

Evaluating the Walkability of Traditional Main Streets: A Comparative Analysis of downtown
Brockville, Cornwall and Kingston, Ontario.

By:

Jordan D. Suffel

A report submitted to the School of Urban and Regional Planning in conformity with the
requirements for the degree of Master of Urban and Regional Planning

Queen's University
Kingston, Ontario
September 2015

Copyright © Jordan D. Suffel 2015

Acknowledgements

I would like to express my sincere gratitude to all of the people who helped me succeed in my academic endeavours.

To my supervisor, Dr. Graham Whitelaw, thank you for introducing me to the subject of Urban Planning in my undergraduate years at Queen's and for advising me throughout the report-writing process.

To Dr. David Gordon, Dr. Leela Viswanathan and Dr. John Andrew, thank you for mentoring and counseling me throughout my graduate studies, as well as for giving me countless opportunities to expand my skills to beyond what is taught in the classroom.

Finally, but certainly with no less significance, I would like to thank my parents, James and Joanne, and my younger sister Megan, for putting up with me over the last seven years of post-secondary education. From the high points of success to the disappointments and frustrations of the many hurdles along the way, thank you for not only tolerating my incessant rambling, but for encouraging me to aspire to more than I could have possibly imagined on my own.

Executive Summary

Overview

Downtowns represent the heart and soul of most small and medium sized cities in North America. They often make up the Central Business District of these communities and their streets and streetscapes have evolved to cater to the predominant transportation modes of each generation. Main streets are usually easy to recognize in the CBD by the buildings that line them, making up a street wall of elaborately detailed and distinctive styles that were developed through time. In response, cities have implemented a variety of strategies in order to revitalize their downtowns, which include heritage building preservation and adaptive reuse, waterfront redevelopment and, most notably, this repedestrianization can be measured by an index of walkability, the focus of my research reported below.

Methods

This research used the Maryland Inventory of Urban Design Qualities walkability audit protocol to evaluate the walkability of three traditional main streets in mid-sized, Eastern Ontario municipalities: Brockville (King Street), Cornwall (Pitt Street) and Kingston (Princess Street). The results from this audit were then used to inform a series of design interventions recommended for the improvement of the pedestrian realm along the three corridors.

Findings and Recommendations

Recommendation 1:

Increase the number of outdoor dining options and other active pedestrian uses.

Design principles: Imageability, human scale.

Cities: Brockville, Cornwall.

Recommendation 2:

Encourage infill along corridor to close gaps in street wall.

Design principles: Enclosure, human scale.

Cities: Brockville, Cornwall.

Recommendation 3:

Encourage variety in the articulation, materials and colours of new infill development.

Design principles: Imageability, human scale, complexity.

Cities: Brockville, Cornwall, Kingston.

Recommendation 4:

Replace mismatched street furniture, plantings and lighting using a consistent, enhanced theme along the corridor.

Design principles: Imageability, complexity.

Cities: Cornwall

Recommendation 5:

Enhance streetscape by strategically locating public art in the pedestrian realm.

Design principles: Human scale, complexity.

Cities: Brockville, Kingston.

Overall, the walkability of Brockville, Cornwall and Kingston's traditional main streets remains high. The evolution of the downtown streetscape character and recent policy adoption has refocused on the pedestrian, designing the right-of-way to accommodate a range of users at the human scale. Although there was no clear, overall winner in terms of the Maryland Inventory of Urban Design Qualities walkability audit, Kingston's Princess Street redevelopment stood out as an excellent example of pedestrian-focused design. Brockville's King Street and Cornwall's Pitt Street corridors also displayed pedestrian-oriented streetscape design features, however, their storefront vacancies and breaks in the street wall ranked them lower on the scale of the walkability audit. The recommendations provided in this report seek to improve the overall pedestrian environment along these important traditional main streets.

Table of Contents

Acknowledgements.....	2
Executive Summary.....	3
Overview.....	3
Methods.....	3
Findings and Recommendations.....	3
Chapter One: Introduction.....	8
Overview.....	8
Urban Design, Walkability and Street Audits.....	8
Traditional Main Streets.....	9
Objective and Research Questions.....	10
Chapter Two: Literature review.....	11
2.1 Overview.....	11
2.2 Traditional Main Street Design.....	12
2.3 Measuring Walkability.....	14
2.4 Audits as a Research Tool.....	15
2.5 Google Street View as a Research Tool.....	16
Chapter Three: Study Area and Policy Background.....	17
3.1 Regional Context – Eastern Ontario.....	17
3.2 City of Brockville, ON.....	19
3.2.1 Neighbourhood Context.....	19
3.2.2 Downtown & Waterfront Master Plan & Urban Design Strategy (2009).....	19
3.3 City of Cornwall, ON.....	21
3.3.2 Streetscape Design Report, 2011.....	21
3.4 City of Kingston, ON.....	23
3.4.1 Neighbourhood Context.....	23
3.4.3 Downtown Action Plan, 2004.....	23
Chapter Four: Methodology.....	25
4.1 Overview.....	25
4.2 Walkability Audit.....	25
4.2.1 The Maryland Inventory of Urban Design Qualities (MIUDQ) Protocol.....	25
4.2.2 Field Survey Instrument.....	28
4.2.3 Street Segments and Locations.....	29
4.3 Generalizability, Reliability and Triangulation.....	33
4.4 Limitations.....	34
Chapter Five: Results and Analysis.....	35
5.1 Overview.....	35
5.2 Introduction and Settings.....	35
5.3 Observational Summary of MIUDQ Audit.....	36
5.3.1 Imageability.....	36
5.2.3 Enclosure.....	44
5.2.4 Human Scale.....	49

5.2.5 Transparency	55
5.2.6 Complexity	58
Chapter Six: Key Findings and Recommendations	64
6.1 Overview	64
6.2 Key Findings.....	64
6.3 Recommendations	66
6.4 Reflection on Methodology & Future Research Considerations.....	76
6.5 Conclusions.....	78
REFERENCES	79
Appendix A.....	83
MIUDQ Field Manual	83
Appendix B	85
Raw Walkability Audit Scores.....	85

Chapter One: Introduction

Overview

This report evaluates the walkability of three traditional main streets located in three mid-sized, Eastern Ontario municipalities: Brockville, Cornwall and Kingston. The streetscapes were evaluated using a walkability audit protocol following the Maryland Inventory of Urban Design Qualities (MIUDQ). A better understanding of the current walkability of these corridors will help inform recommendations for design interventions that will enhance the pedestrian realm of the important central business districts of these mid-sized cities.

Urban Design, Walkability and Street Audits

In the past, researchers have emphasized the importance of macro-scale design features at the neighbourhood level in determining walkability, such as block length, frequency of intersections, destination proximity and density. However, new research has demonstrated that micro-features of the urban environment, namely the design characteristics relating to safety, quality and context, are just as important as those at the macro-scale (Adkins et al., 2012).

Auditing tools are a reliable method for evaluating walkability and allow researchers to gather and score information based on a specific protocol. Audits can be used to evaluate, for example, how environments influence people's levels of physical activity, travel behaviour, sense of safety and/or their enjoyment and use of space (Sukumaran, 2012). The Maryland Inventory of Urban Design Qualities (MIUDQ) protocol is a recently developed pedestrian audit tool that uses perceptual urban design qualities as a framework for evaluating walkability. It assesses the *experience* of walking down a street, departing from the traditional measurements used

for auditing pedestrian travel behavior. Furthermore, researchers have recently recognized that the detailed imagery available through Google Street View can be a viable data source for assessing many physical environmental features without in-person observation. This development in research methods has opened the door to more geographically diverse comparative studies as it has driven down the costs associated with travel to case study locations.

Traditional Main Streets

Main streets are usually easy to recognize by the buildings that line them, making up a street wall of elaborately detailed and distinctive styles that were developed through time and that capture and maintain interest. Usually situated in the oldest areas of the city, downtowns and their main streets embody the heritage of a community and make up a considerable percentage of its commercial tax base as Central Business Districts (CBD). Most of the building types along traditional main streets are no more than three to four storeys in height and are built right up to the sidewalk (zero lot-line) with ground-floor retail and upper-floor residential uses. Furthermore, the shape and architecture of main streets is determined in part by the dominant type of transportation. Mid-century pressures from increased car ownership led to a drastic change in street design, including the addition of parking provisions, vehicular right-of-way widening, the narrowing of sidewalks and the pedestrian realm, and the elimination of street trees. Over the years and thanks to a growing body of research that has linked urban walkability to human health, re-pedestrianization of public space has been on the rise. Cities have implemented a variety of strategies in order to revitalize their downtowns, which include heritage building preservation and adaptive reuse, waterfront redevelopment and, most notably, improvements to the pedestrian realm.

Objective and Research Questions

This report's objective and two main research questions are addressed below:

Objective: Compare and contrast the downtown “Main Streets” of Kingston, Cornwall and Brockville, Ontario in terms of their pedestrian-oriented design using the Maryland Inventory of Urban Design Qualities (MIUDQ) framework.

Research Question 1: How well have pedestrian-oriented design features been integrated within the main street study areas?

Research Question 2: What improvements can be made to enhance the pedestrian environment along these streetscapes?

Chapter Two: Literature review

The term “Main Street” signifies the built-up commercial area, or downtown, of small communities. [It] has come to symbolize a place close to the people, people who have few pretenses and honest aspirations, and because it fuses images of place and time. –Richard V.

Franca Viglia, Main Street Revisited

2.1 Overview

Downtowns represent the heart and soul of most small and medium sized cities in North America. Although the majority of professional and academic literature has focused on downtowns within large urban centres, “for every Boston and Pittsburg there are hundreds of smaller cities and towns pursuing [downtown] regeneration”, and thus they should not be ignored (Breen & Rigby, as cited in Robertson, 1999). There is some debate among researchers with respect to the population thresholds that constitute a mid-sized city. However, for the purposes of this report medium sized (or mid-sized) cities are defined as those with populations between 20,000 and 200,000 residents (Kunzmann, 2010).

Usually situated in the oldest areas of the city, downtowns embody the heritage of a community and make up a considerable percentage of its commercial tax base as Central Business Districts (CBD). Furthermore, downtowns have traditionally served as the main community gathering places by hosting cultural festivals, parades, civic celebrations and other events (Robertson, 1999). Despite the historic significance of downtowns, the trend toward suburbanization has reduced the incentive for development and redevelopment of land in CBD, which has contributed to the widespread decline of these areas (Brueckner, 2000). In response to this decline, cities have implemented a variety of strategies in order to revitalize their downtowns, which include heritage building preservation and adaptive reuse, waterfront redevelopment and, most notably, improvements to the pedestrian realm (Robertson, 1999).

Although each of these strategies has merit, this report focuses primarily on pedestrianization improvements as a means of revitalizing main streets in mid-sized municipalities within Ontario.

2.2 Traditional Main Street Design

Main streets are usually easy to recognize by the buildings that line them, making up a street wall of elaborately detailed and distinctive styles that were developed through time and that capture and maintain interest (Francaviglia, 1996). When assessing the built environment in any community, it is important to recognize the difference between *building type* and *building style*. Building types are distinguished from one another based on the basic arrangements of building layout, floor plans and massing. Building styles on the other hand are determined through architectural and ornamental details that have been applied to the basic building structure (Houser, 2011). Most of the building types along traditional main streets are no more than three to four storeys in height and are built right up to the sidewalk (zero lot-line) with ground-floor retail and upper-floor residential uses (Francaviglia, 1996). These “two part blocks”, as described by Richard Longstreth (2000), have been key to the development of main streets over the last two centuries. As early as 1815, buildings along main streets featured commercial frontage with large ground-floor window casings to advertise goods and services, along with smaller windows for the upper floor residential units (Francaviglia, 1999). Some of the older buildings along main streets were originally built for single-block residential use but were later re-purposed and retrofitted with plate glass windows along their main floors to “open up the façade at street level and create accessible storefronts” (Francaviglia, 1999, p. 24). These façades, which constitute building style, have generally maintained their high level of detail and incorporate a number of distinct architectural features including cornices, pilasters, modillions, parapets and awnings (Houser, 2011). When several buildings with these design features are

constructed side by side, they create the impression of a colonnade and reinforce the continuity of the street wall (Francaviglia, 1999). During the Victoria Era (1870-1900), an increased importance was put on building ornamentation and the variety of elements and materials employed in construction, with a higher proportion of building façades covered with decorative wood, stone, brick and cast iron patterns (Longstreth, 2000). Other architectural styles that can be seen along most traditional downtown streetscapes and building façades include Edwardian architecture (1900-1920), Art Deco (1920-1930), Brutalist architecture (1950-1970) and Postmodern architecture of the late 20th century (Longstreth, 2000).

Francaviglia (1999) asserts that the shape and architecture of main streets is determined in part by the dominant type of transportation. In the 1920s, the increase in personal car ownership began to impact main street design. Parallel parking provisions, for example, were integrated into the planning and construction of right-of-ways and asphalt-based pavement surfaces were applied to accommodate increased road traffic (Francaviglia, 1999). The layout of the street network has an immense impact on vehicular traffic flow and the safety of both drivers and pedestrians. The width of streets also affects the ratio of built and open space (Francaviglia, 1999). Many scholars have argued that the “perfect” ratio of building height to street width hovers somewhere around 1:3, with anything taller causing negative shadow effects and loss of human scale (Ewing, 1996). Wider right-of-ways along traditional main streets has provided the opportunity to integrate strategically planted street trees that can soften the streetscape, provide shade, and enhance the sense of place that might be hindered by a tall street wall (Francaviglia, 1999). Finally, the open spaces within downtown neighbourhoods, such as village greens and public squares, are usually keystone community gathering places. They are points in which

people interact and, when placed in the right location, help to define the character of the main street (Francaviglia, 1999).

2.3 Measuring Walkability

In the past, researchers have emphasized the importance of macro-scale design features at the neighbourhood level in determining walkability, such as block length, frequency of intersections, destination proximity and density (Cervero & Kockleman, 1997; Alfonzo, 2005; Argawal et al., 2008). These features can be easily mapped out and evaluated using basic GIS software. This GIS approach has been used to effectively measure connectivity and evaluate walkability in transit-oriented neighbourhoods from a quantitative perspective (Schlossberg & Brown, 2004; Hess, 1997; Randall & Baetz, 2001). However, these studies inherently assume that all roads have adequate and equal pedestrian facilities, thus ignoring the various unique micro-features of the urban environment that influence travel behaviour from a psychological, social and cultural standpoint (Randall, 2001). New research has demonstrated that these micro-features, namely the design characteristics relating to safety, quality and context, are just as important as those at the macro-scale (Adkins et al., 2012).

The study of walkability and public space has led to the development of various methods for collecting street-level data with respect to pedestrian activity. Auditing tools are one such method, allowing researchers to gather and score information based on a specific protocol. Audits can be used to evaluate, for example, how environments influence people's levels of physical activity, travel behaviour, sense of safety and/or their enjoyment and use of space (Sukumaran, 2012). Pedestrian audits are rigorous tools that can effectively assess the micro-features of the urban environment that are often missed at the neighbourhood level, such as

sidewalk width and upkeep, unique and appealing building designs and way-finding signage (Brown et al., 2007).

2.4 Audits as a Research Tool

Various auditing tools have been created and tested for measuring walkability, each containing different objective and subjective parameters. For example, the Systematic Pedestrian and Cycling Environmental Scan (SPACES) was designed by the University of Western Australia to collect information pertaining to roadways and their surrounding elements, whereas the Partnership for a Walkable American developed the Pedestrian and Bicycle Information Centre (PBIC) checklist to report on sidewalk continuity, street safety and attractiveness, and driving behaviour (Lee & Talen, 2014). The Irvine-Minnesota Inventory (IMI) is one of the best-known auditing tools and accounts for both macro-scale and micro-scale features of the environment in order to gain an understanding of the entire study area. Other in-person walkability auditing tools include Walking Suitability Assessment Form (WSAF), the St. Louis University Audit Tool (SLU), and the Pedestrian Environment Data Scan (PEDS). The majority of these protocols assess various physical features including building heights, block lengths, pedestrian and vehicular traffic volumes, road conditions, parking and the presence and quality of sidewalks (Lee & Talen, 2014). However, recent research indicates that subtler features, referred to as *perceptual* urban design qualities, may have a greater influence on active transportation choices (Ewing & Clemente, 2013). The Maryland Inventory of Urban Design Qualities (MIUDQ) protocol is a recently developed pedestrian audit tool that uses these perceptual qualities as a framework for evaluating walkability. The MIUDQ protocol, described

in further detail in Chapter 4, seeks to assess the *experience* of walking down a street, departing from the traditional measurements used for auditing pedestrian travel behaviour.

2.5 Google Street View as a Research Tool

While in-person pedestrian audits are effective tools for gathering subjective observational data related to walkability, they are prone to some significant limitations; namely, the time and costs of travelling to each observation site (Lee & Talen, 2014). Because of this constraint, researchers have recognized that the detailed imagery available through Google Street View can be a viable data source for assessing many physical environmental features without in-person observation (Brownson et al., 2009; Clarke et al., 2010; Rundle et al., 2011; Lee & Talen, 2014). Clarke et al. (2010) were the first to assess the feasibility of Google Street View as an audit method, testing the reliability between data collected from the online imagery and through in-person observation. Their study confirmed that the virtual audit tool was a reliable method for assessing general neighbourhood characteristics such as recreational facilities and land uses (Clarke et al., 2010). An independent study by Rundle et al. (2011) also found a relatively high agreement between the results from Google Street View and in-person observations related to pedestrian safety, vehicular traffic, parking and infrastructure.

There are, however, limitations associated with using online imagery as a substitute for in-person observation. Lee and Talen (2014) recognized that the data retrieved from Google Street View is not necessarily current and updated year to year. Furthermore, some streets within the database lack panoramic views for one side of the street segment, restricting the ability to obtain accurate micro-feature data (Lee & Talen, 2014).

Chapter Three: Study Area and Policy Background

3.1 Regional Context – Eastern Ontario

The Eastern Ontario Region spans from the western counties of Durham and North York to the Quebec provincial boarder and from the shores of Lake Ontario up to Algonquin Park (Figure 1). The area is home to approximately 2 million residents and makes up 15 percent of the total provincial population.



Figure 1: Context Map of Eastern Ontario Study Municipalities. Source: EOWC, 2012.

Ottawa, Canada’s National Capital, is the largest municipality in the area and the region’s major growth centre (Minnes, S. & Douglas, J. A., 2013). However, significant growth has been recorded in areas outside of the city over the last decade, illustrated in Table 1, and the population is expected to continue to increase in the coming years (Minnes, S. & Douglas J. A., 2013).

Belleville	46,245	46,025	48,821	49,454	6.94%
Brockville	21,750	21,375	21,957	21,870	0.55%
Cornwall	47,405	45,965	45,965	46,340	-2.25%
Kingston	112,605	114,195	112,580	117,787	4.60%
Ottawa	721,110	774,075	812,129	883,391	22.50%
Pembroke	14,175	13,490	13,930	14,360	1.31%
Peterborough	69,355	71,450	75,406	78,698	13.18%
Trenton	41,625	41,370	42,697	43,086	3.51%

Table 1: Population of Major Eastern Ontario Municipalities from 1996-2011. Source: Statistics Canada, 2012.

This report evaluated the walkability of three downtown main streets in medium-sized municipalities in Eastern Ontario: Kingston, Cornwall and Brockville (Figure 1). Between 1996 and 2011, both Kingston and Brockville increased in population, while the City of Cornwall decreased by over 2%. All three municipalities have distinct, historic downtowns that have developed around traditional commercial main streets. Each municipality has also adopted at least one secondary plan to address issues relating to the future development of their downtown neighbourhoods. The following section will describe each neighbourhood and briefly summarize the planning policies within their most recent downtown secondary plans that relate to urban design and pedestrian-oriented development.

3.2 City of Brockville, ON

3.2.1 Neighbourhood Context

Figure 2 below delineates the City of Brockville's Downtown Improvement Area boundaries.



Figure 2: City of Brockville Downtown Improvement Area, Source: Google Maps.

3.2.2 Downtown & Waterfront Master Plan & Urban Design Strategy (2009)

Table 2 outlines the relevant policies and design recommendations from the City of Brockville's Downtown & Waterfront Master Plan & Urban Design Strategy (2009). The document is directed mostly toward the reanimation of Brockville's waterfront, but identifies two main "traditional streets" within the downtown core – King Street and Broad Street – as key commercial areas for future streetscape improvements and redevelopment.

City of Brockville
<i>Downtown & Waterfront Master Plan & Urban Design Strategy (2009)</i>
<u>General</u>
<ul style="list-style-type: none"> • Encourage a range of uses in the downtown core • Enhance existing heritage character • Create a unique shopping, dining and entertainment district • King Street and Broad Street will maintain their Main Street status and be the primary focus economic and institutional activities • Enhance existing parks and open space network • Prioritize pedestrians and cyclists in appropriate areas
<u>Streetscape-Specific Policies</u>
<ul style="list-style-type: none"> • Ensure consistency of sidewalks, boulevards, plantings, landscaping, furniture, lighting, signage, public art and utilities • Create pedestrian scaled streetscape by implementing zero-lot-line frontages, height minimums and maximums and articulated building facades • Intersections and cross-walks must be well-demarcated • Create pedestrian linkages between parking areas, buildings and sidewalks • Install well-designed street furnishing (seating, waste/recycling receptacles etc.), lighting features, paving/landscaping materials • Strategically locate street trees
<u>Other Relevant Design Policies</u>
<ul style="list-style-type: none"> • Integration of parks, open space, parkettes, urban squares and facilities • Ensure uninterrupted views down streets toward waterfront • Install landscaping to provide low-maintenance, naturalized and native species plantings • New development must be respectful of and reinforce existing architectural style and theme

Table 2: Summary of Brockville’s Downtown & Waterfront Master Plan & Urban Design Strategy.

3.3 City of Cornwall, ON

3.3.1 Neighbourhood Context

Figure 3 below delineates the City of Cornwall's Downtown Improvement Area boundaries.



Figure 3: City of Cornwall Downtown (Pitt Street) Improvement Area, Source: Google Maps, Heart of the City.

3.3.2 Streetscape Design Report, 2011

The following table outlines the relevant policies and design recommendations within Cornwall's Streetscape Design Report (2011). The report was commissioned by the Heart of the City BIA, a business improvement association that represents both the Centretown commercial

area along Pitt Street and Le Village commercial area along Water Street. Design recommendations within the report are specific to each distinct neighbourhood.

City of Cornwall
<i>Streetscape Design Report (2011)</i>
<u>General</u>
<ul style="list-style-type: none"> • Increase connectivity between Downtown and Le Village neighbourhoods • Increase connectivity between BIAs and the waterfront • Better incorporate Cornwall Square commercial centre into the surrounding area • Capitalize on opportunities to beautify existing parkettes and parking lots • Identify key sites for improvement and/or future development • Identify ways to increase on-street activity throughout the area
<u>Centretown-Specific Design Recommendations</u>
<ul style="list-style-type: none"> • Build or replace sidewalks on both sides of the streets in the study area • Implement decorative sidewalk paving materials where appropriate • Improve crosswalks along Pitt Street by resurfacing them with quality decorative materials • Add crosswalks at important and/or busy intersections • Replace asphalt along edges of sidewalks with grass or other landscaping • Parking lots adjacent to streets should be landscaped around the edges • Parking lot entrances along streetscapes should be integrated in an aesthetically pleasing way • Replace parking meters with upgraded electronic system • Install heritage plaques on designated buildings to celebrate the City's history • Implement an improved street signage and wayfinding system • Adopt new signage and banner theme for Centretown • Clean and repair existing murals and identify areas for new public art

Table 3: Summary of Cornwall's Streetscape Design Report.

3.4 City of Kingston, ON

3.4.1 Neighbourhood Context

Figure 3 below delineates the City of Kingston's Downtown Improvement Area boundaries.

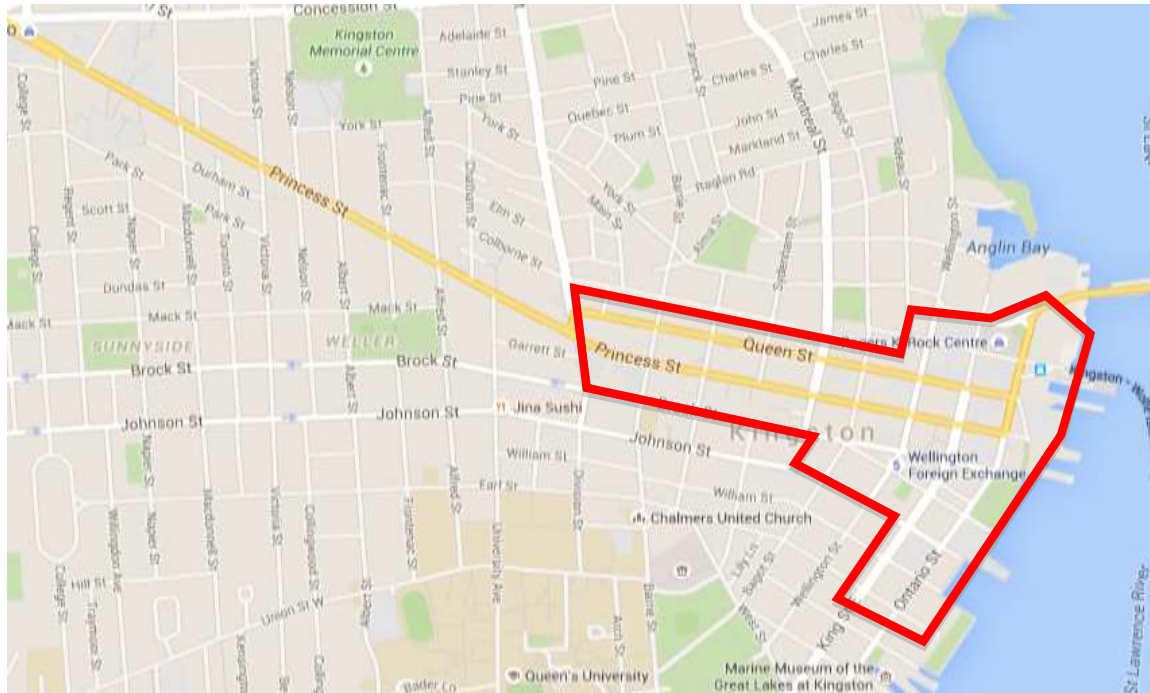


Figure 4: City of Kingston Downtown Improvement Area, Source: Google Maps.

3.4.3 Downtown Action Plan, 2004

The following table summarizes the relevant policies and design recommendations within the City of Kingston's Downtown Action Plan (2004). The plan itself addresses the entire area outlined in the figure above, but there are specific and distinct recommendations for streetscapes along the Princess Street corridor.

City of Kingston
<i>Downtown Action Plan (2004)</i>
<u>General</u>
<ul style="list-style-type: none"> • Increase green space and connections to the waterfront • Coordinate streetscape improvements (street furniture, paving, lighting, cross sections, open space) • Identify opportunities for tourism, recreation and entertainment
<u>Downtown Streetscapes</u>
<ul style="list-style-type: none"> • Maintain a generous clearway and smooth sidewalk to accommodate a large number of pedestrians • Centre the lights and furniture along boulevards to maximize sense of pedestrian safety • Enhance legibility of crosswalks by extending concrete sidewalks across driving lanes
<u>Princess Street Design Recommendations</u>
<ul style="list-style-type: none"> • Maintain one-way traffic with two travel lanes to eliminate the need for turning lanes and to keep crosswalks shorter • 3.0m wide sidewalks with architectural quality of concrete finish • 2.4-2.6m textured boulevards • Granite curbs • Complimentary pedestrian and street signs • Open planters • Street furnishings (benches, trash receptacles, bike racks) • Signal poles and node markers with integrated street name signs • Granite pavers on concrete as special node treatment at Bagot Street • Lay-bys for parking and loading • Smooth, quality asphalt road surfaces

Table 4: Summary of Kingston’s Downtown Action Plan.

Chapter Four: Methodology

4.1 Overview

This chapter outlines the research protocol and evaluation criteria that are used to address this report's research questions. The evaluation criteria are used to assess the conditions of the pedestrian environments along the three streets being studied. The chapter also details the Maryland Inventory of Urban Design Qualities (MIUDQ) walkability auditing protocol, which has been selected as the primary method of data collection for this study. The value and legitimacy of using Google Street View as an observation method is also addressed. Finally, the chapter reviews the limitations associated with the methods and evaluation criteria with respect to generalizability, reliability and validity.

4.2 Walkability Audit

4.2.1 The Maryland Inventory of Urban Design Qualities (MIUDQ) Protocol

The audit tool being used for this study is the Maryland Inventory of Urban Design Qualities (MIUDQ) protocol, a “research-based, practical instrument and methodology for measuring the design qualities that create pedestrian-oriented urban environments” (Ewing & Clemente, 2013). According to the MIUDQ protocol, walkability can be reliably measured using five perceptual qualities of the built environment: imageability, enclosure, human scale, transparency and complexity. The following section provides Ewing and Clemente's definitions for each of these perceptual qualities and a brief explanation of how they are physically manifested in the built environment.

Imageability

“The quality of a place that makes it distinct, recognizable and memorable [and] plays into the innate human ability to see and remember patterns”.

Humans have an innate ability to recognize and remember patterns that capture attention, evoke emotion and create a sense of place. The presence of a characteristic theme, vernacular architecture and landmarks attracts people to enter and spend time in a space (Cullen, 1961; Ewing & Handy, 2009). The MIUDQ audit tool measures imageability by evaluating the presence of landmarks such as courtyards, plazas and parks, major landscape features, historic and/or unusual building architecture, dining and number of people within the study area.

Enclosure

“The degree to which streets and other public spaces are visually defined by buildings, walls, trees and other vertical elements”.

Streets are visually defined by vertical elements such as buildings, trees and walls, creating the comforting sense of being in an outdoor room when the correct height to width ratios are achieved. Although there is some disagreement in academia as to what this ratio should be, the general consensus is somewhere between a 1:2 to 1:3 ratio of building height to street width in pedestrian-scaled areas (Ewing, 1996). The sense of enclosure can be enhanced along streetscapes through the integration of terminal vistas such as landmarks, public art and prominent natural landscape features. Breaks in the continuity of the street wall, such as inactive storefronts, vacant lots, parking lots and driveways, erode the sense of enclosure along a street. The MIUDQ audit tool measures enclosure by estimating the proportion of building street walls

to road width, as well as the presence of street trees and other vertical elements along the street segment.

Human Scale

“The size, texture and articulation of physical elements that match the size and proportions of human sight and speed”.

Moderately scaled buildings in both height and width, narrow streets and smaller spaces are proportioned in a way that relate to human form. Although there is some disagreement among researchers about the number of storeys at which a building exceeds these proportions, they agree that the taller buildings along a streetscape should include street-level architectural details such as windows, enclaves, step-backs, plazas and outdoor dining features that compensate for their larger scale. The MIUDQ audit tool measures enclosure using window proportions, building height, presence of small landscaping features and outdoor furniture, as well as building and street lighting.

Transparency

“The degree to which people can see or perceive what lies beyond the edge of a street, and more specifically, the degree to which people perceive human activity beyond the edge of a street or public space”.

Transparency is very obvious along commercial streets where the activity within the interiors of buildings can be easily seen or perceived through display windows, doors and midblock openings. Blank walls and reflective glass panels that inhibit sight lines are not conducive to this perceptual quality. Of all the measures defined in this study, transparency is the

one most often defined in urban design guidelines and land development codes. The MIUDQ audit tool evaluates transparency by measuring the proportion of windows and street walls, as well as the proportion of active use per block.

Complexity

“The visual richness of a place that depends on the variety of physical environment, including the number and kinds of buildings, architectural diversity and ornamentation, street furniture and human activity”.

Complexity has been extensively studied and measured by urban designers. Slow-moving pedestrians require higher levels of complexity than motorists to maintain their interest in a space. Therefore, the walkability of streets relies heavily on the variation in architecture, building details and colours, landscape, and the presence of other people. The key to complexity is diversity; diversity of building ages, diversity of social settings and diversity of uses. The MIUDQ audit tool measure this perceptual quality by counting the number of buildings, building styles and colours, public art pieces , outdoor dining and the number of people using the space.

4.2.2 Field Survey Instrument

Ewing and Clemente provide a walkability auditing field survey instrument and training protocol in their book *Measuring Urban Design* (2014). The instrument is meant to evaluate both sides of commercial streets on a block-by-block basis. The tool counts and/or measures 25 design criteria that are grouped into the five perceptual qualities described above. Results are synthesized and criteria are evaluated for their potential impact on pedestrians both within and

beyond the street segment. Results from the field survey can be found in **CHAPTER 5** and the full template for Ewing and Clemente's field survey instrument can be found in **APPENDIX**.

Based on these criteria, three segments of each commercial main street were selected for study. Based on time constraints and the varying lengths of the streets being studied, three segments for each were considered representative of each neighbourhood.

4.2.3 Street Segments and Locations

1. Brockville, Ontario

King Street between Chase Street and Victoria Avenue

King Street is an arterial street that runs parallel to the St. Lawrence River through the centre of Brockville's downtown, parallel to the St. Lawrence River. The street is, in fact, an urban segment of King's Highway Number 2, commonly referred to as Highway 2. Although King Street is downtown Brockville's main commercial strip, there has been a significant economic decline in the area over the last several years and many storefronts now lie empty and abandoned (City of Brockville, 2013). In December of 2009, the City of Brockville adopted the Downtown & Waterfront Master Plan & Urban Design Strategy and it is from this document that the boundaries of the CBD are drawn. The King Street study segments are illustrated in Figure 5.



Figure 5: King Street, Brockville, ON.

2. Cornwall, Ontario

Pitt Street between Fourth Street and First Street

Pitt Street is a one-way arterial road at the heart of Cornwall’s original Central Business District. However, the last three decades have seen commercial development occur primarily in areas outside of the downtown and thus commercial enterprises along Pitt Street have suffered (Heart of the City, 2004). In 2003, Toronto-based consulting firm Forrec published a revitalization plan for Pitt Street that included recommendations for streetscape upgrades such as the relocation of electrical wires, instruction of new landscaping features and the replacement of current mix-matched lighting (Forrec, 2003). In 2005, IBI Group published a follow-up document outlining implementation strategies for the Forrec designs in a Community Improvement Plan. Unfortunately, very few of these upgrades have been executed. The Pitt Street study segments are illustrated in Figure 6.



Figure 6: Pitt Street study area, Cornwall, ON.

3. Kingston, Ontario

Princess Street between Montreal Street and King Street East

Princess Street is the main commercial strip within Kingston’s Central Business District. Although it is a busy, one-way collector street in the city’s downtown core, Princess Street has ample pedestrian infrastructure and is a popular area for walking and window-shopping (City of Kingston, 2012). From February to July 2013, the street underwent a major reconstruction between Bagot Street and King Street in order to upgrade aging stormwater and sewage infrastructure. The multi-million dollar project also included upgrades to surface features such as sidewalk widening, landscaping, lighting and street furniture, all of which are outlined in the

city's Downtown Action Plan. The next phase of the project will see similar upgrades between Bagot Street and Clergy Street, scheduled for completion in 2016. The Princess Street study segments are illustrated in Figure 7.

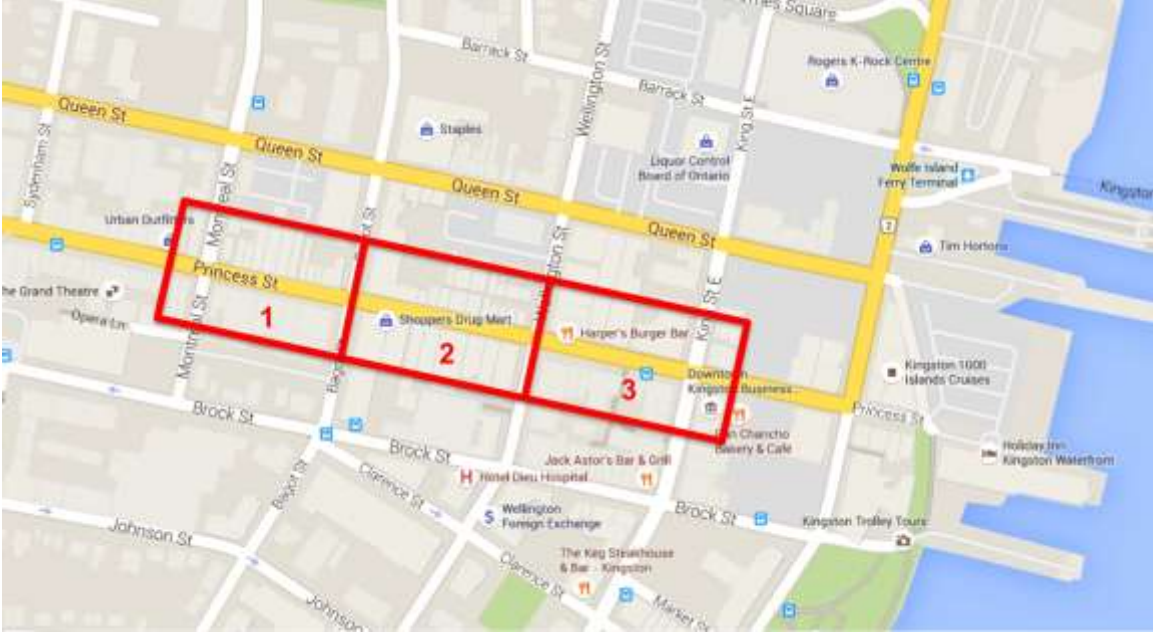


Figure 7: Princess Street study area, Kingston, ON.

4.3 Generalizability, Reliability and Triangulation

External validity, or generalizability, can be achieved when an existing, well-tested tool and/or theory is used to collect and analyze data within a research protocol (Yin, 2009). The MIUDQ field manual and score sheet “connect the perceptual qualities that influence walkability with practical measurement tools based on empirical research and real-world testing” (Ewing & Clemente, 2013, p. 23). Research performed along 588 blocks in New York City using the MIUDQ protocol confirmed that urban design perceptual qualities can be rated consistently by various experts and that the auditing tool can be employed consistently by various researchers (Ewing & Clemente, 2013).

Reliability is demonstrated when a study can be repeated and achieve the same results (Yin, 2009). The methods outlined in this chapter provide a detailed, easy to follow research protocol and design. By providing a detailed description of the evaluation criteria and auditing protocol, as well as the score sheet that is used to evaluate the walkability of the streetscapes under study, the audit can easily be replicated.

The triangulation of data sources and collection techniques is a way of improving the validity of case studies (Yin, 2009). This study will collect information with respect to the walkability of Princess Street, King Street and Pitt Street through the evaluation of the most recently documented Google Street View images, a literature review and a review of best practice case studies. Direct observations of street segments will be used to verify findings from the Street View analysis. The use of multiple data sources reduce the impact of researcher bias by providing multiple forms of evidence for the findings, thus increasing the validity of the study.

4.4 Limitations

There are a number of factors that may limit the findings of this report. Firstly, give the time-sensitive and seasonal restraints; Google Streetview was used to perform the bulk of the walkability audits. Although it has been empirically proven that Streetview is a valid method for carrying out observations (Lee & Talen, 2014), the images captured and displayed online may not be accurate representations of the current streetscapes being studied. This study attempts to mitigate this issue by performing site visits to verify the information and data and to make adjustments when necessary.

Furthermore, the inherent subjectivity of walkability audits and the single-researcher resource constraints may lead to biases in data collection and interpretation. By closely following the protocol and training manual outlined in *Measuring Urban Design*, it is hoped that these biases can be reduced. Photographic evidence from site visits will be used to confirm findings and update any information that may be lacking from the Google Streetview analysis.

Finally, the Ewing and Clemente survey bases its audit on perceptual design qualities and may ignore other important neighbourhood-level features that affect walkability such as intersection design, cycling facilities, sidewalk quality and the street's connectivity to the surrounding area. By reviewing the policy and background information related to each study area it is hoped that the recommendations in this study reflect a more holistic understanding of walkability in the neighbourhoods

Chapter Five: Results and Analysis

5.1 Overview

This chapter presents and evaluates the results collected through the MIUDQ pedestrian audit. Results are analyzed for each city. A summary of key findings and recommendations inferred from this analysis can be found in chapter 6. The MIUDQ audit provides a quantitative output of qualitative evaluation criteria of streetscapes and their surroundings. The tool instructs the researcher to take numerical counts and measurements of various streetscape and building features that are reflected in one or multiple perceptual quality categories. These numerical data are then tallied and used to compare the qualitative integrity these visual and emotional perceptions. While these quantitative results can provide valuable data for comparison between cases, they are somewhat difficult to contextualize and can be better understood in a narrative summary. The following sections provide a narrative of the individual results of the MIUDQ audit for each of the tool's perceptual qualities. Within the audit tool there is some overlap in evaluation criteria and an effort has been made to discuss these points within the context of a single design category for simplicity. The raw data tables from the audit can be found in Appendix A.

5.2 Introduction and Settings

Because the pedestrian audits were conducted first through the use of Google Street View, the dates and times of each observation differ. The most recent images from the Google Street View database were used in order to gain the most accurate representation of the current streetscapes as possible. Furthermore, site visits were conducted throughout the spring of 2015 in order to validate the Google Street View method and to observe any significant changes made to

the streetscape. These site visits also allowed for the observation of noise levels and pedestrian counts along the study segments. Details of the streets and settings for both the original Google Street View audits, as well as the site visits, are included in Table 5:

	<i>Brockville</i>	<i>Cornwall</i>	<i>Kingston</i>
Street Name	King Street	Pitt Street	Princess Street
From	John Street	Fourth Street	Montreal Street
To	Market Street East	First Street	King Street
Google Street View Date	August 2012	August 2012	April 2014
Weather Conditions	Sunny	Sunny	Sunny
In-Person Observations Date	April 15 th , 2015	May 27 th , 2015	May 25 th , 2015
Weather Conditions	Sunny, cold	Sunny, hot	Sunny, hot

Table 5: Street descriptions and observational settings.

5.3 Observational Summary of MIUDQ Audit

Although Ewing and Clemente’s protocol is composed of a quantitative evaluation of the streetscape, its goal is to qualify human perceptions as they relate to streetscape design. The following sections detail the observations and analyses of the case studies based on Ewing and Clemente’s five perceptual qualities of urban design.

5.3.1 Imageability

Imageability is a measure of the quality of spatial identity. All three case studies showcased varying levels of imageability. Table 6 outlines the observational summary for imageability for all three case studies.

King Street in Brockville received some of the highest scores in this category, with prominent landscape features and a high proportion of historic, pre-war buildings along the

studied corridor (Figure 10). The consistent use of themed lighting, seating and other street furniture also contributed to the street’s identity. Views to the North at the intersection of Broad Street are directed up a well-manicured boulevard containing a historic fountain to the city’s architecturally significant courthouse (Figure 9). Furthermore, due to the low-rise nature of many of the buildings, as well as the various cross-streets running toward the waterfront, there are numerous unobstructed views toward the St. Lawrence River to the South (Figure 8). These key landmarks are integral to Brockville’s well-preserved downtown core. Pedestrian activity was high along the street and noise levels kept at a relative minimum thanks to strategically placed street trees and planters that create a buffer between the pedestrian clearway and the street.



Figure 8: Southern views at an intersection along King Street look toward the St. Lawrence River and Brockville Yacht Club.



Figure 9: Historic carriageway along King Street provides access to rear courtyard.



Figure 10: View North at the intersection of King Street and Broad Street terminated by historic courthouse building. Public art is visible along manicured boulevard.

Cornwall's Pitt Street received relatively good overall scores for imageability. However, when broken down into segments, the northern section of the study area had significantly lower scores, which increased on more southern segments. Few historic buildings have been preserved along the corridor and many of those still standing have been altered, minimizing their street presence. The three most significant buildings along the street, the Chamber of Commerce (Figure 12), the police precinct and the Seaway Building, are examples of mid-century modern architecture along the streetscape. The police precinct property and the Chamber of Commerce both contribute greatly to the public realm by providing a large, manicured, accessible courtyard and garden including a decorative fountain, seating areas and pedestrian-scaled lighting. Other courtyards along the street are provided between buildings and often lead to rear parking lots and loading spaces for downtown businesses. The terminal vista created by the historic clocktower at the Southern end of the corridor is a significant city landmark (Figure 11). Finally, the street boasted a high level of noise along the vehicular right-of-way accompanied a medium level of pedestrian activity.



Figure 11: The historic clock tower located at the foot of Pitt Street is a visual landmark in the city.



Figure 12: Cornwall's Chamber of Commerce at the corner of Pitt Street and Third Street has a well-manicured garden and pedestrian-scaled lighting.

Princess Street in Kingston received the highest overall scores for imageability, which was consistent along all three study segments. With a high proportion of historic buildings displaying ornate and eclectic architectural features, Princess Street has maintained its traditional main-street character (Figures 13 & 14). Almost all buildings along the study area have distinct, visually appealing signage and identifiers. Only one accessible courtyard was located along the street, however it not only provided the space for restaurant amenities, it also created a mid-block pedestrian pathway to the adjacent street. There was a high level of pedestrian activity along the sidewalks, accompanied by a high level of noise due once again to the vehicular traffic along the street, as well as the transient loading zones.



Figure 13: Buildings along Princess Street display an eclectic range of both historic and modern architecture.



Figure 14: Southbound sight lines on Princess Street looking toward Lake Ontario are obstructed by large hotel development and parking lot.

IMAGEABILITY	
Neighbourhood	Description
<i>Brockville</i>	<ul style="list-style-type: none"> • Received some of the highest scores for imageability along entire corridor. • Prominent landscape features include hill leading up to courthouse and St. Lawrence River. • High proportion of historic buildings, however many have been left vacant. • Many historic buildings have decorative, architectural, non-rectangular features. • Outdoor dining present along corridor. • High level of pedestrian activity. • Medium noise level due to vehicular traffic and loading, buffered by street trees and planters.
<i>Cornwall</i>	<ul style="list-style-type: none"> • Received good for overall imageability, with scores increasing on more southern street segments. • Few historic buildings, many of which have been altered and do not maintain a strong street presence. • Most buildings had identifiers, however there was a lack of consistency in the quality and aesthetic appeal of signs. • Well-designed, accessible courtyards that often led to parking lots at the rear of buildings. • Medium level of pedestrian activity along sidewalks. • High level of noise due to vehicular traffic.
<i>Kingston</i>	<ul style="list-style-type: none"> • Received highest scores for overall imageability, with consistent scores along all street segments. • High proportion of historic buildings, many of which have been restored or have maintained original façades. • Almost all buildings had distinct, aesthetically pleasing building identifiers. • One accessible courtyard available to the public from street-level. • Various outdoor dining options. • High level of pedestrian activity along sidewalks. • High level of noise due to vehicular traffic and transient on-street parking/loading zones.

Table 6: Observational summary of imageability for the three study areas.

5.2.3 Enclosure

Enclosure reflects the degree to which the objects within and surrounding the streetscape define the pedestrian environment. Table 7 outlines the observational summary for enclosure for the three study areas.

Brockville's King Street scored well in this respect, with long sight lines providing unobstructed views to both the St. Lawrence River and the historic courthouse. Modest building heights, the slight incline down to the waterfront, and the presence of cross-streets contributed to this effect. The almost completely unbroken street wall was lined with mature street trees strategically planted in esthetically appealing planters (Figure 15). However, some vacant corner lots did create breaks in continuity (Figure 16). King Street itself was relatively narrow and some shadowing of buildings can be expected, however the proportion was not overwhelming to the pedestrian.



Figure 15: Street wall and street trees in the early spring along King Street in Brockville.



Figure 16: Empty corner lot on King Street in Brockville, ON.

Enclosure scores for Cornwall's Pitt Street were not as impressive as those for Brockville. Although long sight lines provided clear views of the historic clocktower and the waterfront beyond, there were a significant number of vacant lots that created a very broken street wall along the entire corridor. The large vacant lot at the corner of Pitt Street and Second Street is directly across from a large corner parking lot (Figure 17), creating a significant open space along the street frontage. Although the parking lot has been enhanced with aesthetically pleasing pavers and planters, the opposing 8-storey Seaway Building dwarfs it. Pitt Street did score well in terms of the presence, strategic location and frequency of mature street trees along the corridor (Figure 18), however the style of planters and grates in which the trees were planted were not as esthetically pleasing as Brockville's.



Figure 17: A corner parking lot at the corner of Pitt Street and Second Street in Cornwall has been enhanced with quality paving materials and planters, however, it is not appropriate for such a busy intersection.



Figure 18: Mature street trees along West side of Pitt Street create a natural barrier between the pedestrian and vehicular ROW.

Kingston's enclosure scores for Princess Street were also relatively high. However, where Brockville scored high for prominent sight lines, Kingston fell short. A large hotel at the foot of Princess Street blocked any views toward the waterfront and the incline up the street did not provide a pleasant sight. Princess Street scored highest for continuous street wall with no significant breaks along the entire corridor (Figure 19). The redevelopment of the street in 2014 saw the inclusion of esthetically pleasing planters, trees and street furniture (Figure 20). Due to the recent updates, street trees have yet to reach maturity, though they have the potential to greatly enhance the sense of enclosure along the street in the coming years.



Figure 19: The consistent building wall along Princess Street with building height proportionate to road ROW evokes a sense of place for pedestrians using the space.



Figure 20: Esthetically pleasing planters not only provide shade and protection from vehicular traffic, they also help to manage stormwater runoff and provide informal seating for users.

ENCLOSURE	
Neighbourhood	Description
<i>Brockville</i>	<ul style="list-style-type: none"> • Long sight lines along King Street and at cross streets and vacant lots looking South toward St. Lawrence River. • Almost completely unbroken street wall along entire corridor, punctuated only by minor cross streets. • Modest proportion of sky visible. • Abundant number of street trees along entire corridor.
<i>Cornwall</i>	<ul style="list-style-type: none"> • Long sight lines up and down the street, broken only in the southern segments by large clocktower in Lamoureux Park. • Street wall broken by courtyards and parking lots, with significant breaks at the corner of Second Street where one corner lot is vacant and another has been turned into a private parking lot. • High proportion of sky visible due to low-rise buildings. • Street trees planted consistently along both sides of the street.
<i>Kingston</i>	<ul style="list-style-type: none"> • Scored well for all measures of enclosure. • Unbroken street wall along both sides of all street segments. • Low proportion of sky visible due to building height and relative width of ROW. • Street trees abundant and planted in enhanced stormwater planters along both sides of the street.

Table 7: Observational summary of enclosure for the three study areas.

5.2.4 Human Scale

Human scale evaluates the size, texture and articulation of physical elements that match the size and proportions of human sight and speed. Along the streetscape, this translates to ROW width, building height and street-level design features. Table 8 outlines the observational summary for human scale for all three case studies.

All three streets being studied consisted of 2 to 4-storey buildings, with some variation between cities. Brockville's building massing was the most consistent of the three along its entire corridor, with buildings generally between 2-3 storeys and higher buildings located at the corners of significant intersections (Figure 21). Most buildings had street-level display windows, however many of these were vacant retail locations that had been boarded up. An abundance of strategically placed, theme street furniture greatly contributed to the public realm and appealed to pedestrians. Furthermore, a number of attractive historic plaques and wayfinding signs were placed at street corners and across from important landmarks (Figure 22). Although there were few outdoor dining options along the street due to narrow sidewalks, many restaurants had large garage-door-style windows which, when opened, have the potential to create a patio effect for diners.



Figure 21: Although most buildings along King Street are between one and three storeys, this four-storey corner building is of the appropriate scale relative to the width of the two adjacent vehicular ROWs.



Figure 22: Wayfinding signage along King Street make it easy for pedestrians to navigate downtown

Cornwall's median building height was the lowest of all three case studies with a number of single storey buildings along the corridor. Paradoxically, the street also boasted the tallest building of all three cases: the 8-storey modernist Seaway Building (Figure 23). Many buildings did not have street-facing display windows and many of those that did were vacant and boarded up. The number of street furniture items along Pitt Street was the lowest of all three case studies. Furthermore, there was no consistent theme of lighting or furniture along the corridor, with different benches, trash receptacles and street lighting in each individual segment. On the other hand, there were a number of outdoor dining options along the street and within the courtyards to the sides of buildings, with a number of new restaurant options advertised to be open in the near future (Figure 24).



Figure 23: The Seaway Building, an 8-storey modernist structure at the corner of Pitt Street and Second Street, dwarfs adjacent buildings along the downtown main street.



Figure 24: Restaurants take advantage of wider sidewalks for seasonal patio uses on Pitt Street.

Kingston scored high in all measures of human scale. Virtually all buildings had large storefront windows and, though a significant number of these were vacant. The wide right-of-way allowed for an appropriate average building height between 3-4 storeys. Street furniture was upgraded at the end of the 2014 construction period and followed a consistent theme along the corridor. Benches and trash receptacles were strategically placed around planters and street trees to provide protection from the elements and create a barrier between the pedestrian and vehicular right of ways (Figure 26). Dining options were abundant along the street, as well as the presence of the large garage door style windows found in both Brockville and Cornwall.



Figure 25: Street trees, furniture and lighting are strategically placed along the Princess Street ROW.

HUMAN SCALE	
Neighbourhood	Description
<i>Brockville</i>	<ul style="list-style-type: none"> • Most buildings with street-level windows along entire corridor, however many of these buildings are vacant and boarded up. • Mostly 2-3 storey buildings, with a few 4-storey buildings at major intersections. • Abundance of street furniture, including consistent theme. • Good wayfinding signage and informational historic plaques along streetscape to inform about prominent buildings in the area. • Few outdoor dining options, but many restaurants with large garage-door-style windows for patio effect.
<i>Cornwall</i>	<ul style="list-style-type: none"> • Few buildings had street-level windows in the northern segment and only 75% of buildings in the southern segments had large, street-level windows for advertising goods and services • Buildings mostly between 2-3 storeys and did not cast significant shadows. • Modernist Seaway Building (8 storeys) on northwestern corner of Pitt Street and Second Street is far too tall for the scale of the street and casts a terrible shadow on adjacent properties. • Lowest street furniture counts of all case studies. • No consistency or theme in street furniture along the corridor (ex. different benches, trash cans, lighting in each segment) • Few outdoor dining options available along the street, however some restaurants utilized courtyards for side-yard dining that was visible to pedestrians.
<i>Kingston</i>	<ul style="list-style-type: none"> • Almost all buildings with street-level windows along entire corridor. • Mostly 3-4 storey buildings with wide right-of-way so no significant shadows cast. • Abundance of street furniture with benches strategically placed under trees and around planters to shelter from vehicular traffic and provide shade and comfort. • Consistent theme in street furniture along the corridor. • Many outdoor dining options as well as large garage-door-style windows for patio effect.

Table 8: Observational summary of human scale for the three study areas.

5.2.5 Transparency

Transparency is the degree to which people can see or perceive what lies beyond the edges of a street. By measuring the street wall coverage, building window coverage and proportion of active uses, transparency infers the pedestrian's perception of human activity in their surroundings. Table 9 outlines the observational summary for transparency for all three case studies.

As previously explained, Brockville's King Street had a relatively consistent street wall with breaks occurring almost exclusively at street intersections. Although window coverage was high, the proportion of active uses along the corridor was low due to a high number of vacant building storefronts.



Figure 26: One of many vacant storefronts along King Street.

Pitt Street in Cornwall wall was penetrated by a number of vacant lots, parking access alleyways and courtyards. Scores for active use were the lowest of all three case studies due to the high number of building vacancies. Furthermore, many storefronts had few or no street-fronting windows.



Figure 27: Underutilized alleyway and street frontage along Pitt Street in Cornwall.

Kingston's Princess Street had a virtually unbroken street wall along the segments being audited. A high proportion of active uses along the street frontage was apparent, with many stores and restaurants advertising late-night hours. All retail buildings had large street fronting windows and many of the restaurants had "garage door" style mock patios that provided walk-through access when open.



Figure 28: The Sleepless Goat in Kingston does not have a patio but uses a walk-through storefront concept to connect with the sidewalk.

TRANSPARENCY	
Neighbourhood	Description
<i>Brockville</i>	<ul style="list-style-type: none"> • Street wall was relatively consistent, with breaks happening mostly at intersections (empty corner lots). • Proportion of active use was low due to high number of abandoned/unused buildings. • All storefronts had street level windows, however many were boarded up due to building vacancy.
<i>Cornwall</i>	<ul style="list-style-type: none"> • Large empty lots and parking access alleyways perforated street wall. • Low proportion of active use due to high number of abandoned/unused buildings. • Some storefronts had few or no street fronting windows.
<i>Kingston</i>	<ul style="list-style-type: none"> • Consistent, unbroken street wall along all three street segments. • High proportion of active uses, with many buildings (mostly restaurants and drinking establishments) open later at night. • All storefronts had street level windows, with many cafes and restaurants utilizing “garage door” style windows for easy walk-through access.

Table 9: Observational summary of transparency for the three study areas.

5.2.6 Complexity

Complexity measures the visual richness of a place. It is characterized by the variety of architectural building styles, shapes and colours, public art and observed pedestrian activity.

Table 10 outlines the observational summary for the complexity of all three case studies.

All three streets hosted buildings of a wide variety of primary and accent colours and patterns. Buildings along King Street in Brockville had a variety of architectural styles and details (Figure 29 & 30). Although there were no piece of public art directly along the corridor, views toward the historic courthouse building at the corner of King Street and Broad Street featured a decorative fountain and detailed landscape design characteristics. When the site was

visited in person, numerous pedestrians were taking advantage of the sidewalks, most of who were older adults or groups of teenagers.



Figure 29: An eclectic mix of building architecture in Brockville creates an interesting streetscape.



Figure 30: A variety of building heights and materials adds to the level of complexity along King Street.

Although a variety of building colours and accent details were found along Pitt Street, Cornwall's downtown corridor lacked variation in architectural style. The architectural integrity of many of the older pre-war buildings had been compromised due to lack of maintenance and the addition of new ground-level storefronts, likely accomplished between the 1970s-1990s. On the other hand, Cornwall was the only case study to feature public art along the downtown streetscape. Three murals were displayed in the study area (Figure 31), as well as a functional decorative clock within a new corner parking lot. The fountain and courtyard at the police precinct also created an esthetically pleasing, artistic display (Figure 32). When the site was visited there were some pedestrians using the sidewalks, though it was the least busy of all three cases. Users were mostly groups of teenagers and young adults, as well elderly adults and a handful of women with baby strollers.



Figure 31: Mural on Second Street in Cornwall depicts municipal history and displays public art in a prominent location downtown.



Figure 32: Courtyard and fountain located at the front of Cornwall's Police Station and municipal office building.

Princess Street was the busiest in terms of pedestrian activity. Along with a wide range of architectural styles, buildings and accent colours, Kingston's downtown was the most vibrant of the three case studies (Figure 33). Although no public art was visible from the sidewalk, the architectural details of the storefronts created a visually appealing street façade. Historic building layouts that include a number of old carriageways allow for creative patio and courtyard entrances (Figure 34). Pedestrian activity was high, with sidewalk users ranging from elderly adults to teens and young families, as well as those using wheelchairs, walkers and mobility canes.



Figure 33: Kingston's heritage is displayed in the variety of architecture visible along Princess Street.



Figure 34: By utilizing the existing architectural features along the streetscape, businesses have been able to capitalize on unique placemaking opportunities.

COMPLEXITY	
Neighbourhood	Description
<i>Brockville</i>	<ul style="list-style-type: none"> • Variety of building colours and accent patterns. • Wide range of architectural styles. • No visible pieces of public art from the sidewalks, however a large decorative fountain and detailed landscape features visible up Broad Street toward the historic courthouse. • Numerous pedestrians along the sidewalks, mostly older adults and some groups of teenagers.
<i>Cornwall</i>	<ul style="list-style-type: none"> • Variety of building colours and accent patterns. • Little variety in architectural style. • Three (3) murals and one (1) sculptural clock visible along streetscape. • Some pedestrians along the sidewalks, mostly elderly adults, groups of teenagers and some women with children/baby strollers.
<i>Kingston</i>	<ul style="list-style-type: none"> • Wide variety of building colours and accent patterns. • Wide range of architectural styles as well as many ornate building details. • No visible pieces of public art from the sidewalks. • Numerous pedestrians along the sidewalks from a wide range of age groups and physical abilities (visually impaired with mobility canes, wheelchairs, strollers etc.)

Table 10: Observational summary of complexity for the three study areas.

Chapter Six: Key Findings and Recommendations

6.1 Overview

This chapter summarizes the most important findings from the MIUDQ walkability audit and suggests a series of recommendations for the improvement of the public and pedestrian realm of the three main street case studies. A reflection on the study methodology and a discussion of future research considerations is also provided.

6.2 Key Findings

All three case studies received varying scores for each of the MIUDQ's perceptual design qualities. Although Kingston's Princess Street stands out as a significantly more walkable environment than Brockville and Cornwall's downtown main streets, a number of eclectic strengths and weaknesses were identified in all three case studies.

One of the common strengths along each of the traditional main streets was the presence of long sight lines terminated by, in the case of Brockville and Cornwall, prominent landscape features. Furthermore, a relatively consistent and appropriate building height to street width ratio was seen along all three corridors, with some exceptions noted below. Although to varying degrees, all three cities maintained a proportion of historic buildings along the main street frontage. The presence of street trees along all three corridors, although differing in frequency and arrangement, greatly contributed to the public realm and walkability of the neighbourhood.

In terms of common weaknesses, all three case studies had a high frequency of vacant or abandoned buildings. This trend is consistent with findings from the literature review that point toward the recent economic decline in downtowns across North America. Tables 11 through 13 illustrate the perceived strongest and weakest qualities of each case study.

BROCKVILLE: King Street	
<i>Strongest Qualities</i>	<i>Weakest Qualities</i>
<ul style="list-style-type: none"> Prominent landscape features, both natural and built, within long sight lines. 	<ul style="list-style-type: none"> High number of vacant or abandoned buildings.
<ul style="list-style-type: none"> High proportion of historic buildings with a variety of architectural features made up a relatively consistent street wall. 	<ul style="list-style-type: none"> Large empty corner lots broke up street wall.
<ul style="list-style-type: none"> Consistent, esthetically pleasing street furniture, planting and lighting theme. 	<ul style="list-style-type: none"> Few outdoor dining options or other interactive street frontage uses.
<ul style="list-style-type: none"> Good building height to street width ratio. 	

Table 11: Key findings for Brockville, ON.

CORNWALL: Pitt Street	
<i>Strongest Qualities</i>	<i>Weakest Qualities</i>
<ul style="list-style-type: none"> Prominent landscape feature at southern end of street created attractive terminal vista. 	<ul style="list-style-type: none"> Empty lots resulted in broken street wall along the corridor.
<ul style="list-style-type: none"> Well-manicured, publically accessible courtyards and gardens. 	<ul style="list-style-type: none"> Many inactive store frontages and buildings lacking street-facing windows.
<ul style="list-style-type: none"> Murals painted along sides of buildings served as public art, showcasing the city's history. 	<ul style="list-style-type: none"> Inconsistent street furniture, tree planting and lighting theme, with different styles used along each segment.
	<ul style="list-style-type: none"> Low proportion of maintained historical buildings.

Table 12: Key findings for Cornwall, ON.

KINGSTON: Princess Street	
<i>Strongest Qualities</i>	<i>Weakest Qualities</i>
<ul style="list-style-type: none"> High proportion of well-maintained, architecturally diverse buildings. 	<ul style="list-style-type: none"> No obvious pieces of public art visible along streetscape.
<ul style="list-style-type: none"> Consistent street wall with little to no breaks along corridor. 	<ul style="list-style-type: none"> Numerous vacant storefronts.
<ul style="list-style-type: none"> Abundance of tree trees and attractive stormwater planting cells. 	<ul style="list-style-type: none"> Heavy traffic along narrow vehicular right-of-way.
<ul style="list-style-type: none"> Consistent, enhanced street furniture and lighting theme. 	

Table 13: Key findings for Kingston, ON.

6.3 Recommendations

Recommendation 1: Encourage infill along corridor to close gaps in street wall.

Design principles: Enclosure, human scale.

Cities: Brockville, Cornwall.

One of the most significant contributors to walkability is the sense of enclosure one feels within a space. Both King Street and Pitt Street had a number of vacant lots, which creates significant gaps in the consistency of the street wall and decreases the corridors' enclosure score.

Infilling vacant lots, especially those in prominent locations such as intersection corners, would greatly increase the sense of enclosure along the streetscape. Brockville's underutilized corner parking lots along King Street could be relocated to the rear of buildings or along side streets, creating opportunity to build appropriately-scale, mixed-use structures along the corridor. On the other hand, the most prominent lot vacancy in Cornwall, located at the corner of Pitt Street and Second Street, is directly across the street from the city's tallest building (Figure 35). Not only does the vacancy degrade enclosure, the juxtaposition of the two polar opposites is in violation of the proportions of human scale. Fortunately, the vacant lot currently slotted for 4-storey mixed-use development in the near future, which will greatly enhance enclosure in the area (Figure 36).



Figure 35: Empty corner lot on the corner of Pitt Street and Second Street in Cornwall.



Figure 36: The Dominion, Cornwall – a proposed 4-storey mixed-use infill project at the corner of Pitt Street and Second Street. SOURCE: Bourgon Construction.

Recommendation 2: Increase the number of outdoor dining options and other active pedestrian uses.

Design principles: Imageability, human scale, transparency.

Cities: Brockville, Cornwall.

The presence of active uses greatly enhances the perception of walkability within a space. Outdoor dining along main streets is a great way to integrate the principles of imageability, human scale and transparency along a pedestrian corridor. Both Brockville and Cornwall lacked in their proportion of active building uses and had notably less outdoor dining options than Kingston.

Both King Street and Pitt Street have relatively narrow pedestrian clearways along their equally narrow sidewalks and there is little opportunity to set up functional patio space. Utilizing sidewalk bump-outs and alleyways for outdoor dining is recommended in the Brockville and Cornwall case studies in order to increase the proportion of active use along the corridors. Some Cornwall restaurant owners are adopting this principle already, with a new restaurant in a re-purposed building downtown utilizing an old parking lot entrance space for patio dining (Figure 37). When there is insufficient space for a proper patio, restaurant and drinking establishments are encouraged to create an open air environment for diners and to enhance the pedestrian's perception of transparency while travelling along the corridor (Figure 38).



Figure 37: Adaptively reused building in Cornwall uses side yard to create a patio space.



Figure 38: Kingston's narrow sidewalks limit patio space. This brewery on Princess Street upgraded its storefront to include a garage door that can be opened to seasonally create a mock patio.

Recommendation 3: Encourage more variety in the articulation, materials and colours of new infill development.

Design principles: Imageability, human scale, complexity.

Cities: Brockville, Cornwall, Kingston.

One of the biggest design contributors to the principle of complexity is the variety of building architecture along a streetscape. All three cities scored well for their varying use of building and accent colours, however many of these eclectic features were limited to the older, historic buildings along the corridors. Almost all of the infill development along the three streets, with the exception of a few remarkable additions in Kingston (Figures 39 & 40), displayed a bland colour scheme and nondescript and bland architectural elements.

Complexity, imageability and human scale can all be addressed by encouraging the strategic use of colour, building materials and building articulation. While infill development and additions to existing buildings should respect the height and setback requirements of the neighbourhood, consideration should also be given to building form and its relative appearance along the streetscape. Stepbacks, use of colour and integration of materials that respect and even showcase the heritage attributes along the street should be encouraged.



Figure 39: Infill development along Princess Street is modern in style but is set back from the street and creates an interesting building articulation along the streetscape.



Figure 40: The Smith Robinson Building at the foot of Princess Street further showcases the possibilities for the innovative integration of historic and modern building features.

Recommendation 4: Replace mismatched street furniture, plantings and lighting using a consistent, enhanced theme along the corridor.

Design principles: Imageability, complexity.

Cities: Cornwall

A consistent theme in street furniture, plantings, lighting and decoration can greatly enhance the imageability and complexity of a public space. It creates a sense of place and helps distinguish the area from its surroundings. Brockville and Kingston's main downtown streets did well in this respect. Cornwall, on the other hand, had different street furniture and lighting installments on each block along the Pitt Street corridor.

It is recommended that street furniture and lighting be replaced along Pitt Street with consistent and enhanced upgrades. Benches should be located in illuminated areas and close to street trees in order to provide adequate light and shade to users at various times of day. The use of innovative planting boxes may also provide opportunity to integrate seating and stormwater management capacity into their design (Figure 41). Planting and street furnishing placement should also aim to create a barrier between the pedestrian and vehicular realm, promoting the pedestrian's perception of safety while walking down the street (Figure 42).



Figure 41: Traffic-calming curb bump-out in Pittsburg doubles as an enhanced stormwater catchment planter. Source: <http://www.project15206.org/>



Figure 42: Kingston's street furniture and plantings are a good example of integrating natural elements within the hardscape of a narrow ROW.

Recommendation 5: Enhance streetscape by strategically locating public art in the pedestrian realm.

Design principles: Human scale, complexity.

Cities: Brockville, Kingston.

Although Brockville and Kingston ranked high in the categories of human scale and complexity, they completely lacked integration of public art along their main street corridors. The argument could be made that the high quality of building architectural integrity along the street serves as a form of public art, however there are no obvious indications that the cities highlight it as so.

It is recommended that highly visible areas along the streetscape be designated to display public art. Whether they are sculptures, artistic lighting or murals, pieces of public art should be highlighted along the corridor. Because of the narrow sidewalks and zero-lot-line building setbacks, murals may be the most viable option for integrating artwork along the streetscapes in these case studies. Temporary murals can also be integrated along the streetscape to conceal construction or renovation efforts and shield pedestrians from hazardous work zones (Figure 43). Further opportunities to enhance wayfinding in the downtown may also take advantage of creative artwork (Figures 44 & 45). Another potential area for temporary public art installments is within the storefronts of vacant buildings. This is an attractive option for artists as the storefronts provide a sheltered and safe display area for their work. It also mitigates any issues of sidewalk encroachment and maintenance issues such as snow removal or accessibility.

All of these projects present opportunities for partnerships with local artists and businesses to reinforce a positive relationship between the city and the BIA. Cornwall's murals are an excellent example of community-based public art in that they were painted by local artists and they portray important local stories and histories. It is recommended that a similar approach

be adopted by both Brockville and Kingston as an opportunity to further placemaking along their main street corridors.



Figure 43: Temporary mural used at the corner of Pitt Street and Second Street in Cornwall used to hide construction site.



Figure 44: Innovative pedestrian wayfinding design for narrow ROW space that does not allow room for street signage. Source: <http://basig.net/kontakt-2/>



Figure 45: Wayfinding signage may double as public art if adequate space is available. Source: Manufaktura.

6.4 Reflection on Methodology & Future Research Considerations

Overall, the use of the MIUDQ audit was a simple and effective tool for evaluating the walkability of the three traditional main street case studies. It allowed the streets to be evaluated in a consistent way that made results comparable to one another and informed recommendations for design interventions specific to each city. The use of Google Street View further simplified the process of data collection as it eliminated the need to coordinate travel to and from each location, as well as reduced the amount of distraction during the audit and allowed the researcher to take more time to evaluate more finite design details that may have been missed while walking. When the sites were visited in the spring in order to verify results from the Street View audit, very few changes were made to the data.

One of the limitations to the Street View method is the lack of real-time information it can provide. For example, the noise levels, traffic levels and pedestrian counts in the MIUDQ scoresheet could not be accounted for until site visits were performed. Furthermore, other case study locations may present a greater disparity between the Street View images and the current streetscape environment.

Three considerations should be made for further research with respect to this particular study and report:

1. The site visits and Street View images were each collected on a single day during a single season, and were then evaluated using the MIUDQ protocol by a single observer.

Increasing the number of observers for the audit would help to gain a more holistic and unbiased interpretation of the streetscape's perceptual design qualities. Furthermore, performing the audit at different times of day and during different seasons, especially in these Eastern Ontario municipalities where harsh seasonal weather affects the physical outdoor environment, would give insight into how pedestrians use the space under different conditions.

2. Walkability audits do not collect or evaluate human walking behaviour data. The collection of this type of information would be valuable for determining where certain amenities should be focused along the corridors.
3. The MIUDQ protocol evaluates building and streetscape design features as they relate to perceptual qualities of the built environment. Although it has been deemed a valid method for collecting data on walkability, it is not the only audit protocol available for doing so. The same case studies could be evaluated using another protocol, for example the Pedestrian Environment Data Scan (PEDS) which focuses on road attributes such as

street and sidewalk width, quality and connectivity, to gather a more holistic understanding of how the interaction between the vehicular and pedestrian right-of-ways interact and what the effects are on walkability.

6.5 Conclusions

Overall, the traditional main streets of Brockville, Cornwall and Kingston can be considered highly ranked in terms of their walkability. The original pedestrian-oriented features of these streets are being reimagined in a modern context as the municipalities endeavour to recapture and redesign spaces for people rather than cars.

As it stands, various issues related to infill and streetscape design exist within all three case studies. Whether it be breaks in the continuation of the street wall, monotonous building articulation or placement and quality of street planting and furniture, no city is perfect in its main street design. It is hoped that the adoption of these recommended design interventions will enhance both the aesthetic appeal and quality of walking environment along each city's main street corridor. By enhancing the quality of these CBD environments, cities can continue to promote the economic growth of local businesses, maintain the heritage of their oldest neighbourhoods, and improve the health of all of its residents.

REFERENCES

- Adkins, A., Dill, J., Luhr, G., & Neal, M. (2012). Unpacking walkability: Testing the influence of urban design features on perceptions of walking environment attractiveness. *Journal of Urban Design*, 17(4), 499-510.
- Agrawal, A. W., Schlossberg, M., & Irvin, K. (2008). How far, by which route and why? A spatial analysis of pedestrian preference. *Journal of Urban Design*, 13(1), 81-98.
- Alfonzo, M. A. (2005). To walk or not to walk? The hierarchy of walking needs. *Environment and Behavior*, 37(6), 808-836.
- Beaty, A. (2014). Evaluating the Walkability of Transit Oriented Development in Metro Vancouver's Northeast Sector. Queen's University. Kingston, ON.
- Brown, B., Werner, C., Amburgey, J. & Szalay, C. (2007). Walkable route perceptions and physical features converging evidence for en route walking experiences. *Environment and Behavior*, 39(1), 34-61.
- Brownson, R. C., Hoehner, C. M., Day, K., Forsyth, A., and Sallis, J.F. (2009). Measuring the Built Environment for Physical Activity: State of the Science. *American Journal of Preventive Medicine*.
- Bruecknew, J. K. (2000). Urban sprawl: Diagnosis and remedies. *International Regional Science Review*, 23(2), 160-171.
- Cervero, R. & Kockelman K. (1997). Travel demand and the 3Ds: Density, diversity and design. *Transportation Research Part D: Transport and Environment*, 2(3), 199-219.
- City of Brockville. (2009). Downtown & Waterfront Master Plan & Design Strategy. Brockville, ON.

- City of Brockville. (2013). Community Improvement Plan for Downtown Brockville. Brockville, ON.
- City of Kingston. (2004). Downtown Action Plan. Kingston, ON.
- Cornwall Heart of the City. (2004). Heart of the City: the project. Cornwall, ON.
- Clarke, P., Ailshire, J., Melendez R., Bader M., and Morenoff, J. (2010). Using Google Earth to Conduct a Neighborhood Audit: Reliability of a Virtual Audit Instrument. *Health & Place* 16 (6) (November): 1224–12
- Cullen, G. (1961). *The Concise Townscape*. Architectural Press: New York, NY.
- Ewing, R. (1997). Pedestrian and Transit-Friendly Design: a primer for smart growth.
- Ewing, R. & Clemente, O. (2013). *Measuring urban design: Metrics for livable places*. Washington DC: Island Press.
- Ewing, R. & Handy, S. (2009). Measuring the unmeasurable: urban design qualities related to walkability. *Journal of Urban Design*, 14(1), 65-84.
- Forrec. (2003). Cornwall Heart of the City Revitalization Concept. Cornwall, ON.
- Francaviglia, R. V. (1996). *Main Street Revisited: time, space and image building in small town America*. Iowa City: University of Iowa Press.
- Hess, P. (1997). Measures of connectivity. *Places*, 11(2), 58-65.
- Houser, M. (2011). Anatomy of a Main Street Building. [Microsoft Power Point]. Retrieved from: http://www.dahp.wa.gov/sites/default/files/Anatomy_of_MainStreet_0.pdf
- IBI Group. (2005). City of Cornwall & Heart of the City Community Improvement Plan. Cornwall, ON.

- Kunzmann, K. R. (2010). Medium-sized towns, strategic planning and creative governance. In Cerreta, M., Concilio, G. and Monno, V. *Making Strategies in Spatial Planning*. (1st Eds.). Netherlands: Springer.
- Lee, S. & Talen, E. (2014). Measuring walkability: A note on auditing methods. *Journal of Urban Design*, 19(3), 368-388.
- Longstreth, R. W. (2000). *The Buildings of Main Street: A guide to American commercial architecture*. Walnut Creek, CA: AltaMira Press.
- Minnes, S. & Douglas, J.A. 2013. A Profile of Eastern Ontario. *Canadian Regional Development: A Critical Review of Theory, Practice and Potentials*.
- Randall, T. & Baetz, B. (2001). Evaluating pedestrian connectivity for suburban sustainability. *Journal of Urban Planning and Development*, 127(1), 1-15.
- Robertson, K. A. (1999). Can small-city downtowns remain viable? A national study of development issues and strategies. *Journal of the American Planning Association*, 65(3), 70-83.
- Rundle, A. G., Bader, M. D., Richards, C.A., Neckerman, K. M., and Teitler, J. O. (2011). Using Google Street View to Audit Neighborhood Environments. *American Journal of Preventive Medicine* 40 (1) (January): 94–100.
- Schlossberg, M. & Brown, N. (2004). Comparing transit oriented development based on walkability indicators. *Transportation Research Record: Journal of the Transportation Research Board*, 1887(1), 34-42.
- Statistics Canada. *Census Profile*. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa.

Sukumaran, S. (2012). Assessing the pedestrian environments of three Toronto streets: Bloor Street, Queen Street West and Young Street. (Master's Report). Retrieved from QSPACE

Yin, R. K. (2009). *Case study research: Design and methods fourth edition*. London: Sage.

Appendix A

MIUDQ Field Manual

Measuring urban design qualities scoring sheet				auditor:			
street:		from:		to:			
block ID/face num.:		date & time:		weather/temp:			
Step #	Quality	Step	Process	Direction	Study area	Recorded value	
Imageability							
L1	imageability	accessible courtyards, plazas, parks, and gardens	count	both sides	within		
L2	imageability	visible/prominent major landscape features	count	both sides	beyond		
L3	imageability	proportion historic building/block (exclude thru st.)	est. (.10)	both sides	within		
L4	imageability	buildings with identifiers	count	both sides	within		
L5	imageability	buildings with nonrectangular shapes	count	both sides	within		
L6	imageability	presence of outdoor dining	Y=I/N=0	your side	within		
L71	imageability	people	walk-through	your side	within		
L72						walk-through 1	
L73						walk-through 2	
L74						walk-through 3	
L75						walk-through 4	
		Total/4					
L8	imageability	noise level (1-5; 5 is loudest)	est. (1-5)	both sides	within		
Enclosure							
2.1	enclosure	long sight lines (0-3)	count	both sides	beyond		
2.21	enclosure	proportion of street wall	est. (0.10)	your side	within		
2.22	enclosure	proportion of street wall (exclude thru st)	est. (0.10)	opposite side	within		

2.31	enclosure	proportion of sky	est. (0.05)	ahead	beyond	
2.32	enclosure	proportion of sky	est. (0.05)	across	beyond	
2.4	enclosure	street trees (Y = your side, O = opposite, M = median)	presence	both sides	within	Y O M
Human Scale						
3.1	human scale	long sight lines (0–3)	—	both sides	beyond	
3.2	human scale	proportion window (street-level)/block	est. (0.10)	your side	within	
3.3	human scale	building height	average	your side	within	
3.4	human scale	small planters	Count	your side	within	
3.51	human scale	pieces of street furniture & other street items	Count	your side	within	
3.52	human scale	outdoor dining tables	Count	your side	within	
3.53	human scale	lights on buildings (not more than 10 ft. high)	Count	your side	within	
Transparency						
4.1	transparency	proportion window (street-level)/ block	—	your side	within	
4.2	transparency	proportion street wall	—	your side	within	
4.3	transparency	proportion active use/block	est. (0.10)	your side	within	
Complexity						
5.1	complexity	buildings	count	both sides	within	
5.21	complexity	basic building colors	count	both sides	within	
5.22	complexity	accent colors	count	both sides	within	
5.3	complexity	presence of outdoor dining	—	your side	within	
5.4	complexity	pieces of public art	count	both sides	within	

Appendix B

Raw Walkability Audit Scores

City	BROCKVILLE			
Street	KING STREET			
From	JOHN STREET			
To	BUELL STREET			
Date	Aug-12			
	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	2
visible/prominent major landscape features	count	both sides	beyond	1
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.8
buildings with identifiers	count	both sides	within	0.7
buildings with non-rectangular shapes	count	both sides	within	0.4
presence of outdoor dining	y/n	your side	within	0
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.25
proportion of sky	est.	across	beyon	0.15
street trees	y/o/m	both sides	within	y/o

<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	30
small planters	count	your side	within	3
pieces of street furniture and other street items	count	your side	within	39
outdoor dining tables	count	your side	within	0
lights on buildings	count	your side	within	3
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.8
<i>Complexity</i>				
buildings	count	both sides	within	17
basic building colours	count	both sides	within	4
accent colours	count	both sides	within	7
pieces of public art	count	both sides	within	0

City	BROCKVILLE
Street	KING STREET
From	BUELL STREET
To	BROAD STREET
Date	Aug-12

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	1
visible/prominent major landscape features	count	both sides	beyond	1
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.9
buildings with non-rectangular shapes	count	both sides	within	0.6
presence of outdoor dining	y/n	your side	within	0
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	0
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.35
proportion of sky	est.	across	beyon	0.15
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	32
small planters	count	your side	within	2

pieces of street furniture and other street items	count	your side	within	26
outdoor dining tables	count	your side	within	0
lights on buildings	count	your side	within	5
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.8
<i>Complexity</i>				
buildings	count	both sides	within	22
basic building colours	count	both sides	within	4
accent colours	count	both sides	within	8
pieces of public art	count	both sides	within	0

City	BROCKVILLE
Street	KING STREET
From	BROAD STREET
To	BETHUNE STREET
Date	Aug-12

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	2
visible/prominent major landscape features	count	both sides	beyond	3
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.7
buildings with non-rectangular shapes	count	both sides	within	0.5
presence of outdoor dining	y/n	your side	within	1
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	2
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	0.9
proportion of sky	est.	ahead	beyond	0.25
proportion of sky	est.	across	beyon	0.35
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.7
building height	average	your side	within	31
small planters	count	your side	within	4

pieces of street furniture and other street items	count	your side	within	29
outdoor dining tables	count	your side	within	3
lights on buildings	count	your side	within	17
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.7
<i>Complexity</i>				
buildings	count	both sides	within	20
basic building colours	count	both sides	within	4
accent colours	count	both sides	within	7
pieces of public art	count	both sides	within	0

City	CORNWALL
Street	PITT STREET
From	FOURTH STREET
To	THIRD STREE
Date	Aug-12

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	3
visible/prominent major landscape features	count	both sides	beyond	0
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.3
buildings with non-rectangular shapes	count	both sides	within	3
presence of outdoor dining	y/n	your side	within	0
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	0.6
proportion of street wall	est.	opposite side	within	0.3
proportion of sky	est.	ahead	beyond	0.35
proportion of sky	est.	across	beyon	0.55
street trees	y/o/m	both sides	within	0
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.5
building height	average	your side	within	20
small planters	count	your side	within	2

pieces of street furniture and other street items	count	your side	within	16
outdoor dining tables	count	your side	within	0
lights on buildings	count	your side	within	4
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.3
<i>Complexity</i>				
buildings	count	both sides	within	10
basic building colours	count	both sides	within	5
accent colours	count	both sides	within	6
pieces of public art	count	both sides	within	1

City	CORNWALL
Street	PITT STREET
From	THIRD STREET
To	SECOND STREET
Date	Aug-12

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	2
visible/prominent major landscape features	count	both sides	beyond	0
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.4
buildings with non-rectangular shapes	count	both sides	within	5
presence of outdoor dining	y/n	your side	within	1
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	0.7
proportion of street wall	est.	opposite side	within	0.9
proportion of sky	est.	ahead	beyond	0.25
proportion of sky	est.	across	beyon	0.25
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	25

small planters	count	your side	within	6
pieces of street furniture and other street items	count	your side	within	21
outdoor dining tables	count	your side	within	4
lights on buildings	count	your side	within	0
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.6

City	CORNWALL
Street	PITT STREET
From	SECOND STREET
To	FIRST STREET
Date	Aug-12

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	3
visible/prominent major landscape features	count	both sides	beyond	1
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.5
buildings with non-rectangular shapes	count	both sides	within	21
presence of outdoor dining	y/n	both sides	within	6
presence of outdoor dining	y/n	your side	within	1
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	0.8
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.15
proportion of sky	est.	across	beyon	0.05
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	25

small planters	count	your side	within	10
pieces of street furniture and other street items	count	your side	within	18
outdoor dining tables	count	your side	within	0
lights on buildings	count	your side	within	4
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.8
<i>Complexity</i>				
buildings	count	both sides	within	22
basic building colours	count	both sides	within	4
accent colours	count	both sides	within	10
pieces of public art	count	both sides	within	1

City	KINGSTON
Street	PRINCESS STREET
From	MONTREAL STREET
To	BAGOT STREET
Date	Apr-14

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	0
visible/prominent major landscape features	count	both sides	beyond	0
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.6
buildings with non-rectangular shapes	count	both sides	within	0.4
presence of outdoor dining	y/n	your side	within	0
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.25
proportion of sky	est.	across	beyon	0.1
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	27
small planters	count	your side	within	1

pieces of street furniture and other street items	count	your side	within	18
outdoor dining tables	count	your side	within	0
lights on buildings	count	your side	within	13
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.9
<i>Complexity</i>				
buildings	count	both sides	within	17
basic building colours	count	both sides	within	5
accent colours	count	both sides	within	8
pieces of public art	count	both sides	within	0

City	KINGSTON
Street	PRINCESS STREET
From	BAGOT STREET
To	WELLINGTON STREET
Date	Apr-14

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	0
visible/prominent major landscape features	count	both sides	beyond	0
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.7
buildings with identifiers	count	both sides	within	1
buildings with non-rectangular shapes	count	both sides	within	0.6
presence of outdoor dining	y/n	your side	within	1
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.25
proportion of sky	est.	across	beyon	0.15
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.8
building height	average	your side	within	25
small planters	count	your side	within	2

pieces of street furniture and other street items	count	your side	within	27
outdoor dining tables	count	your side	within	3
lights on buildings	count	your side	within	14
<i>Transparency</i>				
proportion active use/block	est.	your side	within	0.9
<i>Complexity</i>				
buildings	count	both sides	within	16
basic building colours	count	both sides	within	3
accent colours	count	both sides	within	8
pieces of public art	count	both sides	within	0

City	KINGSTON
Street	PRINCESS STREET
From	WELLINGTON STREET
To	KING STREET
Date	Apr-14

	Process	Direction	Area	Recorded Value
<i>Imageability</i>				
accessible courtyards, plazas, parks and gardens	count	both sides	within	1
visible/prominent major landscape features	count	both sides	beyond	0
proportion historic buildings/block buildings with identifiers	est.	both sides	within	0.9
buildings with non-rectangular shapes	count	both sides	within	0.7
presence of outdoor dining	y/n	your side	within	1
<i>Enclosure</i>				
long sight lines (0-3)	count	both sides	beyond	1
proportion of street wall	est.	your side	within	1
proportion of street wall	est.	opposite side	within	1
proportion of sky	est.	ahead	beyond	0.2
proportion of sky	est.	across	beyon	0.1
street trees	y/o/m	both sides	within	y/o
<i>Human Scale</i>				
proportion windows/block	est.	your side	within	0.9
building height	average	your side	within	32
small planters	count	your side	within	2

pieces of street furniture and other street items	count	your side	within	16
outdoor dining tables	count	your side	within	6
lights on buildings	count	your side	within	8
<i>Transparency</i>				
proportion active use/block	est.	your side	within	1
<i>Complexity</i>				
buildings	count	both sides	within	14
basic building colours	count	both sides	within	5
accent colours	count	both sides	within	8
pieces of public art	count	both sides	within	0