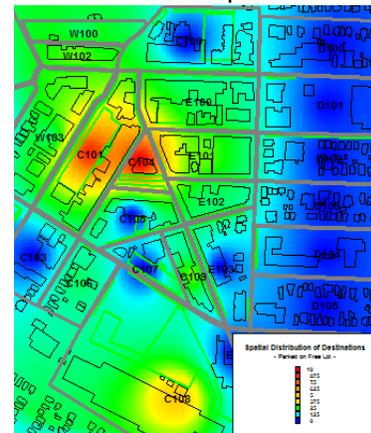


Figure 38: Spatial Distribution of Primary Destinations of Users of Cooper Free Lot

11. The parking spaces on the Market Square block served parking demands generated by 9 other blocks in the downtown showing its relative strength and importance to the delivery of service to demands attracted outside of its own block boundaries.
12. The third key block - Erie lot C101 - continues the theme of serving largely the demand generated on its own block location. In addition the market capture area is spreading to the block immediately west and east of it. The latter is of course where the City Hall Annex building is situated. Pertinent to current "buzz" regarding the Market Square re-development it was found through our online surveys that this block's parking space inventory serves **12** other block areas in the downtown.
13. The distribution of destinations of those who are parked on the "free" Cooper lot on Block C108 located at the very bottom of the downtown serves to remind us of how parking location, level of service and price of that service interplay.

Market Square Re-development Options

Over the course of the project to formulate a parking strategy for the downtown the re-development of the Market Square has been raised. While the scope of the parking strategy is broader in terms of operations and short and long term remedies to the public parking services, this particular development concept is spatially at the heart of the downtown but as evidenced by the parking activity data collection program it is a critical parking customer service area.

Two options were presented for review.

Option 1: retains 32 spaces on the Market Square block thus displacing 36 spaces.

Option 2: retains 48 spaces and loses 20 spaces.

The parking study went on to look at scenarios to determine what share of customers other parking facilities could service should a change to the parking supply on Market Square in particular occur. The key parking characteristic is this: what type of customers are we losing as a result of changes to the current inventory, and can another parking facility still be within reasonable walking distance to service that demand.

It is clear that Albert Street and Erie Street off-street facilities are within reasonable proximity to Market Square to warrant this kind of analysis. Albert Street - although within comparable walking distance was quickly determined to be currently operating at full optimal potential. It was thus taken out of the set of analysis. This left an analysis of the Erie lot potential.

The info graphic Figure 39 serves to summarize among other things, comparative metrics for the 68 on-street spaces at Market Square and Erie Street's 136 off-street parking facility. The ranges of these critical metrics are provided over the course of four full day survey days (2 in July and 2 in December pre-Christmas).

Using the metrics above, the analysis of current walking distances from each site (Erie and the Market Square block), we concluded that there is an opportunity to currently accommodate displaced customers in either of the two development options.

Impacts of Losing Space on Market Sq.

July 16, 2016

Note 1: Test the scenario that shows the loss of 45 on-street spaces on on Market Square (Block C104). These spaces would be lost under a couple of design initiatives currently before the City regarding the re-purpose and re-design of the public space behind City Hall located on this block.

Note 2: The analysis of dispersion of the parking demand due to the loss of space points to a fairly equal geographic pattern throughout the downtown blocks. The pressure on surrounding blocks appears to be minor 2 to 5% increase.

Sample Metrics	Market Sq	Erie
Capacity - Spaces	68	136
Volume	189 to 292	164 to 381
Average Parked Cars	32 to 57	38 to 108
% Avg Occ	47% to 84%	28% to 80%
Peak Parked Cars	54 to 72	47 to 140
% Peak Occ	79% to 106%	34% to 103%
Turnover	3.5 to 4.4	2.7 to 3.5
Intensity AM	0 to 5	0
Intensity NOON	0 to 18	0 to 8
Intensity AFT	0 to 26	0 to 9
Avg Stay (Minutes)	105 to 120	133 to 168
VOL WITHIN LIMIT	163 to 261	129 to 307
VOL OUTSIDE LIMIT	13 to 45	35 to 104
Key Performance Index	54% to 98%	38% to 78%

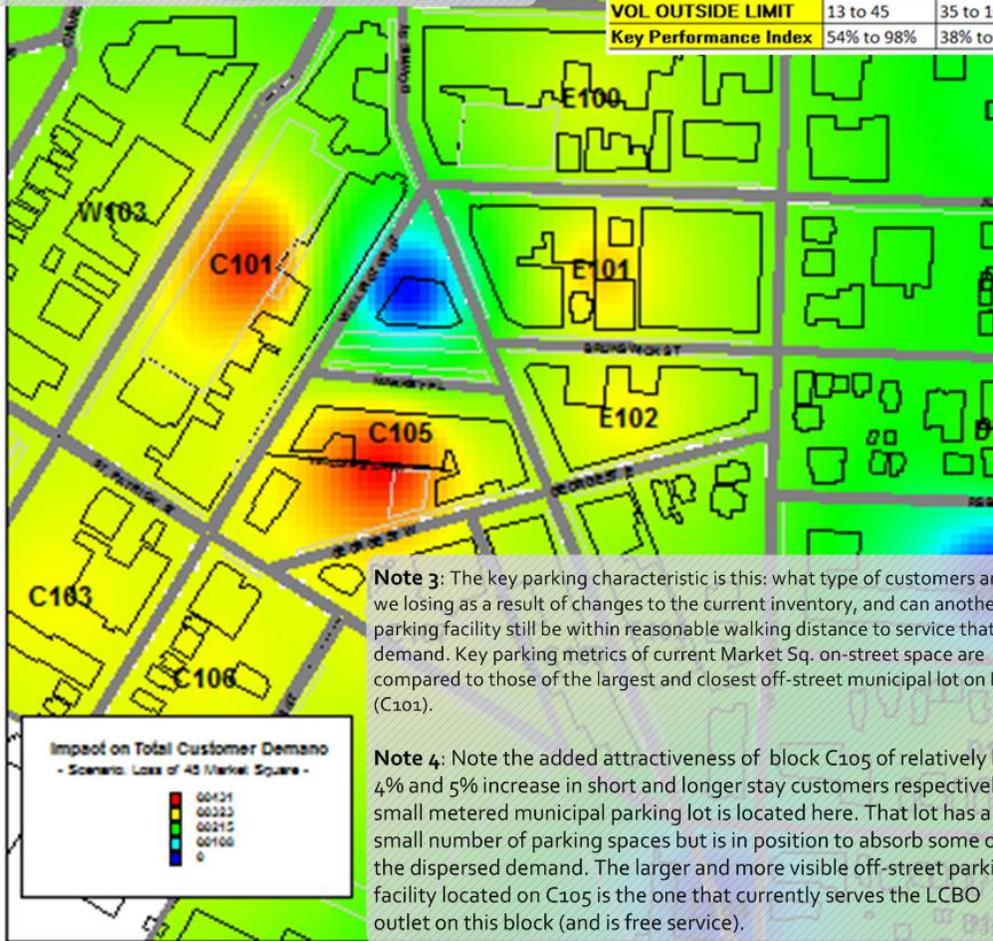


Figure 39: Info graphic Showing Impact on Customer Demand if 45 Spaces Lost on Market Square

The Erie lot can accommodate the displacement of either 20 or 36 spaces. Just to further understand the conclusion please note that this is not a numerical calculation but the analysis looked at duration of stay, turnover and peak and average occupancy of space on both existing Market Square on-street facilities and on the Erie lot.

To be clear, each displaced parking stall on the Market Square on average means a displacement of 3.5 to 4.4 vehicles per space over the course of the day. In the design options above this translates to asking 126 to 158 customers who drive to that block to find parking on Erie (and elsewhere) under Option 1. Under Option 2, it means asking 70 to 88 customers who drive and park there now to find alternative.

As shown in the metrics table on info graphic Figure 39, the current user profile of the Market Square on-street parking facilities indicates a relatively high portion of users to over-stay the three hour time restriction (VOL Outside Limit statistic shown in the table). The overstay element of the profile equates to a manageable 7 percent of total daily volume to a high of 15 percent. This is important to consider because it defines the nature of those customers that we might be displacing. Displacing higher turnover visitors to the downtown is somewhat more critical to the economic health of the downtown versus displacing longer stay (possibly business owners) customers who can seek out less conveniently located parking space in the downtown.

We would likely need to consider reducing monthly contract or longer stay parking on the Erie lot to ensure that we have excess capacity to accommodate this transferred usage.

Cooper Site Potential Re-development

The parking strategy study has to deal with not only the possible redevelopment of Market Square but with the potential re-development of this site. At the time of writing this report some designs were presented but nothing firm has been recommended. The re-development of the structure on this site impacts a historical physical structure. The contemplated re-build program on this site would restore and re-purpose the historic building. In addition to its commercial/residential potential the site currently plays a vital role in the supply of over 400 surface municipal parking spaces.

Some 300 spaces on the Cooper site are offered to customers free of charge. This report has spoken to the key role that these spaces play in the delivery of parking service. This report has pointed out the impact that these free spaces have on walking distance to and from primary destinations in the downtown.

The info graphic Figure 40 speaks to a significant impact on parking service delivery system. The loss of Cooper site parking impacts not only the immediately surrounding area but impacts the C-corridor block supply. The Cooper site is clearly an integral piece to the current and future balance of parking demand and supply. The re-development designs therefore need to take into account a public parking space component. But it is important to keep in mind that the current importance that Cooper's parking supply plays in the overall balance of demand and supply may lie only with the fact that currently it offers parking service free of charge.

The Downie St municipal facility provides an important role here as well. Over the course of the past few months, there are indications that those spaces are drawing from overflow conditions on the Cooper site as well as continuing to provide vital service for buses that cater to the summer theatre attractions in the downtown.

In addition to the Cooper site's historical building re-development potential the University of Waterloo property is set for expansion as well. There may be opportunities here to consolidate the municipal parking on this site that would serve strategically the varied parking demand sources - the Cooper re-development and the University.

As noted in the info graphic, if public parking cannot be replaced on the site, then significant pressure will result throughout the parking infrastructure system specifically pressure east of Downie and certainly along the C-corridor blocks. To re-iterate the pressure on those existing facilities along the C-corridor will require partnerships with private land owners to provide replacement supply as noted in the info graphic.

Erie Site Potential Re-development

While there are currently no talk of re-development of the 138 space municipal parking facility at the time of this report, we wanted to measure the impact of its loss to the parking infrastructure system. The site is one that geometrically is suited for not only parking but likely commercial/residential uses. This site was also the subject of a proposal to build a half-module deck above the surface lot. That proposal is discussed in Technical Appendix C. It should also be noted that the Erie lot is well served by pedestrian routes formed by archway from the lot to Wellington at mid-block and by an urban landscaped route that leads the customer to the north end of the block towards Ontario St.

Suffice to say here that Erie site is crucial to the parking service and its loss or reduction in parking space would put significant pressure on the service delivery system. Info graphic Figure 41 shows blocks to the west of Erie (W-corridor) and again blocks within the C-corridor would be under severe pressure to absorb the loss of the Erie lot parking spaces.

Intensification of Residential Use

While at the time of writing, no specific proposals have been tabled (aside from the Market Square re-development), there was some project team discussion that **infill** projects were likely to come. The University of Waterloo's Stratford downtown campus is scheduled for expansion which would likely generate the need for accommodation units close to it in the downtown.

The intensification of residential development in the downtown might have the following effects on parking demand and supply:

- Should future downtown development include a resident population, it would require a wide range of services that satisfy the day to day living requirements (food and personal/medical services). These uses would generate a walk-in market not one that requires driving a vehicle.

- A resident population grows into a community. This community becomes more engaged in its surroundings by protecting it from invasive traffic and demanding a set of urban design standards that encourages a more pedestrian environment. Any future parking space development would need to be evidenced and need to reflect sensitivity to resident population in terms of its size and urban design.
- A resident population requires parking space on-site for the storage of their own vehicles and more likely to face a conflict with their visitors and people who are shopping, dining and engaging in commercial activities.
- A year-round entertainment and community focus point such as Market Square generates pedestrian traffic that needs to be woven into the existing urban transportation network.

Quantifying the singular or cumulative impact of changes in character of the downtown would be very difficult. However the impact of most of what we discussed here is that there would be a downward pressure on parking demand in the longer term planning horizon.

Impacts of Losing Cooper Site

July 10, 2016

Note 1: Test the scenario that shows the loss of 280 spaces on the Cooper site (Block C108). Note that this off street parking service is free of charge.

Note 2: Pressure on C103 through to C107 that lie north of Cooper site. These blocks would see a 23% increase in their attraction of shorter stay demand and 33% increase in their attraction of longer stay demand.

Note 3: The average increase in shorter stay parking demand attraction is 29% on the D-blocks (east of Waterloo). On average the longer stay attraction to these blocks particularly D106 and D107 as shown would likely increase 31%

Note 4: Note the added attractiveness of the Kalbfleisch block W104 of 11% and 10% increase in short and longer stay customers respectively.

Note 5: Parking service pressure also found on block C104 (Market Square) – a 13% increase in attraction of short stay and 12% in the attraction of longer stay customer.

Note 6: The entire C-block corridor could see an average increase of 8% in shorter stay customer and 7% in longer stay attraction under this scenario.

Note 7: Opportunities for increasing the parking supply within this C-block corridor lies with having to partner with commercial property/business owners – LCBO site [C105] is one such example. The St Patrick surface lot [C107] is municipal site that has the right geometry that would allow the construction of parking deck structure. But it would appear that C107 is the relatively least desirable block to assume the displaced parking demand under this scenario

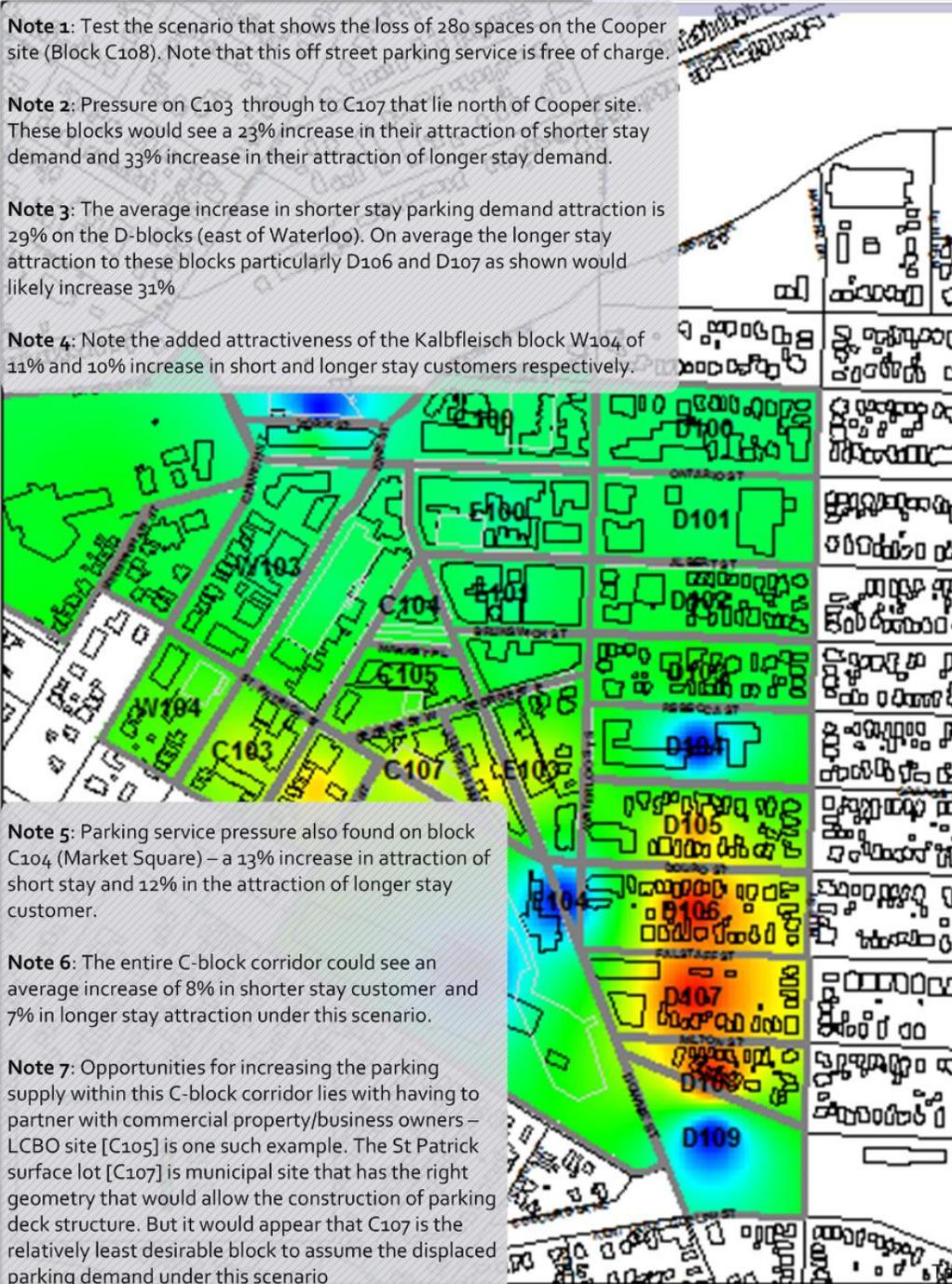


Figure 40: Info graphic Showing Impacts of Losing Cooper Site Parking

Impacts of Losing Erie Lot

July 10, 2016

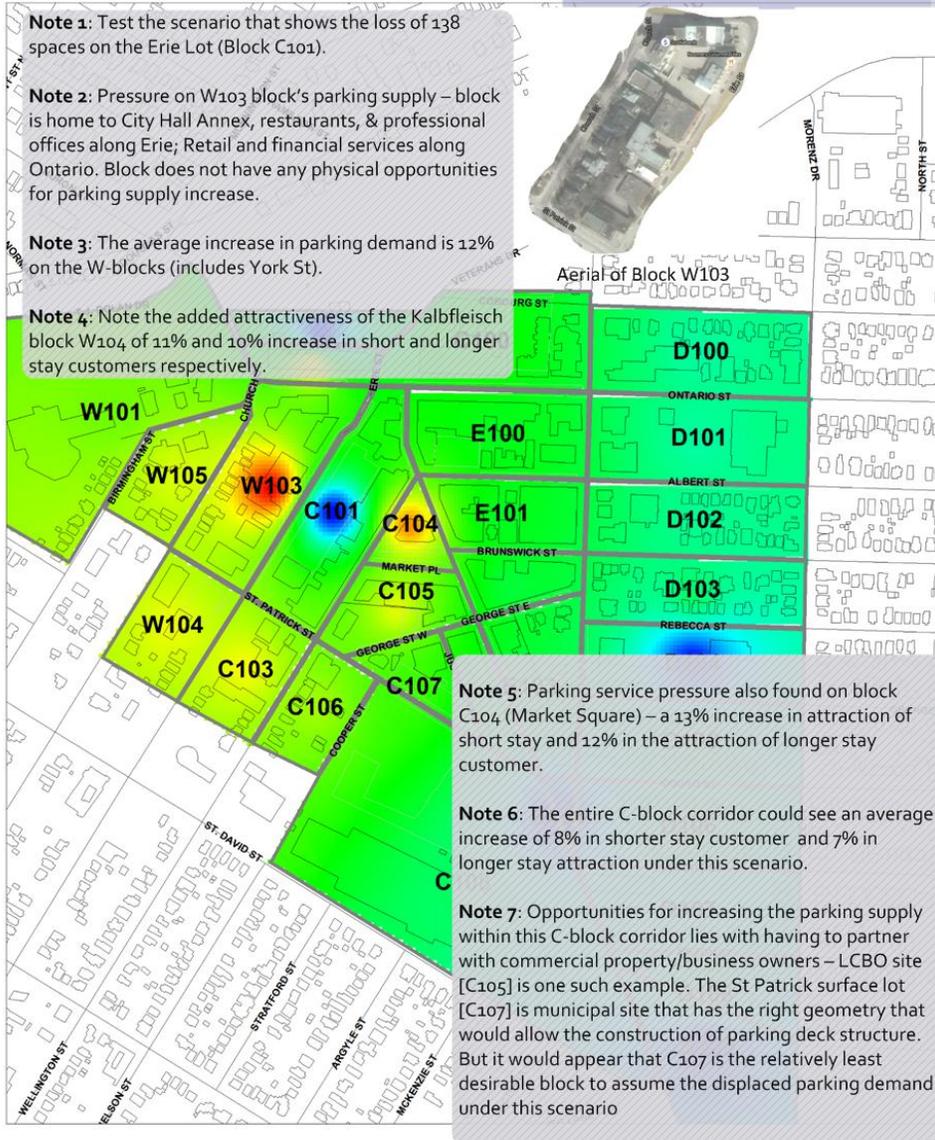


Table 27

Figure 41: Info graphic Showing Impacts of Losing Erie Lot Spaces

Impact of Changes in Technology and Character of Downtown

Technological changes have and will have an impact on mobility means, on the quantity and ultimately the need for parking. The delivery of parking service to the customer is one of the five factors that we discussed in this report. Specifically we discussed how our customers felt concerning payment options, time restrictions on the use of parking space and enforcement. This parking strategy needs to acknowledge that changes in the way we move around town will impact the urban landscape. The technologies are:

- Driverless vehicles
- Shared economy or "dial-up" service
- Continuation of internet based shopping for and purchase of services and products from the comforts of your home or office, and
- Technology that finds a vacant parking space for you if you are driving your own vehicle

The introduction of technology specific to mobility may effect parking demand and supply as follows:

- Combining the driverless vehicle with the "shared economy" technology, the on-demand service will not require a vehicle to rest in a parking space. Circulating around the block looking for a vacant parking space is not necessary as a driverless vehicle need only to pick up or drop off its passengers. Remember that a vehicle spends 96 percent of its time parked;
- Infrastructure changes are required so that assisted driving works - from clear network sensors, availability of charging stations to broadband wireless network that allows for communication between vehicles and that infrastructure;
- Most analysts believe that this technology will provide a safer and more efficient mobility service to us. It will also promise a cleaner environment as it is based on non-fossil fuel technology;
- Auto industry is well into the development of vehicles that can operate as such. Stratford is a test site for driver-assisted technology;
- Dialing up a transportation service will become more economical when compared to the outright purchase of your own vehicle; and,
- The driver technology will likely not reduce road congestion, however it will reduce traffic that circulates the downtown looking for parking spaces (estimated to be of the order of 35 to 45 percent of the total volume).

Quantifying the singular or cumulative impact of these technology changes would be very difficult. However the impact of most of what we discussed here is that there would be a downward pressure on parking demand in the longer-term planning horizon. The introduction of the parking space guidance technology (where we indicate where vacant parking space is available) would contribute to the

optimization of existing parking space use which supports a tenant of a contemporary transportation strategy.

Summary

Parking Demand Analysis

This technical report presents an analysis of the parking demand side of the public parking service. The report begins with discussion of five factors: physical environment, trip characteristics, and attraction of parking supply, parking operations and the customer experience. Each has a significant impact on parking demand.

Reflecting on the outcomes of this parking demand analysis process the following salient findings are offered:

Factor 1: Physical Environment

1. The commercial land use space is concentrated in a dense building form. The facades of the buildings along Ontario, Wellington and Downie form a solid unified commercial visual address along the horizontal, and residential, service and offices that sit on top of the grade level commercial use along the vertical. This urban form serves the following impact on the study of parking demand:
 - a. People driving along Ontario, Wellington and Downie can more easily see the shops as the solid urban facade presents a “billboard” of sorts;
 - b. Once the motorist finds the intended primary destination point, the focus of the motorist turns to reading the signs that direct them to parking space – be it along Ontario, Wellington or Downie in an on-street space or to an off-street parking space; and,
 - c. The network of streets provides various channels that allow the motorist to safely park their vehicle or negotiate movement in and around the downtown.
2. The broad range of land uses will play into the computation of parking demand as a number of different land use types attract parking demand at varying peak hours of the day, varying days of the week, and at varying magnitudes.
3. The interplay of these factors will provide an estimate of the potential size of the parking demand. **Walking distance** to and from parking space and these land uses will help distribute that parking demand to the parking supply and assess the level of customer service

4. The study discusses the potential physical changes to the downtown environment that will affect parking demand and parking supply options in the short and longer-term planning horizon. Specific discussion centered on re-development on Market Square, the Cooper site and the expansion of the University of Waterloo campus. Some of these developments will take parking supply away, add new demand, or intensify the demand for space even more in the longer term.
5. The study went beyond the physical changes that will exert a **downward** pressure on future parking demand and supply and spoke to the impacts generated by technology:
 - a. Driverless or driver-assisted vehicles
 - b. Shared economy or dial-up travel service
 - c. Online internet sourced shopping and purchase of goods and services
 - d. Live and interactive available parking space guidance system

Factor 2. Trip Characteristics

This factor discusses the inherent differences that arise among different land uses in terms of trip characteristics, namely: **patterns** of parking demand over the course of the day, week, and season; **magnitude** of parking attracted per land use type and other trip characteristics that assist in defining the parking demand.

The discussion also spoke to the impact on peak hour parking attraction of such trip characteristics such as having multiple destinations for one trip - essentially sharing one parking space among several destinations.

Factor 3. Attraction of Parking Supply (Walking)

Emerging from the online surveys one of our most critical factors that affect parking demand specifically the decision of where people will park is the measurement of an acceptable walking distance to and from parking space and primary destination.

The analysis of walking distance serves to identify parking space that is marketable to various types of customers and as such it does impact where and what type of parking services are in demand.

Total Distance	Average	STD	Lo95	Hi95	Blocks
2526	101	4	99	103	C100 - Cobourg
6930	69	3	68	69	C101 - Erie
1055	176	28	154	198	C103
6031	58	4	57	59	C104 - Market
2088	116	10	111	121	C105
366	61	14	50	72	C106
329	66	11	56	75	C107 - StPatrick
16372	381	30	372	390	C108 - Free Parking Areas
826	165	30	139	191	C109
1673	239	21	223	255	D101
184	92	0	92	92	D102
569	190	42	142	237	D103
232	232	0	232	232	D105
17105	349	87	325	373	E100 - Albert
7070	354	96	312	396	E101
6644	391	45	369	412	E102
5004	417	44	392	442	E103
260	260	0	260	260	E104
6429	918	0	450	918	W100 - Library block
328	164	29	124	204	W101 - York
1359	272	0	272	272	W102
3506	270	76	228	311	W103
689	344	12	328	361	W104 - Kalbfleisch

Figure 42: Block Summary of Walking Distances [Total, Average, Low & High]

We offered these observations:

6. Fifty-five (55) percent of respondents parked their vehicles and had their primary destinations on the very same block.
7. For those who parked on a **municipal off street** parking facility, surveys indicated that **83 percent** were able to find a space within 5 minutes, while those who parked on an **on-street**

parking space **63 percent** were able to do so. This is typical as on-street space is clearly a preferred choice but is more restrictive in terms of inventory.

8. As well, **73 percent** of those survey takers who chose to park on a **private customer** only parking facility were able to find space within 5 minutes!

9. Market Square (C104) and Erie lot's Block C101 represent 46 percent of the total online destinations. The facilities on these prime blocks serve two-thirds of the parking demand attracted by its uses. Be mindful that the Market Square block offers 68 on-street parking spaces while the Erie block provides 227 spaces including a 136 off-street parking facility. The 66% - 67% capture rate is an indicator of a high level of customer service.

Factor 4. Parking Operations

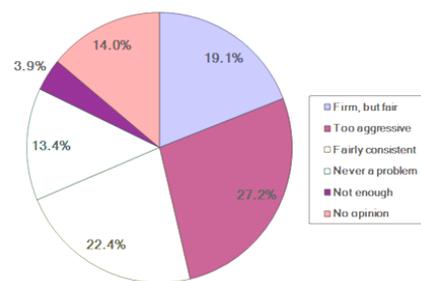
The discussion within this factor deals with how the public parking system is reflective of current travel market. Is the parking charge a rational and marketable one? How is the parking system reflective of what is important to not just the motoring public but is it in keeping with other objectives of the transportation strategy for the city and region?

The discussion turned to incentive programs that feature **free** parking or reduction in the use of private vehicle programs. While it is difficult to determine if this feature directly contributes to the decision to drive a vehicle or not, such programs demonstrate the community's desire to begin to transform historical travel mode choices. Stratford's downtown features a significant parking supply on the Cooper site that serves a large portion of the customer market and is free of charge. Examples of promotional programs currently available to customers are:

- Free Sunday parking
- Free Saturday parking December 1st to April 30th
- Car free Fridays in June, July and August

The provision of free parking and its impact on walking distances is documented in this report. The walking threshold for both longer and shorter stay customers (250 and 100 meters respectively) is completely shattered with recorded distances of 300 to 350 meters to/from that Cooper lot. Thus the traditional relationship of duration of stay and walking distance is shattered when price of parking is taken into account. From a parking planning point of view, if cost recovery for the parking service is not a business requirement for the municipality, then all parking can be distributed to the fringe areas of the downtown, producing a very different landscape in terms of service and land use.

What is your opinion about the level of parking enforcement?



This section ended with a discussion of a vital **enforcement** tool that the parking operation needs in order to ensure safety, fair and shared use of parking space. Most customers indicated that

enforcement was not issue with close to 67 percent of those who had an opinion said that the level of enforcement ranged from firm but fair to not enough.

Factor 5. Customer Experience

Flowing from the online surveys, a customer profile of a typical visitor to the downtown was drawn:

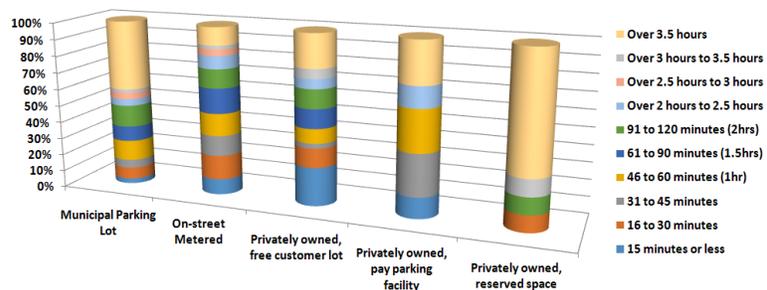
- 10. Eight-three percent of our responses were from customers who visited the downtown on a weekday.
- 11. Thirty-seven percent of our responses were from customers who visited the downtown in the morning (8 am to 11 am).
- 12. Thirty percent of our responses were from customers who are in the downtown for work-related or business meeting purposes.

- 13. Seventy-seven percent came to the downtown from their place of residence.
- 14. Eighty-three percent came by car or truck, with a significant 12.5% who walked from their residence.
- 15. Sixty-five percent of those who drove to the downtown parked on-street, and 23% in a municipal off-street facility.

Destination is outside of the boundaries shown	Frequency	Pct Distribution
C100 - Pazzo Taverna	27	4.8%
C101 - Reno's Bistro, The Butcher The Baker	134	23.7%
C103 - Convenience Plaza	5	0.9%
C104 - City Hall / Market Square	127	22.5%
C105 - Cora, Pizza Pizza, Carrie's K9 Cuts	16	2.8%
C106 - Parlour Inn	8	1.4%
C107 - Police Station	6	1.1%
C108 - Waterloo Stratford Campus	7	1.2%
C109 - Black Swan	8	1.4%
D100 - Tim Horton's	3	0.5%
D101 - Shoppers Drug Mart	11	1.9%
D102 - The Prune, Post Office	2	0.4%
D103 - Gentle Rain, Marley And Me	6	1.1%
D104 - Jeanne Sauve, Romeo Public School	0	0.0%
D105 - St. John's United	1	0.2%
D106 - St Paul's	0	0.0%
E100 - Bentley's, Armoury	65	11.5%
E101 - TD Bank, Albert St. Inn	49	8.7%
E102 - Avon & Studio Theatres	17	3.0%
E103 - Downie Street Burgers	16	2.8%
E104 - Parkette	1	0.2%
W100 - Library	14	2.5%
W101 - Park activities along river	0	0.0%
W102 - York & Ontario St shops	18	3.2%
W103 - United Way, City Hall Annex	22	3.9%
W104 - Royal Canadian Legion, Home Appliance	1	0.2%
Response Count	565	

- 16. On average each visitor had 2.2 destination points in the downtown on their trip.
- 17. Top draws for visitor's primary destination are shown in red on the snippet table to the right.
- 18. Pulling out just those who drove their vehicles and had indicated that either dining, shopping or entertainment was their primary trip purpose, the average duration of stay is 1:53 hr.
- 19. Generally speaking the longer the duration of stay the more destinations.
- 20. About 32% of respondents stay for more than two hours. The duration of stay category – 1 to 1.5 hours – serves the broadest range of stores visited.

21. Parking space choice and parking space type by customer duration of stay is shown in the graphics here. Note the wide coverage of durations that the on-street service. The private customer lots (free of charge) also provide that same wide range of customer durations. The municipal off-street facilities seem to be more attractive to not only less numbers of customers but also those with longer durations of stay.



22. Looking at the parking type choice from another perspective. The on-street parking space here in the downtown has a very wide customer stay market range. The off-street space is continuing to attract customers with slightly longer durations of stay, but in most of the other durations of stay categories on-street space provides a very high level of service.

Evaluation of Current Parking Demand and Supply

Flowing out of the detailed discussion of parking demand, we presented a five step procedure to best determine current level of parking demand and its distribution over the downtown. The salient findings of this analysis are:

Step 1: Calculate Peak Hour Parking Demand

With some understanding of the physical environment and its impact on parking demand both now and in the future the next factor we discussed was the quantity of trips attracted by the physical environment. The deliverable is a set of peak hour parking ratios showing peak number of parking spaces attracted by each land use type (number of spaces for every 100 square meters of land use type).

The computed peak hour quantity took into account the following inputs:

Land Use Activity	Employee	Visitor	Total
Retail	0.72	0.62	1.34
Services	0.72	0.80	1.52
Financial Services	0.72	1.11	1.83
Commercial Office	0.72	0.13	0.85
Government Services	0.77	0.39	1.16
Medical Services	0.67	1.14	1.81
Restaurants	0.72	1.08	1.80
Entertainment	0.58	4.12	4.69
Residential	1.16	0.10	1.26
General (ndustry, institutional, etc)	0.41	0.51	0.92

- Individual peak attraction of parking demand by land use type
- Temporal variation of that parking demand over the course of the day; taking into account that certain land uses peak at different times of the day
- Day of the week variation of that parking demand for different land uses;
- Seasonal variation in that parking demand (theatre, summer tourism, etc)
- Multiple destinations and their impact on the number of peak spaces that may be required when one parking space serves a number of different destinations;
- Market synergy or walk-in market: where certain land uses in the downtown draw customers from those who already work in the downtown and thus do not impact the peak parking demand
- The outcome of this piece was a set of peak hour parking ratios (number of spaces for every 100 square meters of specific land use). The application of these ratios to the quantity and type of land use generated an estimate of longer stay (work trips) and shorter stay parking demand.

The resulting quantity of trips generated by these computed peak hour ratios is calibrated against the observed number of parking space occupancy (over the course of four day long field surveys). Applying the peak hour rates to the land use quantities generated an overall employee parking demand for about 750 stalls in the downtown and approximately 1000 stalls for visitor (short stay) parking demand. The peak hour of the day parking demand so calibrated generates a total parking demand range of 1640 to 1840 stalls with a mid-range target of 1740 parking spaces in the downtown.

Step 2: Compute Block Level Peak Hour Demands

Having computed the peak hour parking factors in Step 1, the spatial distribution of employee and visitor demands generated per block is presented on Figures 23 to 25. The analysis highlights of this spatial view of parking demand are:

23. Solid demand for long and short parking east of Downie north of George and well as an intense demand generated by uses just west of Wellington north of St Patrick;
24. Longer stay parking demand focus points are: west of Erie Street (annex City Hall), central corridor blocks formed by Brunswick and Ontario on the south and north and by Waterloo / Downie on the east and west;
25. Short stay parking demand distribution opens up two new blocks: E100 (Ontario /Waterloo/ Albert and Downie) and C108 where the Cooper site is located;
26. Major generators of longer stay parking demand are: public services as the courts, city hall and a pocket of personal service professional offices; and
27. Major generators of shorter stay visitor parking demand are: theatre, retail and restaurants along Ontario corridor as well as Downie and Waterloo.

Step 3: Compare Block Parking Demands to Block Parking Supply

Illustrations showing the numeric surplus or deficiency of parking space that occur when block parking demands are compared to block parking supply. This step however does not adequately reflect the fluid dynamic that exists between where people park and where their primary destination occurs. The step however brings parking supply (space that serves employee and visitor) into the process of understanding where opportunities to provide a higher level of customer service.

Step 4: Apply Walking Distance Characteristics to Parking Space Choice

Figures 29 (Long stay or work trips), 30 (Short stay or visitor trips) and 31 (total long and short stay trips) display net surplus or deficit in the downtown. The following salient findings drive the direction of our parking management strategy:

28. Based on its location - central to parking demand and within the local characteristic walking distance - **Block E101** is in position to serve significant portion of shorter stay parking demand. This block is bounded by Albert / Waterloo / Brunswick and Downie streets;
29. **Block W103** - west of the Erie lot block - also is strategic to serve both long and short stay parking demand;
30. The triangle formed by Blocks C108, Block E101 and Block W103 is in strategic position to provide parking service when walking distances are taken into account; and
31. A cautionary note is that the significant draw that Block C108 (Cooper site) shows is a result of a walking distance profile that results from a somewhat distorted market coverage; this block presents parking service at no charge; this operation characteristic lengthens the walking distance threshold for both long and short stay trip types;

Step 5: Compare Distributed Parking Demand to Parking Supply

The key outcomes of this step are:

32. It is understood that corridor E generates a significant portion of the downtown's long and short stay parking demands. Corridor E is home to one of the busiest off-street parking facility on Albert Street.
33. While the demand to supply comparison shows an extraordinary deficit in both long and short stay parking space deficit, the opportunity for expansion of parking inventory within the corridor is limited.
34. The parking supply within this corridor is currently at capacity in its response to this demand. Technical Report B will elaborate but important at this point is that the supply is optimally used by customers. There does not appear to be abuse in terms of customers parking beyond the three hour time limits that would mean other customers cannot share the limited parking space.
35. We need to look at how the parking supply in reality is responding to the demand. Our field surveys of parking space use will provide insights into how well the parking inventory is performing.
36. The most common way of expressing the balance between parking demand and supply is to quote the occupancy or peak utilization of its supply (75 percent occupancy at 14:00 hrs for example). In practical terms however, this particular metric is not very helpful because it contradicts what we have been saying throughout steps 1 to 5: the walking distance to and from primary destination and parking space provides a broader spatial perspective on the balance of supply and its demand.
37. The outcome of step five (5) serves to provide the study with a spatial focus of where opportunity theoretically emerges. It does not point to specific properties within the downtown where supply can be changed in order to more effectively respond to its market.
38. The balance of parking demand and supply is beyond the numerical differences between them. The state of balance – surplus or deficit – can and does point to potential operational opportunities. For example, note that the longer stay parking demand customer is consistently in an imbalance. Overall that customer market is in deficit position. The free parking operation at Cooper's site however demonstrates how the parking management strategy can manipulate the parking space choice decision by selling its service free of user charges. This operational characteristic serves to manipulate customers' acceptance of longer walking distance by off-setting its cost to the customer.
39. Building on the walking distance and the impact of operational characteristics, the outcome of steps 1 to 5 point to the need to measure how stable the parking space inventory is over the short and longer term planning horizon.

Market Potential Opportunities Resulting from Changes

The state of balance between parking demand and supply is sensitive to the stability of the underlying conditions that determine demand and supply. Over time there will be changes to the **physical** environment that will impact the nature and quantity of trips to the downtown, and there will likely be

changes to the physical environment in terms of properties that currently supply parking space that may not continue to do so. In addition that balance is affected by changes in **operations** that can impact the level of customer service and then in turn impact customer demand for space. And finally the balance can and will be impacted by the effects of **technology** on the demand for and delivery of parking service.

Changes to the physical environment included these known sites:

- Over the course of the project to formulate a parking strategy for the downtown the re-development of the **Market Square** has been raised. While the scope of the parking strategy is broader in terms of operations and short and long term remedies to the public parking services, this particular development concept is spatially at the heart of the downtown but as evidenced by the parking activity data collection program it is a critical parking customer service area.
- Two options were presented for review:
 - Option 1: retains 32 spaces on the Market Square block thus displacing 36 spaces.
 - Option 2: retains 48 spaces and loses 20 spaces.
- **Potential re-development of the Cooper site and the University of Waterloo campus.** At the time of writing this report some designs were presented but nothing firm has been recommended. The re-development of the structure on this site impacts a historical physical structure. The contemplated re-build program on this site would restore and re-purpose the historic building. In addition to its commercial/residential potential the site currently plays a vital role in the supply of over 400 surface municipal parking spaces. The University's expansion plans were not available but have been the subject of discussion. The potential is always there to consolidate parking space requirements for both the Cooper site and the University's expansion.
- **Effect of losing Erie St Municipal Lot or Cooper site's free parking lot.** The report tested walking distance, demand and market appeal of these key parking facilities if their supply were to be reduced or lost. The report provided the spatial distribution of current trips to either of these lots to other blocks. The magnitude of a change in the infrastructure's current capacity was determined to be significant especially given that both of these lots represent a significant portion of public parking inventory. The report provided the insight that Erie and Cooper sites are the best physical geometry to accommodate a longer-term parkade solution if and when the demand reaches that critical capacity.

Possible adoption of technological changes may result in the following effects on longer-term parking demand and supply:

Technological changes have and will have an impact on mobility means, on the quantity and ultimately the need for parking. This parking strategy needs to acknowledge that changes in the way we move around town will impact the urban landscape. The selected technologies are:

- Driverless vehicles;
- Shared economy or "dial-up" service;

- Continuation of internet based shopping for and purchase of services and products from the comforts of your home or office; and
- Technology that finds a vacant parking space.

The introduction of technology specific to mobility may effect parking demand and supply as follows:

- Combining the driverless vehicle with the "shared economy" technology, the on-demand service will not require a vehicle to rest in a parking space. Circulating around the block looking for a vacant parking space is not necessary as a driverless vehicle need only to pick up or drop off its passengers. Remember that a vehicle spends 96 percent of its time parked;
- Infrastructure changes are required so that assisted driving works - from clear network sensors, availability of charging stations to broadband wireless network that allows for communication between vehicles and that infrastructure;
- Most analysts believe that this technology will provide a safer and more efficient mobility service to us. It will also promise a cleaner environment as it is based on non-fossil fuel technology;
- Auto industry is well into the development of vehicles that can operate as such. Stratford is a test site for driver-assisted technology;
- Dialing up a transportation service will become more economical when compared to the outright purchase of your own vehicle; and,
- The driver technology will likely not reduce road congestion, however it will reduce traffic that circulates the downtown looking for parking spaces (estimated to be of the order of 35 to 45 percent of the total volume).

Quantifying the singular or cumulative impact of these technology changes would be very difficult. However the impact of most of what we discussed here is that there would be a **downward** pressure on parking demand in the longer-term planning horizon.

The introduction of the parking space guidance technology (where we indicate where vacant parking space is available) would contribute to the optimization of existing parking space use which supports a tenant of a contemporary transportation strategy.