

QUALITY OF LIFE IN CONTEMPORARY NEIGHBORHOOD DESIGN INITIATIVES: AN  
EMPIRICAL STUDY TO ASSESS QUALITY OF LIFE THROUGH SPATIAL DIMENSION  
IN NEW URBANIST AND LEED-ND CERTIFIED NEIGHBORHOODS

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## **ABSTRACT**

### **QUALITY OF LIFE IN CONTEMPORARY NEIGHBORHOOD DESIGN INITIATIVES: AN EMPIRICAL STUDY TO ASSESS QUALITY OF LIFE THROUGH SPATIAL DIMENSION IN NEW URBANIST AND LEED-ND CERTIFIED NEIGHBORHOODS**

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The overarching purpose of this study is to analyze qualitatively and quantitatively the spatial characteristics of two types of neighborhoods, namely New Urbanist (NU) neighborhoods and Leadership in Energy and Environmental Design (LEED) certified neighborhoods. LEED certified neighborhoods are commonly referred to as LEED for Neighborhood Development (LEED-ND). In this research study, the spatial quality of these two types of neighborhoods was examined through assessing the quality of five dimensions of a neighborhood's urban form, which are: safety, comfort, connectivity, place making and aesthetic quality. Three types of neighborhoods were selected and examined using two main analytical tools: neighborhood scorecard, and residents' survey. Two neighborhoods were selected to examine NU neighborhoods in Michigan in the United States, which are Cherry Hill Village (CHV) a greenfield residential development, and Mason Run (MR) a brownfield residential development. The third neighborhood was selected to examine LEED-ND certified neighborhoods, which is Saint Luke (SL) neighborhood in Ohio in the United States.

The neighborhood scorecard included a total of 150 design guidelines that yield better Quality of Life (QoL) in residential developments through urban form. The residents' survey included a set of questions that examined the residents' perceptions regarding the five physical characteristics necessary to yield better QoL. A total of 154 surveys were collected for data analysis that used one-way ANOVA tests, Tukey's post-hoc tests, and multiple regression



models. The major findings from the neighborhood scorecard are that CHV neighborhood provides was safer than the brownfield NU residential development and the LEED-ND certified neighborhood. In terms of fulfilling the recommended design guidelines for place making and aesthetic quality, again the Greenfield NU neighborhood had earned higher points than the other two neighborhoods.

The major findings from the survey are: Survey participants living in both NU neighborhoods were more satisfied with their QoL more than the participants living in the LEED-ND certified neighborhood. Also, respondents living in NU neighborhoods perceived their neighborhoods as safer places to live in more than participants living in the LEED-ND certified neighborhood. On the other hand, respondents living in the NU brownfield development perceived their neighborhood as the least comfortable neighborhood. In terms of the internal connectivity of the neighborhood, respondents living in NU greenfield development identified the internal connectivity of their neighborhood as the highest compared to the other two neighborhoods. Respondents living in the LEED-ND certified neighborhood had the highest mean in terms of their perceptions of sense of belonging. The perception of the aesthetic quality of the neighborhood was the highest among respondents living in the NU greenfield development.

This research study concludes by suggesting recommendations to improve the principles and design guidelines of NU and LEED-ND certified neighborhoods to achieve better QoL. The recommendations suggest emphasizing certain spatial characteristics that yield better QoL in Greenfield, and brownfield residential developments.

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## KEY TO ABBRIVIATIONS

QoL    Quality of Life

S-QoL   Subjective Quality of Life

O-QoL   Objective Quality of Life

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Although urbanization plays a pivotal role in economic growth, educational welfare, and advancement in innovation and technology, it has also placed a sizeable obstacle for pursuing social equity and providing better Quality of Life (QoL) for the public (Macke et al., 2018; Vojnovic, 2014; Wey and Huang, 2018). Social and spatial polarization, automobile dependent landscapes, loss of place identity, privatization of public services, pollution and climate change are just few issues that degrade QoL (Ochoa et al., 2018; Vojnovic, 2014). Unfortunately, such dilemmas will continue to occur in alarming rates, especially that by 2030 almost over 70% of world population is projected to live in urban areas (Komeily and Srinivasan, 2015; Ochoa et al., 2018). As such, immediate actions are needed to restructure the urban morphology of cities in order to achieve a better QoL for people, especially on the neighborhood scale.

Over the past few decades, the emergence of QoL concept has renewed interest in developing neighborhood planning and design initiatives to be able to enhance city life in general, and the citizens' quality of living in particular (Cao and Zhang, 2016; Sharifi, 2016; Zuniga-Teran et al., 2017). Various neighborhood design initiatives have emerged to achieve better QoL for inhabitants by utilizing urban design tools, such as New Urbanism (NU). NU has gained recognition in the past few decades, as a model for community planning and an alternative to conventional suburban developments (Godschalk, 2004; Heins, 2015). According to designers and researchers of NU movement, arranging new developments, especially neighborhoods, based on the principles of successful cities in Europe and the United States is a

key component to NU ideology (Markley, 2018). The urban form of NU developments has to possess the following characteristics: compact, mixed-use land-use, pedestrian friendly, public and community gathering spaces, diverse housing types, neo-traditional architecture, civic buildings, well-defined streets and hierarchy of street network, transit stops within walking distance (Markley, 2018). Proponents of NU state that the principles of NU movement can be a huge stride to correct social ills and environmental degradation experienced in both cities and suburbs alike (Din et al., 2013; Markley, 2018).

The pursuit of sustainability in neighborhood design has also provoked major thinking transitions in the practice of urban design, which has led to the development of Neighborhood Sustainability Assessment (NSA) tools (Reith and Orova, 2015; Yoon and Park, 2015). Higher level of sustainable development leads to the higher level of well-being, and thus yield higher level of QoL (Haapio, 2012; Yoon and Park, 2015). NSA tools include both local and international systems that utilize urban design strategies to evaluate the level of sustainability of neighborhoods (Haapio, 2012; Yoon and Park, 2015). NSA tools are not mandatory programs; they are voluntary rating systems (Gouda and Masoumi, 2018). In 2009, U.S. Green Building Council (USGBC) has launched Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) rating system (Gouda and Masoumi, 2018). LEED-ND has gained significant acknowledgment as a very crucial standard in sustainable development (Szibbo, 2016) among the urban planning and design professions around the world, especially in North America (Boeing et al., 2014; Gouda and Masoumi, 2018; Sharifi and Murayama, 2014a; Szibbo, 2016).

While NU movement and LEED-ND certification system have recently become masterworks of neighborhood design initiatives in the United States and around the world, a key

question remains unanswered. The question is whether NU and LEED-ND certified neighborhoods deliberately promote better QoL for their residents? Proponents of NU claim that NU neighborhoods support and provide better QoL for its residents through delivering safe, comfortable and compact mixed-uses; however to date, there is little empirical evidence to support such claims (Foster et al., 2016; Szibbo, 2016). LEED-ND rating system has also been praised for promoting livability and social benefits, yet such claims are rarely supported in evidence (Szibbo, 2016). Also, a gap in the literature exists regarding the evaluation of NU neighborhoods and NSA tools and in terms of social sustainability, and QoL, which is crucial to complete the sustainability triad on the local scale (Sharifi and Murayama, 2014b; Szibbo, 2016).

A limited number of studies focus on the role of the urban form and urban design in shaping good neighborhoods, which conjointly affect people's neighborhood satisfaction level, and thus the QoL. According to the current literature, NU and LEED-ND are under-investigated in terms of neighborhood satisfaction analysis, especially from the residents' perspective (Markley, 2018; Szibbo, 2016). It is still unclear if the design guidelines of NU developments and the criteria of LEED-ND adequately provide better QoL for their residents or not (Markley, 2018; Szibbo, 2016). Also, much of the current discussion about NU developments emphasize the impact of neighborhood design on certain domains, such as trips from/to work, physical activity of residents, street connectivity assessment and environmental protection (Park, 2017; Zuniga-Teran et. al, 2017).

Other urban studies focus heavily on comparing between the different NSA tools, and also focus on questioning the applicability of the NSA tools in different urban contexts across the globe (Sharifi and Murayama, 2014b). With that being said, it is important to further investigate the impacts of the spatial arrangements of NU, and LEED-ND certified neighborhoods on QoL,

and to assess the satisfaction degree of their residents' perspective in terms of their neighborhoods' physical design.

## 1.2 Problem Statement

While NU and LEED-ND certified neighborhoods have contributed to fostering sustainability, their limitations have been also identified (Haapio, 2012; Luederitz et al., 2013; Westerhoof, 2015). Studying the impacts of the spatial arrangements of NU and LEED-ND certified neighborhoods on their residents' QoL is still under examined (Cao, 2016). Also, the perceptions of their residents regarding the spatial characteristics of NU and LEED-ND certified neighborhoods are particularly poorly understood (Cao, 2016; Haapio, 2012; Szibbo, 2016; Westerhoff, 2015).

Earlier works focused primarily on predicting the possible successes and failures of NU and LEED-ND neighborhoods in terms of density, and transit accessibility, and less attention had been given to examining the relationship between their urban forms and QoL (Szibbo, 2016; Westerhoff, 2015; Zuniga-Teran et. al, 2017).

In addition, most of the earlier works that addressed QoL in social science field had focused precisely on the effect of green infrastructure and environmental amenities on social interactions, physical health, and walking behaviors, and does not consider other planning mechanisms, such as urban form, that can affect QoL (Cao and Zhang, 2016; Szibbo, 2016; Zuniga-Teran et. al, 2017).

Previous empirical studies observed the impact of NU neighborhoods, on a limited number of domains, such as trips from/to work, physical activity of residents, street connectivity assessment and environmental protection (Park, 2017; Zuniga-Teran et. al, 2017). Such research studies primarily focused on examining a limited number of neighborhood case studies through



mainly monitoring the impacts of the built environment on the physical activity from a professional perspective, and not through the residents' perspectives (Park, 2017; Zuniga-Teran et. al, 2017).

Numerous studies investigated the strengths and weaknesses of Neighborhood Assessment Tools (NAT), and provided recommendations for future improvement, such as the studies done by Haapio (2012), Sharifi and Murayama (2014b). Haapio (2012) investigated the differences and linkages between three NAT tools: LEED-ND, BREEAM Communities, and CASBEE-UD, and concluded by discovering strong associations between the three tools.

Sharifi and Murayama (2014b) study included more NAT tools. Their study highlighted the gaps found in the NAT, such as the inadequate performance of all the NAT mechanisms in terms of social and economic sustainability (Sharifi and Murayama, 2014b). They also performed a cross evaluation assessment between three certifications systems in different countries; USA, UK, and Japan (Sharifi and Murayama, 2014b). They discovered that the global standards of NAT tools were not feasible, and suggested developing more context specific, and project-based NAT tools (Sharifi and Murayama, 2014b).

Also, Aranoff et al. (2013) briefly investigated LEED-ND livability standards by comparing the design standards in the Neighborhood Pattern and Design category to the residents' perceived definition of livability in a non-LEED-ND neighborhood in San Francisco (Aranoff et al., 2013). Aranoff et al. (2013) concluded that the categories in LEED neighborhood certification system did not reflect the criteria needed to achieve livability. They recommended further examining the design standards of NPD category to truly reflect the needs of livable neighborhoods.

Wu et al. (2018) conducted a study that aimed at improving the overall performance of LEED-ND rating system by investigating the transition from green buildings to green neighborhoods. Their study compared the credits obtained from 55 LEED-ND certified plans with credits obtained from LEED-NC buildings (Wu et al., 2018).

Previous studies also observed and analyzed the differences between LEED-ND and other NAT tools, but many overlooked the impact of LEED-ND on the social domain and neighborhood satisfaction (Szibbo, 2016). There had been very little attention given to examine comprehensively the impact of the spatial characteristics of NU and LEED-ND neighborhoods especially through post-occupancy surveys (Szibbo, 2016).

Neighborhood design affects and shapes people's lifestyles, and thus affects their well-being. However, as discussed before, only a few studies examined the effect of the spatial structure of neighborhood designs on QoL. With that being said, there is a need for creating a set of design guidelines that can assist in designing better neighborhoods socially and spatially through shaping adequate urban interventions, design regulations, and guidelines. Also, there is a need for integrating the residents' spatial preferences with theoretical endeavors and practical neighborhood design deliberations to improve QoL in neighborhoods, especially in NU and LEED-ND certified neighborhoods.

### 1.3 Purpose of the Study

The overarching purpose of this study is to critically analyze the principles and practices in New Urbanism and LEED certified neighborhoods, through the lens of their residents' perceptions regarding the spatial characteristics of these two types of neighborhoods. The main questions of this research are: Do LEED-ND and NU neighborhoods adopt design guidelines that support Quality of Life (QoL)? What is the satisfaction level of the residents in NU neighborhoods, and LEED-ND? What are the differences and similarities between the two types of neighborhoods? How can NU and LEED-ND design codes and principles be improved?

The main objectives of this study are: (1) to create a comprehensive set of spatial indicators that have been shown to improve QoL, (2) to identify the most important spatial characteristics in neighborhoods according to the residents' perceptions and input, (3) to examine the ability of NU and LEED-ND certified neighborhoods to achieve better QoL for their residents, (4) to improve the principles and design guidelines of NU movement and LEED-ND certification system to yield better QoL, and (5) to assist urban designers and planners understand and bridge the desires of residents in the present moment with longer-term needs under the sustainability vision.

In order to support the research's purpose and objectives, this study examined three case studies that represented NU neighborhoods: Cherry Hill Village (CHV), a greenfield residential development in Canton, MI, and Mason Run (MR), a brownfield residential development in Monroe, MI, and a LEED-ND certified neighborhood, which is Saint Luke's (SL) Community in Cleveland, OH.

The spatial characteristics of the three types of neighborhoods were examined based on the quality of five spatial dimensions of a neighborhood's urban form, which are: safety, comfort, connectivity, place making and aesthetic quality five. The Five spatial dimensions selected for this study were based on extensive literature review regarding the recommended physical characteristics of urban form to improve QoL in neighborhoods. Two main analytical tools were used to adequately meet the objectives and goals of this research study: a neighborhood scorecard, and residents' survey. Chapter 3 elaborates more about the contents and procedures of these two tools.

The data collected from the qualitative and the quantitative analysis was then analyzed to shape adequate suggestions and recommendations to improve the design guidelines and principles of NU movement and LEED-ND certification system to improve their QoL.

#### 1.4 Research Hypotheses

In order to appropriately hone the objectives of this research study, eighteen hypotheses were tested. Residents' perceptions of the five spatial characteristics needed to improve QoL in neighborhoods were investigated. The five spatial characteristics were: safety, comfort, place making and sense of belonging, connectivity, and aesthetics. Each spatial criterion included a set of hypotheses to adequately examine the quality of the urban form of NU and LEED certified neighborhoods. The hypotheses of this research study were categorized and listed as the following:

General criterion:

- 1) Residents who live in both New Urbanist and LEED-ND certified neighborhoods are highly satisfied by their QoL in their neighborhoods.

Safety criterion:

- 2) Residents who live in New Urbanist neighborhoods feel as safe as residents who live in LEED-ND certified neighborhood in terms of crime.
- 3) Residents who live in New Urbanist neighborhoods feel as safe as residents who the LEED-ND certified neighborhood in terms of traffic safety.
- 4) Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods during the day.
- 5) Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods at night.
- 6) The perception of safety when visiting public spaces in the morning is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.
- 7) The perception of safety when visiting public spaces at night is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.
- 8) The perception of safety when using public transit services is the same is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.
- 9) The perception of biking safety is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.

Comfort Criterion:

- 10) New Urbanist and LEED-ND certified neighborhoods are comfortable neighborhoods for their residents.

11) The perception of pedestrian comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.

12) The perception of comfort level when visiting public places is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.

13) The perception of comfort level when using public transit services is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.

14) The perception of biking comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.

Connectivity Criterion:

15) The perception of the internal connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

16) The perception of the external connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

Place making and sense of belonging Criterion:

17) The perception of sense of belonging is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

Aesthetic Criterion

18) The perception of aesthetic quality of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

### 1.5 Importance of the Study

Neighborhood design affects and shapes people's lifestyles, and thus affects their well-being. However, as discussed before, very little number of studies has examined the effect of the spatial structure of neighborhood designs on QoL. As such, the overall goal of this research study was to assess the spatial quality of two renowned neighborhood design initiatives, NU and LEED-ND certified neighborhoods. This research aimed to critically question if NU and LEED-ND certified neighborhoods design guidelines delivered better QoL for their residents or not, and to verify and refine the actions and design guidelines followed by both design initiatives. In order to examine appropriately the spatial features of the two types of neighborhoods a set of design guidelines had been identified. This set of design guidelines was referred to as the neighborhood scorecard in this research study.

The spatial arrangements of those two types of neighborhoods were carefully examined through extensive field studies using the neighborhood scorecard. The design guidelines included in the neighborhood scorecard were shaped based on literature that addressed QoL in neighborhoods. Accordingly, the neighborhood scorecard was another crucial outcome of this study. This neighborhood scorecard could be applied on any type of residential developments. It could also help urban planners and designers identify and implement the recommended spatial features of residential developments to yield better QoL.

In addition, the results of the residents' survey in this research study could help in bridging the gap between the professionals' perspective regarding the best practices for boosting QoL and the residents' preferences for better QoL. Accordingly, this study could help in integrating the residents' social and spatial preferences with theoretical endeavors and deliberations to deliver livable neighborhoods that attain better QoL for their residents.

Finally, the results of this study could help in polishing the design protocols followed by NU and LEED-ND certified neighborhoods to boost QoL in such renowned design movements. This research study suggests a set of recommendations for both neighborhood design initiatives based on the reconciliation between the residents' preferences and the objective observations of professional to improve QoL. The recommendations included in this study were shaped based on the research results through carefully revisiting each design principle and guidelines in NU and LEED-ND certification system. Such recommendations could assist in improving the overall QoL on the neighborhood scale, and thus achieving sustainability on the macro-scale of cities.



## CHAPTER 2

### THEORETICAL BACKGROUND

#### 2.1 Spatial Dimension of Quality of Life in Literature

With the current unprecedented growth of urban population the interest in assessing Quality of Life (QoL) in cities has increased (Al-Qawasmi, 2019; Fischler, 2000). Also, improving QoL has been a prevalent topic in most of the social sciences and urban planning studies. For the past decades, creating developments, especial housing developments that yield better QoL has been the goal of most of the contemporary planning endeavors and movements. The concept of QoL has gained popularity by the end of World War II, and with the rise of globalization and urbanization (Chen et al., 2016).

The term QoL first surfaced in the 1930's, but it gained momentum in the beginning of the 1960s to enhance the public's living conditions after WWII (Al-Qawasmi, 2019; Pinto et al., 2017). At that time, the term QoL was merely about portraying the effect of material wealth on people's lives and standard of living (Al-Qawasmi, 2019; Fischler, 2000). Then, research on QoL progressed significantly in late 1960s by the Social Indicators Movement, which shifted the focus to the social attributes of life (Chen et al., 2016; Farquhar, 1995; Fischler, 2000; Ferriss, 2006; Marans, 2015; Noll, 2004). Afterwards, geographical, climatic, and technological shifts had made the term QoL to be prominent and to evolve as well in almost most of the scientific and social domains (Chen et al., 2016; Pacione 2003; Zhang, 2017). The rapid urbanization across the globe, the decline in natural resources, the precedent shift in technological proceedings and globalization made the term QoL more prominent to include spatial and political factors in addition to the social factor (Chen et al., 2016; Pacione 2003; Zhang, 2017).

To date, despite the fact there is not a universally accepted definition of QoL, scholars have a consensus that QoL is a multifaceted construct that encompasses different domains, including social, psychological, physical, and environmental health (Al-Qawasmi, 2019; Baron et al., 2019; Niedermeier et al., 2019). Also, there is a consensus that QoL is shaped by objective realities, and subjective factors that are based on personal perceptions (Al-Qawasmi, 2019; Tacoral et al., 2015; Zhang, 2017). The World Health Organization (WHO) provides a widely accepted definition of QoL as the individuals' perception of their position in life, their goals, and their expectations based on the cultural system they live in (Pinto et al., 2017; Macke et al., 2018; Tacoral et al., 2017). This definition suggests that QoL is about the idiosyncrasies of each person in terms of psychological and physical conditions, personal philosophies, political and social morals, environmental, and spiritual dimensions.

In social and behavioral studies, QoL is defined as the person's experiences and satisfactions about her/his life and circumstances (Al-Qawasmi, 2019; Kamp et al., 2003; Pinto et al., 2017; Wey and Wei, 2015; Zhang, 2017). QoL in urban design and planning disciplines is usually defined as the general well-being of people according to the quality of their surrounding environment (Al-Qawasmi, 2019). The definition of QoL in urban studies often involves both the external objective circumstances and the person's subjective perception of these external circumstances (Al-Qawasmi, 2019; Von Wirth et al., 2016).

According to literature, QoL is considered an extensive topic with no clear definition, but it is usually subjectively measured by individual opinion, and objectively assessed by standardized measures (Macke et al., 2018; Tacoral et al., 2015). Thus, the assessment of QoL is multifaceted and it reflects the subjective and objective mechanisms of peoples' lives. Subjective condition, or Subjective Quality of Life (SQoL), is related to the individual's satisfaction with

her/his life based on internal psychological perspectives, such as the individual's satisfaction with her/his health, income, employment status, social belonging, work environment, etc. (Das, 2008; Santos et al., 2007; Wey and Wei, 2015). While the objective condition, or Objective Quality of Life (OQoL) indicators are related to the tangible measurements of the exogenous characteristics of the natural and built environments, such as, housing type, infrastructure, per capita green space, recreational and leisure facilities (Das, 2008; Santos et al., 2007; Wey and Wei, 2015).

Both terms, QoL and well-being, have been used interchangeably across different disciplines; some scholars use QoL as a synonym for well-being. Some other scholars claim that both terms have to be distinguished from each other since well-being is more psychologically or spiritually oriented perspective and more related to happiness concepts (Lambert et al., 2015; Pinto et al., 2017), while QoL symbolizes a broader concept of living conditions, specifically related to the perception and satisfaction of the individual with her/his own life (Pinto et al., 2017). QoL in urban studies involves five main criteria: spatial, social, environmental, economic, and institutional, which are crucial to yield decent urban QoL (Ebrahimzadeh et al., 2016; Węziak-Białowolska, 2016).

Examining the spatial features of neighborhoods, precisely examining the outdoor quality of place of residence was the focus of this research study. QoL in this research study involved both the objective circumstances of QoL in terms of the built environment and the residents' 'subjective' perceptions of these objective circumstances.

The outdoor quality of the place of residence in this research study was examined through the lens of the quality of the urban form of neighborhoods. In general, urban form is classified into two scales: macro and micro scales (Sharifi, 2019). Urban form on the macro-level is related

to the overall size, structure and organization of the city, development type, and the spatial distribution of population and employment (Sharifi, 2019). While the micro-level of urban form is concerned with the design and arrangement of other spatial elements such as open spaces, streets, buildings, blocks, and neighborhoods (Sharifi, 2019), urban form is the spatial distribution of human activities that involves land use configurations, transportation systems, communication infrastructure (Burgess, 2000; Lynch, 1981). Urban form, at the neighborhood scale, is often defined in terms of connectivity and accessibility (street network, transportation); land use types, intensity, mix, and proximity; population, employment, and amenities' density and distribution (clustering, scatter); and contiguity (dispersion, fragmentation) and built environment shape (Lang et al., 2019).

Urban form is considered as one of the main contributors to social sustainability (Eizenberg and Jabareen, 2017). Creating better QoL for residents in neighborhoods depends greatly on the spatial arrangements that achieve a high degree of livability. Eizenberg and Jabareen (2017) suggested a set of recommendations that enhances QoL in the context of urban form, including: compactness, sustainable transportation system, density, mixed land-use, diversity, passive solar designs, greening, and the development of brownfields and rehabilitation of underused properties/structures (Eizenberg and Jabareen, 2017). There is an agreement upon set of guiding principles to achieve better QoL through urban form (Balsas, 2004; Eizenberg and Jabareen, 2017; Maleki et al., 2015; Wheeler, 2001). This set of principles includes: inclusiveness, accessibility, equity, safety, participation, continuity, and aesthetic quality (Maleki et al., 2015; Oberlink, 2006). In depth elaboration regarding this set of principles is included later in this chapter.

## 2.2 Contemporary Neighborhood Designs and QoL

Neighborhoods are considered integral planning units for achieving sustainable cities, and enhancing the inhabitants' QoL, as long as they provide urban forms that enhance inclusiveness, accessibility, equity, safety, participation, continuity, and aesthetic quality (Oberlink, 2006; Sharifi, 2016; Stangl and Guinn, 2011; Westerhoff, 2015). The definition of a neighborhood can vary widely. In some cases it can be either a one square mile or several square miles, with different number of blocks and people (Wheeler, 2004). The typical neighborhood definition is applied on a walkable residential area, with a radius of one mile or less (Wheeler, 2004). The term neighborhood can be also applied on an area that has a unified architectural style, and cohesive social, economic, and physical characteristics (Wheeler, 2004).

In the last two decades, various neighborhood design initiatives have emerged to attain better QoL for inhabitants through urban form. Both NU and LEED-ND certified neighborhoods have recently become masterworks of neighborhood design initiatives. As mentioned before, this study aims to critically question if NU neighborhoods or LEED-ND certified neighborhoods provide better QoL for its residents, and to verify and refine the actions and design guidelines taken by NU or LEED-ND. The following section unfolds the background and current design critiques of New Urbanism communities and LEED-ND certified neighborhoods in terms of spatial QoL.

### 2.2.1 New Urbanist Neighborhoods and Quality of Life

New Urbanism started as a movement in the field of urban design in the United States in 1980 (Duany et al., 2010; Kim and Larsen, 2017). The movement has utilized urban design strategies to increase the overall quality of life by endorsing compactness, pedestrian movement, and equity, whilst preserving the land and protecting the environment for future generations

(Calthorpe, 2011; Duany et al., 2010; Kim and Larsen, 2017; Park, 2017). The Congress for the New Urbanism (CNU) was initially established in 1993 in partnership with the US Department of Housing and Urban Development (HUD) (Kim and Larsen, 2017). Six architects founded CNU: Peter Calthorpe, Andres Duany, Elizabeth Plater-Zyberk, Elizabeth Moule, Daniel Solomon, and Stephanos Poly-zoides (Zali et al., 2016). New Urbanists stress that green buildings will contribute more to the sustainability if they do only exist in high-quality, walkable, accessible, and compact neighborhoods to conserve natural resources, to nurture the local economies, and social fabrics (CNU, 2019; Duany et al., 2010). The key principle of New Urbanism is to create a traditional town where people can live, work, eat, entertain, and shop to reduce auto dependency, and to revitalize the public realm' (Woodward, 2013).

New Urbanism's Charter emerged in 1996 and it is considered the most important document that explains the theoretical content of new urbanism movement (Trudeau and Malloy, 2011). The Charter has clear 27 key principles shaped by architects, planners, interested citizens, scholars, elected officials, and developers (Elshater, 2012; Trudeau and Malloy, 2011). The Charter's principles are meant to guide urban planning, and architecture design, and public policy in order to develop diverse neighborhoods with distinct characteristics on different spatial scales (Elshater, 2012; Trudeau and Malloy, 2011). CNU principles are shaped by the designers and founders of the NU movement to guide public policy, development practice, urban planning, and design on the regional to the single-building scale (CNU, 2019). As mentioned before, this research study focused on assessing the urban form of NU neighborhoods. Accordingly, only the design principles on the neighborhood block, street, and the building scales were examined. Table 2.1 illustrates a general description of CNU principles (see Appendix A for full CNU principles).

**Table 2.1: CNU Principles on the Neighborhood, District, Corridor, Block, Street and Building Scales**

| Number of Total Principles | Scale                                | General description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9                          | Metropolis, city and town            | <p>Metropolitan regions are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks, and river basins. The metropolis is made of multiple centers that are cities, towns, and villages, each with its own identifiable center and edges. The developments that occur within its center should protect and converse farmlands, natural habitats, natural water bodies, etc. Expanding the current physical mesh of the metropolis and its centers should not encourage suburbanization but rather should encourage infill developments and encourage attaining the metropolis's identifiable edges.</p> <p>The development and redevelopment the multiple centers of the metropolis, including towns and cities, should reflect and respect the historical patterns, socio-economic status of the surroundings. The metropolis should include a spectrum of public and private services and uses that are equally accesses by all types of people with different physical and economic abilities.</p> |
| 11                         | Neighborhood, district, and corridor | <p>Neighborhoods should be compact and mixed-use to encourage walking and therefore decreasing carbon footprint. Neighborhoods and districts should be equipped with decent and affordable public transportation system that connects between the vital areas within neighborhoods, towns and cities. in this smaller scale of development respecting human scale when designing streets and encouraging walkability to everyday uses are both crucial to create healthier physical and social environments. Affordable housing is another crucial aspect that should be included within the physical mesh of the a mixed-income neighborhoods and should not be secluded to the periphery of developments.</p> <p>Neighborhoods and districts are encouraged to include an array of parks of different sizes and scales and should be equally accessible to all types of people.</p>                                                                                                                                                                            |
| 8                          | Block, street, and building          | <p>Respecting the pedestrian's needs is a crucial aspect for this scale of development. Streets should be designed to reflect and enhance the communities' unique identities and needs. Also, streets should be safe, secure and interesting to the users. The overall deign and uses in new developments or infill developments should respect and add to the existing surrounding physical, social and economic realms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Note: Adapted from CNU

The International Organization for Standardization (ISO) indicators for sustainable communities and QoL were applied to appropriately evaluate the impacts of CNU principles on QoL. In the ISO standards, neighborhood features have an impact on the three dimensions of sustainability (ISO, 2006). Table 2.2 illustrates the impacts of the different subjective and objective features of QoL on the three E's of sustainability.

**Table 2.2: Impacts of Subjective and Objective Dimensions of QoL on Sustainability Indicators According to ISO**

| <b>Standard</b>                       | <b>Environmental</b> | <b>Economic</b> | <b>Equity</b> |
|---------------------------------------|----------------------|-----------------|---------------|
| Access to services                    | x                    | x               | x             |
| Accessibility                         | -                    | -               | x             |
| Aesthetic quality                     | -                    | -               | x             |
| Alternate transport options           | x                    | -               | x             |
| Affordable housing                    | -                    | x               | x             |
| Air emissions                         | x                    | -               | -             |
| Air quality/ indoor conditions        | -                    | -               | -             |
| Green Building certification achieved | x                    | x               | x             |
| Costs                                 | -                    | x               | -             |
| Employment                            | -                    | x               | x             |
| Energy efficiency                     | x                    | -               | -             |
| Fresh water consumption               | x                    | -               | -             |
| Land use                              | x                    | -               | x             |
| Land contamination                    | x                    | -               | -             |
| Life-cycle analysis                   | x                    | x               | x             |
| Maintainability                       | -                    | x               | x             |
| Materials                             | x                    | -               |               |
| Noise pollution                       | x                    | -               | x             |
| Non-renewable resources               | x                    | -               | -             |
| Parking                               | x                    | -               | x             |
| Recycling                             | x                    | -               | x             |
| Reduction in carbon dioxide emissions | x                    | -               | -             |
| Reuse of buildings                    | x                    | -               | -             |
| Safety                                | -                    | x               | x             |
| Sustainable design commitment         | x                    | x               | x             |
| Water consumption                     | x                    | x               | -             |
| Water efficiency                      | x                    | -               | -             |

Note: Adapted from 2006 ISO Environmental report



According to the ISO standard (ISO, 2006), an environmental indicator measures the impact on the change/deterioration of the environment or resources depletion, the economic indicator is related to issues of productivity, and economic value, and the social indicator is related to health issues, equity, safety, and cultural values to society (ISO, 2006). Table 2.3 illustrates the Impacts of the eighteen CNU Principles on the 3 E's of sustainability, and also illustrates the relation of CNU principles to QoL.

**Table 2.3: Impacts of CNU Design Principles on Sustainability Dimensions and Relation to QoL**

| Principle Number | Environmental | Economic | Equity | Spatial QoL |
|------------------|---------------|----------|--------|-------------|
| #10              | -             | -        | x      | -           |
| #11              | x             | -        | x      | x           |
| #12              | x             | -        | x      | x           |
| #13              | -             | -        | x      | x           |
| #14              | -             | x        | -      | x           |
| #15              | x             | -        | x      | x           |
| #16              | -             | -        | x      | x           |
| #17              | -             | x        | x      | x           |
| #18              | x             | -        | x      | x           |
| #19              | -             | -        | x      | x           |
| #20              | -             | -        | -      | x           |
| #21              | -             | -        | x      | x           |
| #22              | -             | -        | x      | x           |
| #23              | x             | -        | x      | x           |
| #24              | x             | x        | x      | x           |
| #25              | -             | -        | x      | x           |
| #26              | x             | x        | x      | -           |
| #27              | x             | x        | x      | -           |

CNU has also developed urban design guidelines Form-Based Codes (FBCs), in the early 1980s, as an alternative development regulation method to conventional zoning ordinance (Parolek et al., 2008). The designers and founders of NU emphasize that the Euclidean zoning codes have diminished the vital and spontaneous land use agglomeration that once existed in old

cities (Inniss, 2007). Conventional zoning places emphasis on land use, low-density developments and automobile dependency, while FBCs place much value on traditional neighborhood design (Markley, 2018). FBCs advocate the return to the compact densities, value public spaces and also, FBCs value and recognize the interrelationships between buildings and between public and private spaces, and scale with regard to sustainable design principles (Crawford et al., 2015; Garde, 2009).

FBCs' primary goal is to restore the physical decay of suburbs and to strengthen civic life, and livable communities through recreating the active old traditional towns of the past (Walters, 2011). FBCs are regulations that organize the physical form of developments to strengthen public realm (Walters, 2011). FBCs can be customized according to the vision of any community based on specific practices. FBCs are more concise than conventional zoning codes, and they emphasize illustrations over text (Crawford et al., 2015; Walters, 2011).

### 2.2.2 Spatial Characteristics of New Urbanist Neighborhoods

New Urbanists compiled design guidelines for NU in a design guidebook, *New Urbanism Best Practices Guide*, with a dedicated chapter for neighborhood designs (Steuteville and Langdon, 2009). Also, the CNU explicitly narrates neighborhood design principles in a book, Charter of New Urbanism in order to help local authorities, designers, developers and communities understand the design principles for NU. Duany et al. (2010) in *Suburban Nation* is also another type of resource to comprehensively understand the general principles of NU and the specific needs for neighborhood designs to meet NU principles. In this research study, those three types of resources are mainly used to unfold the basic principles and guidelines for NU neighborhood designs. According to those sources, there were basic design guidelines that

needed to be followed in order to pursue NU ideology. The following section unfolded the main design guidelines found in NU neighborhoods.

NU neighborhoods aim to increase social interaction and sense of community through blurring the differences between private residential space and public spaces by utilizing symbolic architectural link to the small towns of pre-World War II (Beauregard, 2002; CNU, 2019; Duany et al., 2010). Street facing porches and balconies, bay windows, shallow housing setbacks, and narrow street widths are some of the salient architectural elements that are widely adopted in NU neighborhoods to enhance social interactions (CNU, 2019; Duany et al., 2010). Such architectural elements are also used to increase the safety of the neighborhoods from crime. According to New Urbanists, streets have to be watched over by buildings with active fronts. The Victorian architecture of NU neighborhoods that includes front porches, balconies, doors, and large windows provide natural surveillance in neighborhoods and thus deter crime and any undesirable intruders. Also, the residential houses in NU neighborhoods are located in close proximity to the sidewalks to add more eyes on the streets. Also, NU neighborhoods are famous for the white picket fences, which are inspired from the American traditional village. The white picket fences are to enhance social interactions between neighbors since the fences have to be of maximum height of 5-6 feet (CNU, 2019; Duany et al., 2010).

Decreasing the amount of blank walls along residential streets by placing car garages at the rear of the buildings is also another important physical feature in NU neighborhoods (Duany et al., 2010). Designers and founders of NU indicate decreasing the amount of blank walls along residential streets results in creating more engaging building fronts, and thus enhancing socialization among residents (Duany et al., 2010). Minimizing blank walls along residential streets create active fronts and thus create safer streets. The provision of active destinations in

neighborhoods is another technique used by designers and founders of NU to create a livelier and safer neighborhood. According to the designers and founders of NU, these destinations have to vary in terms of function and size and most importantly have to be accessible by foot (Duany et al., 2010). The destinations could be public green spaces, an active intersection with mixed-uses, a plaza with seating areas, etc. Such active destinations function as stages for social interactions. Also, such active destinations add to the safety of the neighborhoods since they attract users throughout the day.

NU neighborhoods encourage walkability through creating safe sidewalks for pedestrians and sidewalk from traffic. On-street parking, narrow streets, and two-way streets are the main design techniques adopted to control the speed of vehicular movement in NU neighborhoods (Duany et al., 2010; Kunstler, 1997). According to Duany et al. (2010), parked cars on residential streets function as steel barriers between the street and the sidewalks, which protect sidewalk users from moving traffic. On-street parking slows down traffic because drivers become more vigilant for cars pulling in and out (Duany et al., 2010).

Narrow streets with few number of car lane is also another contributor to pedestrians' safety in neighborhoods according to the designers and founders of NU. Main thoroughfares should not exceed four lanes in width (Duany et al., 2010). Narrow streets are not enough to control the speeding flow of vehicular movement, and curb radius is another design issue that must be addressed (Duany et al., 2010). Curb radius has a significant effect on the speed of cars while turning around in intersections (Duany et al., 2010). Small curb radii in intersections force speeding cars to slow down while turning and also decrease the pedestrians' crossing distance along vehicular paths (Duany et al., 2010).

According to the designers and founders of NU, creating comfortable streets is another aspect to encourage walkability. Architectural enclosure or sense of enclosure is a huge contributor to increase walking desirability because people feel comfortable when they feel oriented and sheltered (Duany et al., 2010). According to the designers and founders of NU, people are attracted to places that are well defined, with clear boundaries and limited openings. In order to create comfortable streets, the ratio between the width of the street and the height of the buildings along that street has to ensure the provision of comfortable enclosure for its pedestrians (Duany et al., 2010).

In general, the most accepted ratio to yield such comfort level is about 6:1 (Duany et al., 2010). If the distance between building fronts exceeds six times the height of those building fronts, the feeling of street enclosure will be lost and thus the street will fail to attract pedestrians (Duany et al., 2010). Designing a hierarchy of streets network also affect walkability in residential neighborhoods (Duany et al., 2010).

Street patterns in residential developments have to accommodate the needs of automobiles without risking the safety and comfort of pedestrians and cyclists. Streets have to follow a hierarchical flow with clear major avenues or thoroughfares and also streets have to include secondary streets as well, with a minimum number of cul-de-sacs. Hierarchy of streets is always supported and adopted in all NU neighborhoods in an effort to overcome the traffic problems of the suburban subdivisions. Residential suburban subdivisions are famous for following dendritic streets that relies mostly on collector roads, which carries all vehicular volumes and traffic in and out of the subdivision. Suburban developments rely on branched out curvilinear streets from one main collector street with cul-de-sacs that favor the vehicular movement and needs over walkability and the public realm.

Cul-de-sacs are dead ends that interrupt the flow of the vehicular movement as well as the pedestrian movement, which results in creating longer trips either by car or on foot (Kunstler, 1997). An interconnected street network that follows a grid pattern is always recommended by NU in order to effectively disperse traffic, shorten vehicular and walking trips, and grid street pattern allows more route options. Curvilinear streets also decrease the legibility of a neighborhood. On the other hand, following a grid street pattern enhances the legibility of a neighborhood and encourages walkability (Kunstler, 1997).

NU neighborhoods are famous for including alleyways in their street patterns. Alleyways are narrow streets that have width that ranges between 12-15 feet and are mainly located at the rear of the buildings (Duany et al., 2010). Alleyways are highly effective for two main reasons: 1-they improve the visual appeal of the neighborhoods since they house most of the undesirable visual features in a neighborhood, such as trash receptacles, recycling bins, utility boxes, garages doors, mail boxes, etc., 2- they increase the safety of the residents since fire trucks can have additional pathways to access the houses and buildings (Duany et al., 2010).

Additionally, the designers and founders of NU agree that lot and block sizes affect the social and spatial realms of neighborhoods. Duany et al. (2010) suggest that a variation in lot size can pave the way for including different housing types that can serve a variety of households with different socio-economic structures (Duany et al., 2010). Creating a neighborhood that includes different housing types is more inclusive, healthier and more vibrant in contrast to the suburban subdivision that segregates the community according to housing types and socio-economic backgrounds (Duany et al., 2010).

Such the variation of housing types in a neighborhood enhances a neighborhood's visual interest and creates more interesting street fronts in contrast to the cookie-cutter condition along

the streets in the suburban subdivisions (Duany et al., 2010). New Urbanists claim that visually interesting streets instigate walkability and thus support sustainability and enhance the QoL of residents. The inclusion of mixed uses is another important aspect for improving the residents' QoL in NU neighborhoods. According to New Urbanists, single-use neighborhoods discourage walkability and increase car dependency, which result in affecting negatively the QoL of the public and the environmental quality as well.

Neighborhoods have to provide safe and comfortable access to daily and weekly needs, such as grocery store, public transit shelters, schools, parks, playgrounds, library, doctor's office, etc. within a convenient walking distance (Duany et al., 2010). Accordingly, the designers and founders of NU created the pedestrian shed to increase accessibility to daily and weekly needs on foot. The pedestrian shed is considered to be the distance people are willing to walk before choosing to drive, which is typically a five-minute walk (Duany et al., 2010). A radius measuring  $\frac{1}{4}$  of a mile represents the pedestrian shed, which is approximately 400 meters based on a five-minute walk. According to NU, utilizing the pedestrian shed technique in the initial design phases of a residential development will enhance the accessibility of residents to their daily needs and thus will improve their QoL (Duany et al., 2010).

The pedestrian shed is applied to the distance between the center and edge of the neighborhood (Duany et al., 2010). According to NU, a walkable neighborhood is the neighborhood that allows its residents to identify the center and edge of a neighborhood, and distance between the center and the edges of neighborhood have to be within a  $\frac{1}{4}$ -mile. The pedestrian shed in this case allows not for only increasing accessibility to the center of the neighborhood on foot, but also enhances the legibility of the neighborhood.

### 2.2.3 New Urbanism and Current Issues

Although CNU principles are widely accepted and implemented in urban design and planning practices across the USA (Walters, 2011), many critics find that New Urbanism does not focus much on fulfilling the three dimensions of sustainability (Berke, 2002; Grant, 2006; Kim and Larsen, 2017). For example, Trudeau (2013) states that New Urbanism has failed to meet its social sustainability goals. Critics of NU argue that NU developments fail to offer adequate affordable housing options, and focus much on the physical appearance (Beauregard, 2002; Kim and Larsen, 2017).

Although most of the CNU neighborhood principles, as shown in Table 2.2, are geared towards achieving social sustainability, a large body of research found that NU communities often fail to fully adhere to such principles (Park, 2017). One of the most forceful critiques of NU is that NU generates exclusive and socially homogeneous communities (Trudeau and Malloy, 2011). For example, despite the fact that CNU's goal #13 is to "bring people of diverse ages, races, and incomes into daily interaction" (CNU, 2019, Principle #13), empirical studies have regularly conclude that NU communities home sale prices exceed those of similar conventional subdivisions (Johnson and Talen, 2008; Markley, 2018). Critics of NU assert that the high price of NU subdivisions create exclusive enclaves for the rich in many projects across the United States (Kim and Larsen, 2017; Markley, 2018). Such exclusive NU communities dwindle equity and trigger social and spatial disparities, and also induce gentrification and displacement and create homogenous communities as well (Al-Hindi, 2001; Dill, 2006; Kim and Larsen, 2017; Markley, 2018).



Another critique of NU is that NU contributes to sprawl (Trudeau and Malloy, 2011). Although principles #11 and 15 advocate dense and compact urban form, several urban scholars have suggested that NU developments are just efforts that make suburbs more attractive (Trudeau and Malloy, 2011). Such assertion rests largely on the fact that most of NU projects are located primarily on lands at the urban fringe in suburban settings with low building and population densities (Trudeau and Malloy, 2011). Furthermore, developers often use NU sustainability principles as a strategy to market and sell suburban subdivisions (Park, 2017).

NU movement has also been critiqued for extensively depending on traditional architecture and regulating heavily the built environment (Beauregard, 2002). Beauregard (2002), in *New Urbanism: Ambiguous Certainties*, has described the nostalgic physical appearance of the buildings in NU developments as ‘historical Pastiche’ that has failed to promote unique physical identity and has succeeded instead in promoting ambiguous and inconsistent developments that are highly guarded by the knowledge of experts. NU has been attacked for grounding its principles and design guidelines on the knowledge of experts, mostly architects, and protecting property values through firm homeowner association rules and regulations (Beauregard, 2002). Such regulations limit architectural creativity and possibilities, and also, limit the public’s input (Beauregard, 2002). New urbanism has also been criticized for using embellished architecture and facades that can only be afforded by affluent clientele (Sharifi, 2016).

#### 2.2.4 LEED-ND Certification for Neighborhood Development and Quality of Life

Since the turn of the century, urban sustainability, specifically at the neighborhood scale, has emerged as a crucial solution to address the issue of climate change, improve public health, and improve the overall QoL for residents as well (Garde, 2009; Reith and Orova 2015; Sharifi,

2016). National and local authorities are increasingly supporting efforts to better understand neighborhood's sustainability and livability (Zanella et al., 2015). As such, the development of Neighborhood Assessment Tools (NAT) has spread in the last decade (Reith and Orova, 2015), including local and international systems for evaluating neighborhood sustainability systems (Haapio, 2012). For example, Building Research Establishment Environmental Assessment Methodology (BREEAM) is developed in the United Kingdom; Comprehensive Assessment System for Built Environment Efficiency for Urban Development (CASBEE) is developed in Japan, and Ecodistricts and LEED-ND in the USA LEED-ND (Gouda and Masoumi, 2018) (see Table 2.4).

LEED-ND, a sustainability rating system for neighborhoods, has gained significant recognition as “a gold standard in sustainable development” (Szibbo, 2016) among the urban planning professionals, and around the world, especially in North America (Boeing et al., 2014; Sharifi and Murayama, 2014b; Szibbo, 2016).

NAT are voluntary tools that are applied by the project initiators (Sharifi and Murayama, 2013). NAT tools are considered a third-party evaluation against a number of pre-defined sustainability criteria, providing credibility for the planning project (Wangel et al., 2016). They are shaped to support the planning organization to define and implement sustainability targets early in the process, in order to attain sustainable outcomes (Wangel et al., 2016). Consequently, the certification systems provide a platform and a common language for communication and collaboration between stakeholder groups and promote a joint understanding of the project and its intended outcomes (Sharifi and Murayama, 2013).

**Table 2.4: Well-known Neighborhood Assessment Tools (NAT)**

| <b>Tool</b>                | <b>LEED-ND</b>                                                                                                                             | <b>BREEAM</b>                                                                                                     | <b>Eco-city</b>                                                                                     | <b>SCR</b>                                                                                                                                                                                        | <b>CASBEE-UD</b>                                                                                                                                                                                                                   |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Country of origin</b>   | USA                                                                                                                                        | UK                                                                                                                | Austria, Germany, Finland, Italy, Hungary, Slovak Republic, Spain                                   | Australia                                                                                                                                                                                         | Japan                                                                                                                                                                                                                              |
| <b>Launch date</b>         | 2009                                                                                                                                       | 2009                                                                                                              | 2002-2005                                                                                           | 2007                                                                                                                                                                                              | 2006 (revised 2007)                                                                                                                                                                                                                |
| <b>Founder</b>             | USGBC, CNU, and NRDC                                                                                                                       | Building Research Establishment (BRE)                                                                             | EU research project                                                                                 | Victorian State Government                                                                                                                                                                        | Japan Sustainable Building Consortium (JSBC), and Japan Green Building Council Japan (JaGBC)                                                                                                                                       |
| <b>Certification level</b> | Certified<br>40-49 points<br><br>Silver<br>50-59 points<br><br>Gold<br>60-79<br><br>Platinum<br>80-100 points                              | Unclassified<br><25<br>Pass<br>≥25<br>Good<br>≥40<br>Very good<br>≥55<br>Excellent<br>≥70<br>Outstanding<br>≥85   | E-poor<br>D-Normal practice<br>C-Advanced<br>B-Best practice<br>A-Innovative                        | -                                                                                                                                                                                                 | Poor ≥3<br>Fairly poor=1.5-3.0<br>Good =1.0-1.5<br>Very good =0.5-1.0<br>Excellent <0.5                                                                                                                                            |
| <b>Main Categories</b>     | Smart location and linkages; neighborhood pattern and design; green infrastructure and buildings; innovation and design; regional priority | Climate and energy; resources; place shaping; transport; community; ecology and biodiversity; business; buildings | Context; urban structure; transport; energy flows; material flows; socio-economic issues; processes | Commercial performance measurement; housing affordability performance measurement; well-being performance measurement; urban design excellence performance measurement; environmental measurement | Natural environmental quality in urban development; service function for the designated area; contribution to the local community; environmental impact, and landscape; social infrastructure; management of the local environment |

Note: Adapted from Sharifi and Murayama (2013)

In 2007, the United States Green Building Council (USGBC) in collaboration with the Congress for the New Urbanism (CNU) and the Natural Resources Defense Council (NRDC) developed a new certification program, namely LEED-ND pilot (Aranoff et al., 2013). The goal of this partnership is to launch a national leadership standard for evaluating and rewarding existing and new environmentally superior green neighborhood developments guided by framework of the LEED Green Building Rating System. USGBC was founded in 1993 to promote environmental values and sustainable design in the construction industry (Boeing et al., 2014). The standards developed by USGBC are called the Leadership in Energy and Environmental Design standards (LEED).

LEED has a variety of rating systems, such as: Existing Buildings (EB), New Construction (NC), and Commercial Interiors (CI). These ratings systems evaluate the sustainable performance of a building's operations and performance (Wu et al., 2018). While LEED-ND is developed in an effort to extend LEED's energy and environmental standards sustainability beyond isolated building projects to the scale of neighborhoods (Talen et al., 2013, Wu et al., 2018), USGBC released the latest version of LEED-ND in 2009 (Wu et al., 2018).

LEED-ND certification system is different from other LEED rating systems in terms of site selection. LEED-ND integrates the principles of green buildings, smart growth, New Urbanism into a comprehensive rating system to assess neighborhood performance (Wu et al., 2018). Green building approach regards achieving sustainability in the building's life cycle (Wu et al., 2018). Smart growth refers to the implementation of conservation strategies that are sensitive to the environment to achieve economic and social growth (Wu et al., 2018).

LEED-ND implements a set of metrics to boost neighborhood sustainability through enhancing accessibility, density, social equity, and land-use diversity (Talen et al., 2013). Projects seeking LEED-ND certifications have to be assessed by a LEED-ND Accredited Professional (AP) (Szibbo, 2016). The AP assesses the registered project according to three main categories: Smart Location and Linkage (SLL), Neighborhood Pattern and Design (NPD), and Green Infrastructure and Buildings (GIB). Innovation and Design Process (ID), and Regional Priority (RP) are two optional credit categories. There are 56 prerequisites and credits in the three main point categories, with possible total scoring of 101 points.

NPD category garners most of the total available points (up to 44 points), followed by GIB (up to 29 points, SLL (up to 27 points), ID (up to 4 points), and finally RP (up to 4 points). SLL focuses on the site selection, water body and agricultural conservation, Land Conservation, and floodplain Avoidance. NPD credits are dedicated for compact developments, walkable streets, mixed-income, and diverse communities. GIB focuses on efficient use of resources, storm water management, and renewable energy sources, construction activity pollution prevention and also green certified buildings (USGBC, 2016). ID points are awarded to projects that implement a sustainable practice, for example, one point is awarded to a project for the inclusion of a LEED Accredited Professional designer. Also, ID focuses on the efficient performances of the built environment of a certain project. RP focuses on promoting communities that address environmental, social equity, and public health priorities relevant to the region (USGBC, 2016).

In order for a project to achieve a certified level, the project needs to score 40 to 49 points, and to achieve silver rating 50 to 59 points, and 60 to 79 points for gold rating (USGBC, 2016). Scoring 80 or more points makes the project LEED-ND platinum certified (Szibbo, 2016;

USGBC, 2016). There is no size limit for a project applying for LEED-ND certification; a project can vary between one-third of an acre to more than 1,000 acres (USGBC, 2018). Currently, there are 32 certified LEED-ND plans, and 94 certified LEED-ND built projects in the USA (USGBC, 2016).

This research study focused mainly on assessing and improving the design guidelines for Smart Locations and Linkage (SLL) and Neighborhood pattern and Design (NPD). The other categories in the certification system were shaped to tackle environmental and urban planning issues that were beyond the scope of this research study. Tables 2.5 and 2.6 illustrate the mandated and credited design guidelines for both Smart Locations and Linkage (SLL) and Neighborhood pattern and Design (NPD).

**Table 2.5: Smart Location and Linkage (SLL) Design Guidelines in LEED-ND Certification System**

|                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Smart Location and Linkage (SLL)Category SLL</b><br><b>Prerequisite: Smart location</b> | <p>Option 1: Infill Sites<br/>         Locate the project on an infill site.<br/>         OR<br/>         Option 2: Adjacent Sites with Connectivity<br/>         Locate the project on an adjacent site where the connectivity of the adjacent land is at least 90 intersections per square mile as measured within a 1/2-mile distance of a continuous segment of the project boundary.<br/>         OR<br/>         Option 3: Transit Corridor<br/>         Locate the project on a site with existing or planned transit service such that at least 50% of dwelling units and nonresidential use entrances are within a 1/4-mile walking distance of at least one bus, streetcar, or rideshare stop, or within a 1/2-mile walking distance of at least one public transportation service<br/>         OR<br/>         Option 4: Sites with Nearby Neighborhood Assets<br/>         Include a residential component equaling at least 30% of the project's total building gross floor area and locate the project near existing uses within a 1/4-mile walking distance of at least five uses within a 1/2-mile walking distance of at least seven uses.</p> <p>Option 1: Infill Sites<br/>         Locate the project on an infill site.<br/>         OR<br/>         Option 2: Adjacent Sites with Connectivity<br/>         Locate the project on an adjacent site where the connectivity of the adjacent land is at least 90 intersections per square mile as measured within a 1/2-mile</p> |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 2.5 (cont'd)**

|                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Smart Location and Linkage (SLL)</b><br/> <b>Category</b><br/> <b>SLL</b><br/> <b>Prerequisite:</b><br/> <b>Smart location</b></p> | <p>distance of a continuous segment of the project boundary that constitutes at least 25% of the total project boundary and is adjacent to previous development.</p> <p>Option 1: Infill Sites<br/>         Locate the project on an infill site.</p> <p>OR</p> <p>Option 2: Adjacent Sites with Connectivity<br/>         Locate the project on an adjacent site where the connectivity of the adjacent land is at least 90 intersections per square mile as measured within a 1/2-mile distance of a continuous segment of the project boundary that constitutes at least 25% of the total project boundary.</p> <p>OR</p> <p>Option 3: Transit Corridor<br/>         Locate the project on a site with existing or planned transit service such that at least 50% of dwelling units and nonresidential use entrances are within a 1/4-mile walking distance of at least one bus, streetcar, or rideshare stop, or within a 1/2-mile walking distance of at least one bus rapid transit stop, light or heavy rail station, or commuter ferry terminal.</p> <p>OR</p> <p>Option 4: Sites with Nearby Neighborhood Assets<br/>         Include a residential component equaling at least 30% of the project's total building gross floor area and locate the project near existing uses such that the project boundary is within a 1/4-mile walking distance of at least five uses, within a 1/2-mile walking distance of at least seven uses.</p> |
| <p><b>SLL Credit: Preferred Locations</b></p>                                                                                            | <p>Option 1: Location Type (1-5 points)<br/>         Locate the project in one of the following locations:</p> <ul style="list-style-type: none"> <li>· a previously developed site that is not an adjacent site or infill site (1 point);</li> <li>· an adjacent site that is also a previously developed site (2 points);</li> <li>· an infill site that is not a previously developed site (3 points); or</li> <li>· an infill site that is also a previously developed site (5 points).</li> </ul> <p>OR</p> <p>Option 2: Connectivity (1-5 points)<br/>         Locate the project in an area that has existing connectivity</p> <p>AND/OR</p> <p>Option 3: Designated High Priority Locations (3 points)<br/>         Earn at least 2 points under NPD Credit Housing Types and Affordability, Option 2, Affordable Housing. AND<br/>         Locate the project in one of the following high-priority redevelopment areas:</p> <ul style="list-style-type: none"> <li>· a site listed by the EPA National Priorities List;</li> <li>· a Federal Empowerment Zone site;</li> <li>· a Federal Enterprise Community site;</li> <li>· a Federal Renewal Community site;</li> </ul>                                                                                                                                                                                                                                                              |
| <p><b>SLL Credit: Brownfield Remediation</b></p>                                                                                         | <p>Option 1: Brownfield Site (1 point)<br/>         At a project site identified as a brownfield or where soil or groundwater contamination has been identified, and the local, state, or national authority requires its remediation, perform remediation to the satisfaction of that authority.</p> <p>OR</p> <p>Option 2: High-Priority Redevelopment Area (2 points)<br/>         Achieve the requirements in Option 1.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Table 2.5 (cont'd)**

|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SLL Credit:<br/>Brownfield<br/>Remediation</b>    | AND<br>Locate the project in one of the following high-priority redevelopment areas:<br>EPA National Priorities List, Federal Empowerment Zone, Federal Enterprise Community, Federal Renewal Community, Department of the Treasury Community Development Financial Institutions Fund Qualified Low-Income, Community (a subset of the New Markets Tax Credit Program), U.S. Department of Housing and Urban Development's Qualified Census Tract (QCT) or Difficult, Development Area (DDA), Or a local equivalent program administered at the national level for projects outside the U.S.                                                                                                                                                                        |
| <b>SLL Credit:<br/>Access to<br/>Quality Transit</b> | Locate the project on a site with existing or planned transit (i.e., service with the funding commitments as specified in SLL Prerequisite Smart Location) service such that at least 50% of dwelling units and nonresidential use entrances are within a 1/4-mile walking distance of at least one bus or streetcar stop, or within a 1/2-mile walking distance of at least one bus, streetcar, or rideshare stops or within a 1/2-mile walking distance of bus rapid transit stop, light or heavy rail station, commuter rail station, or commuter ferry terminal and the transit service at the stop(s) in aggregate meets the minimums                                                                                                                          |
| <b>SLL Credit:<br/>Bicycle<br/>facilities</b>        | Option 1: Bikeable Location (1 point)<br>Locate the project such that the project boundary is within 1/4-mile bicycling distance of an existing bicycle network that connects to at least one of the following.<br>· at least 10 diverse uses;<br>· a school or employment center, if the project total floor area is 50% or more residential; or<br>· a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal.<br>All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.<br>AND/OR<br>Option 2: Bicycle Network (1 point)<br>Design the project such that at least 50% of dwelling units and nonresidential use entrances are located on an existing or planned bicycle network |

Note: Adapted from LEED v4 for Neighborhood Development

To better understand the context of LEED-ND scorecard in terms of QoL, the SLL and NPD categories were evaluated according to the ISO categorization as illustrated in Tables 2.7 and 2.8. As shown in Tables 2.8, design principles out of 55 in LEED-ND's scoring template are directly related to spatial quality of neighborhoods.



**Table 2.6: Neighborhood Pattern and Design (NPD) Design Guidelines in LEED-ND Certification System**

|                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Neighborhood Pattern and design (NPD) Category</b><br><b>Prerequisite:</b><br><b>Walkable Streets</b> | Design and build the project to achieve all of the following:<br>a. 90% of new buildings have a functional entry onto the circulation network or other public space, such as a park or plaza, but not a parking lot.<br>b. At least 15% of the block length of the existing and new circulation networks within and bordering the project has a minimum building-height-to-street-centerline ratio of 1:1.5<br>c. Continuous sidewalks or equivalent all-weather routes for walking are provided along both sides of 90% of the circulation network block length within the project, including the project side of circulation network bordering the project.<br>d. No more than 20% of the block length of the circulation network within the project is faced directly by garage and service bay openings.                                                                                                                                                                                                                                          |
| <b>NPD Prerequisite:</b><br><b>Compact development</b>                                                   | Case 1. Projects with Access to Quality Transit<br>For projects with existing or planned transit service that meets or exceeds the 2-point threshold in SLL Credit Access to Quality Transit, build at the following densities, based on the walking distances to the transit service specified in that SLL credit:<br>· for residential components located within the walking distances: 12 or more dwelling units per acre of buildable land available for residential uses;<br>Case 2. All Other Projects<br>Build any residential components of the project at a density of 7 or more dwelling units per acre of buildable land available for residential uses.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>NPD Prerequisite:</b><br><b>Connected and open Community</b>                                          | Case 1. Surrounding Connectivity<br>Locate the project such that the connectivity within 1/4 mile of the project boundary is at least 90 intersections per square mile. Any part of the circulation network that is counted toward the connectivity requirement must be available for general public use and not gated. Gated areas are not considered available for public use, with the exception of education and health care campuses and military bases where gates are used for security purposes.<br>Additionally, any circulation network within the project must be available for general public use and not gated.<br>Case 2. Internal Connectivity<br>Design and build the project such that its internal connectivity is at least 140 intersections per square mile.<br>Design and build the project with at least one through-connection intersecting or terminating at the project boundary at least every 800 feet, or at existing abutting intervals and intersections of the circulation network, whichever is the shorter distance. |
| <b>NPD Credit:</b><br><b>Walkable Streets</b>                                                            | Façades and Entries<br>a. At least 80% of the total linear distance of building façades facing the circulation network in the project is no more than 25 feet from the property line.<br>b. At least 50% of the total linear distance of building façades facing the circulation network in the project is no more than 18 feet from the property line<br>c. At least 50% of the total linear distance of mixed-use and nonresidential                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>NPD Credit:</b><br><b>Mixed-use Neighborhoods</b>                                                     | Locate or design the project such that 50% of its dwelling units are within a 1/4-mile (400-meter) walking distance of the number of uses listed . For projects with no dwelling units, 50% of dwelling units within a 1/4-mile walking distance of the project boundary must be within a 1/4-mile walking distance of the number of uses within the project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Table 2.6 (cont'd)**

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NPD Credit:<br/>Housing Types<br/>and<br/>Affordability</b>                      | <p>Option 1: Diversity of Housing Types (1-3 points)<br/>Include a sufficient variety of housing sizes and types in the project such that the total variety of planned and existing housing within the project achieves a Simpson Diversity Index score greater than 0.5, using the housing categories below. Projects of less than 125 acres may calculate the Simpson Diversity Index for the area within 1/4 mile of the project's geographic center. The Simpson Diversity Index calculates the probability that any two randomly selected dwelling units in a project will be of a different type.</p> <p>AND/OR</p> <p>Option 2: Bicycle Network (1 point)<br/>Include a proportion of new rental and/or for-sale dwelling units priced for households earning less than the area median income (AMI). Rental units must be maintained at affordable levels for a minimum of 15 years. Existing dwelling units are exempt from requirement calculations.</p>                                                                                                                                     |
| <b>NPD Credit:<br/>reduced<br/>Parking<br/>Footprint</b>                            | <p>For new nonresidential buildings and multiunit residential buildings, either do not build new off-street parking lots, or locate all new off-street surface parking lots at the side or rear, leaving building frontages facing the circulation network free of surface parking lots.</p> <p>Use no more than 20% of the total development footprint area for all new off-street surface parking facilities, with no individual surface parking lot larger than 2 acres. For the purposes of this credit, surface parking facilities include ground-level garages unless they are under habitable building space. Underground or multistory parking facilities can be used to provide additional spaces. On-street parking spaces are exempt from this limitation.</p> <p>Provide preferred parking for carpool or shared-use vehicle parking spaces equivalent to at least 10% of the total off-street parking spaces for each nonresidential and mixed-use building on the site. Such parking spaces must be marked and within 200 feet walking distance of entrances to the building served.</p> |
| <b>NPD Credit:<br/>Access to Civic<br/>and Public<br/>Space</b>                     | <p>Locate 90% of planned and existing dwelling units and nonresidential use entrances within a 1/4 mile walk of at least one civic and passive use space. The spaces must be at least 1/6 acre in area. Spaces less than 1 acre must have a proportion no narrower than 1 unit of width to 4 units of length. Projects larger than 10 acres must have a median space size of at least 1 acre.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>NPD Credit:<br/>Access to<br/>Recreation<br/>Facilities</b>                      | <p>Locate or design the project so that a publicly accessible outdoor recreation facility at least 1 acre in area, or a publicly accessible indoor recreational facility of at least 25,000 square feet, lies within a 1/2-mile walking distance of 90% of new and existing dwelling units and nonresidential use entrances. Outdoor recreation facilities must consist of physical improvements and may include "tot lots," and sports fields, such as baseball diamonds.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>NPD Credit:<br/>Community<br/>Outreach and<br/>Involvement (1-<br/>2 points)</b> | <p>Option 1: Community Outreach (1 point)<br/>Engage the community in redesigns and preliminary design. Each activity must be led by the development team and be directly related to the LEED ND project.</p> <p>AND/OR</p> <p>Option 2: Charrette (2 points)<br/>Comply with Option 1 and conduct a design charrette or interactive workshop of at least two days that is open to the public and includes, at a minimum, participation by a representative group of nearby property owners, residents, business owners, and workers in the preparation of conceptual project plans and drawings.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 2.6 (cont'd)**

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | <p>AND/OR</p> <p>Option 3: Endorsement Program (2 points)</p> <p>Comply with Option 1 and obtain an endorsement from an ongoing local or regional nongovernmental program that systematically reviews and endorses smart growth development projects under a rating or jury system.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>NPD Credit:<br/>Local Food<br/>Production (1<br/>point)</b> | <p>Option 1: Community Gardens (1 point)</p> <p>Dedicate permanent and viable growing space or related facilities (such as greenhouses) within the project. Ensure solar access and provide fencing, watering systems, garden bed enhancements (such as raised beds), secure storage space for tools, and pedestrian access for these spaces.</p> <p>AND/OR</p> <p>Option 2: Community Supported Agriculture (1 point)</p> <p>Purchase shares in a community-supported agriculture program located within 150 miles of the project site for at least 80% of dwelling units within the project (exclusive of existing dwelling units). Each counted dwelling unit must receive CSA service for at least two years, beginning when it is occupied.</p> <p>AND/OR</p> <p>Option 3: Proximity to Farmers Market (1 point)</p> <p>Locate the project's geographic center within a 1/2-mile walking distance of an existing or planned farmers market that is open or will operate at least once weekly for at least five months annually. Farmers market vendors may sell only items grown within 150 miles of the project site.</p> |

Note: Adapted from LEED v4 for Neighborhood Development

**Table 2.7: Impacts of Smart Location and Linkage (SLL) Design Sub-categories on Sustainability Dimensions and Quality of Life (QoL)**

| <b>Smart Location and Linkage (SLL) sub-categories</b>                    | <b>Points</b> | <b>Environmental</b> | <b>Economic</b> | <b>Social</b> | <b>Spatial QoL</b> |
|---------------------------------------------------------------------------|---------------|----------------------|-----------------|---------------|--------------------|
| Smart Location                                                            | Prereq        | x                    | x               | -             | x                  |
| Imperiled Species & Ecological Communities Conservation (SLLp)            | Prereq        | x                    | -               | -             | x                  |
| Wetland & Water Body Conservation (SLLp)                                  | Prereq        | x                    | -               | -             | -                  |
| Agricultural Land Conservation (SLLp)                                     | Prereq        | x                    | -               | -             | -                  |
| Floodplain Avoidance (SLLp)                                               | Prereq        | x                    | x               | x             | x                  |
| Preferred Locations (SLLc)                                                | 1-10 points   | x                    | x               | -             | x                  |
| Brownfield Remediation (SLLc)                                             | 1-2 points    | x                    | -               | x             | x                  |
| Access to Quality Transit (LTc)                                           | 1-7 points    | x                    | -               | x             | x                  |
| Bicycle Facilities (LTc)                                                  | 1-2 points    | x                    | -               | x             | x                  |
| Housing and Jobs Proximity (SLLc)                                         | 1-3 points    | -                    | x               | x             | x                  |
| Steep Slope Protection (SLLc)                                             | 1 point       | x                    | -               | -             | x                  |
| Site Design for Habitat or Wetland and Water Body Conservation (SLL)      | 1 point       | x                    | -               | -             | -                  |
| Restoration of Habitat or Wetlands and Water Bodies                       | 1 point       | x                    | -               | -             | x                  |
| Long-Term Conservation Management of Habitat or Wetlands and Water Bodies | 1 point       | x                    | x               | -             | -                  |

**Table 2.8: Impacts of Neighborhood Patterns and Design (NPD) Sub-categories on Sustainability Dimensions and Quality of Life (QoL)**

| <b>Neighborhood Pattern and Design (NPD) Sub-Category</b> | <b>Points</b> | <b>Environmental</b> | <b>Economic</b> | <b>Social</b> | <b>Spatial QoL</b> |
|-----------------------------------------------------------|---------------|----------------------|-----------------|---------------|--------------------|
| Walkable Streets                                          | Prereq        | -                    | -               | x             | x                  |
| Compact Development                                       | Prereq        | x                    | x               | x             | x                  |
| Connected and Open Community                              | Prereq        | -                    | -               | x             | x                  |
| Walkable Streets                                          | 1-9 points    | -                    | -               | x             | x                  |
| Compact Development                                       | 1-6 points    | -                    | -               | x             | x                  |
| Mixed-Use Neighborhoods                                   | 1-4 points    | x                    | -               | x             | x                  |
| Housing Types and Affordability                           | 1-7 points    | -                    | x               | x             | x                  |
| Reduced Parking Footprint                                 | 1 point       | x                    | -               | x             | x                  |
| Connected and Open Community                              | 1-2 points    | -                    | -               | x             | x                  |
| Transit Facilities                                        | 1 point       | -                    | -               | x             | x                  |
| Access to Civic and Public Space                          | 1 points      | -                    | -               | x             | x                  |
| Transportation Demand Management                          | 2 points      | x                    | x               | -             | -                  |
| Access to Recreation Facilities                           | 1 point       | -                    | -               | x             | x                  |
| Visitability and Universal Design                         | 1 point       | -                    | -               | x             | -                  |
| Community Outreach and Involvement                        | 1-2 points    | -                    | -               | x             | x                  |
| Local Food Production                                     | 1 point       | x                    | x               | x             | x                  |
| Tree-Lined and Shaded Streetscapes                        | 1-2 points    | x                    | -               | x             | x                  |
| Neighborhood Schools                                      | 1 point       | -                    | -               | x             | x                  |

### 2.2.5 Differences between New Urbanist and LEED-ND Certified Neighborhoods

Researchers identify some differences between New Urbanist and LEED-ND certified neighborhoods, despite the integration of NU principles in LEED-ND rating system. For example, many New Urbanism projects are located in suburban areas, and the focus is given mostly to the dynamics of the urban form (Lewin, 2012). New Urbanists state that such leapfrog developments in suburban settings are still considered a suitable development as long as its urban form is compatible with the New Urbanism principles (Lewin, 2012). In contrast, LEED-ND rating puts a great emphasis on Smart Growth location category, and it is a prerequisite to obtain a certification for LEED-ND (Lewin, 2012). The sub-categories of LEED-ND are built upon the foundation of CNU's urban design guidelines, USGBC's materials and land use considerations, and also NRDC's environmental concerns and policies to guide effectively growing cities (USGBC, 2010).

Also, LEED-ND places an emphasis on developing brownfields. According to Sharifi and Murayama (2013), there are 50% of the certified projects have been developed on brownfield sites, which is a significant improvement compared to New Urbanism. The inclusion of some prerequisites in LEED-ND certification, such as: certified green building, minimum building energy performance, indoor water use reduction, and construction activity pollution prevention is another difference between LEED-ND certified neighborhoods and NU neighborhoods. Another difference between the New Urbanism and LEED-ND neighborhood initiatives is that there is no minimum project size for a LEED-ND certified project; yet, a project of 320 acres is considered the maximum size (Szibbo, 2016). Similarly, there is no minimum number of buildings required for a LEED-ND certified project, but at least half of a project's total building square footage must be new construction or major renovation (Talen et

al., 2013). Small infill developments can be also candidates for LEED-ND certified neighborhoods, only if they can complement existing neighborhoods (Garde, 2009).

Another difference related to the building prototypes in New Urbanism neighborhoods is that NU places a great emphasis and restrictions on the housing units design (Walters, 2011). New Urbanism is based on reviving not only the urban fabric of traditional neighborhoods, but also its architectural elements that enhances the public realm, such as different sizes of plazas, front porches, and back alleys reserved for cars, to keep the streets as stages of uninterrupted social interactions (Walters, 2011). New Urbanism controls such design criteria through assigning codes based on the transect zones (Walters, 2011). They also impose regulations and controls on the design of fences, placement of street furniture, and the color of buildings. This type of architectural and aesthetic control is absent in the LEED-ND rating system.

Another difference between the two types of neighborhood is that NU does not have a prerequisite for including energy efficient buildings, while the inclusion of green building is required for gaining LEED-ND certification. LEED-ND certification system awards points for design, and architectural innovations unlike NU neighborhoods, which are controlled by Neo-Traditional architecture (Sharifi, 2016). Also, some scholars argue that NU projects are largely homogenous communities in terms of socio-economic status, while LEED-ND certified projects are more socially inclusive (Freybote et al., 2015; Sharifi, 2016).

#### 2.2.6 LEED-ND Certification and Current Issues

According to literature review, many studies have identified a number of shortcomings with LEED-ND certification system. For example, Wangel et al. (2016) reported a gap in structuring, categorizing, and weighing criteria in LEED-ND certification system in terms of social sustainability when compared to other neighborhood assessment tools (Wangel et al.,

2016). Diaz-Sarachaga et al. (2018) have concluded that the prerequisites in LEED-ND rating system focuses mainly on managerial and environmental dimensions and ignores the economic and social dimensions. A scholarly review of the different NST, including LEED-ND, has concluded that these tools successfully LEED-ND has been attacked for successfully allocate credits for resource and energy conservation through the built environment, but they give less weight to economic development and social goals (Aranoff et al., 2013).

In a study by Arslan et al. (2016), they conclude that LEED ND is better than BREEAM in terms of application, because it gives more freedom to developers and stakeholders to meet the required standards. Happio (2012) states that such freedom leave significant sustainability aspects unaddressed, and in some cases, developers have the freedom to neglect non-mandatory issues. In many cases, developers use LEED-ND for marketing purposes.

Table 2.9 shows that the inclusion of affordable housing in new development worth 1-7 optional points. In a study regarding the evaluation of the social equity dimension of LEED-ND, Szibbo (2016) argues that the rating system of LEED-ND merely supports affordable housing. The study reveals that only 40% of LEED-ND certified projects include affordable housing, which leads to low social equity and thus weakens QoL. Also, Aranoff et al. (2013) argue that LEED-ND standards emphasize aesthetic qualities of the built environment over the social and political factors.

Other studies conclude that LEED-ND is biased in favor of ecological sustainability over social and economic sustainability (Sharifi and Murayama, 2013; Wangel et al., 2016). Most importantly, a high proportion of significant aspects of social sustainability are under weighted, and non-mandatory in LEED-ND scorings, and sometimes not addressed (Haapio, 2012; Wangel



et al., 2016). Haapio (2012) developed a study comparing between BREEAM Communities, CASBEE Urban Communities, and LEED-ND.

In the comparison, Haapio (2012) used seven common themed categories among the three systems, which are: infrastructure, location, transportation, resources and energy, ecology, business, economy, and employment, and finally well-being. According to the comparison, LEED-ND scored the least in terms of well-being and quality of life, and the highest in terms of ecology when compared to BREEAM Communities and CASBEE Urban Communities.

In a study by Arslan et al. (2016), they conclude that LEED-ND is better than BREEAM in terms of application, because it gives more freedom to developers and stakeholders to meet the required standards. Haapio (2012) states that such freedom leave significant sustainability aspects unaddressed, and in some cases, developers have the freedom to neglect non-mandatory issues, which Haapio called 'credit hunting'. In many cases, developers use LEED-ND for marketing purposes.

### 2.3 Spatial Characteristics for Better of Quality of Life

As mentioned earlier, this research study focused primarily on the physical dimensions of QoL with the focus on the spatial characteristics of residential neighborhoods and their impact on QoL. There is no single definition for a good urban form, but in general, a good urban form that yields better QoL is universally defined as the physical arrangement that contributes to social justice, provide desirable and healthy living settings, and responsive to the changing socio-economic dynamics and environmental context (Ahmed, 2017).

A good urban form stimulates social vibrancy, social equity, and spatial livability (Ahmed, 2017; Lynch, 1981). According to the literature, a good urban form can substantially contribute in creating thriving communities and places (Lynch, 1981; Gehl, 1987). There is an

agreed upon set of guiding themes to achieve better QoL through urban form, based on the works of the pioneer urban scholars, such as Lynch, Jacobs, and Appleyard, and Newman. (Balsas, 2004; Eizenberg and Jabareen, 2017; Maleki et al., 2015; Wheeler, 2001). The themes include: safety, comfort, equity and inclusiveness, accessibility, proximity, vibrant and active, historic celebration and continuity, and aesthetic quality (Maleki et al., 2015; Oberlink, 2006). According to the pioneers of urban design, the physical arrangements of neighborhoods have to provide safe and comfortable environments for its residents. Urban forms of residential neighborhoods also have to include vibrant and inclusive public spaces and places to support socialization and to host communal activities. Neighborhoods also have to offer access to public services through providing different modes of transportation.

Lynch (1981) highlights five basic characteristics of a livable urban form that results in better QoL, which he named the “performances dimensions.” The five dimensions are: vitality, sensitivity, fit, accessibility, and control. Vitality is the degree to which the city sustains a sufficient supply of the essential, biological requirements of human beings, including water, air, energy, and food (Lynch, 1981). Sense is the degree of fit between the physical form and the way people recognize and organize it in their minds (Lynch, 1981). Fit, according to Lynch, refers to the harmony between the function or activity and the physical built form (Lynch, 1981). Accessibility includes the ability to reach transportation, to access other functions, such as public facilities, commercial services, etc., the ability to access other people, and the ability to create a constant interaction between city entities (Lynch, 1981). Control is the degree to which the users or the residents control their surrounding built environment. People feel in control when there is enough social and physical space to do what they need to do (Lynch, 1981).

Krieger (2008) in *The Virtues of Cities* has also identified some characteristics of a good urban form of neighborhoods in cities, such as: density, propinquity, juxtaposed realms, neighbors unlike ourselves, social landmarks, texture, detail and narrative, connectivity, street fronts, public life, and adaptability (Kelbaugh and McCullough, 2008). Newman et al. (1999) stated that livability and QoL are based on the human need for social comfort, and health. In other words, livability encompasses individual and community wellbeing. Livability is the degree to which a built environment supports the individual and overall well-being. For example, livability is concerned with how a place is being enjoyed, how accessible it is, and how safe it is (Wey and Wei, 2015). Physical safety is more concerned about diseases, poisons, etc. (Lynch, 1981) psychological and social safety is more about safety against violation attacks, and safety against the prevention of human basic needs, such as food, water, etc. (Lynch, 1981).

Jacobs (1961) in *The Death and Life of Great American Cities* argued that in order to have lively and livable neighborhoods, with decent standards of QoL, there should be “eyes on the street,” by which she means surveillance (Jacobs, 1961). Safety is a crucial dimension for obtaining livable neighborhoods. Oscar Newman (1973) in his book, *Defensible Space*, confirmed Jacob’s concept regarding the importance of constant surveillance on the streets, which in turn increases neighborhood territoriality, and liveliness. Jacobs (1961) also favored the accumulation of history, density, and intensity over the repetitive towers of the Radiant City, and its underused parks, and mono-functional urban fabric of the Corbusian City. Jacobs (1961) stressed the importance of diversity and intensity for achieving vital, safe, and livable city neighborhoods. According to Jacobs (1961), a dynamic street life leads to safer neighborhoods and creates more vibrant cities, through providing primary and secondary uses used all year long. Safer streets engender walkability.

Reduced crime is part of social well-being. A study done by Blakely and Snyder (1999), regarding crime protection techniques, offered that police, and managerial plans, in addition to social interactions and physical designs are also crucial tactics to improve the perception of safety among residents (Kim and Seidel, 2012). Kim and Seidel (2012) suggest in a study done on perceived safety in apartment buildings that to improve residents perceived and actual safety from crime, housing properties must adopt not only managerial efforts, but also architectural interventions that attain social interactions, and that enhances territoriality. According to their study, sense of community and neighborhood attachment, territorial characteristics (such as segregation and protection from the outside, hierarchy of spaces, etc.), resident homogeneity, bright lighting at night, visual access to local police, and direct visual access to public spaces increases perceived and actual safety among residents (Kim and Seidel, 2012).

Jacobs (1961) discusses some valuable recommendations to achieve pedestrian safety in *The Death and Life of American Cities*, such as the importance of having ‘eyes on the streets,’ which resembles natural surveillance. Natural surveillance or ‘eyes on the street’ for Jacobs is a combination of intense diverse uses (morning and night uses like cafes, grocery stores, bars, etc.), and public spaces along sidewalks (Jacobs, 1961). According to Jacobs (1961), unsafe streets that are not safe contain blank walls, high fences, and parking lots.

Oscar Newman (1973) in *Defensible Space* confirmed Jacob’s concept regarding the importance of constant surveillance on the streets, which in turn increases neighborhood territoriality, and liveliness. Jacobs (1961) also favored the accumulation of history, density, and intensity over the repetitive towers of the Radiant City, and its underused parks, and mono-functional urban fabric of the Corbusian City. She stressed the importance of diversity and intensity for achieving vital, safe, and livable city neighborhoods. According to Jacobs (1961), a

dynamic street life leads to safer neighborhoods and creates more vibrant cities, through providing primary and secondary uses used all year long. Safer streets engender walkability.

Weinstein et al. (2008) argued that accessibility, distance, and safety are considered the important factors for the pedestrian's route choice. The street quality or the walking quality also affects walking patterns, such as, street width, presence of trees, connectivity of sidewalks, number of street lanes, and cross walks. Ewing et al. (2005) identified six variables to engender walkability, which are: imageability, enclosure, human scale, transparency, complexity and tidiness (Ewing et al., 2005). Alfonzo developed 5 main of walkability, including feasibility, accessibility (sidewalk connectivity and pattern), safety, comfort, and finally, pleasurability (architectural coherence and aesthetic appeal) (Alfonzo, 2005). It is obvious that some drivers of walkability are, in fact, qualitative in nature and difficult to measure.

Krieger (2008) states that a good city form provides a wide spectrum of choices to people through an interesting pattern of mixed uses because people like to live, work, play, dine, relax, shop, etc. at the same place (Kelbaugh and McCullough, 2008). Also, Krieger stresses the importance of the juxtaposition of diverse housing types is crucial to accommodate different ages, and social/economic groups. Jacobs (1961) identified four conditions to generate a diverse and livable neighborhoods through: First, the district, and most of its internal parts, must serve more than one primary function to insure the presence of people on different schedules, Secondly, most blocks of an urban form must be short to increase choices for people and to enhance accessibility, Thirdly, a mix of buildings that are different in age, condition, and type. According to Jacobs (1961), such mix does not only enhance visual diversity, walkability, sense of place, and social interactions but also ameliorates social and economic stratification and

increases the adaptability of land use and buildings. Lastly a dense concentration of people with different purposes is another key element for achieving diversity (Jacobs, 1961).

Access is the ease of reaching the different functions and activities of a settlement such as services, information, destinations, and other persons with minimum time and effort (Lynch, 1981). The type of the street network, number of street intersections, and the width of streets and sidewalks affect the movement of users in a given area. For example, street patterns that follow a narrow iron grid pattern, with short blocks, lead to more permeability and accessibility (Lynch, 1981). Four-way intersections offer more directness of movement to a destination, while T-junctions reduce choices of movement (Kelbaugh, 2002; Porta and Renne, 2005). Distance to public transit and services are also crucial indicators for achieving a good city form, and therefore inducing walkability (Kelbaugh, 2002; Porta and Renne, 2005), while the presence of myriad of cul-de-sacs disrupt the flow of movement and discourages walkability and affects the legibility of a given urban form (Kelbaugh, 2002).

Accessible urban form refers to the visibility of a place from a distance and its easy circulation (Kelbaugh, 2002). Great neighborhoods are those that are connected directly to public transportation systems, and those that consider the accessibility of the physically challenged, for children and the elderly (Kelbaugh, 2002). According to Krieger (2008), it is hard to sustain social cohesion and engagement when buildings and uses are spread out (Kelbaugh, 2002). Proximity between uses and activities increases social contact and decreases the need for commuting (Kelbaugh and McCullough, 2008). The accessibility of parks and public spaces are also important influences on livability (Maleki et al., 2015).

A rich urban form with diverse public spaces is another pillar of creating livability of neighborhoods. The idea of creating vibrant public spaces for lively neighborhoods can be traced back to William Whyte's publication *The Social Life of Small Urban Spaces* in 1980, and in the work of Jan Gehl's. Whyte (1980) and Gehl (1987) are considered among the first researchers to provide insights about observing and documenting how people use public spaces, and identifying a relationship between the space's design from street furniture, spatial design and the human needs. In Whyte's observations, he asserts that the flexibility of seating places and the diversity of landscape elements lead to increasing the comfort and the use of the space (Whyte 1980).

Whyte (1980) suggests that a diverse choice of seating options, presence of trees, and water elements encourages people to stay and use outdoor public spaces public outdoor spaces. According to Whyte (1980), to create great public spaces for people, they have to have four key qualities: sociability, uses and activities, access, and comfort. Comfort refers to the physical arrangement of a space and its diverse provision of sitting choices, uses, and activities.

Neighborhood design affects physical activity and thus affects walking behaviors (Zuniga-Teran et al., 2017). Walking increases social interaction among neighbors, which can possibly lead to creating a sense of familiarity, and trust in neighborhoods. Sense of community is one main cause for improving social health (Zuniga-Teran et al., 2017). Physical activity, especially walking, has significant effect on psychological well-being (Deka, 2018; Zuniga-Teran, 2017). Walking reduces stress and is linked to better moods. In general, there are two different motivations for walking: walking for recreation and walking for transportation. The sole purpose of walking for recreation is to exercise, relax, and for leisure (Zuniga-Teran et al., 2017). Whereas walking for transportation refers to the walking trips for the purpose of reaching a destination (Zuniga-Teran et al., 2017). Well-being is also linked to nature-health nexus.

Shared natural open space spaces and direct connection with green spaces and nature increases not only social cohesion, but also improve mental and physical health (Zuniga-Teran et al., 2017). Natural open spaces enhance thermal comfort and thus induce walking ((Zuniga-Teran et al., 2017).

Human scale is another factor that encourages walkability and enhances the pedestrian's experience (Ewing and Clemente, 2013). Human scale includes the size, position and arrangement of physical elements that are comfortable for human use and that match human's size and proportions (Ewing and Clemente, 2013). It is important to include visual and physical details to the surrounding physical surfaces that correspond to the speed of human walk. Narrow streets, intimate spaces, and moderate buildings' bulks contribute greatly to the experience of pedestrians through using appropriate human (Ewing and Clemente, 2013). It is important to add appropriate setbacks for taller buildings, and to add trees and more architectural details to lower floors of the tall buildings, in order to moderate the scale of buildings, and streets as well (Ewing and Clemente, 2013).

The design and aesthetic qualities of the landscape and the built environment are other factors for enhancing livability (Lynch, 1981). According to Weber et al. (2008), not only the infrastructural qualities influence the effectiveness of our neighborhoods and streets, but also their aesthetic values play a crucial role in influencing the effectiveness and livability of streets (Weber et al., 2008). For Lynch it is important to wed aesthetics with social values (Lynch, 1981). Such concept has been widely accepted now as "Place-making." The idea of place-making sparked in mid 1960s, in the works of great urban planning mentors like Jacobs, William Whyte and Lynch.



The term place-making started to be widely used by city designers through mid 1990s, and spurred attempts in creating more livable and walkable cities through urban design (Project for Public Spaces, 2018). Place-making is a design technique committed to increasing the connection between people and places, through collaborative coordination among citizens, organizations, developers, planners, and policy makers (Project for Public Spaces, 2018). According to urban scholars, there is no definitive definition for place-making, but rather place-making is better defined as an inclusive social agenda that has key aspects and objectives to enhance and to meet the spatial, social, spiritual, and cultural qualities and needs of a place (Fincher et al., 2016; Project for Public Spaces, 2018). Place-making is about creating places to improve social and spatial conditions of communities, building places for individuals to enjoy and participate, empowering communities through strengthening their social ties and everyday interactions, and highlighting their unique identity and assets.

In a study done by Cavalcante et al. (2014) that aimed at identifying the relationship between street complexity and pedestrians walking patterns, they found that pedestrians are inclined to choose streets that have complex scenes containing an array of visual characteristics preference. According to Cavalcante et al. (2014), visual street complexity compromises shapes, and textures that are in contrast to the surroundings.

Jacobs (1961) encouraged visual diversity and asserted the importance of including different textures, styles, and colors in a lively streetscape, such as different housing types, different building ages, etc. Enhancing the experience of the public is a basic asset for good urbanism through creating interesting visual and physical interruptions in an urban form (Kelbaugh and McCullough, 2008). It is also important to represent something that is specific and identifiable to a community, which consequently can make people more attached to their

neighborhoods and cities (Kelbaugh and McCullough, 2008). The rich details and textures of neighborhoods bolster the overall city's public realm (Kelbaugh and McCullough, 2008).

Place-making is a design technique committed to increasing the connection between people and places that was lost due to suburbanization and prioritizing automobiles over people (Freidman, 2010). According to Friedman (2010), although place attachment and sense of belonging are both invisible traits, tangible physical places, especially places that emphasize place making, results in increasing sense of belonging and place attachment.

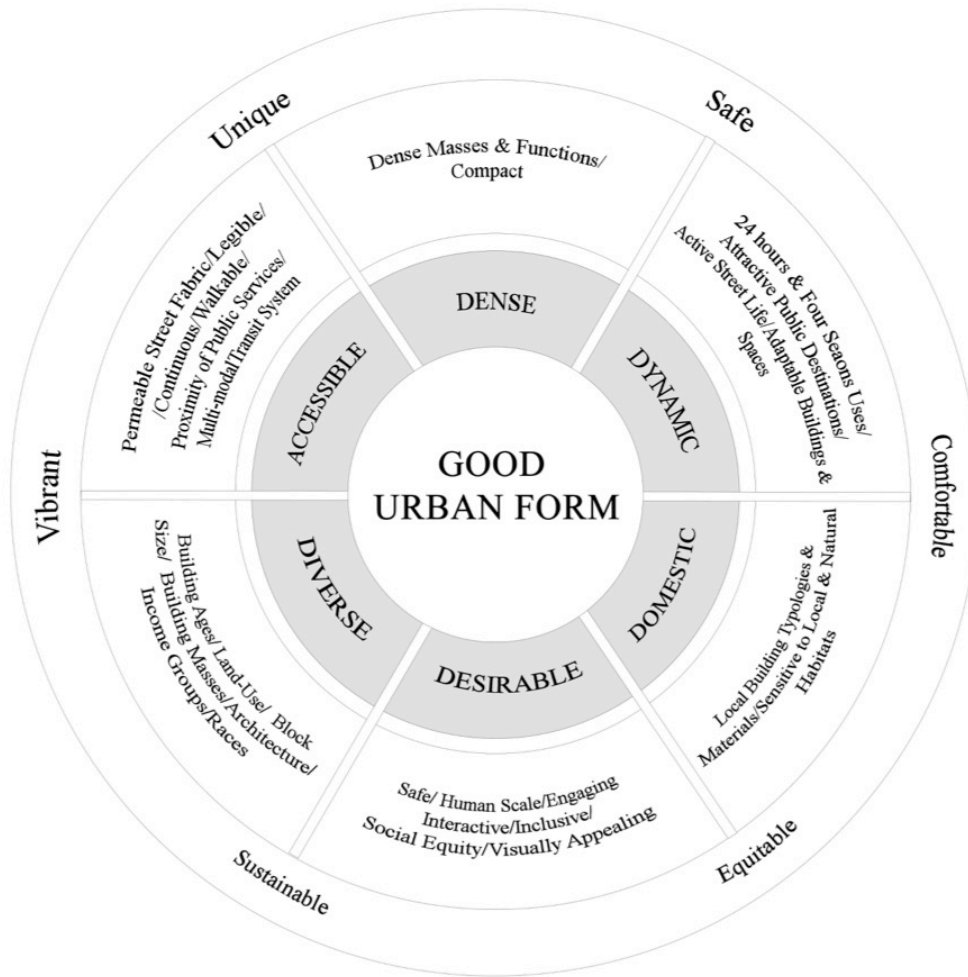
Place attachment impacts the individual's well-being and his/her QoL as well (Scannell and Gifford, 2010; Wirth et al., 2015). Place attachment is a multi-faceted concept that is influenced by three main features, which are: the personal characteristics, the place characteristics, and the psychological processes involving the perception and the experience of place (Scannell and Gifford, 2010; Wirth et al., 2015). This research study focused mainly on the effect of place characteristics on the residents' neighborhood attachment degree.

Neighborhood attachment has an equivalent definition to place attachment, which is defined as the establishment of emotional bond between individuals and specific places. Neighborhood attachment is created through not only social processes but also through psychological processes that happen between the individual and the place (Kelbaugh and McCullough, 2008). The physical environment plays a pivotal role in enhancing neighborhood attachment and sense of belonging (Kelbaugh and McCullough, 2008). Architecture and urban design can highly influence the subjective characteristics of place and neighborhood attachment but ultimately the outcomes are heavily reliant upon the resident's perception (Kelbaugh and McCullough, 2008).

Both the architectural design feature of the built environment and its physical configurations that involves the juxtaposition of different land-uses that induce socialization can highly impact neighborhood attachment (Scannell and Gifford, 2010; Wirth et al., 2015). Memorable places also trigger place attachment and psychological bonds between residents and places (Brown et al., 2003). Ewing and Clemente (2013) name this urban design quality of having a distinct and memorable place as “imageability.”

A place that has high imageability, always has some unique, recognizable physical elements, such as landmarks, unique street furniture, etc. It is a place that has a spatial arrangement composed of smaller spatial elements that make the whole place coherent and easily identifiable (Ewing and Clemente, 2013). According to Lynch (1960), a highly imageable city has an overall recognizable pattern with distinct parts. Lynch (1960) states that to be imageable, it must have the five elements of physical legibility, which are: paths, edges, districts, nodes and landmarks.

Figure 2.1 illustrates the recommended spatial characteristics for creating better QoL according to the literature review. It is recommended to create an urban form for residential neighborhoods that is safe, comfortable, equitable, sustainable, unique, and vibrant. Table 2.9 illustrates a list of design guidelines to yield better QoL in neighborhoods through urban form. This list unfolds the design recommendations based on urban studies literature review, CNU principles and design guidelines and LEED-ND certification design guidelines. The recommended list of design guidelines were divided into main eight characteristics, namely, safe environment, comfortable environment, accessibility to public transit services and other public services, pedestrian oriented streets, permeability and connectivity of street networks, legible layouts, equity and community identity, and finally physical and visual diversity.



**Figure 2.1 : Spatial Characteristics of Good Urban Form**  
(Figure credit to author)

**Table 2.9: Spatial Features for Better Quality of Life in Neighborhoods**

| <b>Spatial Features</b> | <b>Core Concept &amp; Design Recommendations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Safe environment        | <ol style="list-style-type: none"> <li>1. Use traffic calming techniques (speed bumps, brightly painted crosswalks, bulb outs, traffic safety signs, roundabouts, etc.), near residential areas, public spaces, playgrounds, etc.</li> <li>2. Utilize rumble strip to provide visual cues to alert drivers to areas that require special care (shopping centers, freeways undergoing construction work, schools, entrances to residential neighborhoods). Utilize materials like roughened granite and concrete</li> <li>3. Ensure provision of ADA sidewalks with appropriate ramps</li> <li>4. Include natural surveillance (eyes on the street) through mixed use</li> <li>5. Provide proper lighting for open green spaces, parking areas, and along walking/bike trails</li> <li>6. Surround parking areas and green spaces by diverse services/uses</li> <li>7. Avoid multiple lane boulevards (more than 4 lanes)</li> <li>8. Minimize vacant lots, parking lots, driveways (dead spaces) on streets</li> <li>9. Include on-street parking and planted medians</li> <li>10. Ensure safe neighborhoods for kids to play, for example through using traffic calming signs near playgrounds</li> <li>11. Ensure that the of number and location of residential entrances are few and under surveillance/control (using surveillance cameras, location of gateways, etc.)</li> <li>12. Consider designing apartment buildings with secured entrance to the building (entrances should be secured with main doors)</li> <li>13. Consider designing neighborhood streets with mandatory porch/garage lights</li> <li>14. Include buffered sidewalks and bike lanes from streets to increase safety of pedestrians on busy streets, such as tree linings, etc.</li> <li>15. Ensure the continuity and maintenance of sidewalks</li> <li>16. Ensure the continuity and maintenance of bike lanes/trails</li> </ol> |
| Comfortable environment | <ol style="list-style-type: none"> <li>1. Ensure pedestrian's comfort from unpleasant climate/experiences (wind/draft, rain/snow, pollution, glare, noise, dust, etc.), for example through using heat island reduction techniques</li> <li>2. Comfortable outdoor spaces</li> <li>3. Include proper furniture for public spaces with different choices for seating, appropriate lighting, etc. to induce invitations to gather</li> <li>4. Provide ease of movement for all ages, and for people of different motor capabilities</li> <li>5. Avoid steep slopes and dangerous terrains for bike lanes and pedestrian trails</li> <li>6. Include possibilities for hearing/talking/playing/standing/sitting</li> <li>7. Decrease/limit Noise level, such as low level of car traffic on neighborhood streets</li> <li>8. Quality of air</li> <li>9. Ensure the provision of recycling bins and trash bins around playgrounds and throughout the neighborhood</li> <li>10. Consider including signs to minimize construction noise (signs for no construction trucks allowed in the community)</li> <li>11. Consider designing sidewalks with appropriate buffer zone from streets to decrease noise from streets when needed</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Table 2.9 (cont'd)**

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accessibility to safe and comfortable public transit facilities | <ol style="list-style-type: none"> <li>1. Easy access to public transportation from residential areas</li> <li>2. Easy access to public transportation from residential areas</li> <li>3. Easy access to public transit from commercial clusters</li> <li>4. Consider locating public transit stops in safe places</li> <li>5. Consider the comfort of users when using to public transit services</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Pedestrian oriented streets through Human Scale/ Enclosure      | <ol style="list-style-type: none"> <li>1. Ensure that total width of the street, building-to-building, should not exceed the building heights in order to maintain a comfortable feeling of enclosure.</li> <li>2. Include pedestrian-scale street furniture, such as small planters</li> <li>3. Include closely spaced trees along wide streets and tall buildings</li> <li>4. Include on-street parking and planted medians</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                       |
| Permeable and connected street networks                         | <ol style="list-style-type: none"> <li>1. Avoid cul-de-sac</li> <li>2. Consider the provision and dominance of more 4-way intersections in the street network</li> <li>3. Consider designing short blocks for short routes and more choices</li> <li>4. Easy access to recreation facilities, including parks, plazas, shopping facilities,</li> <li>5. Easy access to sport Facilities</li> <li>6. Easy access to job opportunities</li> <li>7. Easy access to cultural facilities</li> <li>8. Easy access to public services</li> </ol>                                                                                                                                                                                                                                                                                                      |
| Legible & Imageable layouts                                     | <ol style="list-style-type: none"> <li>1. Include appropriate/unique way-finding signage system</li> <li>2. Include landmarks, public art, clear edges, and distinctive districts/buildings</li> <li>3. Include memorable architecture and/or different architectural/use features, such as complex shapes, large</li> <li>4. sizes, and high use, etc.</li> <li>5. Provide memorable destinations such as unique plaza design, outdoor amphitheaters, etc. and include urban design elements that increase the sense of place</li> <li>6. Clearly distinguish between private and public spaces</li> <li>7. Design gateways for entrances</li> <li>8. Avoid organic street designs and use iron grid street pattern</li> <li>9. Include urban design elements that increase the sense of place</li> </ol>                                     |
| Equity and Community identity                                   | <ol style="list-style-type: none"> <li>1. Include affordable housing</li> <li>2. Include different dwelling sizes</li> <li>3. Engage community in design stages</li> <li>4. Include public and civic spaces to celebrate community identity and international and national festivals and to encourage interaction among neighborhoods</li> <li>5. Include green spaces that are good for community gardens and other community local food production</li> <li>6. Develop brownfields</li> <li>7. Preserve historic buildings, and/or historic landscapes for public pride, and for reuse</li> <li>8. Proximity between public housing and public facilities and services</li> <li>9. Include destinations with sufficient diversity of uses</li> <li>10. Include focal points/nodes that attract people for a variety of activities</li> </ol> |

**Table 2.9 (cont'd)**

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical/<br>Visual<br>Diversity | <ol style="list-style-type: none"><li>1. Provide of a mixture of lot sizes</li><li>2. Provide hierarchy of public spaces and streets</li><li>3. Include pedestrian-scaled unique designs for streetlights, fountains, benches, special paving, even public art</li><li>4. Include pedestrian-friendly signage system that offer a variation of sign designs (shape, color, lettering, lighting) according to location</li><li>5. Integrate diverse land-uses and activities</li></ol> |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Note: Table created based on literature review, CNU principles, NU design guidelines and LEED-ND certification system

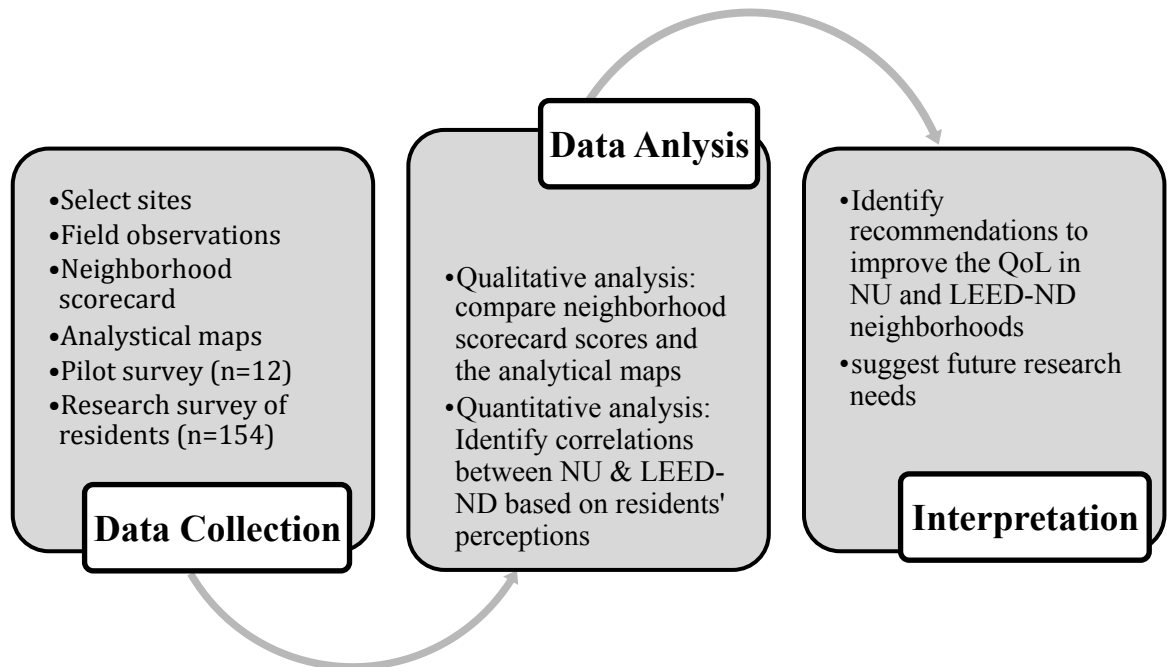
## **CHAPTER 3**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 Introduction**

In this research study, the performance of both New Urbanist (NU) and LEED-ND certified neighborhoods, were assessed based on both qualitative and quantitative analyses, in terms of quality of life. The descriptive analytical approach of this research study was based primarily on field observations and neighborhood scorecard. The neighborhood scorecard was applied to adequately assess the impacts of both the overall spatial arrangements of neighborhoods and the core design principles of NU and LEED-ND movements on the residents' Quality of Life (QoL). This qualitative analytical approach was complemented by quantitative analysis. The quantitative analysis of this research study was primarily based on questionnaire surveys for residents living NU and LEED-ND certified neighborhoods. Figure 3.1 illustrates the data collection and the analysis procedures.





**Figure 3.1: Data Collection and Analysis Procedure**

## 3.2 Data Collection

### 3.2.1 Site Selection

This research study focused on studying NU and LEED-ND neighborhoods in the United States, thus the study sites were exclusively selected in the Midwest region due to convenience of location. In addition, due to the lack of LEED-ND certified projects in Michigan, this study was executed on LEED-ND certified projects located in Ohio. Both Ohio and Michigan States share similar micro and macro scale demographic, economic, and environmental characteristics, which made the comparison between the neighborhoods more feasible and legitimate.

Initially four projects had been selected from Charter of New Urbanism (CNU) project directory and U.S. Green Building Council (USGBC) to conduct the needed qualitative and quantitative analysis for this research, namely Cherry Hill Village (CHV), Mason Run (MR), Saint Luke (SL), and The Flats neighborhoods. CHV neighborhood is a NU green field

residential development located in Canton Township, MI. MR is a NU brown field residential development located in Monroe City, MI. SL and Flats neighborhoods are both LEED-ND certified neighborhoods located in Cleveland City, Ohio.

As mentioned earlier in this chapter, this study basically used both the neighborhood scorecard and residents' surveys to adequately compare between the NU and LEED-ND certified neighborhoods. Accordingly, both visiting the neighborhoods and contacting the residents living in the case studies were crucial aspects for this research. In November 2019, the residents in all case studies were contacted personally to fill out the residents' surveys. The residents living in CHV, MR, and SL neighborhoods were easy to reach and were willing to fill out the surveys. In contrast, it was difficult to reach residents living in the Flats neighborhood since most of its residents live in a secured apartment building that allowed authorized entrants only. Accordingly, contacting the residents of the Flats neighborhood was a challenge. Therefore, this research focused on studying qualitatively and quantitatively the other three neighborhoods, which are CHV, MR, and SL neighborhoods.

CHV, MR and SL neighborhoods are considered unique residential developments in the Midwest Region. CHV neighborhood was the first NU residential neighborhood in Michigan, developed in 1997, and in 2000, the plan for CHV was awarded as an Outstanding Planning Project Award from the Michigan Society of Planning (Cherry Hill Village HOA, 2010). According to CNU, MR neighborhood was the first NU brown field development in Michigan. SL neighborhood was the first LEED-ND pilot project in Ohio. Table 3.1 illustrates some demographic facts about Canton Township in Michigan, Cleveland city Ohio, and Monroe City in Michigan, where the three case studies are located.

Canton Township is located in northwestern Wayne County (Canton Comprehensive Plan, 2018). Canton Township is also equidistant between Detroit and Ann Arbor Cities. Canton has been once famous for sweet corn and dairy farming, is currently experiencing dramatic changes (Canton Comprehensive Plan, 2018). Canton now experiences a rapid population and development growth. As such the planning commission of Canton Township has set up plans and strategies to direct Canton's growth towards more sustainably conscious endeavors (Canton Comprehensive Plan, 2018). The main goal of such developments is to provide different housing options and better services for the growing population. Cherry Hill Village is considered the first NU neighborhood in MI.

The City of Monroe is located on Lake Erie, in the southeast corner of Michigan, about 35 miles south of Detroit. It is the largest city and the county seat of Monroe County. According to the latest published data by the U.S. Census Bureau, the population of the City of Monroe was 20,243, which was about a 6% decrease in population in comparison to the previous decennial figure recorded in 2000 (Resilient Monroe Report, 2013). The community of Monroe is predominately white, with less racial diversity in comparison to the state average (Resilient Monroe Report, 2013).

Prior to World War II, Monroe was largely a farming community, but now farming jobs represents 2.5% of the workforce (Resilient Monroe Report, 2013). Like most of Southeast Michigan, Monroe community has lost numerous high paying manufacturing jobs over the last decade. Therefore, Monroe has a slightly lower median household income as compared to the state average (Resilient Monroe Report, 2013). Monroe City is the third oldest city in Michigan, and it has a rich history, especially from the impact of early French explorers that is still apparent in its many important archeological and historical sites (Resilient Monroe Report, 2013).

Cleveland's total population is 396, 815, with a total of 36 neighborhoods (Statistical Atlas, 2018). In the middle of the 20th century, Cleveland's economy has boomed because of the steel industry. Unfortunately, in 1990, Cleveland has lost almost half of its population and more than half of its jobs in manufacturing due to decline of such industry (Cleveland City Wide Plan, 2006). Simultaneously, the city has experienced increase in suburban developments, which have left behind plenty of vacant lots, and brown fields. As a result of such challenges, Cleveland's Civic Vision 2000 Plan, has been completed in 1990, to re-structure the shrinking city to be livelier, and livable city (Cleveland City Wide Plan, 2006).

The 2000 plan has focused on strategically locating new developments and neighborhoods and encouraging the re-use of vacant/abandoned industrial and commercial land into residential developments, and recreational uses, especially along the Cuyahoga River (Cleveland City Wide Plan, 2006). This Vision Plan has helped the city to manage the shifting economy towards digital technologies and other knowledge-based occupations through providing the needed infrastructure and job opportunities for existing and new industries, also providing decent housing quality for existing and new residents (Cleveland City Wide Plan, 2006). This Vision Plan has successfully managed to boost the resurgence of the city through encouraging sustainable economy, developments, and neighborhoods, and brownfield remediation (Cleveland City Wide Plan, 2006). Saint Luke (SL) neighborhood is the first LEED-ND certified neighborhood in City of Cleveland.

**Table 3.1: Demographic Data for Canton Township,  
City of Cleveland and City of Monroe**

|                                                                                            | <b>Canton Township</b> | <b>Cleveland City</b> | <b>Monroe City</b> |
|--------------------------------------------------------------------------------------------|------------------------|-----------------------|--------------------|
| <b>People</b>                                                                              |                        |                       |                    |
| Total population                                                                           | 90,345                 | 396, 815              | 20,243             |
| Median age                                                                                 | 39.1                   | 35.8                  | 36.6               |
| Households                                                                                 | 32,771                 | 168,496               | 8,179              |
| <b>Race</b>                                                                                |                        |                       |                    |
| White                                                                                      | 72.2%                  | 39.8%                 | 93.6%              |
| African Americans                                                                          | 10.2%                  | 50.4%                 | 2.6%               |
| Hispanics                                                                                  | 3.1%                   | 11.2%                 | 2.0%               |
| Asians                                                                                     | 17%                    | 2.1%                  | 0.9%               |
| <b>Education</b>                                                                           |                        |                       |                    |
| High school graduate or higher                                                             | 47.5%                  | 62.8%                 | 83.8%              |
| Bachelors degree or higher                                                                 | 49.8%                  | 16.4%                 | 20.2%              |
| <b>Income</b>                                                                              |                        |                       |                    |
| Median household income                                                                    | \$85,990               | \$27,854              | \$51,404           |
| Per capita income                                                                          | 38,573                 | \$18,844              | \$29,555           |
| Persons in poverty                                                                         | 8.0%                   | 35.2%                 | 13.8%              |
| <b>Occupation</b>                                                                          |                        |                       |                    |
| Management, business, science, and arts occupations                                        | 51.4%                  | 27.6%                 | 5.8%               |
| Service occupations                                                                        | 13.9%                  | 26.0%                 | 2%                 |
| Sales and office occupations                                                               | 20.8%                  | 22.8%                 | 8.0%               |
| <b>Industry</b>                                                                            |                        |                       |                    |
| Educational services, health care, and social assistance                                   | 23.7%                  | 26.0%                 | 16.5%              |
| Manufacturing                                                                              | 22.7%                  | 13.5%                 | 21.2%              |
| Professional, scientific, and management, and administrative and waste management services | 11.1%                  | 9.3%                  | 12.1%              |
| Arts, recreation, accommodation, and food services                                         | 8.6%                   | 12.4%                 | 8.4%               |

Note: Adapted from Statistical Atlas

### 3.2.2 Site Visits

Site visits were crucial to collect the needed data for the neighborhood scorecard and the analytical maps. Preliminary site visits for the three neighborhoods, Cherry Hill Village (CHV), NU greenfield development, Mason Run, NU brownfield development (MR) and Saint Luke (SL), LEED-ND certified neighborhood, were done between June 1 and 15 in 2019. Those initial site visits had been performed in order to: 1. Confirm that the projects were constructed, 2. Develop a better understanding of the existing physical and social fabric of the case studies, 3. Identify unique physical characteristics that needed to be added in the checklist of the neighborhood scorecard, 4. Identify any notable social and/or special aspects that needed further investigation in future field visits, and 5. Understand the land use and the spatial characteristics of the surroundings of the three cases studies.

After that, a number of site visits had been conducted and the neighborhood scorecards were filled up during those site visits. During those site visits, a variety of photos had been taken to adequately understand the differences between the spatial and visual features of NU and LEED-ND certified neighborhoods. The public spaces and residential streets had been monitored carefully to identify the residents' most visited public spaces, the heavy traffic streets, the level of noise, and to understand the overall dynamics of the three neighborhoods. Chapter IV illustrates profoundly the spatial and social characteristics of each case study based on site visits.

### 3.2.3 Neighborhood Scorecard

The neighborhood scorecard included a checklist of some design aspects that are crucial to improving QoL in neighborhoods. The guidelines included in the neighborhood scorecard were based on a literature review regarding QoL dimensions in urban design and planning disciplines, the Charter of New Urbanism (CNU) principles, guidelines included in *NU Best*

*Practices Guide*, and LEED-ND certification scoring template. Table 2.9 illustrates a comprehensive list of the recommended spatial design interventions that yield better QoL in neighborhoods based on the literature review regarding QoL dimensions in urban design and planning disciplines, the Charter of New Urbanism (CNU) principles, guidelines included in *NU Best Practices Guide*, and LEED-ND certification scoring template. (see Appendix A)

The recommended design guidelines in Table 2.9 were suggested to improve the physical characteristics of neighborhoods, especially their urban form, to yield better QoL in neighborhoods. The recommended list of design guidelines was divided into main eight characteristics, namely, safe environment, comfortable environment, accessibility to public transit services and other public services, pedestrian oriented streets, permeability and connectivity of street networks, legible layouts, equity and community identity, and finally physical and visual diversity.

The neighborhood scorecard was divided into the five main criteria crucial for improving QoL in neighborhoods, namely: safety, comfort, connectivity, place-making and sense of belonging, and aesthetics. Each QoL criterion in the neighborhood scorecard included a set of design guidelines derived from the design recommendations listed in Table 3.2. The listed design guidelines in Table 3.2 were considered crucial to achieving the goals of each QoL criterion. The scorecard had a total of 154 points; one point was attributed per each design guideline.

**Table 3.2: The Neighborhood Scorecard**

| <b>QoL Criteria</b>            | <b>Design Guideline</b>                                                                     | <b>Score</b>             |
|--------------------------------|---------------------------------------------------------------------------------------------|--------------------------|
| Neighborhood safety from crime | 1. Few number of entryways                                                                  | <input type="checkbox"/> |
|                                | 2. Mixed-land use                                                                           | <input type="checkbox"/> |
|                                | 3. Active streets with active nodes/use                                                     | <input type="checkbox"/> |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields compared to the total residential area                      | <input type="checkbox"/> |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input type="checkbox"/> |
|                                | 7. Active street frontages due to the semi-public attachments, such as: porches & balconies | <input type="checkbox"/> |
|                                | 8. Adequate lighting on streets                                                             | <input type="checkbox"/> |
|                                | 9. Adequate lighting for open green spaces                                                  | <input type="checkbox"/> |
|                                | 10. Adequate lighting in parking areas                                                      | <input type="checkbox"/> |
| Total points                   | 10                                                                                          | <hr/>                    |
| Pedestrian safety from traffic | 1. Narrow streets $\leq$ 25 feet                                                            | <input type="checkbox"/> |
|                                | 2. Boulevard/main streets lanes < 4 lanes                                                   | <input type="checkbox"/> |
|                                | 3. Low traffic volumes on residential streets                                               | <input type="checkbox"/> |
|                                | 4. 200 m to 300 m stop intervals in residential areas                                       | <input type="checkbox"/> |
|                                | 5. Bulb out sidewalks and intersections                                                     | <input type="checkbox"/> |
|                                | 6. Traffic calming techniques, such as speed bumps/ Roughened street material               | <input type="checkbox"/> |
|                                | 7. Brightly painted crosswalks                                                              | <input type="checkbox"/> |
|                                | 8. Roundabouts/traffic circles                                                              | <input type="checkbox"/> |
|                                | 9. Turn curb radius < or = 15 feet                                                          | <input type="checkbox"/> |
|                                | 10. On-street parallel parking                                                              | <input type="checkbox"/> |
|                                | 11. Traffic safety street signs                                                             | <input type="checkbox"/> |
|                                | 12. Signs for children 's safety                                                            | <input type="checkbox"/> |
|                                | 13. Other types of safety signs                                                             | <input type="checkbox"/> |
|                                | 14. Sidewalks $\geq$ 4 feet wide                                                            | <input type="checkbox"/> |
|                                | 15. Well-maintained sidewalks                                                               | <input type="checkbox"/> |
|                                | 16. Well-connected sidewalks                                                                | <input type="checkbox"/> |
|                                | 17. Flat sidewalks                                                                          | <input type="checkbox"/> |
|                                | 18. Buffered sidewalks                                                                      | <input type="checkbox"/> |
|                                | 19. Sidewalks curb cuts                                                                     | <input type="checkbox"/> |
| Total points                   | 19                                                                                          | <hr/>                    |
| Walking safety during the day  | 1. Mixed-land use                                                                           | <input type="checkbox"/> |
|                                | 2. Narrow streets $\leq$ 25 feet                                                            | <input type="checkbox"/> |
|                                | 3. Active streets with active nodes/uses                                                    | <input type="checkbox"/> |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area           | <input type="checkbox"/> |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input type="checkbox"/> |
|                                | 7. Minimum length of blank walls along residential streets                                  | <input type="checkbox"/> |
|                                | 8. Active facades with porches & balconies                                                  | <input type="checkbox"/> |
| Total points                   | 8                                                                                           | <hr/>                    |



**Table 3.2 (cont'd)**

|                                        |                                                                                                           |                          |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------|
| Walking safety at night                | 1. Mixed-land use                                                                                         | <input type="checkbox"/> |
|                                        | 2. Narrow streets $\leq$ 25 feet                                                                          | <input type="checkbox"/> |
|                                        | 3. Active streets with active nodes/uses                                                                  | <input type="checkbox"/> |
|                                        | 4. Minimum ratio of grey areas compared to the total residential area                                     | <input type="checkbox"/> |
|                                        | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area                         | <input type="checkbox"/> |
|                                        | 6. Minimum ratio of abandoned buildings compared to the total residential buildings                       | <input type="checkbox"/> |
|                                        | 7. Minimum length of blank walls along residential streets                                                | <input type="checkbox"/> |
|                                        | 8. Active facades with porches & balconies                                                                | <input type="checkbox"/> |
|                                        | 9. Sufficient lighting for pedestrians /mandatory porch/garage lights                                     | <input type="checkbox"/> |
|                                        | 10. Street lighting                                                                                       | <input type="checkbox"/> |
|                                        | 11. Adequate lighting in parking areas                                                                    | <input type="checkbox"/> |
| Total points                           | 11                                                                                                        | _____                    |
| Safety in public spaces during the day | 1. Active facades with porches & balconies                                                                | <input type="checkbox"/> |
|                                        | 2. Absence of long on-street blank walls                                                                  | <input type="checkbox"/> |
|                                        | 3. Active public spaces due to diverse outdoors activities                                                | <input type="checkbox"/> |
| Total points                           | 3                                                                                                         | _____                    |
| Safety in public spaces at night       | 1. Adequate lighting for open green spaces                                                                | <input type="checkbox"/> |
|                                        | 2. Active facades with porches & balconies                                                                | <input type="checkbox"/> |
|                                        | 3. Absence of long on-street blank walls                                                                  | <input type="checkbox"/> |
|                                        | 4. Active public spaces due to diverse outdoors activities                                                | <input type="checkbox"/> |
| Total points                           | 4                                                                                                         | _____                    |
| Safety of public transit facilities    | 1. Continuous sidewalks to main public transit stops                                                      | <input type="checkbox"/> |
|                                        | 2. Safe locations of public transit stops, for example having safe crossings to main public transit stops | <input type="checkbox"/> |
|                                        | 3. Safe shelters                                                                                          | <input type="checkbox"/> |
| Total points                           | 3                                                                                                         | _____                    |
| Biking safety                          | 1. Flat bike trails                                                                                       | <input type="checkbox"/> |
|                                        | 2. Well maintained bike lanes                                                                             | <input type="checkbox"/> |
|                                        | 3. Connected bike lanes                                                                                   | <input type="checkbox"/> |
|                                        | 4. Biking safety signage                                                                                  | <input type="checkbox"/> |
| Total points                           | 4                                                                                                         | _____                    |
| <b>QoL criteria</b>                    | <b>Design Guideline</b>                                                                                   | <b>Score</b>             |
| Comfortable neighborhood               | 1. Well maintained neighborhood                                                                           | <input type="checkbox"/> |
|                                        | 2. Adequate number of trash receptacles on residential streets                                            | <input type="checkbox"/> |
|                                        | 3. Clean air                                                                                              | <input type="checkbox"/> |
|                                        | 4. Adequate number and location of signs used to minimize noise                                           | <input type="checkbox"/> |
|                                        | 5. Buffers to reduce traffic noise                                                                        | <input type="checkbox"/> |
|                                        | 6. Easy and Legible layout with short blocks block size $\leq$ 330 feet X 330 feet                        | <input type="checkbox"/> |
|                                        | 7. Adequate way-finding signage system                                                                    | <input type="checkbox"/> |
|                                        | 8. Clear center                                                                                           | <input type="checkbox"/> |
|                                        | 9. Clear edge                                                                                             | <input type="checkbox"/> |
|                                        | 10. Distinguishable entry ways to the neighborhood                                                        | <input type="checkbox"/> |
|                                        | 11. Convenient access to public services                                                                  | <input type="checkbox"/> |

**Table 3.2 (cont'd)**

| <b>QoL criteria</b>       | <b>Design Guideline</b>                                                              | <b>Score</b>             |
|---------------------------|--------------------------------------------------------------------------------------|--------------------------|
|                           | 12. Convenient access to convenience stores                                          | <input type="checkbox"/> |
|                           | 13. Adequate population density                                                      | <input type="checkbox"/> |
|                           | 14. Adequate building density                                                        | <input type="checkbox"/> |
| Total points              | 14                                                                                   |                          |
| Pedestrian comfort        | 1. Low traffic on residential streets                                                | <input type="checkbox"/> |
|                           | 2. Sidewalks =, > 4 feet wide                                                        | <input type="checkbox"/> |
|                           | 3. Flat sidewalks                                                                    | <input type="checkbox"/> |
|                           | 4. Comfortable sidewalks with closely spaced trees to protect from sun               | <input type="checkbox"/> |
|                           | 5. Comfortable sidewalks to accommodate different ages and physical capabilities     | <input type="checkbox"/> |
|                           | 6. Well-connected sidewalks                                                          | <input type="checkbox"/> |
|                           | 7. Well-maintained sidewalks                                                         | <input type="checkbox"/> |
|                           | 8. Streets that respect human scale. Streets' width does not exceed building heights | <input type="checkbox"/> |
|                           | 9. Pedestrian scale street furniture                                                 | <input type="checkbox"/> |
|                           | 10. Block does not exceed 330 feet x 330 feet                                        | <input type="checkbox"/> |
| Total points              | 10                                                                                   |                          |
| Comfortable public spaces | 1. Adequate number of public spaces that integrate all ages                          | <input type="checkbox"/> |
|                           | 2. Adequate number of public spaces for all physical abilities                       | <input type="checkbox"/> |
|                           | 3. Provision of shaded areas in public spaces                                        | <input type="checkbox"/> |
|                           | 4. Adequate public space furniture                                                   | <input type="checkbox"/> |
|                           | 5. Adequate number of trash receptacles in public spaces                             | <input type="checkbox"/> |
| Total points              | 5                                                                                    | <input type="checkbox"/> |
| Public transit comfort    | 1. Adequate number of public transit dry shelters                                    | <input type="checkbox"/> |
|                           | 2. Adequate number of transit stops                                                  | <input type="checkbox"/> |
|                           | 3. Connected sidewalks to public transit stops                                       | <input type="checkbox"/> |
| Total points              | 3                                                                                    |                          |
| Biking comfort            | 1. Flat bike trails                                                                  | <input type="checkbox"/> |
|                           | 2. Well-maintained bike lanes                                                        | <input type="checkbox"/> |
|                           | 3. Well-connected bike lanes                                                         | <input type="checkbox"/> |
|                           | 4. Adequate number of bike racks/bike storage facilities                             | <input type="checkbox"/> |
| Total points              | 4                                                                                    |                          |
| <b>QoL criteria</b>       | <b>Design Guideline</b>                                                              | <b>Score</b>             |
| Internal connectivity     | 1. Short blocks block size < or = 330 feet X 330 feet                                | <input type="checkbox"/> |
|                           | 2. Hierarchy of street network                                                       | <input type="checkbox"/> |
|                           | 3. Connected streets                                                                 | <input type="checkbox"/> |
|                           | 4. Intersection density 140 intersections/square mile                                | <input type="checkbox"/> |
|                           | 5. Minimum number of cul-de-sacs                                                     | <input type="checkbox"/> |
|                           | 6. number of 4-way intersections > number of T-junctions                             | <input type="checkbox"/> |
|                           | 7. Well-connected sidewalks                                                          | <input type="checkbox"/> |
|                           | 8. Well-connected bike lanes                                                         | <input type="checkbox"/> |
|                           | 9. Physical connection to historic sites/buildings                                   | <input type="checkbox"/> |
| Total points              | 9                                                                                    |                          |
| External connectivity     | 1. Hierarchy of street network                                                       | <input type="checkbox"/> |
|                           | 2. Connected streets                                                                 | <input type="checkbox"/> |
|                           | 3. Well-connected sidewalks                                                          | <input type="checkbox"/> |

**Table 3.2 (cont'd)**

|                                     |                                                                                   |                          |
|-------------------------------------|-----------------------------------------------------------------------------------|--------------------------|
|                                     | 4. Well-connected bike lanes                                                      | <input type="checkbox"/> |
|                                     | 5. Number of public transits stops in proportion to the residential area          | <input type="checkbox"/> |
|                                     | 6. Residential area located within a 10 min walk (800 m) from transit stops       | <input type="checkbox"/> |
|                                     | 7. Residential area located within a 10 min walk (800 m) from commercial stores   | <input type="checkbox"/> |
|                                     | 8. Residential area located within a 10 min walk (800 m) from public school       | <input type="checkbox"/> |
|                                     | 9. Residential area located within a 10 min walk (800 m) from green spaces        | <input type="checkbox"/> |
|                                     | 10. Residential area located within a 10 min walk (800 m) from recreational areas | <input type="checkbox"/> |
|                                     | 11. Residential area located within a 10 min walk (800 m) from cultural services  | <input type="checkbox"/> |
| Total points                        | 11                                                                                |                          |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>             |
| Place-making and sense of belonging | 1. Mixed-use                                                                      | <input type="checkbox"/> |
|                                     | 2. Pedestrian oriented streets                                                    | <input type="checkbox"/> |
|                                     | 3. Close proximity of public spaces to residential areas                          | <input type="checkbox"/> |
|                                     | 4. Public spaces with all age-integrated outdoors activities                      | <input type="checkbox"/> |
|                                     | 5. Recreational venues (e.g. tennis, soccer, baseball, etc.).                     | <input type="checkbox"/> |
|                                     | 6. Easy access to outdoor living spaces / Universal design/ADA                    | <input type="checkbox"/> |
|                                     | 7. Clear center                                                                   | <input type="checkbox"/> |
|                                     | 8. Clear edge                                                                     | <input type="checkbox"/> |
|                                     | 9. Historically preserved lands/buildings                                         | <input type="checkbox"/> |
|                                     | 10. Physical connection to historically preserved lands/buildings                 | <input type="checkbox"/> |
|                                     | 11. Visual connection to historically preserved lands/buildings                   | <input type="checkbox"/> |
|                                     | 12. Community garden or access to healthy food and farmers market                 | <input type="checkbox"/> |
|                                     | 13. Unique neighborhood design                                                    | <input type="checkbox"/> |
|                                     | 14. Affordable housing                                                            | <input type="checkbox"/> |
|                                     | 15. Diverse housing types                                                         | <input type="checkbox"/> |
| Total points                        | 15                                                                                |                          |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>             |
| Aesthetics                          | 1. Diverse building types                                                         | <input type="checkbox"/> |
|                                     | 2. Diverse lot sizes                                                              | <input type="checkbox"/> |
|                                     | 3. Various housing ages                                                           | <input type="checkbox"/> |
|                                     | 4. Various building materials                                                     | <input type="checkbox"/> |
|                                     | 5. Architectural details                                                          | <input type="checkbox"/> |
|                                     | 6. Landmarks                                                                      | <input type="checkbox"/> |
|                                     | 7. Hierarchy of public spaces                                                     | <input type="checkbox"/> |
|                                     | 8. Diverse land use                                                               | <input type="checkbox"/> |
|                                     | 9. Unique features at night                                                       | <input type="checkbox"/> |
|                                     | 10. Scenic views/unique street vistas                                             | <input type="checkbox"/> |
|                                     | 11. Buffers to block undesirable abandoned area/s                                 | <input type="checkbox"/> |
|                                     | 12. Buffers to block undesirable building/s and or elements                       | <input type="checkbox"/> |
|                                     | 13. Aesthetic treatment of parking area/s                                         | <input type="checkbox"/> |
|                                     | 14. Coherent signage system                                                       | <input type="checkbox"/> |

**Table 3.2 (cont'd)**

|       |                                                             |                          |
|-------|-------------------------------------------------------------|--------------------------|
|       | 15. Coherent building additions including fences/ mailboxes | <input type="checkbox"/> |
|       | 16. Coherent streetscape                                    | <input type="checkbox"/> |
|       | 17. Well-maintained Street scape                            | <input type="checkbox"/> |
|       | 18. Well-maintained neighborhood                            | <input type="checkbox"/> |
| Total | 18                                                          |                          |

The scorecard was filled during field investigation trips based on the visual and physical assessment of the three neighborhoods. The neighborhood scorecard was used as a complementary analytic tool to the residents' survey to clearly identify the design guidelines that mostly affected the residents' perceptions for each QoL criteria. Consequently, the neighborhood scorecard assisted in extrapolating the appropriate recommendations to improve the design guidelines of NU and LEED-ND movements.

#### 3.2.4 Field Visits Observations

The descriptive analysis of the three case studies was also based on critical observation of the spatial arrangement and the residents' behavior as well. In addition to those observations, analytical maps had been created for each neighborhood to clearly understand the current physical features of the NU and LEED-ND certified neighborhoods in terms of safety, comfort and connectivity features. For example, safety analytical map illustrated the safety measures that were adopted in each type of neighborhood, including the types and locations of pedestrian traffic safety signs, on-site hazardous elements, light poles, etc.

Thus, conducting neighborhood scorecard, field observations, and analytical maps were crucial to this study to effectively analyze the spatial and design factors that impacted QoL in NU and LEED-ND certified neighborhoods. The scorecards, field observations, and the analytical maps assisted in defining the appropriate recommendations to improve QoL in both types of neighborhoods, NU and LEED-ND certified neighborhoods.

### 3.2.5 Residents' Survey

Neighborhood satisfaction usually functions as an effective indicator of quality of life, in addition to other dimensions such as: personal satisfaction (by personal attributes), and community satisfaction (by sense of community and community attributes) (Mouratidis, 2017; Park, 2017; Yang, 2008). This research conducted a neighborhood satisfaction survey for the residents living in the three case studies. As mentioned before, CHV, MR and SL neighborhoods were purposely selected in the Midwest Region to represent the characteristics of NU and LEED-ND certified neighborhoods. Random walk approach or door-to-door recruitment strategy was used to obtain a random sample of residents to participate in this research study. Door-to-door survey was used because it was the best method for reaching a sufficient number of households.

#### 1. Sampling and Response Rates

The empirical data on the residents' perceptions on the five main QoL criteria was collected through door-to-door questionnaire surveys. The residents living in the selected three neighborhoods were the potential subjects of this survey. The survey was distributed randomly among the residents of the selected neighborhoods. The sample size for this research was set to be 165. Table 3.3 illustrates the targeted number of samples per each case study, and the total number of collected responses. All incomplete responses were eliminated. In this study, incomplete surveys were defined as unanswered questions. Open-ended questions included in the survey were optional. Therefore, unanswered open-ended questions were not considered as unanswered questions. The contents of the survey questions were explained later in details in this section. (see Appendix B)

**Table 3.3: Sampling Method**

| Survey sample          | Neighborhood type                                              |                                                     |                                                |
|------------------------|----------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------|
|                        | Cherry Hill Village (CHV) New Urbanist greenfield neighborhood | Mason Run (MR) New Urbanist brownfield neighborhood | Saint Luke (SL) LEED-ND certified Neighborhood |
| Target sample          | 65                                                             | 55                                                  | 45                                             |
| Total                  | 165                                                            |                                                     |                                                |
| Complete responses     | 60                                                             | 54                                                  | 40                                             |
| \$5 Gift cards offered | None                                                           | None                                                | 18                                             |
| Total                  | 154                                                            |                                                     |                                                |

## 2. Questionnaire Survey Collection

The residents of three case studies had been visited and revisited on different days, during different times of the day (morning, afternoon, and evening) until a sufficient number of responses were collected. The first round of distributing the questionnaire survey started on November 5, 2019 and lasted till December 2, 2019.

Participants were asked to complete the survey within 24 hours. Upon completion, residents were asked to place their completed responses on their front porches for collection. Most of the participants were willing to complete the questionnaire in less than three hours, especially the seniors who lived in SL neighborhood, and residents living in MR neighborhood. Residents living in CHV and MR neighborhoods were willing to participate without any monetary incentives unlike some residents in SL neighborhood who asked for some type of incentives. Monetary incentives, \$5 gift cards, were gifted to a total number of 18 participants living in SL neighborhood. Table 3.4 illustrates the recruiting process of the survey.

**Table 3.4: Questionnaire Survey Schedule**

| <b>Neighborhood Type</b>                                       | <b>Survey period</b> | <b>No. of contacted households</b> | <b>No. of distributed Gift card</b> | <b>No. of collected survey</b> | <b>No. of reliable Response</b> | <b>Response rate</b> |
|----------------------------------------------------------------|----------------------|------------------------------------|-------------------------------------|--------------------------------|---------------------------------|----------------------|
| Cherry Hill Village (CHV) New Urbanist greenfield neighborhood | Nov.5- Nov.26, 2019  | 73                                 | 0                                   | 65                             | 60                              | 92.3%                |
| Mason Run (MR) New Urbanist brownfield neighborhood            | Nov.11- Dec.2, 2019  | 58                                 | 0                                   | 55                             | 54                              | 98.2%                |
| Saint Luke (SL) LEED-ND certified neighborhood                 | Nov.10- Dec.1, 2019  | 45                                 | 18                                  | 40                             | 40                              | 88.9%                |

### 3. Contents of the Questionnaire

The survey was constructed based on literature review regarding the spatial attributes of neighborhoods to improve QoL in neighborhoods, which are: safety, comfort, connectivity, sense of place, and aesthetics. In order to assess the residents' perceived satisfaction with the spatial quality of NU and LEED-ND certified neighborhoods, that survey included a set of variables under each QoL criterion. Each set of variables was formed based on the design guidelines that were commonly adopted in NU and LEED-ND certified neighborhoods to improve QoL.

The survey included four sections. The first section included questions about the respondent's houses, household, and their daily and weekly routines in their neighborhood. Table 3.5 illustrates the type of questions that were included in the first section of the survey and the scales that were used for assessment.

**Table 3.5: Contents of Section I in the Survey**

| <b>Section I.</b>                                       | <b>Questions</b>                                                                                | <b>Scale</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residents perception of their dwelling and neighborhood | Ownership status of the residential unit                                                        | Own, rent, other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                         | Household status                                                                                | I live alone. I live with my parents, I live with children without spouse/partner, I live with spouse/partner with no children, I live with spouse/partner and with children, I live with my friends/roommates, other                                                                                                                                                                                                                                                                                              |
|                                                         | Number of households                                                                            | Total number of households including yourself                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                         | Number of children living with you                                                              | Total number of children, Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                         | Age of children                                                                                 | Ages in numbers, Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                         | Place of residence size                                                                         | Total area in square feet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                         | Type of residential unit                                                                        | Number of bedrooms and bathrooms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                         | Move in date                                                                                    | Month/year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                         | Length of residence                                                                             | Number of years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                         | Neighborhood first choice selection                                                             | Yes. No. I don't know                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                         | Reasons considered when selecting current neighborhood                                          | Age of Housing. Housing price. Close to work. Close to family members. Close to highways. Close to public transit services. Close to commercial areas. Close to entertainment choices. Close to healthcare facilities. Close to good schools. Maintenance of the streets and sidewalks. Aesthetics of the neighborhood. Outdoors activities. Ecofriendly living. Historically preserved buildings/areas. Low crime rate. Well-maintained bike lanes. Pedestrian friendly community. Community with diverse income. |
|                                                         | Reasons for moving out                                                                          | To be close to family members. To be close to public transit. To be close to leisure places. To be close to work. To walk to shops/restaurants. To have a bigger. To have a bigger lot size. To pay less mortgage. To pay less rent. Other e                                                                                                                                                                                                                                                                       |
|                                                         | Distance between place of residence and workplace                                               | Distance in miles. Work from home. Not employed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                         | Transportation mode to workplace                                                                | Walk. Car. Bike. Public transportation. Carpool. Other. Not applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                         | Travel time to workplace                                                                        | Number of minutes and/or hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                         | Number of automobile trips per day                                                              | Average number of car trips per day. Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                         | Distance between place of residence and schools                                                 | Distance in miles. Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                         | Frequency of visiting the following services: grocery stores, bank, doctor, pharmacy, religious | Once a day. Once a week. 2-5 times a day. 2-5 times a week. Very 2 weeks. Rarely. Never. Other                                                                                                                                                                                                                                                                                                                                                                                                                     |



**Table 3.5 (cont'd)**

| <b>Section I.</b>                                       | <b>Questions</b>                                                             | <b>Scale</b>                                                                                                                |
|---------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Residents perception of their dwelling and neighborhood | destinations, beauty salon, post office, library, restaurants, athletic club | Rank the services on a scale from 1 to 10 based on your number of visits during the week (1=most visited, 10=least visited) |
|                                                         | Transportation mode to the pervious services                                 | Walk. Bike. Bus. Car                                                                                                        |
|                                                         | Walking frequency around the neighborhood                                    | Once a day. Once a week. 2-5 times a day. 2-5 times a week. Very 2 weeks. Rarely. Never. Other                              |
|                                                         | Biking frequency around the neighborhood                                     | Once a day. Once a week. 2-5 times a day. 2-5 times a week. Very 2 weeks. Rarely. Never. Other                              |

The second section of the survey included questions to assess the participants' general knowledge of about NU or LEED-ND movements. Simultaneously, the questions in the second section of the survey focused mainly on assessing the participants' perception regarding the roles of specific design elements, commonly adopted in NU and LEED-ND neighborhoods, in improving QoL. For example, the first set of questions in the survey included specific design principles, widely adopted in NU neighborhoods to enhance pedestrians' safety from traffic, such as narrow streets with on-street parking, the use of tree-lining along sidewalks to function as barriers from the moving traffic, etc. Table 3.6 illustrates the contents of the survey regarding all the discussed design principles regarding the safety criterion.

Section II also included questions regarding the perception of the residents' comfort in their neighborhood. As discussed before in Chapter II, the comfort criterion included a set of basic aspects including: overall comfort of the neighborhood, pedestrian comfort, comfortable public spaces, biking comfort, and comfortable use of public transit services. Table 3.7 illustrates the contents of the survey regarding all the discussed design principles under the comfort criterion.

**Table 3.6: Safety Criterion in the Survey**

| <b>Section II.</b>                                                                                        | <b>Questions</b>                                                                                                                                                                                   | <b>Scale</b>                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Residents perception of neighborhood overall safety                                                       | My neighborhood is safe and free from crime                                                                                                                                                        | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                                                                                                           | My neighborhood is safe because it has few entryways that helps in limiting the access of unwelcomed intruders                                                                                     |                                                                                                                                        |
|                                                                                                           | My neighborhood is safe because it has active places/areas                                                                                                                                         |                                                                                                                                        |
|                                                                                                           | My neighborhood is safe because it has buildings with front porches, balconies, and stoops along residential streets                                                                               |                                                                                                                                        |
|                                                                                                           | My neighborhood is safe because it does not have any abandoned areas/buildings                                                                                                                     |                                                                                                                                        |
|                                                                                                           | My neighborhood is safe because it has adequate number of street light poles                                                                                                                       |                                                                                                                                        |
|                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                        |
| Residents’ perception of pedestrians’ safety from traffic                                                 | My neighborhood provides good pedestrian safety measures from traffic                                                                                                                              |                                                                                                                                        |
|                                                                                                           | My neighborhood provides adequate traffic calming techniques, such as speed bumps, brightly painted crosswalks, etc. that enhances my safety from traffic                                          |                                                                                                                                        |
|                                                                                                           | The narrow streets in my neighborhood and the on-street parking improved my safety from traffic when I walk around the neighborhood                                                                |                                                                                                                                        |
|                                                                                                           | The tree-linings along sidewalks improved my safety from traffic when I walk around the neighborhood because they protect me from moving traffic on streets                                        |                                                                                                                                        |
| Residents’ perception of safety when walking alone around in the neighborhood in the morning and at night | I feel safe walking around in my neighborhood in the morning /at night                                                                                                                             |                                                                                                                                        |
|                                                                                                           | I feel safe walking alone in the neighborhood in the morning /at night because of the placement of porches, balconies and stoops on the front facades of the buildings along residential buildings |                                                                                                                                        |
|                                                                                                           | I feel safe walking alone in the neighborhood in the morning/at night because buildings with front porches,                                                                                        |                                                                                                                                        |

**Table 3.6 (cont'd)**

|                                                                            |                                                                                                                                                                                                       |                                                                                                                                        |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
|                                                                            | balconies, stoops, and bay windows are placed close to the sidewalks                                                                                                                                  | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                                                                            | Do you think that placing car garages at the rear of building improved your safety when you walk alone in the neighborhood in the morning? /at night?                                                 |                                                                                                                                        |
|                                                                            | I feel safe walking around my neighborhood in the morning/at night because my neighborhood has active and busy public areas                                                                           |                                                                                                                                        |
|                                                                            | I feel safe walking around my neighborhood at night because of the mandatory lights in porches and balconies                                                                                          |                                                                                                                                        |
|                                                                            | I feel safe when I visit the open green spaces in my                                                                                                                                                  |                                                                                                                                        |
| Residents’ perception of safety when they visit open green spaces at night | I feel safe when I visit the open green spaces in my neighborhood at night                                                                                                                            |                                                                                                                                        |
|                                                                            | I feel safe when I visit the open green spaces in my neighborhood at night because of the front porches, balconies, and stoops that are attached to the fronts of the surrounding buildings           |                                                                                                                                        |
|                                                                            | I feel safe when I visit the open green spaces in my neighborhood at night because buildings with shallow fronts, front porches, balconies, stoops, and bay windows are placed close to the sidewalks |                                                                                                                                        |
| Residents’ perception of safety when they bike around their neighborhood   | I feel safe biking around my neighborhood                                                                                                                                                             |                                                                                                                                        |
|                                                                            | My neighborhood has a well-connected network of bike lanes/trails                                                                                                                                     |                                                                                                                                        |
|                                                                            | My neighborhood has a well-maintained network of bike lanes/trails                                                                                                                                    |                                                                                                                                        |
|                                                                            | My neighborhood has bike lanes/trails that are safe and away from dangerous terrains                                                                                                                  |                                                                                                                                        |
| Residents’ perception of safety when they use public transit               | My neighborhood provides safe public transit services                                                                                                                                                 |                                                                                                                                        |
|                                                                            | My neighborhood provides safe public transit stops/stations locations and routes                                                                                                                      |                                                                                                                                        |

**Table 3.7: Comfort Criterion in the Survey**

| <b>Section II.</b>                            | <b>Questions</b>                                                                                                                                                                | <b>Scale</b>                                                                                                                           |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Residents perception of neighborhood comfort  | My neighborhood provides comfortable environment to live in                                                                                                                     | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                                               | My neighborhood is safe because it has few entryways that helps in limiting the access of unwelcomed intruders                                                                  |                                                                                                                                        |
|                                               | My neighborhood is well-maintained                                                                                                                                              |                                                                                                                                        |
|                                               | My neighborhood is clean                                                                                                                                                        |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it provides adequate noise buffers, such as trees to buffer traffic noise from main streets                                              |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it has low traffic streets                                                                                                               |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it provides easy access to services that I regularly visit, such as grocery stores, shopping, restaurants, etc.                          |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it has an easy and clear layout design                                                                                                   |                                                                                                                                        |
|                                               | My neighborhood is comfortable because has a clear central area and a clear edge                                                                                                |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it has adequate way finding signage system                                                                                               |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it has an adequate population destiny and is not crowded by people                                                                       |                                                                                                                                        |
|                                               | My neighborhood is comfortable because it has an adequate building destiny and is not crowded by buildings                                                                      |                                                                                                                                        |
| Residents’ perception of pedestrians’ comfort | The sidewalks in my neighborhood are comfortable                                                                                                                                |                                                                                                                                        |
|                                               | The sidewalks in my neighborhood are comfortable because they have tree linings that protect me from the sun                                                                    |                                                                                                                                        |
|                                               | My walking experience in my neighborhood is comfortable because the ration between the width of the streets and the height of buildings is comfortable and respects human scale |                                                                                                                                        |
|                                               | The sidewalks in my neighborhood are comfortable because they are wide                                                                                                          |                                                                                                                                        |

**Table 3.7 (cont'd)**

|                                                                           |                                                                                                                                               |                                                                                                                                        |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
|                                                                           | enough to accommodate several activities, such as walking, jogging, standing, biking, etc.                                                    | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                                                                           | The sidewalks in my neighborhood are comfortable because they are well-connected                                                              |                                                                                                                                        |
|                                                                           | The sidewalks in my neighborhood are comfortable because they are well-maintained                                                             |                                                                                                                                        |
|                                                                           | The sidewalks in my neighborhood are comfortable for all different physical abilities and different ages                                      |                                                                                                                                        |
| Residents’ perception of comfort when visiting open green spaces          | My neighborhood provides comfortable open green spaces                                                                                        |                                                                                                                                        |
|                                                                           | My neighborhood has a decent number of public open green spaces                                                                               |                                                                                                                                        |
|                                                                           | My neighborhood has open green spaces that have convenient street furniture for sitting, gathering, socializing, etc.                         |                                                                                                                                        |
|                                                                           | My neighborhood has clean open green spaces                                                                                                   |                                                                                                                                        |
|                                                                           | My neighborhood has open green spaces that are equally accessible by people with different ethnicities, incomes, physical abilities, and ages |                                                                                                                                        |
| Residents’ perception of comfort when they bike around their neighborhood | My neighborhood provides comfortable biking experience                                                                                        |                                                                                                                                        |
|                                                                           | My neighborhood provides comfortable biking experience because it has well-connected bike lanes                                               |                                                                                                                                        |
|                                                                           | My neighborhood provides comfortable biking experience because it has well-maintained bike lanes                                              |                                                                                                                                        |
|                                                                           | My neighborhood provides comfortable biking experience because it provides adequate number of bike racks and bike storage facilities          |                                                                                                                                        |
| Residents’ perception of comfort when they use public transit facilities  | My neighborhood provides comfortable public transit services                                                                                  |                                                                                                                                        |
|                                                                           | My neighborhood provides dry public transit shelters                                                                                          |                                                                                                                                        |
|                                                                           | My neighborhood provides comfortable routes to public transit                                                                                 |                                                                                                                                        |

Section II also included questions regarding the perception of the residents' proximity and connectivity to public services and other destinations within their neighborhood, and outside their neighborhoods. The questions in the connectivity criterion are based on the literature review and NU basic design guidelines for improving the internal and external connectivity of neighborhoods with public services and other basic needs, such as grocery stores. Table 3.8 illustrates the contents of the survey regarding all the discussed design principles under the connectivity criterion.

**Table 3.8: Connectivity Criterion in the Survey**

| <b>Section II.</b>                                                       | <b>Questions</b>                                                                                                                                                                                                            | <b>Scale</b>                                                                                                                           |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Residents perception of internal connectivity within their neighborhoods | My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach                                                                                                                        | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                                                                          | My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach on foot because it has short blocks and an adequate number of street intersections                                     |                                                                                                                                        |
|                                                                          | My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach on foot because it has well-connected sidewalks                                                                        |                                                                                                                                        |
|                                                                          | My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach by bike because it provides well-connected bike lanes                                                                  |                                                                                                                                        |
| Residents’ perception of external connectivity of their neighborhoods    | I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood                                                                                                          |                                                                                                                                        |
|                                                                          | I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood by car because the streets in my neighborhood are well-connected to the other surrounding streets        |                                                                                                                                        |
|                                                                          | I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood on foot because the sidewalks in my neighborhood are well-connected to the other surrounding sidewalks   |                                                                                                                                        |
|                                                                          | I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood by bike because the bike lanes in my neighborhood are well-connected to the other surrounding bike lanes |                                                                                                                                        |
|                                                                          | I live within approximately 10                                                                                                                                                                                              |                                                                                                                                        |

**Table 3.8 (cont'd)**

|  |                                                                                   |                                                                                                                                        |
|--|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
|  | minutes walk from a grocery store and other convenience stores                    | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|  | I live within approximately 10 minutes walk from public services, such as library |                                                                                                                                        |
|  | I live within approximately 10 minutes walk from a public transit stop/station    |                                                                                                                                        |

Place belonging criterion and its main design aspects were included in section II in the survey. In order to fulfill place-making criterion in any residential development the following aspects had to be provided: unique architectural styles, memorable physical arrangement of buildings, coherent streetscapes, and active public realm through active residential streets and public spaces. Table 3.9 illustrates the contents of the survey regarding place-making criterion.



**Table 3.9: Place-making Criterion in the Survey**

| <b>Section II.</b> | <b>Questions</b>                                                                                                                                                                            | <b>Scale</b>                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Place-making       | My sense of belonging has been enhanced since I moved to this neighborhood                                                                                                                  | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|                    | My sense of belonging has been improved because it has unique Victorian architectural style                                                                                                 |                                                                                                                                        |
|                    | My sense of belonging has been improved because it resembles old traditional neighborhoods by providing narrow streets, a central gathering space, alleyways, etc.                          |                                                                                                                                        |
|                    | My sense of belonging has been improved because my neighborhood provides a decent number of open green spaces with                                                                          |                                                                                                                                        |
|                    | My sense of belonging has been improved because the streets in my neighborhood has front porches, balconies, and stoops that gives me the opportunity to socialize with my neighbors        |                                                                                                                                        |
|                    | My sense of belonging has been improved because the streets in my neighborhood are active with minimal amount of blank walls                                                                |                                                                                                                                        |
|                    | My sense of belonging has been improved because Home Owners Association imposes strict regulations regarding the exterior improvements of any house.                                        |                                                                                                                                        |
|                    | My sense of belonging has been improved because my neighborhood provides open green spaces that are accessible by all different physical abilities, different ages, and diverse ethnicities |                                                                                                                                        |

The visual appeal criterion and its main design aspects were included in section II of the survey as well. In order to fulfill the visual appeal criterion in any residential development the following aspects had to be provided: unique architectural styles, memorable physical arrangement of buildings, coherent streetscapes, and active public realm through active residential streets and public spaces. Table 3.10 illustrates the contents of the survey regarding place-making criterion.

**Table 3.10: Aesthetics Criterion in the Survey**

| Section II. | Questions                                                                                                                                                         | Scale                                                                                                                                  |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Aesthetics  | My neighborhood is visually attractive                                                                                                                            | From “Strongly disagree” to “Strongly agree”<br><br>1= Strongly disagree<br>2= Disagree<br>3= Neutral<br>4= Agree<br>5= Strongly agree |
|             | Do you think that alleyways have improved the visual appeal of your neighborhoods?                                                                                |                                                                                                                                        |
|             | The visual appeal of my neighborhood is improved because of the Victorian architectural style of the buildings                                                    |                                                                                                                                        |
|             | The visual appeal of my neighborhood is improved because it provides adequate buffers that blocks the views to any undesirable buildings/areas in my neighborhood |                                                                                                                                        |
|             | The visual appeal of my neighborhood is improved because Home Owners Association imposes strict regulations regarding the exterior improvements of any house.     |                                                                                                                                        |

The final section of the survey included questions regarding the participants’ demographic and socio-economic characteristics, including: gender, age, ethnicity, educational attainment, employment status, and household income. Also, this section included two questions regarding the participants’ additional perceptions about their neighborhoods. Table 3.11 illustrates the content of section III, the final section of the survey.

**Table 3.11: Contents of Section III in the Survey**

| <b>Section III.</b> | <b>Questions</b>                                                                                                            | <b>Scale</b>                                                                                                                                      |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | Gender, Age (range), Race, Educational attainment (range) Employment status, Household annual income (range)                | Categorical indicators                                                                                                                            |
|                     | Would you recommend this neighborhood to your family members, friends, colleagues, and/or others to live in?                | From “Never recommend” to “Highly recommend”<br><br>1= Never recommend<br>2= Don’t recommend<br>3= Neutral<br>4= Recommend<br>5= Highly recommend |
|                     | Do you have any further comments that you would like to share in order to improve the quality of life in your neighborhood? | Open ended question                                                                                                                               |

### 3.2.6 Reliability and Validity

Reliability and validity are important aspects for any scientific research. Measures used in scientific research should be reliable and valid. Reliability is the degree to which a test, experiment or any other research or measurement technique gives the same results on repeated trials (Creswell, 2014). Accordingly, in order to consider this research reliable is to be able to replicate the research procedures and to reuse the research tools and yielding consistent measurements on every repeated trial (Creswell, 2014).

In this research, to increase the reliability of the measures used in the survey, the survey questions included similar questions to measure same aspects. For example, in order to ensure the reliability of the measurement procedure used in the surveys to assess the residents’ perception of neighborhood safety, the residents were asked about this aspect with different expressions. The reliability test was also applied to the survey results in RStudio, a statistical analysis software program, and Cronbach’s alpha values were obtained to assess the reliability of

the participants' perceptions for each QoL criterion. Cronbach's alpha is a coefficient of reliability and is the most common measure of reliability or internal consistency (Creswell, 2014).

Validity is the extent to which a study accurately meets, satisfies, or answers a researcher's question in a study (Creswell, 2014). Validity is about the trustworthiness of the results of research findings. Validity is concerned with the study's success in reflecting what the researcher wanted to measure (Creswell, 2014). There are two types of validity: internal validity and external validity (Creswell, 2014). Internal validity is concerned with the internal procedures applied in an investigation, while external validity refers to representativeness and generalizability of research findings.

Additionally, the survey errors were minimized as much as possible in this research. Non-response errors were eliminated in the study; all incomplete surveys including total non-response, and item non-response were eliminated. This research study examined three case studies that have similar socio-economic dynamics and spatial characteristics, which enhanced its validity, since the results and findings can be generalized on other neighborhoods. The scorecard also increased the validity of the research, since it was applied as an additional analytical tool to extrapolate results and findings.

### 3.2.7 Analysis Plan

This research study used two tools for analysis: the neighborhood scorecard and the residents' survey. Consequently, the results of this research were based finding correlations between the NU and LEED-ND certified neighborhoods according to the set of design guidelines included in the neighborhood scorecard and the residents' perceptions. The correlations between the three neighborhoods, CHV, MR, and SL, in terms of spatial characteristics were qualitatively

assessed based on the neighborhood scorecard. During site visits, the neighborhood scorecard were filled and were complemented by analytical maps in order to accurately identify correlations and differences between NU and LEED-ND neighborhoods.

As mentioned in earlier sections, the neighborhood scorecard included a checklist of crucial design guidelines for improving QoL in residential neighborhoods. The checklist was divided into five main criteria essential for improving the QoL in neighborhoods, which are: safety, comfort, connectivity, place attachment, and aesthetics. Each neighborhood was assessed according to the total score it earned per criterion. The correlations between the three neighborhoods were assessed according to the total score they earned per criteria. The neighborhood scorecard also assisted in identifying the design guidelines that were either adopted or overlooked in each neighborhood per each criterion. Consequently, the scorecard was an important tool to assist in formulating recommendations to improve the design principles and guidelines of both NU and LEED-ND neighborhoods.

The quantitative analysis of this research was based on the questionnaire survey. The questions of the survey were designed to document the participants' perceptions about some aspects including: their satisfaction levels with their QoL in their neighborhoods, their satisfaction levels with their neighborhoods as places to live in and raise children, and their willingness degree to recommend their neighborhoods to family and friends. Also, the survey questions were designed to document the participants' perception of about the five criteria of QoL, safety, comfort, connectivity, place making, and aesthetics among the three neighborhoods. The perceptions of residents regarding some design principles that affect those five criteria were analyzed, subsequently, the effectiveness of such design principles were assessed in each

neighborhood. The results from this analysis determined if NU neighborhood and LEED-ND certified neighborhoods were different or similar in terms of providing better QoL.

Correlational research was the primarily quantitative analytical approach used for this study. The questions included in the survey assisted in outlining important descriptive and inferential statics. The descriptive analysis, including frequency and percentage, helped in identifying the general characteristics of the responses. The inferential statics helped in examining the effectiveness of the design guidelines that were adopted in each type of neighborhood, NU and LEED-ND. The design guidelines were the independent variables, while the five main criteria, safety, comfort, connectivity, place-making and aesthetics were the dependent variables. Table 3.12 shows the research hypotheses and the analysis plan for each hypothesis.

Correlations between the residents' perceptions, regarding the design guidelines of the five QoL criteria, were analyzed among the case studies. The correlation analysis included one-way ANOVA tests and Tukey's post-hoc tests. Further statistical analysis was applied through using multiple regression models and Stepwise multiple regression analyses to detect the impact of the guidelines on each QoL criterion according to the perceptions of residents living in the three neighborhoods.

**Table 3.12: Research Hypotheses Analysis Plan**

| <b>Research Hypotheses</b>                                                                                                                                                                |                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <b>Residents perceptions of QoL</b>                                                                                                                                                       | <b>Analysis</b>                                                   |
| Residents who live in New Urbanist and LEED-ND certified neighborhoods are highly satisfied by their QoL in their neighborhoods                                                           | Frequency, one-way ANOVA test, Tukey's post-hoc test              |
| <b>Safety Criterion Hypothesis</b>                                                                                                                                                        | <b>Analysis</b>                                                   |
| Residents who live in New Urbanist neighborhoods feel as safe as residents who live in LEED-ND certified neighborhood in terms of crime.                                                  | Neighborhood scorecard, one-way ANOVA test, Tukey's post-hoc test |
| Residents who live in New Urbanist neighborhoods feel as safe as residents who the LEED-ND certified neighborhood in terms of traffic safety.                                             |                                                                   |
| Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods during the day. |                                                                   |
| Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods at night.       |                                                                   |
| The perception of safety when visiting public spaces in the morning is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                           |                                                                   |
| The perception of safety when visiting public spaces at night is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                 |                                                                   |
| The perception of safety when using public transit services is the same is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                       |                                                                   |
| The perception of biking safety is the same is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                                   |                                                                   |
| <b>Comfort Criterion Hypothesis</b>                                                                                                                                                       | <b>Analysis</b>                                                   |
| The perception of pedestrian comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                                    | Neighborhood scorecard, one-way ANOVA test, Tukey's post-hoc test |
| The perception of comfort level when visiting public places is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                   |                                                                   |
| The perception of comfort level when using public transit services is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                            |                                                                   |
| The perception of biking comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                                        |                                                                   |
| <b>Connectivity Criterion</b>                                                                                                                                                             | <b>Analysis</b>                                                   |
| The perception of the internal connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.                                   | Neighborhood scorecard, one-way ANOVA test, Tukey's post-hoc test |
| The perception of the external connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.                                   |                                                                   |
| <b>Place-making Criterion</b>                                                                                                                                                             | <b>Analysis</b>                                                   |
| The perception of sense of belonging is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.                                                              | Neighborhood scorecard, one-way ANOVA test,                       |

**Table 3.12 (cont'd)**

| <b>Place-making Criterion</b>                                                                                                                   | <b>Analysis</b>                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
|                                                                                                                                                 | , Tukey's post-hoc test                                           |
| <b>Aesthetic Criterion</b>                                                                                                                      | <b>Analysis</b>                                                   |
| The perception of aesthetic quality of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods. | Neighborhood scorecard, one-way ANOVA test, Tukey's post-hoc test |



## CHAPTER 4

### QUALITATIVE ANALYSIS AND FINDINGS FROM SITE VISITS AND NEIGHBORHOOD SCORECARDS

#### 4.1 Introduction

As mentioned before in Chapter 3, this research study would qualitatively assess the urban design features of the three types of neighborhoods: Cherry Hill Village (CHV), New Urbanist greenfield development, Mason Run (MR) New Urbanist brownfield development, and Saint Luke (SL), LEED-ND certified neighborhood. The qualitative analysis of the three neighborhoods was based on field visits, official reports, Google Maps, and the neighborhood scorecard. The scorecard was used to adequately assess the impacts of the spatial arrangements of neighborhoods and the core design principles of New Urbanism (NU) movement on the residents' Quality of Life (QoL). Consequently, such assessment assisted in extrapolating appropriate recommendations to further improve the QoL of the residents of NU neighborhoods.

The neighborhood scorecard included a checklist of the design aspects, which were concluded from literature review regarding QoL in neighborhoods. This checklist was divided into the five main criteria crucial for improving QoL in neighborhoods, namely: safety, comfort, place-making and sense of belonging, connectivity, and aesthetics. Each criterion had a set of a number of design guidelines. Those design guidelines were considered crucial to achieving the goals of each QoL criterion, and thus attaining better QoL in residential neighborhoods. The scorecard had a total of 154 points; one point was attributed per each design guideline. The scorecard was filled during field investigation trips to the three case studies.

#### 4.1.1 New Urbanist Greenfield Neighborhood Qualitative Analysis and Scorecard Results

Cherry Hill Village (CHV) is a New Urbanist Greenfield neighborhood built on approximately 136 acres of land (see Figure 4.1). CHV is a non-gated community, located in Canton Township, Michigan. CHV neighborhood follows the social and spatial ideals of traditional neighborhoods. The following is a descriptive analysis of the urban design features and the spatial arrangement of CHV neighborhood based on the design guidelines listed in the neighborhood scorecard and based on other related on-field observations. Table 4.1 illustrates the scorecard of CHV neighborhood, and the total number of points earned per each QoL criterion.



**Figure 4.1: Satellite Image of Cherry Hill Village (CHV) Neighborhood**  
(Source: Google Maps)

**Table 4.1: New Urbanist Greenfield Neighborhood Scorecard**

| <b>QoL Criteria</b>            | <b>Design Guideline</b>                                                                     | <b>Score</b>                        |
|--------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------|
| Neighborhood safety from crime | 1. Few number of entryways                                                                  | <input checked="" type="checkbox"/> |
|                                | 2. Mixed-land use                                                                           | <input checked="" type="checkbox"/> |
|                                | 3. Active streets with active nodes/use                                                     | <input checked="" type="checkbox"/> |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input checked="" type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields compared to the total residential area                      | <input checked="" type="checkbox"/> |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 7. Active street frontages due to the semi-public attachments, such as: porches & balconies | <input checked="" type="checkbox"/> |
|                                | 8. Adequate lighting on streets                                                             | <input type="checkbox"/>            |
|                                | 9. Adequate lighting for open green spaces                                                  | <input type="checkbox"/>            |
|                                | 10. Adequate lighting in parking areas                                                      | <input checked="" type="checkbox"/> |
| Total points                   | 10                                                                                          | 8                                   |
| Pedestrian safety from traffic | 1. Narrow streets $\leq 25$ feet                                                            | <input checked="" type="checkbox"/> |
|                                | 2. Boulevard/main streets lanes $< 4$ lanes                                                 | <input checked="" type="checkbox"/> |
|                                | 3. Low traffic volumes on residential streets                                               | <input checked="" type="checkbox"/> |
|                                | 4. 200 m to 300 m stop intervals in residential areas                                       | <input checked="" type="checkbox"/> |
|                                | 5. Bulb out sidewalks and intersections                                                     | <input type="checkbox"/>            |
|                                | 6. Traffic calming techniques, such as speed bumps/ Roughened street material               | <input type="checkbox"/>            |
|                                | 7. Brightly painted crosswalks                                                              | <input type="checkbox"/>            |
|                                | 8. Roundabouts/traffic circles                                                              | <input type="checkbox"/>            |
|                                | 9. Turn curb radius $< \text{or} = 15$ feet                                                 | <input checked="" type="checkbox"/> |
|                                | 10. On-street parallel parking                                                              | <input checked="" type="checkbox"/> |
|                                | 11. Traffic safety street signs                                                             | <input checked="" type="checkbox"/> |
|                                | 12. Signs for children 's safety                                                            | <input checked="" type="checkbox"/> |
|                                | 13. Other types of safety signs                                                             | <input checked="" type="checkbox"/> |
|                                | 14. Sidewalks $=, > 4$ feet wide                                                            | <input checked="" type="checkbox"/> |
|                                | 15. Well-maintained sidewalks                                                               | <input checked="" type="checkbox"/> |
|                                | 16. Well-connected sidewalks                                                                | <input checked="" type="checkbox"/> |
|                                | 17. Flat sidewalks                                                                          | <input checked="" type="checkbox"/> |
|                                | 18. Buffered sidewalks                                                                      | <input checked="" type="checkbox"/> |
|                                | 19. Sidewalks curb cuts                                                                     | <input checked="" type="checkbox"/> |
| Total points                   | 19                                                                                          | 15                                  |
| Walking safety during the day  | 1. Mixed-land use                                                                           | <input checked="" type="checkbox"/> |
|                                | 2. Narrow streets $\leq 25$ feet                                                            | <input checked="" type="checkbox"/> |
|                                | 3. Active streets with active nodes/uses                                                    | <input checked="" type="checkbox"/> |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input checked="" type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area           | <input checked="" type="checkbox"/> |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 7. Minimum length of blank walls along residential streets                                  | <input checked="" type="checkbox"/> |
|                                | 8. Active facades with porches & balconies                                                  | <input checked="" type="checkbox"/> |
| Total points                   | 8                                                                                           | 8                                   |

**Table 4.1 (cont'd)**

|                                        |                                                                                                           |                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------|
| Walking safety at night                | 1. Mixed-land use                                                                                         | <input checked="" type="checkbox"/> |
|                                        | 2. Narrow streets $\leq$ 25 feet                                                                          | <input checked="" type="checkbox"/> |
|                                        | 3. Active streets with active nodes/uses                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Minimum ratio of grey areas compared to the total residential area                                     | <input checked="" type="checkbox"/> |
|                                        | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area                         | <input checked="" type="checkbox"/> |
|                                        | 6. Minimum ratio of abandoned buildings compared to the total residential buildings                       | <input checked="" type="checkbox"/> |
|                                        | 7. Minimum length of blank walls along residential streets                                                | <input checked="" type="checkbox"/> |
|                                        | 8. Active facades with porches & balconies                                                                | <input checked="" type="checkbox"/> |
|                                        | 9. Sufficient lighting for pedestrians /mandatory porch/garage lights                                     | <input checked="" type="checkbox"/> |
|                                        | 10. Street lighting                                                                                       | <input type="checkbox"/>            |
|                                        | 11. Adequate lighting in parking areas                                                                    | <input checked="" type="checkbox"/> |
| Total points                           | 11                                                                                                        | 10                                  |
| Safety in public spaces during the day | 1. Active facades with porches & balconies                                                                | <input checked="" type="checkbox"/> |
|                                        | 2. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 3. Active public spaces due to diverse outdoors activities                                                | <input checked="" type="checkbox"/> |
| Total points                           | 3                                                                                                         | 3                                   |
| Safety in public spaces at night       | 1. Adequate lighting for open green spaces                                                                | <input type="checkbox"/>            |
|                                        | 2. Active facades with porches & balconies                                                                | <input checked="" type="checkbox"/> |
|                                        | 3. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Active public spaces due to diverse outdoors activities                                                | <input checked="" type="checkbox"/> |
| Total points                           | 4                                                                                                         | 3                                   |
| Safety of public transit facilities    | 1. Continuous sidewalks to main public transit stops                                                      | <input checked="" type="checkbox"/> |
|                                        | 2. Safe locations of public transit stops, for example having safe crossings to main public transit stops | <input type="checkbox"/>            |
|                                        | 3. Safe shelters                                                                                          | <input type="checkbox"/>            |
| Total points                           | 3                                                                                                         | 1                                   |
| Biking safety                          | 1. Flat bike trails                                                                                       | <input checked="" type="checkbox"/> |
|                                        | 2. Well maintained bike lanes                                                                             | <input checked="" type="checkbox"/> |
|                                        | 3. Connected bike lanes                                                                                   | <input checked="" type="checkbox"/> |
|                                        | 4. Biking safety signage                                                                                  | <input type="checkbox"/>            |
| Total points                           | 4                                                                                                         | 3                                   |
| <b>QoL criteria</b>                    | <b>Design Guideline</b>                                                                                   | <b>Score</b>                        |
| Comfortable neighborhood               | 1. Well maintained neighborhood                                                                           | <input checked="" type="checkbox"/> |
|                                        | 2. Adequate number of trash receptacles on residential streets                                            | <input type="checkbox"/>            |
|                                        | 3. Clean air                                                                                              | <input checked="" type="checkbox"/> |
|                                        | 4. Adequate number and location of signs used to minimize noise                                           | <input checked="" type="checkbox"/> |
|                                        | 5. Buffers to reduce traffic noise                                                                        | <input checked="" type="checkbox"/> |
|                                        | 6. Easy and Legible layout with short blocks block size $<$ or $=$ 330 feet X 330 feet                    | <input type="checkbox"/>            |
|                                        | 7. Adequate way-finding signage system                                                                    | <input type="checkbox"/>            |
|                                        | 8. Clear center                                                                                           | <input checked="" type="checkbox"/> |
|                                        | 9. Clear edge                                                                                             | <input checked="" type="checkbox"/> |
|                                        | 10. Distinguishable entry ways to the neighborhood                                                        | <input checked="" type="checkbox"/> |
|                                        | 11. Convenient access to public services                                                                  | <input type="checkbox"/>            |

**Table 4.1 (cont'd)**

|                           |                                                                                      |                                     |
|---------------------------|--------------------------------------------------------------------------------------|-------------------------------------|
|                           | 12. Convenient access to convenience stores                                          | <input type="checkbox"/>            |
|                           | 13. Adequate population density                                                      | <input checked="" type="checkbox"/> |
|                           | 14. Adequate building density                                                        | <input checked="" type="checkbox"/> |
| Total points              | 14                                                                                   | 9                                   |
| Pedestrian comfort        | 1. Low traffic on residential streets                                                | <input checked="" type="checkbox"/> |
|                           | 2. Sidewalks =, > 4 feet wide                                                        | <input checked="" type="checkbox"/> |
|                           | 3. Flat sidewalks                                                                    | <input checked="" type="checkbox"/> |
|                           | 4. Comfortable sidewalks with closely spaced trees to protect from sun               | <input checked="" type="checkbox"/> |
|                           | 5. Comfortable sidewalks to accommodate different ages and physical capabilities     | <input checked="" type="checkbox"/> |
|                           | 6. Well-connected sidewalks                                                          | <input checked="" type="checkbox"/> |
|                           | 7. Well-maintained sidewalks                                                         | <input checked="" type="checkbox"/> |
|                           | 8. Streets that respect human scale. Streets' width does not exceed building heights | <input checked="" type="checkbox"/> |
|                           | 9. Pedestrian scale street furniture                                                 | <input checked="" type="checkbox"/> |
|                           | 10. Block does not exceed 330 feet x 330 feet                                        | <input type="checkbox"/>            |
| Total points              | 10                                                                                   | 9                                   |
| Comfortable public spaces | 1. Adequate number of public spaces that integrate all ages                          | <input checked="" type="checkbox"/> |
|                           | 2. Adequate number of public spaces for all physical abilities                       | <input checked="" type="checkbox"/> |
|                           | 3. Provision of shaded areas in public spaces                                        | <input checked="" type="checkbox"/> |
|                           | 4. Adequate public space furniture                                                   | <input checked="" type="checkbox"/> |
|                           | 5. Adequate number of trash receptacles in public spaces                             | <input checked="" type="checkbox"/> |
| Total points              | 5                                                                                    | 5                                   |
| Public transit comfort    | 1. Adequate number of public transit dry shelters                                    | <input type="checkbox"/>            |
|                           | 2. Adequate number of transit stops                                                  | <input type="checkbox"/>            |
|                           | 3. Connected sidewalks to public transit stops                                       | <input checked="" type="checkbox"/> |
| Total points              | 3                                                                                    | 1                                   |
| Biking comfort            | 1. Flat bike trails                                                                  | <input checked="" type="checkbox"/> |
|                           | 2. Well-maintained bike lanes                                                        | <input checked="" type="checkbox"/> |
|                           | 3. Well-connected bike lanes                                                         | <input checked="" type="checkbox"/> |
|                           | 4. Adequate number of bike racks/bike storage facilities                             | <input type="checkbox"/>            |
| Total points              | 4                                                                                    | 3                                   |
| <b>QoL criteria</b>       | <b>Design Guideline</b>                                                              | <b>Score</b>                        |
| Internal connectivity     | 1. Short blocks block size < or = 330 feet X 330 feet                                | <input type="checkbox"/>            |
|                           | 2. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 3. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 4. Intersection density 140 intersections/square mile                                | <input checked="" type="checkbox"/> |
|                           | 5. Minimum number of cul-de-sacs                                                     | <input checked="" type="checkbox"/> |
|                           | 6. number of 4-way intersections > number of T-junctions                             | <input type="checkbox"/>            |
|                           | 7. Well-connected sidewalks                                                          | <input checked="" type="checkbox"/> |
|                           | 8. Well-connected bike lanes                                                         | <input checked="" type="checkbox"/> |
|                           | 9. Physical connection to historic sites/buildings                                   | <input type="checkbox"/>            |
| Total points              | 9                                                                                    | 6                                   |
| External connectivity     | 1. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 2. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 3. Well-connected sidewalks                                                          | <input type="checkbox"/>            |

**Table 4.1 (cont'd)**

|                                     |                                                                                   |                                     |
|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|
|                                     | 4. Well-connected bike lanes                                                      | <input checked="" type="checkbox"/> |
|                                     | 5. Number of public transits stops in proportion to the residential area          | <input type="checkbox"/>            |
|                                     | 6. Residential area located within a 10 min walk (800 m) from transit stops       | <input type="checkbox"/>            |
|                                     | 7. Residential area located within a 10 min walk (800 m) from commercial stores   | <input type="checkbox"/>            |
|                                     | 8. Residential area located within a 10 min walk (800 m) from public school       | <input type="checkbox"/>            |
|                                     | 9. Residential area located within a 10 min walk (800 m) from green spaces        | <input checked="" type="checkbox"/> |
|                                     | 10. Residential area located within a 10 min walk (800 m) from recreational areas | <input checked="" type="checkbox"/> |
|                                     | 11. Residential area located within a 10 min walk (800 m) from cultural services  | <input checked="" type="checkbox"/> |
| Total points                        | 11                                                                                | 7                                   |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Place-making and sense of belonging | 1. Mixed-use                                                                      | <input checked="" type="checkbox"/> |
|                                     | 2. Pedestrian oriented streets                                                    | <input checked="" type="checkbox"/> |
|                                     | 3. Close proximity of public spaces to residential areas                          | <input checked="" type="checkbox"/> |
|                                     | 4. Public spaces with all age-integrated outdoors activities                      | <input checked="" type="checkbox"/> |
|                                     | 5. Recreational venues (e.g. tennis, soccer, baseball, etc.).                     | <input type="checkbox"/>            |
|                                     | 6. Easy access to outdoor living spaces / Universal design/ADA                    | <input checked="" type="checkbox"/> |
|                                     | 7. Clear center                                                                   | <input checked="" type="checkbox"/> |
|                                     | 8. Clear edge                                                                     | <input checked="" type="checkbox"/> |
|                                     | 9. Historically preserved lands/buildings                                         | <input checked="" type="checkbox"/> |
|                                     | 10. Physical connection to historically preserved lands/buildings                 | <input type="checkbox"/>            |
|                                     | 11. Visual connection to historically preserved lands/buildings                   | <input type="checkbox"/>            |
|                                     | 12. Community garden or access to healthy food and farmers market                 | <input type="checkbox"/>            |
|                                     | 13. Unique neighborhood design                                                    | <input checked="" type="checkbox"/> |
|                                     | 14. Affordable housing                                                            | <input type="checkbox"/>            |
|                                     | 15. Diverse housing types                                                         | <input checked="" type="checkbox"/> |
| Total points                        | 15                                                                                | 11                                  |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Aesthetics                          | 1. Diverse building types                                                         | <input checked="" type="checkbox"/> |
|                                     | 2. Diverse lot sizes                                                              | <input checked="" type="checkbox"/> |
|                                     | 3. Various housing ages                                                           | <input type="checkbox"/>            |
|                                     | 4. Various building materials                                                     | <input checked="" type="checkbox"/> |
|                                     | 5. Architectural details                                                          | <input checked="" type="checkbox"/> |
|                                     | 6. Landmarks                                                                      | <input checked="" type="checkbox"/> |
|                                     | 7. Hierarchy of public spaces                                                     | <input type="checkbox"/>            |
|                                     | 8. Diverse land use                                                               | <input checked="" type="checkbox"/> |
|                                     | 9. Unique features at night                                                       | <input type="checkbox"/>            |
|                                     | 10. Scenic views/unique street vistas                                             | <input checked="" type="checkbox"/> |
|                                     | 11. Buffers to block undesirable abandoned area/s                                 | <input checked="" type="checkbox"/> |
|                                     | 12. Buffers to block undesirable building/s and or elements                       | <input checked="" type="checkbox"/> |
|                                     | 13. Aesthetic treatment of parking area/s                                         | <input type="checkbox"/>            |

**Table 4.1 (cont'd)**

|              |                                                             |                                     |
|--------------|-------------------------------------------------------------|-------------------------------------|
|              | 14. Coherent signage system                                 | <input checked="" type="checkbox"/> |
|              | 15. Coherent building additions including fences/ mailboxes | <input checked="" type="checkbox"/> |
|              | 16. Coherent streetscape                                    | <input checked="" type="checkbox"/> |
|              | 17. Well-maintained Street scape                            | <input checked="" type="checkbox"/> |
|              | 18. Well-maintained neighborhood                            | <input checked="" type="checkbox"/> |
| Total points | 18                                                          | 14                                  |

### 1. Safety criterion

Safety criterion was identified previously in this research study as one of the major contributors to improve people's QoL. In this study, the safety criterion of a neighborhood encompassed some safety categories, including: neighborhood safety from crime, pedestrians' safety from traffic, safety of residents when they walk alone around their neighborhood during the day and at night, safety of residents when visiting public spaces during the day and at night, safety of residents when using public transit facilities, and biking safety. Table 4.2 summarizes the total number of scores earned per safety category in the neighborhood scorecard for CHV neighborhood.

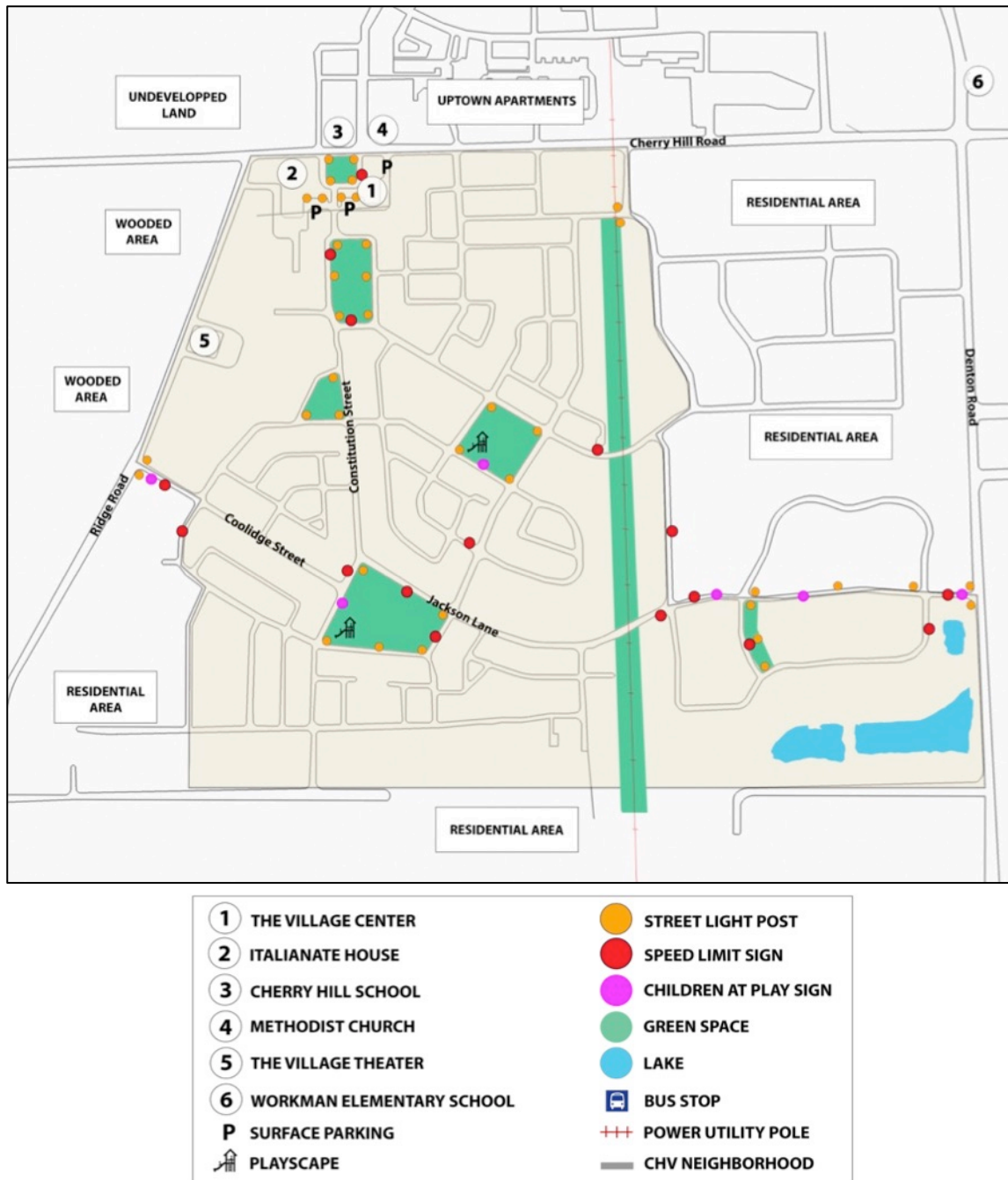
**Table 4.2: New Urbanist Greenfield Neighborhood Scores Summary  
for Safety Criterion**

| QoL criteria                              | CHV score (points) | Possible points |
|-------------------------------------------|--------------------|-----------------|
| Neighborhood safety from crime            | 8                  | 10              |
| Pedestrian safety from traffic            | 15                 | 19              |
| Walking safety measures during the day    | 8                  | 8               |
| Walking safety measures at night          | 10                 | 11              |
| Public safety measures during the day     | 3                  | 3               |
| Public safety measures at night           | 3                  | 4               |
| Public transit facilities safety measures | 1                  | 3               |
| Biking safety                             | 3                  | 4               |

CHV neighborhood earned a total of 49 points out of 60 in terms of overall safety. In terms of neighborhood safety from crime, CHV earned a total of 8 points out of 10 points. According to the design guidelines listed in the neighborhood scorecard, the provision of few entryways, active nodes and mixed-uses, active street fronts, and the provision of adequate lights on residential streets, in public spaces, and in parking areas are recommended for improving a neighborhood's safety from crime. According to the field investigation, CHV neighborhood had few numbers of entryways.

CHV neighborhood had three main entryways, located on Cherry Hill, Denton and Ridge streets. CHV houses a mixed-use building located on Cherry Hill Village. This mixed-use building is known as the Village Center, and it houses a variety of uses, including a medical center (dentist office, internal medicine, wellness center, obstetrics & gynecology, radiology), a pharmacy, an ice-cream parlor, and a grocery store. This block of mixed-uses is considered an active node in the neighborhood as it also encompasses a traditional plaza with a water fountain and plenty of seating options (see Figure 4.2-3-4).





**Figure 4.2: On-site Safety Measures in Cherry Hill Village (CHV) Neighborhood**  
(Figure credit to author)



**Figure 4.3: The Village Center in Cherry Hill Village (CHV) Neighborhood and its Traditional Architecture (Image credit to author)**



**Figure 4.4: The Traditional Plaza of the Village Center (Image credit to author)**

Although this active block enhanced the safety the surrounding residential, the Village Center is located far away from approximately 70% of CHV residential units. Accordingly, this active node enhanced the safety of a handful number of residential units only (see Figure 4.3-4). On the other hand, CHV provided an adequate number of open green spaces that were also considered as active nodes. There are a total number of five public main green spaces in CHV (see Figure 4.2). Residents actively used these spaces since they provided diverse seating options and outdoors activities. Such active spaces enhanced the neighborhood safety and the pedestrians' safety as well.

Attaining natural surveillance through the provision of semi-public spaces that are attached to buildings is another design feature that is widely adopted in NU neighborhood to enhance the neighborhood's overall safety. The semi-public attachments include front porches, balconies, stoops, etc. The semi-public attachments allow for a 24-7 surveillance of the streets. All the buildings throughout CHV neighborhood had front porches and/or balconies (see Figure 4.5-6). Residents of CHV actively used their porches and balconies as stages for social interactions and relaxation, and thus improving the safety of the neighborhood, as well as the pedestrians' safety.

NU neighborhoods are also known for placing car garages at the rear of the residential buildings in an attempt to reduce both asphalt areas and blank walls along residential streets. The reduction of blank walls leads to creating more active streets, and thus enhancing the safety of the sidewalk users. More than 90% of the residential buildings in CHV had rear or sidecar garages, while a handful number of residential buildings had street facing car garages, which helped in creating safer environment for sidewalk users (see Figure 4.7).





**Figure 4.5: Single-houses with Front Porches in Cherry Hill Village (CHV) Neighborhood**  
(Image credit to author)



**Figure 4.6: Front Porch of a Single-family Overlooking the Street in Cherry Hill Village (CHV) Neighborhood** (Image credit to author)



**Figure 4.7: Typical Residential Street in Cherry Hill Village (CHV) Neighborhood with Active Fronts** (Image credit to author)

As mentioned earlier in Chapter II, greys areas, abandoned buildings/areas and brownfields negatively affect the overall safety of the neighborhood. CHV neighborhood did not have any brownfields or abandoned buildings. In terms of grey areas, the only surface parking area in CHV neighborhood was provided in proximity to Village Center. This parking area offered a total number of 32 parking spaces (including handicapped parking), with adequate lighting. In terms of lighting in CHV neighborhood at night, the residential streets depended mostly on the mandatory lights of the semi-public attachment to buildings, including lights along front porches, balconies, and stoops. Figure 4.2 shows the exact locations of the streetlight poles in CHV neighborhoods. According to Figure 4.2, the streetlight posts were mostly located around public spaces, The Village Center and its parking area, and a handful of streetlight posts were found along Jackson Lane (see Figure 4.8).





**Figure 4.8: Light Post Design in one of the Public Green Spaces in Cherry Hill Village (CHV) (Image credit to author)**

In terms of pedestrian's safety, narrow streets are recommended for residential projects because narrow streets help in slowing traffic and thus attaining pedestrians' safety. CHV neighborhood had a hierarchical street network of narrow streets. The main streets in CHV neighborhood were 25 feet wide, while the arterial streets and alleyways were 20 feet wide. Such narrow street network reduced the vehicle speed and helped in enhancing pedestrians' safety in CHV neighborhood. The average block size in CHV was 205ftx580ft, which fulfilled the recommended distance for stop intervals to occur. The recommended stop intervals in residential areas are between 200m to 300m.

In terms of speed limit, the recommended speed limit in residential projects is equal or less than 25 miles/hour. All streets in CHV neighborhood had speed limit of 25 miles/hour, which also fulfilled the recommended speed limit for pedestrians' safety from traffic. New

Urbantists stress that one-way streets increase speed and thus putting the lives of pedestrians as well as drivers at risk, thus two-ways streets are recommended in residential projects. Also, NU recommend the provision of on-street parking to slow down the moving traffic. On-street parking is encouraged in NU neighborhoods for two main reasons: 1-to slow down traffic on residential streets, and 2- to act as a barrier between the pedestrians on the sidewalks and the moving traffic on the streets.

Figure 4.9 and 4.10 illustrate that all of the residential streets of CHV neighborhood were two-way streets that allowed for on-street parking along the right side of the street curb. Such street design enhanced the pedestrians' safety from traffic in the neighborhood. Also curb return radii of streets are recommended to be not more than 15 feet to force cars to slow down when they make the turn. The major thoroughfares in CHV had curb turn radii of 15 feet, which created a safer pedestrian crossing.

CHV neighborhood had a decent traffic safety signage system all over the neighborhood. Speed limit signs were heavily located along major thoroughfares. In addition, there were stop signs at almost every street intersection in the neighborhood. Also, signs for traffic safety for children were located along major thoroughfares and around the perimeters of playground areas (see Figure 4.2). CHV also provided some other signs for enhancing residents' safety, such as swimming warning signs located along the lakes.

According to the site visits to CHV neighborhood, the speed limit signs, and on-street parking might not be enough to slow down traffic on residential streets. According to the thorough physical investigation of the neighborhood, Jackson Lane, and Coolidge Street had heavy traffic with speedy drivers, despite the presence of speed limit signs, and the on-street parking.



**Figure 4.9: Typical Narrow Street Design in CHV Neighborhood with On-street Parking and Traffic Safety Signs (Image credit to author)**



**Figure 4.10: Typical Street Intersection Design in CHV Neighborhood (Image credit to author)**



Placing buildings in close to street curbs with shallow front yards is another well-known technique utilized in NU neighborhoods to slow down traffic and to control the speed on major thoroughfares with high volumes of traffic (see Figure 4.9-10). According to designers and researchers of NU, drivers tend to slow down when the buildings are located close to the sidewalks. The recommended depth for front yards of residential buildings is between 20 feet-24 feet. CHV neighborhood adopted such technique to slow down traffic on main streets. For example, buildings located on Constitution Street, a main street in the neighborhood, had buildings with shallow fronts that ranged between 18 to 22 feet in depth.

The provision of well-maintained and well-connected sidewalks is another crucial aspect when considering pedestrian's safety. A network of well-maintained and well-connected sidewalks is the preferred accommodation for pedestrians because they separate pedestrians from the moving traffic along streets. CHV neighborhood had a well-connected and well-maintained network of sidewalks. All sidewalks in CHV neighborhood were 4 feet wide and were accessible by all ages and different physical abilities. All sidewalks included curb cuts that allowed the sidewalks to be accessible by all physical abilities. In addition, almost 90 % of the sidewalks in CHV were lined up with trees, which acted as a buffer from moving traffic and thus enhancing the safety of the sidewalk users.

To improve pedestrians' safety when crossing streets, it is recommended to have street intersections with bulb outs to lessen the distance that will be crossed by pedestrians, and it is recommended to provide brightly painted cross walks. Also, speed bumps, roundabouts, and using rough pavement materials are all other technique used for calming traffic and thus improving pedestrians' safety. CHV neighborhood did not provide any roundabouts or speed bumps. In addition, the streets did not include any brightly painted sidewalks. The street

intersections in CHV neighborhood were rich with stop signs, but those intersections did not have any bulb outs to further enhance pedestrians' safety. All streets in CHV neighborhood were asphalt streets and no other roughened materials were used to slow traffic throughout the neighborhood.

As mentioned earlier in Chapter 2, semi-public attachments, minimum length of blank walls along residential streets, and active nodes/open public spaces are all recommended design guidelines that not only enhance the overall safety of neighborhoods from crime but also the safety of residents when they walk alone around their neighborhoods during day and at night. Fortunately, CHV neighborhood provided such recommended guidelines for enhancing the safety of its residents. Also, the absence of abandoned buildings, and grey areas in CHV neighborhood could also enhance the residents' safety when walking alone around their neighborhood during the day and night.

In terms of improving residents' safety when walking alone around their neighborhood at night, CHV provided a handful number of streetlight poles scattered around the neighborhood and were located mainly on the perimeters of the green spaces and along the neighborhoods' entryways (see Figure 4.2). Mandatory lights along the semi-public attachments to the buildings were the main sources of streetlights in CHV. The sidewalks in CHV neighborhood did not have any pedestrian or streetlight poles. Such lack of streetlights along sidewalks might affect the safety of pedestrians' when walking alone around the neighborhood at night.

Another aspect that is considered crucial for pedestrians' safety is the elimination or minimization of any hazardous elements in neighborhoods, such as power lines, etc. Power lines running through CHV neighborhood were considered the only hazardous element found on the premise of CHV neighborhood (see Figure 4.2-10-11). The power lines in CHV had a buffer

distance of approximately 50 feet on both sides of the power lines. The space around the power lines was used as a green space with a linear pedestrian and bike trail.



**Figure 4.11: Power Lines Running through CHV Neighborhood**  
(Image credit to author)

In terms of the safety of open green spaces in CHV, the public green spaces in the neighborhood were located within the physical fabric of the residential blocks. Such locations enhanced the safety of the users of the open green, since the open green spaces were surrounded by the active fronts of the residential buildings and streets. Despite the fact that streetlight poles were found mainly in open green spaces in CHV neighborhood, the number of the light poles might not be enough for enhancing the users' safety. Placing light poles along the peripheries of the green spaces, away from most of the seating and activities areas might also affect the safety of public space users.

In terms of safety of residents when using public transit services, CHV provided safe routes to nearby public transit services. A bus station located on Cherry Hill Road mainly served CHV neighborhood (see Figure 4.2). The neighborhood did not provide any public transit services. In terms of biking safety, CHV did not provide shared streets, but the bike trails/lanes in CHV were well-maintained, well-connected, and located away from dangerous slopes and terrains.

## 2. Comfort criterion

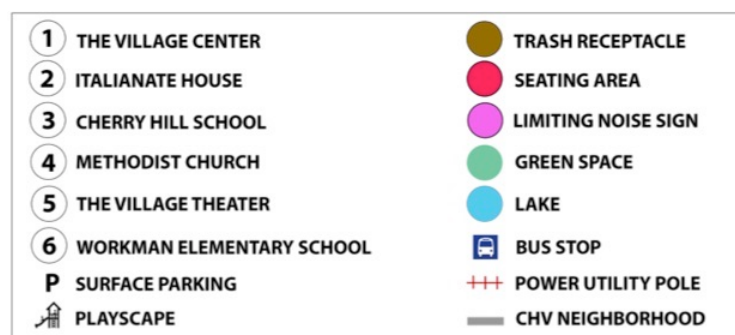
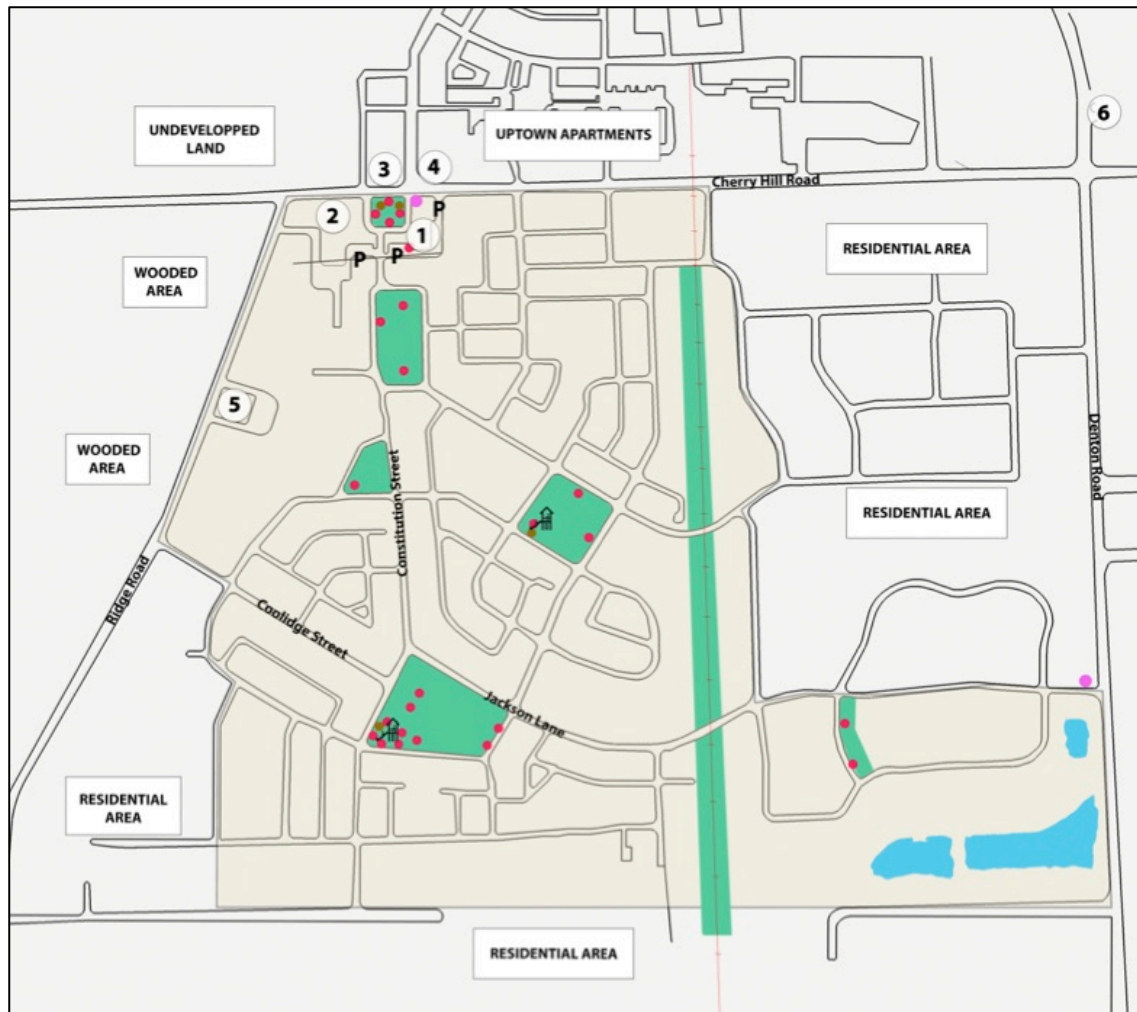
Resident's spatial comfort is another criterion that is crucial for improving QoL in neighborhoods. In order to fulfill this criterion, a number of design elements have to be provided in a neighborhood to ensure that residents live in a comfortable and relaxing environment. This criterion includes multiple aspects of comfort, which are: overall cleanness of the neighborhood, cleanness of public spaces and green areas, quiet environment, access to natural areas, comfortable population and building densities, pedestrians' comfort, biking comfort, and the residents' comfortable level when using public transit in the neighborhood. CHV neighborhood earned a total of 27 points under the overall comfort category. Table 4.3 illustrates the number of points earned in the scorecard per each comfort type in CHV neighborhood.

A comfortable neighborhood requires that a neighborhood to be well maintained and clean. The overall cleanness of the neighborhood is assessed in the scorecard by mapping the location and the quantity of public trash bins in the neighborhood and in public spaces. In CHV neighborhood, a few numbers of trash receptacles were located in public spaces, while the sidewalks did not have any public trash receptacles or recycling bins (see Figure 4.12). Despite the lack of trash receptacles in the neighborhood, the neighborhood was clean and well maintained.

In terms of providing a quiet environment, CHV neighborhood provided tree linings as noise buffers along major thoroughfare to reduce noise from traffic. According to the site visits, the provision of tree linings along some streets in CHV neighborhood, especially along Constitution Street and Jackson Lane, was not enough to block traffic noise (see Figure 4.13-14). These two streets were main arterial spines in the neighborhood with heavy traffic movement accompanied by high traffic noise. Accordingly, providing tree linings to alleviate traffic noise might not be an efficient technique on some streets in CHV.

**Table 4.3: Cherry Hill Village (CHV) Scores Summary for Comfort Criterion**

| <b>QoL criteria</b>               | <b>CHV score (points)</b> | <b>Possible points</b> |
|-----------------------------------|---------------------------|------------------------|
| Neighborhood comfort              | 9                         | 14                     |
| Pedestrian comfort                | 9                         | 10                     |
| Public space comfort              | 5                         | 5                      |
| Public transit facilities comfort | 1                         | 3                      |
| Biking comfort                    | 3                         | 4                      |



**Figure 4.12: On-site Comfort Measures in Cherry Hill Village (CHV) Neighborhood**  
(Figure credit to author)





**Figure 4.13: Constitution Street in CHV Neighborhood**  
(Image credit to author)



**Figure 4.14: Jackson Lane in CHV Neighborhood**  
(Image credit to author)

In an attempt to provide a quiet environment in the neighborhood, CHV neighborhood limited the passing of construction trucks into the neighborhood through the provision of warning signs on main entryways (see Figure 4.15-16). Overall, the neighborhood was quiet, and did not have any major on-premise sources of noise.

In terms of creating a comfortable experience for pedestrians, human scale was adequately addressed in the neighborhood. The residential streets in CHV demonstrated an adequate spatial enclosure that is important for pedestrians' comfort. For example, CHV residential streets are narrow with few lanes and had a comfortable building to street ratio. The typical building to street ratios in CHV was 1:1.5, which is a recommended ratio for residential projects. As shown in Figure 4.17, the streets' widths in CHV did not exceed the building heights. Also, the residential buildings and the mix-use buildings did not exceed four stories in height, which added to the comfort of pedestrians' experience and enhanced street enclosure. The street furniture in CHV also respected human scale, including benches, streetlight poles, mailboxes, etc. The streets and the public spaces were adequately furnished according to pedestrians' scale to enhance their walking experience.





**Figure 4.15: Signage to Limit the Passing of Construction Trucks on Cherry Hill Road**  
(Image credit to author)



**Figure 4.16: Signage to Limit the Passing of Construction Trucks on Denton Road**  
(Image credit to author)



**Figure 4.17: Typical Building to Street Ratio in CHV Neighborhood**  
(Image credit to author)

The comfort of sidewalks is another crucial aspect for creating comfortable neighborhoods. The sidewalks in CHV were 4 feet wide, well connected, and well maintained. Most of the sidewalks were lined up with trees that protect pedestrians from the effects of urban heat island, strong winds, and other weather events. The sidewalks in CHV were comfortable for all types of users and all different physical abilities.

It is also widely accepted in the urban design field that short blocks add to pedestrians' comfort. The recommended size of a block is 330 feet x 330 feet to allow short cuts and navigation comfort for both pedestrians' and vehicular movement. Also, short blocks give a better sense of human scale and thus adding to the comfort of pedestrians. As mentioned before, the average block size in CHV was 205feet x 580feet. The average width of blocks in CHV fulfilled the recommended width for comfortable blocks, while their lengths surpassed the

recommended size. CHV blocks had longer length than recommended, which might in return affect the walking comfort of its residents.

In order to create a spatial arrangement of neighborhoods that is highly legible and easy to navigate through either on foot or by automobiles, the neighborhood has to have a clear center and a clear edge. Despite the fact that The Village Center in CHV neighborhood was intentionally designed to be the center of CHV neighborhood, its location at the periphery of the neighborhood's premise, on Cherry Hill Road, had lessened its spatial function as the center of the neighborhood.

The Village Center functioned more as an entryway to the neighborhood and not as the neighborhood's center. On the other hand, the neighborhood had clear edges. Main streets and natural areas defined adequately the edges of the neighborhood. Also, in order to create a legible and comfortable layout design for neighborhoods, it is recommended that the distance between the edge and the center of a neighborhood does not exceed a pedestrian walking shed of 5 minutes walk. Approximately, 75 percent of the residential units in CHV neighborhood did not fall within that recommended pedestrian shed.

Way finding signage, landmarks, and distinguishable buildings/areas assist in facilitating navigation through neighborhoods. CHV had a coherent street signage system, but lacked way finding signs to properly direct pedestrians to the different destinations, such as The Village Centre, playscapes, in the neighborhood. Corner buildings with unique designs and colors were the dominant technique utilized in CHV to enhance its legibility (see Figure 4.18).



**Figure 4.18: Unique Design for Corner Building in CHV Neighborhood**  
(Image credit to author)

Another technique used in CHV to enhance legibility was the gradual transformation in building and population density and street design between the blocks located near the center of the neighborhood and at its edge. New Urbanists typically organize building density and population density in neighborhoods based on the Transect. For example, the center of the neighborhood has to be dense and urban and the edge of the neighborhood has to be more rural, exactly like the different Transect sectors.

In CHV, one could sense the gradual increase in building and population density towards the center of the neighborhood, especially along Constitution Street. Constitution Street housed most of the condominium units in CHV. The condominiums and the narrowly spaced trees line up Constitution Street, which resulted in creating a unique urban street in the neighborhood (see Figure 4.19).



**Figure 4.19: Condominiums along Constitution Street in CHV Neighborhood**  
(Image credit to author)

Designing various lot sizes is another design technique, commonly utilized by New Urbanists, to emphasize the idea of the gradual change in population and building density from the center to the edge of the neighborhood. For example, in CHV, the lot sizes were smaller towards the center of the neighborhood compared to the lot's sizes located at the edge of the neighborhood. Residential blocks with smaller lots sizes allow for higher number of building density per capita and thus higher population density. According to the field investigation, the typical lot size of single-family house in CHV was 45feet x 120feet, whereas the average lot size at its edge was 75feet x 135feet.

According to Duany (2000), a shift in the public realm from urban to rural and a transition from cultural to natural realms have to occur between the areas around the center of the neighborhood and near its edge. Such shift assists in emphasizing the idea of a village and to

enhance a neighborhood's legibility. Also, the streets become more curvilinear towards the edges of the neighborhood unlike the linearity of most streets towards the center of the neighborhood. In addition to the building density, the front yards and street frontages are shallower and closer to street curbs towards the center of the neighborhood in contrast to its edges to emphasize the urban feel of the center.

Most residential units located closer to the center of CHV neighborhood had shallow fronts with a depth not more than 20 feet from the street curb, whereas the front yards of residential houses located near its edge were deeper, 36 feet in depth (see Figure 4.20-21). In CHV, the tree lining stopped lining up towards the Eastern and Southern edges of the neighborhood; the tree arrangement became more varied in species and more rural like in shape towards the edge.

Unique entryways and active nodes destinations are also widely accepted as means to facilitate navigation through neighborhoods. CHV had a very distinguishable entryway on Cherry Hill Road. This entryway had also a formal village square that had a rectangular shape with a water fountain, surrounded by seating areas, planters and trees. This village square had also an educational map of the surrounding historic buildings. The Village Center was the most important active node in the neighborhood, and it definitely helped pedestrians find their way through the neighborhood.

In terms of diverse destinations in the neighborhood, CHV had five public spaces, each offering a different type of activity. For example, one public space offered a playscape, seating area, and a landmark, while another one offered a serene and scenic environment through its woods like design (see Figure 4.22-23-24 & 25).





**Figure 4.20: Shallow Front Yards along Streets Close to the Center of CHV Neighborhood**  
(Image credit to author)



**Figure 4.21: Deep Front Yards along Streets Close to the Edge of CHV Neighborhood**  
(Image credit to author)



**Figure 4.22: Active Public Space with a Playscape in CHV Neighborhood**  
(Image credit to author)



**Figure 4.23: Woods-like Public Space in CHV Neighborhood**  
(Image credit to author)





**Figure 4.24: Open Green Space in CHV Neighborhood**  
(Image credit to author)



**Figure 4.25: Open Green Space with Seating Area in CHV Neighborhood**  
(Image credit to author)

In terms of landmarks and distinguishable historic destinations, CHV neighborhood was located in Cherry Hill District which housed some significant historic buildings in Canton Township, such as: the Cherry Hill House, the only Italianate building in the township, the Gothic Revival Cherry Hill United Methodist Church and its associated cemetery, and the Cherry Hill School. The historic church and the Italianate House were located at the West edge of the neighborhood on Ridge Road, while the historic school was located across the street from the neighborhood on Cherry Hill Road.

Despite the proximity of those historic landmarks to CHV neighborhood, they did not actually help in increasing the pedestrians' legibility of CHV neighborhood. Those historic landmarks were not physically or visually connected to the neighborhood; trees and buildings mostly hindered the views of such significant landmarks. The Village Center, the Cherry Hill School and the Village Theater were all located at the same intersection, which created a very distinguishable and active node along Cherry Hill road (see Figure 4.26). The Village Theater was another important landmark in Canton Township, and it was considered a major attraction not only on the local level but also regionally.

Accessing natural areas is another aspect that enhances the residents' comfort. CHV neighborhood adequately provided open green spaces that were accessible by all ages, races, and physical abilities. Open green spaces were located within the residential clusters not only to provide safe open green spaces but also to increase the residents' accessibility to green spaces. The design of the public green spaces in CHV allowed for an array of outdoors activities to take place. The green spaces offered shaded seating areas, picnic areas, playgrounds, pedestrian and biking trails, and they also offered places for community gatherings. The semi-public

attachments of the front yards including porches, balconies, and stoops offered additional outdoors living rooms for residents to enjoy the outdoors and to relax as well.



**Figure 4.26: The Village Theater on Cherry Hill Road**  
(Image credit to author)

Up to date, there were approximately 600 households in CHV. The neighborhood offered a comfortable living environment in terms of population and building densities. The average building block density was six residential units per acre, which fulfilled the recommended density for creating comfortable residential projects on Greenfield projects.

In terms of comfort when using public transit facilities, the neighborhood did not offer any public transit shelters, and it did not have proper signage to direct pedestrians or public transit users to the bus stop located on Cherry Hill Village. In terms of biking comfort, the bike lanes/trails in CHV neighborhood were comfortably located away from dangerous slopes and terrains, well-connected and well-maintained. The bike lanes/trails in CHV neighborhood were located in close proximity to residential units that could improve the comfort of bikers.

### 3. Connectivity criterion

The connectivity criterion highlights the degree of internal street connectivity of a neighborhood, as well as the neighborhood's level of proximity and connectivity with the surrounding public and private facilities. Table 4.4 illustrates the total points earned in the scorecard regarding the connectivity criterion in CHV neighborhood.

**Table 4.4: Cherry Hill Village (CHV) Scores Summary for Connectivity Criterion**

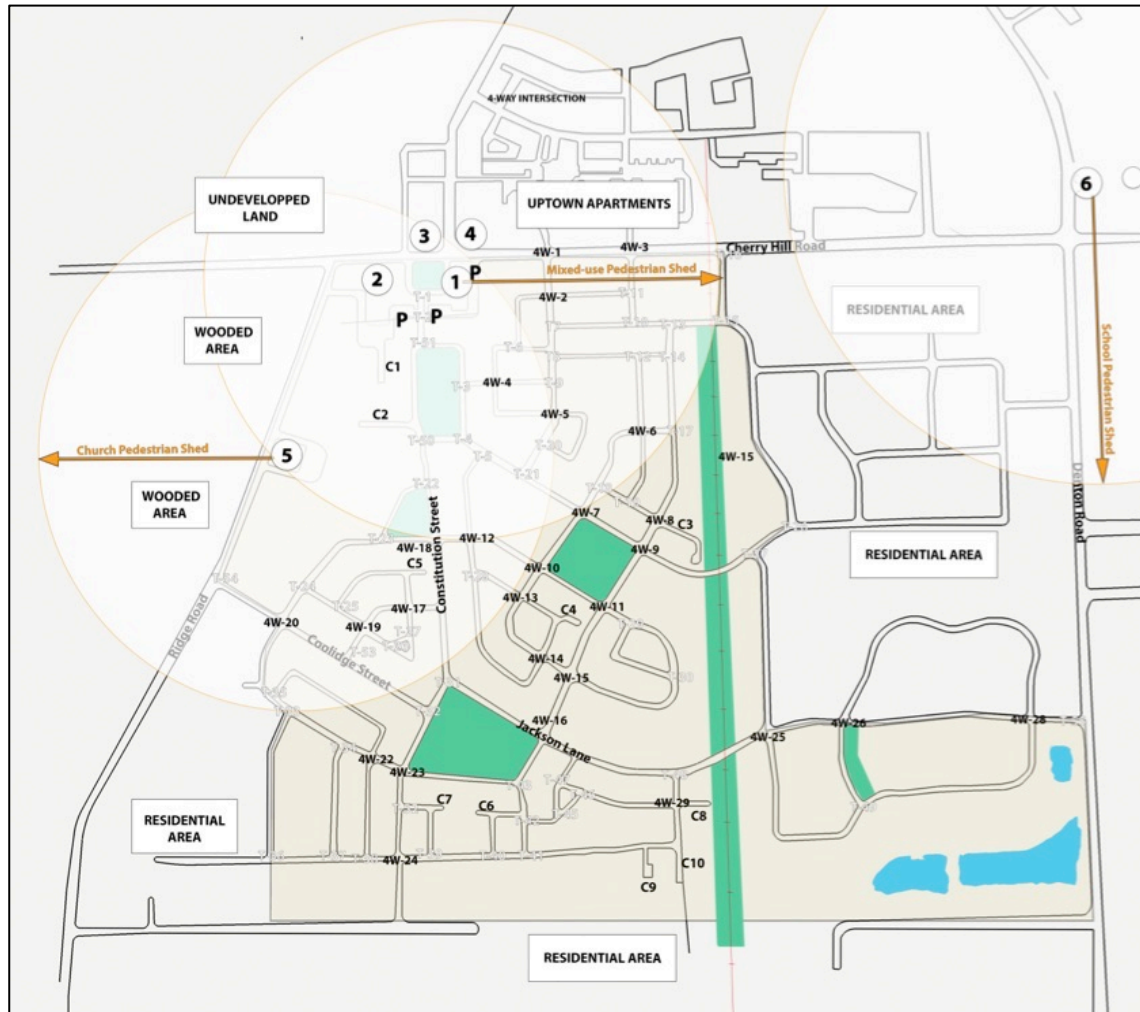
| <b>QoL criteria</b>   | <b>CHV score (points)</b> | <b>Possible points</b> |
|-----------------------|---------------------------|------------------------|
| Internal connectivity | 6                         | 9                      |
| External connectivity | 6                         | 11                     |

As mentioned before in Chapter 2, the layout of a neighborhood affects its internal connectivity to a great extent. A neighborhood with a layout that has short blocks, well-connected street and sidewalks, as well as well-connected network of bike lanes/trails increases the internal connectivity of a neighborhood. It is widely accepted that shorter blocks create better internal connectivity because it provides more street intersections. Street intersections are widely

accepted as a major contributor for enhancing the internal connectivity of developments in general; more street intersections give more choices and short cuts for pedestrians as well as drivers. The recommended intersection density for enhancing internal connectivity is 140-intersections/square mile.

CHV neighborhood earned a total of 6 points out of 9 points in terms of internal connectivity (see Table 4.4). In terms of the density of intersections per square mile, CHV neighborhood had a total number of 84 street intersections, 29 4-way intersections and 55 T-junctions. Accordingly, CHV fulfilled the recommended number of intersections density per square mile. On the other hand, the number of T-junctions outweighed the number of the 4-way intersections, which could possibly affect the internal connectivity level for pedestrians and drivers. CHV had a total number of 10 cul-de-sacs, with an average length of 120 feet. But such few numbers of cul-de-sacs, with such short length, might not negatively affect the overall internal connectivity of the street network of CHV (see Figure 4.27).

The well-connected sidewalk network and connected bike lanes/trails improved the internal connectivity of CHV neighborhood. Residents could reach various destinations in the neighborhood either on foot or by bike. CHV provided open green spaces that were strategically located in the close proximity to residential units. The street network of CHV neighborhood divided the layout of the neighborhood into quadrants. Each quadrant had a green space located within 5 minutes walking distance from residential units.



|                             |                        |
|-----------------------------|------------------------|
| 1 THE VILLAGE CENTER        | 4W 4-WAY INTERSECTION  |
| 2 ITALIANATE HOUSE          | T T-JUNCTION           |
| 3 CHERRY HILL SCHOOL        | C CUL-DE-SAC           |
| 4 METHODIST CHURCH          | G GREEN SPACE          |
| 5 THE VILLAGE THEATER       | L LAKE                 |
| 6 WORKMAN ELEMENTARY SCHOOL | B BUS STOP             |
| P SURFACE PARKING           | P++ POWER UTILITY POLE |
|                             | CHV NEIGHBORHOOD       |

**Figure 4.27: On-site Connectivity Measures in Cherry Hill Village (CHV) Neighborhood**  
(Figure credit to author)

Connectivity and proximity to the surrounding public services and other amenities, improves people's QoL in neighborhoods. According to Duany (2002), grocery stores, civic buildings, libraries, churches, green spaces and public transit stops are considered important communal facilities that have to be within 5 minutes' walk from all residential units in a neighborhood. Schools have to be within 15 minutes walking distance from residential areas. In CHV neighborhood, only 145 households could reach the Village Center on foot within the recommended 10 minutes' walk; approximately a total of 88 single house units and 57 condos out of a total of 600 residential units were able to reach the on-premise mixed-use development (see Figure 4.27). Only 145 households could reach on foot bus stop located on Cherry Hill Road within 10 minutes' walk. As mentioned before, there was a church located on Denton Road, and approximately less than half of the residential units in CHV lied within its pedestrian shed (see Figure 4.27).

In terms to proximity to public schools, as Figure 4.27 shows, all residential units in CHV did not fall within the 15 minutes walking distance pedestrian shed of the nearest school. The nearest public elementary school (Workman Elementary) was not accessible by foot for all of CHV residents since the walking distance to the school was more than 15 minutes in terms of the proximity of the neighborhood to main commercial corridors in the area, CHV neighborhood was located approximately 3.5 miles away from Ford Road. Ford Road was considered the main commercial corridor in Canton Township. Residents of CHV had to drive to Ford Road for their daily and/or weekly needs. Accordingly, the external connectivity of CHV neighborhood with the surrounding needed services was not as strong as its internal connectivity.



#### 4. Place-making and sense of belonging

According to the neighborhood scorecard, CHV earned a total of 11 points out of 16 points in terms of place-making criterion. In general, NU neighborhoods aim to strengthen the public realm and the public's sense of community and belonging through place-making. As mentioned before in Chapter 2, place-making is about strengthening the connection between people and places through celebrating cultural identity, social equity, and physical identity of places.

Place-making enhances the sense of community and sense of belonging through blurring the distinction between the public and private realms. Accessible and attractive public spaces and active public realms along streets are both tools that are utilized to enhance sense of belonging.

NU neighborhoods are famous for having street that include semi-public attachments to residential buildings, such as front porches, balconies, stoops, large bay windows, and shallow setbacks, in attempt to blur the distinction between private and public realms (Duany and Plater-Zyberk, 1992). The integration of private residential spaces with the surrounding public spaces encourage socialization among residents, and thus enhance the sense of the residents' place attachment and sense of belonging to their neighborhoods (Duany and Plater-Zyberk, 1992).

All of the residential buildings in CHV had the semi-public attachments. Also, the condominiums had shared front porches. CHV had a unique sense of place through implementing place-making design guidelines. New Urbanists emphasize more on the idea of blurring the division between private and public spaces and create active walkable streets through the implementation of the famous white picket fences. White picket fences are inspired from the American traditional old towns and they are widely used in NU neighborhoods as a technique to border the private front and back yards, whilst encouraging neighborly public



interactions. Rather than using solid tall fences to border private spaces, NU neighborhoods implements short picket fences (maximum height is 6 feet only on easements) to serve as a friendly barrier between the private and public realms. Such design technique enhances social interactions and thus improves the sense of belonging.

White picket fences were a prominent design element implemented in a lot of single-family houses in CHV neighborhood. The white picket fences allowed for interactions between neighborhoods not only along residential streets but also in the backyards (see Figure 4.28-29). The back and front picket fences allowed for social interactions among neighbors in their private spaces. A well-defined center and edge also strengthen place identity and the sense of belonging on the neighborhood level. CHV had a clear center and a clear edge. The Village Center and its plaza acted as symbols of public pride for CHV residents, which could result in increasing the sense of belonging. Shallow fronts were prevalent in the CHV neighborhood especially towards the center of the neighborhood to accentuate the idea of the urban feel of the center assisted in creating a unique sense of place. The gradual change between the street designs and building and population densities between the center and the edge of the neighborhood in CHV neighborhood assisted in creating a sense of place.

The provision of comfortable, safe, and accessible public destinations is another aspect on the community level that enhances the sense of belonging, and communal bonding. CHV provided a decent number and size to house a variety of outdoors functions/activities of public spaces to celebrate social connections and enhance the sense of belonging among residents. The public spaces in CHV also provided an adequate balance between active and passive open spaces. The public green spaces in CHV were within 5 minutes' walking distance from all residential units and they were accessible by all ages, races, and all physical abilities.



**Figure 4.28: Single-family House in CHV Neighborhood with Fenced Front Yard**  
(Image credit to author)



**Figure 4.29: Private Backyards with White Picket Fences in CHV**  
(Image credit to author)

Placing garage doors at the rear of the buildings is another salient design principle in NU neighborhoods to encourage socialization and thus creating a unique sense of place. CHV neighborhood had succeeded in creating a unique sense of place through embracing such design technique. Almost 90 percent of the residential buildings in CHV had rear garages or car garages placed on alleyways, and a handful number of residential buildings had street facing car garages. Minimizing blank walls on residential streets combined with the semi-public attachments to the buildings had added a unique sense of place to the residential streets in CHV, and thus could help in improving the residents' sense of belonging. The Victorian architecture of the buildings in CHV also created a unique identity for the neighborhood, and thus could enhance the residents' sense of belonging.

Pedestrian oriented streets are another significant aspect that enhances sense of place and sense of belonging. Adequately designed streets for pedestrians are considered public spaces that increase the chances for social interactions leading to increasing the sense of community. The streets in CHV followed the design guidelines recommended for creating pedestrian oriented streets. The street designs were sensitive to human scale, lined up with trees, and active. The sidewalks were also stages for social interactions.

The provision of different housing types is another aspect to enhance social cohesion on the community level. A neighborhood that houses an array of housing types usually generates a community with diverse demographics and socioeconomic backgrounds, thus promoting social interactions among different types of populations, resulting in creating a unique sense of place. As mentioned before, CHV provided single-family houses with different lot sizes, and condominiums. The condominiums were blended harmoniously, architecturally and spatially, within the physical fabric of the neighborhood, in contrast to other neighborhoods that used to

segregate residential units according to their building types. In CHV, the condominiums shared the same public facilities in the neighborhood. They also had semi-public attachments, such as balconies and front porches. Some condominiums had private front porches, while others had shared front porches.

Despite the fact that CHV celebrated communal bonding through the adoption of several place-making techniques, it had failed to adequately address and honor the surrounding historic buildings. The physical arrangement of CHV buildings and tree linings blocked most of the views to the surrounding historical landmarks. In addition, the design of the street network of CHV did not offer a direct physical connection to such significant local icons.

CHV neighborhood did not provide affordable housing; on the contrary, the neighborhood offered luxurious housing units. According to recent housing listings, the prices of the residential units in CHV ranged between \$150,000 and \$565,000 for 1,068 – 3,960 square feet consecutively. According to Neighborhood Scout.com, the median real estate price of CHV was \$469,840, which was considered more expensive than 97.6% of the neighborhoods in the state of Michigan. It also indicates that the current average rental price in CHV is \$2,407.

A unique sense of place is not only about creating spaces that are accessible by all ages and physical abilities, but also a unique sense of place is about providing accessible buildings as well. According to New Urbanists (2018), lifelong communities have to provide a “zero-step entry” (Ochoa et al., 2018) for as many houses, apartments, and other public buildings as well. New Urbanists stress that designs that guarantee accessibility for the disabled within buildings and in other public spaces places, such as street corners and bus stops combined with the design intention for creating lifelong occupancy communities are crucial for improving the QoL in neighborhoods. On the building level, building forms could be modified to reflect the fact that

people are living longer, often with disabilities or chronic health problems. In CHV, all condominium buildings had ADA accessible entries. Also, single-family houses located on corner lots and single-family houses with square footage equal or more than 2,300 square feet offered side entry doors that could be retrofitted into accessible ramps for easier access.

## 5. Aesthetics

According to the neighborhood scorecard, CHV neighborhood earned a total of 14 points out of 18 points. The design of CHV neighborhood reflected strong inspirations and connections to traditional town designs. The Victorian architecture of the buildings in CHV and their semi-public attachments added to aesthetics of the neighborhood. Also, most of the exterior of the residential houses in CHV were personally customized according to the homeowners' preferences to avoid the cookie-cutter type of housing development, which added visual and physical uniqueness to the neighborhood. Only a handful number of blocks in CHV resembled the cookie-cutter type of development. CHV neighborhood was built on different phases, and built by different builders, which resulted in creating the cookie-cutter type of development. At the same time, such handful number of blocks did not dramatically affect the visual and physical coherence of the streetscape in CHV neighborhood.

As mentioned before in Chapter 2, a streetscape includes the natural and built elements of the street that form a street's character, including: design of the road (number of lanes, width of street, street pavement material, etc.), design of buildings, street furniture, tree linings, vegetation, public spaces, sidewalks, fronts of adjoining buildings, etc. Street furniture also played a role in influencing the neighborhood's visual appeal. CHV neighborhood provided a coherent design of street furniture, including landscape elements, outdoors seating benches, public trash receptacles, streetlight posts, and signage. Traffic safety signage, street names

signage, and real estate signage in CHV had a coherent design as well that contributed greatly to the overall aesthetics of the neighborhood.

Also, the diverse lot sizes of CHV neighborhood added to the visual interest of the neighborhood. As mentioned before, the lot sizes were smaller in size around the center of the neighborhood and gradually they got bigger in size towards the edge, which resulted in creating diverse street views and vistas along CHV streets. Most of the bigger lots in CHV were corner lots with bigger houses, and with distinguishable exterior color, which added to the visual appeal of the streets in CHV.

On the other hand, The Village Center was visually and physically disconnected from the spatial fabric of the neighborhood. The streets in CHV were all lined up with trees and are spatially well connected to the different destinations in the neighborhood except for Village Center. The Village Center was to some extent isolated visually and physically from the rest of the neighborhood. Rear car garages of some of the residential units in CHV defined the edge of the Village Center, which weakened the visual appeal of this main node (see Figure 4.30-4.31).

The location of the parking area of the Village Center between the Village Center block and the surrounding residential blocks resulted separating the Village Center block from the rest of the spatial fabric of the neighborhood visually and physically. Also, the main parking area or the side parking of the Village Center were not visually appealing and lacked the visual and physical homogeneity with the rest of the neighborhood (see Figure 4.32).

Despite the fact that alleyways are designed to house the undesirable elements such as trash receptacles and recycling bins to create pleasant street views, the design of the alleyways in CHV does not support such function. The width of the alleyways and their entrances were 18

feet wide in CHR, which highly affected the continuity of the street and disrupted the pedestrians' walking experience on the sidewalks as Figure 4.33 shows.

In terms of the aesthetic appeal of entryways, the Northern main entrance to CHV from Cherry Hill Road was inviting and was esthetically appealing, on the other hand, the Eastern and Western entryways to the neighborhood were aesthetically poor and not inviting. The images below illustrate the visual appearance of the three main entryways to CHV.





**Figure 4.30: Rear Car Garages Facing the Village Center in CHV**  
(Image credit to author)



**Figure 4.31: Village Center Main Parking Area on Constitution Street**  
(Image credit to author)





**Figure 4.32: Village Center Side Parking Area**  
(Image credit to author)

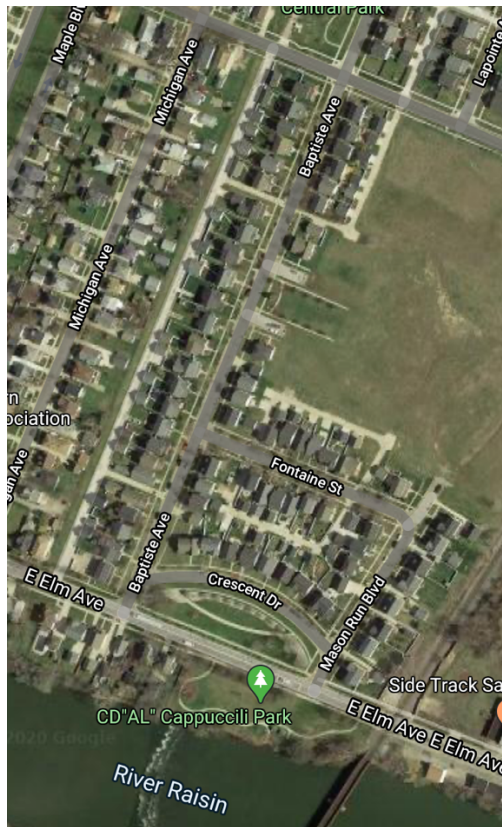


**Figure 4.33: Alleyway in CHV Neighborhood**  
(Image credit to author)

#### 4.1.2 New Urbanist Brownfield Development Qualitative Analysis and Scorecard Results

Mason Run (MR) is built on a contaminated former paper mill site. It is considered the largest brownfield NU development in the State of Michigan (see Figure 4.34). Phase one is comprised of 105 single-family homes, while the second phase, not built yet, is supposed to house 130 single-family homes. Phase one of MR is built on approximately 40 acres. Arterial streets define the edges of MR neighborhood. The neighborhood is bordered by East Elm Street, Michigan Avenue, and Eliot road. East Noble Street runs through the neighborhood, dividing its residential fabric into two residential sections; the Northern and the Southern section.

The Southern section houses most of the MR residential units, approximately 70% of the total residential units in MR neighborhood. MR is a non-gated community that blends well spatially and visually with the surrounding housing blocks. MR has two main entryways from East Elm Street that are well defined by an open green space. Table 4.5 illustrates the total points earned per QoL criterion in MR neighborhood based on the recommended design guidelines listed in the neighborhood scorecard.



**Figure 4.34: Satellite Image of Mason Run (MR) Neighborhood**  
(Source: Google Maps)

**Table 4.5: Mason Run (MR) New Urbanist Brownfield Neighborhood Scorecard**

| <b>QoL Criteria</b>            | <b>Design Guideline</b>                                                                     | <b>Score</b>                        |
|--------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------|
| Neighborhood safety from crime | 1. Few number of entryways                                                                  | <input type="checkbox"/>            |
|                                | 2. Mixed-land use                                                                           | <input type="checkbox"/>            |
|                                | 3. Active streets with active nodes/use                                                     | <input type="checkbox"/>            |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input checked="" type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields compared to the total residential area                      | <input type="checkbox"/>            |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 7. Active street frontages due to the semi-public attachments, such as: porches & balconies | <input checked="" type="checkbox"/> |
|                                | 8. Adequate lighting on streets                                                             | <input checked="" type="checkbox"/> |
|                                | 9. Adequate lighting for open green spaces                                                  | <input checked="" type="checkbox"/> |
|                                | 10. Adequate lighting in parking areas                                                      | <input checked="" type="checkbox"/> |
| Total points                   | 10                                                                                          | 6                                   |
| Pedestrian safety from traffic | 1. Narrow streets $\leq$ 25 feet                                                            | <input checked="" type="checkbox"/> |
|                                | 2. Boulevard/main streets lanes $<$ 4 lanes                                                 | <input checked="" type="checkbox"/> |
|                                | 3. Low traffic volumes on residential streets                                               | <input checked="" type="checkbox"/> |
|                                | 4. 200 m to 300 m stop intervals in residential areas                                       | <input checked="" type="checkbox"/> |
|                                | 5. Bulb out sidewalks and intersections                                                     | <input type="checkbox"/>            |
|                                | 6. Traffic calming techniques, such as speed bumps/ Roughened street material               | <input type="checkbox"/>            |
|                                | 7. Brightly painted crosswalks                                                              | <input type="checkbox"/>            |
|                                | 8. Roundabouts/traffic circles                                                              | <input type="checkbox"/>            |
|                                | 9. Turn curb radius $<$ or $=$ 15 feet                                                      | <input type="checkbox"/>            |
|                                | 10. On-street parallel parking                                                              | <input checked="" type="checkbox"/> |
|                                | 11. Traffic safety street signs                                                             | <input type="checkbox"/>            |
|                                | 12. Signs for children 's safety                                                            | <input type="checkbox"/>            |
|                                | 13. Other types of safety signs                                                             | <input type="checkbox"/>            |
|                                | 14. Sidewalks $=$ , $>$ 4 feet wide                                                         | <input checked="" type="checkbox"/> |
|                                | 15. Well-maintained sidewalks                                                               | <input checked="" type="checkbox"/> |
|                                | 16. Well-connected sidewalks                                                                | <input checked="" type="checkbox"/> |
|                                | 17. Flat sidewalks                                                                          | <input checked="" type="checkbox"/> |
|                                | 18. Buffered sidewalks                                                                      | <input checked="" type="checkbox"/> |
|                                | 19. Sidewalks curb cuts                                                                     | <input checked="" type="checkbox"/> |
| Total points                   | 19                                                                                          | 11                                  |
| Walking safety during the day  | 1. Mixed-land use                                                                           | <input type="checkbox"/>            |
|                                | 2. Narrow streets $\leq$ 25 feet                                                            | <input checked="" type="checkbox"/> |
|                                | 3. Active streets with active nodes/uses                                                    | <input checked="" type="checkbox"/> |
|                                | 4. Minimum ratio of grey areas compared to the total residential area                       | <input checked="" type="checkbox"/> |
|                                | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area           | <input type="checkbox"/>            |
|                                | 6. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 7. Minimum length of blank walls along residential streets                                  | <input checked="" type="checkbox"/> |
|                                | 8. Active facades with porches & balconies                                                  | <input checked="" type="checkbox"/> |
| Total points                   | 8                                                                                           | 6                                   |

**Table 4.5 (cont'd)**

|                                        |                                                                                                           |                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------|
| Walking safety at night                | 1. Mixed-land use                                                                                         | <input type="checkbox"/>            |
|                                        | 2. Narrow streets $\leq$ 25 feet                                                                          | <input checked="" type="checkbox"/> |
|                                        | 3. Active streets with active nodes/uses                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Minimum ratio of grey areas compared to the total residential area                                     | <input checked="" type="checkbox"/> |
|                                        | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area                         | <input type="checkbox"/>            |
|                                        | 6. Minimum ratio of abandoned buildings compared to the total residential buildings                       | <input checked="" type="checkbox"/> |
|                                        | 7. Minimum length of blank walls along residential streets                                                | <input checked="" type="checkbox"/> |
|                                        | 8. Active facades with porches & balconies                                                                | <input checked="" type="checkbox"/> |
|                                        | 9. Sufficient lighting for pedestrians /mandatory porch/garage lights                                     | <input checked="" type="checkbox"/> |
|                                        | 10. Street lighting                                                                                       | <input checked="" type="checkbox"/> |
|                                        | 11. Adequate lighting in parking areas                                                                    | <input checked="" type="checkbox"/> |
| Total points                           | 11                                                                                                        | 9                                   |
| Safety in public spaces during the day | 1. Active facades with porches & balconies                                                                | <input type="checkbox"/>            |
|                                        | 2. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 3. Active public spaces due to diverse outdoors activities                                                | <input type="checkbox"/>            |
| Total points                           | 3                                                                                                         | 1                                   |
| Safety in public spaces at night       | 1. Adequate lighting for open green spaces                                                                | <input checked="" type="checkbox"/> |
|                                        | 2. Active facades with porches & balconies                                                                | <input type="checkbox"/>            |
|                                        | 3. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Active public spaces due to diverse outdoors activities                                                | <input type="checkbox"/>            |
| Total points                           | 4                                                                                                         | 2                                   |
| Safety of public transit facilities    | 1. Continuous sidewalks to main public transit stops                                                      | <input type="checkbox"/>            |
|                                        | 2. Safe locations of public transit stops, for example having safe crossings to main public transit stops | <input type="checkbox"/>            |
|                                        | 3. Safe shelters                                                                                          | <input type="checkbox"/>            |
| Total points                           | 3                                                                                                         | 0                                   |
| Biking safety                          | 1. Flat bike trails                                                                                       | <input checked="" type="checkbox"/> |
|                                        | 2. Well maintained bike lanes                                                                             | <input checked="" type="checkbox"/> |
|                                        | 3. Connected bike lanes                                                                                   | <input checked="" type="checkbox"/> |
|                                        | 4. Biking safety signage                                                                                  | <input type="checkbox"/>            |
| Total points                           | 4                                                                                                         | 3                                   |
| <b>QoL criteria</b>                    | <b>Design Guideline</b>                                                                                   | <b>Score</b>                        |
| Comfortable neighborhood               | 1. Well maintained neighborhood                                                                           | <input checked="" type="checkbox"/> |
|                                        | 2. Adequate number of trash receptacles on residential streets                                            | <input type="checkbox"/>            |
|                                        | 3. Clean air                                                                                              | <input checked="" type="checkbox"/> |
|                                        | 4. Adequate number and location of signs used to minimize noise                                           | <input type="checkbox"/>            |
|                                        | 5. Buffers to reduce traffic noise                                                                        | <input type="checkbox"/>            |
|                                        | 6. Easy and Legible layout with short blocks block size $\leq$ 330 feet X 330 feet                        | <input type="checkbox"/>            |
|                                        | 7. Adequate way-finding signage system                                                                    | <input type="checkbox"/>            |
|                                        | 8. Clear center                                                                                           | <input checked="" type="checkbox"/> |
|                                        | 9. Clear edge                                                                                             | <input type="checkbox"/>            |
|                                        | 10. Distinguishable entry ways to the neighborhood                                                        | <input checked="" type="checkbox"/> |
|                                        | 11. Convenient access to public services                                                                  | <input type="checkbox"/>            |

**Table 4.5 (cont'd)**

|                           |                                                                                      |                                     |
|---------------------------|--------------------------------------------------------------------------------------|-------------------------------------|
|                           | 12. Convenient access to convenience stores                                          | <input type="checkbox"/>            |
|                           | 13. Adequate population density                                                      | <input checked="" type="checkbox"/> |
|                           | 14. Adequate building density                                                        | <input checked="" type="checkbox"/> |
| Total points              | 14                                                                                   | 6                                   |
| Pedestrian comfort        | 1. Low traffic on residential streets                                                | <input checked="" type="checkbox"/> |
|                           | 2. Sidewalks =, > 4 feet wide                                                        | <input checked="" type="checkbox"/> |
|                           | 3. Flat sidewalks                                                                    | <input checked="" type="checkbox"/> |
|                           | 4. Comfortable sidewalks with closely spaced trees to protect from sun               | <input checked="" type="checkbox"/> |
|                           | 5. Comfortable sidewalks to accommodate different ages and physical capabilities     | <input checked="" type="checkbox"/> |
|                           | 6. Well-connected sidewalks                                                          | <input checked="" type="checkbox"/> |
|                           | 7. Well-maintained sidewalks                                                         | <input checked="" type="checkbox"/> |
|                           | 8. Streets that respect human scale. Streets' width does not exceed building heights | <input checked="" type="checkbox"/> |
|                           | 9. Pedestrian scale street furniture                                                 | <input checked="" type="checkbox"/> |
|                           | 10. Block does not exceed 330 feet x 330 feet                                        | <input type="checkbox"/>            |
| Total points              | 10                                                                                   | 9                                   |
| Comfortable public spaces | 1. Adequate number of public spaces that integrate all ages                          | <input type="checkbox"/>            |
|                           | 2. Adequate number of public spaces for all physical abilities                       | <input checked="" type="checkbox"/> |
|                           | 3. Provision of shaded areas in public spaces                                        | <input checked="" type="checkbox"/> |
|                           | 4. Adequate public space furniture                                                   | <input type="checkbox"/>            |
|                           | 5. Adequate number of trash receptacles in public spaces                             | <input type="checkbox"/>            |
| Total points              | 5                                                                                    | 2                                   |
| Public transit comfort    | 1. Adequate number of public transit dry shelters                                    | <input type="checkbox"/>            |
|                           | 2. Adequate number of transit stops                                                  | <input type="checkbox"/>            |
|                           | 3. Connected sidewalks to public transit stops                                       | <input checked="" type="checkbox"/> |
| Total points              | 3                                                                                    | 1                                   |
| Biking comfort            | 1. Flat bike trails                                                                  | <input checked="" type="checkbox"/> |
|                           | 2. Well-maintained bike lanes                                                        | <input checked="" type="checkbox"/> |
|                           | 3. Well-connected bike lanes                                                         | <input checked="" type="checkbox"/> |
|                           | 4. Adequate number of bike racks/bike storage facilities                             | <input type="checkbox"/>            |
| Total points              | 4                                                                                    | 3                                   |
| <b>QoL criteria</b>       | <b>Design Guideline</b>                                                              | <b>Score</b>                        |
| Internal connectivity     | 1. Short blocks block size < or = 330 feet X 330 feet                                | <input type="checkbox"/>            |
|                           | 2. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 3. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 4. Intersection density 140 intersections/square mile                                | <input checked="" type="checkbox"/> |
|                           | 5. Minimum number of cul-de-sacs                                                     | <input checked="" type="checkbox"/> |
|                           | 6. number of 4-way intersections > number of T-junctions                             | <input type="checkbox"/>            |
|                           | 7. Well-connected sidewalks                                                          | <input checked="" type="checkbox"/> |
|                           | 8. Well-connected bike lanes                                                         | <input checked="" type="checkbox"/> |
|                           | 9. Physical connection to historic sites/buildings                                   | <input type="checkbox"/>            |
| Total points              | 9                                                                                    | 6                                   |
| External connectivity     | 1. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 2. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 3. Well-connected sidewalks                                                          | <input type="checkbox"/>            |

**Table 4.5 (cont'd)**

|                                     |                                                                                   |                                     |
|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|
|                                     | 4. Well-connected bike lanes                                                      | <input checked="" type="checkbox"/> |
|                                     | 5. Number of public transits stops in proportion to the residential area          | <input type="checkbox"/>            |
|                                     | 6. Residential area located within a 10 min walk (800 m) from transit stops       | <input type="checkbox"/>            |
|                                     | 7. Residential area located within a 10 min walk (800 m) from commercial stores   | <input type="checkbox"/>            |
|                                     | 8. Residential area located within a 10 min walk (800 m) from public school       | <input type="checkbox"/>            |
|                                     | 9. Residential area located within a 10 min walk (800 m) from green spaces        | <input checked="" type="checkbox"/> |
|                                     | 10. Residential area located within a 10 min walk (800 m) from recreational areas | <input checked="" type="checkbox"/> |
|                                     | 11. Residential area located within a 10 min walk (800 m) from cultural services  | <input type="checkbox"/>            |
| Total points                        | 11                                                                                | 6                                   |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Place-making and sense of belonging | 1. Mixed-use                                                                      | <input type="checkbox"/>            |
|                                     | 2. Pedestrian oriented streets                                                    | <input checked="" type="checkbox"/> |
|                                     | 3. Close proximity of public spaces to residential areas                          | <input checked="" type="checkbox"/> |
|                                     | 4. Public spaces with all age-integrated outdoors activities                      | <input type="checkbox"/>            |
|                                     | 5. Recreational venues (e.g. tennis, soccer, baseball, etc.).                     | <input type="checkbox"/>            |
|                                     | 6. Easy access to outdoor living spaces / Universal design/ADA                    | <input checked="" type="checkbox"/> |
|                                     | 7. Clear center                                                                   | <input checked="" type="checkbox"/> |
|                                     | 8. Clear edge                                                                     | <input type="checkbox"/>            |
|                                     | 9. Historically preserved lands/buildings                                         | <input checked="" type="checkbox"/> |
|                                     | 10. Physical connection to historically preserved lands/buildings                 | <input type="checkbox"/>            |
|                                     | 11. Visual connection to historically preserved lands/buildings                   | <input type="checkbox"/>            |
|                                     | 12. Community garden or access to healthy food and farmers market                 | <input type="checkbox"/>            |
|                                     | 13. Unique neighborhood design                                                    | <input checked="" type="checkbox"/> |
|                                     | 14. Affordable housing                                                            | <input type="checkbox"/>            |
|                                     | 15. Diverse housing types                                                         | <input type="checkbox"/>            |
| Total points                        | 15                                                                                | 6                                   |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Aesthetics                          | 1. Diverse building types                                                         | <input type="checkbox"/>            |
|                                     | 2. Diverse lot sizes                                                              | <input type="checkbox"/>            |
|                                     | 3. Various housing ages                                                           | <input type="checkbox"/>            |
|                                     | 4. Various building materials                                                     | <input type="checkbox"/>            |
|                                     | 5. Architectural details                                                          | <input checked="" type="checkbox"/> |
|                                     | 6. Landmarks                                                                      | <input type="checkbox"/>            |
|                                     | 7. Hierarchy of public spaces                                                     | <input type="checkbox"/>            |
|                                     | 8. Diverse land use                                                               | <input type="checkbox"/>            |
|                                     | 9. Unique features at night                                                       | <input type="checkbox"/>            |
|                                     | 10. Scenic views/unique street vistas                                             | <input checked="" type="checkbox"/> |
|                                     | 11. Buffers to block undesirable abandoned area/s                                 | <input type="checkbox"/>            |
|                                     | 12. Buffers to block undesirable building/s and or elements                       | <input checked="" type="checkbox"/> |
|                                     | 13. Aesthetic treatment of parking area/s                                         | <input checked="" type="checkbox"/> |

**Table 4.5 (cont'd)**

|              |                                                             |                                     |
|--------------|-------------------------------------------------------------|-------------------------------------|
|              | 14. Coherent signage system                                 | <input type="checkbox"/>            |
|              | 15. Coherent building additions including fences/ mailboxes | <input checked="" type="checkbox"/> |
|              | 16. Coherent streetscape                                    | <input checked="" type="checkbox"/> |
|              | 17. Well-maintained Street scape                            | <input checked="" type="checkbox"/> |
|              | 18. Well-maintained neighborhood                            | <input checked="" type="checkbox"/> |
| Total points | 18                                                          | 8                                   |

### 1. Safety Criterion

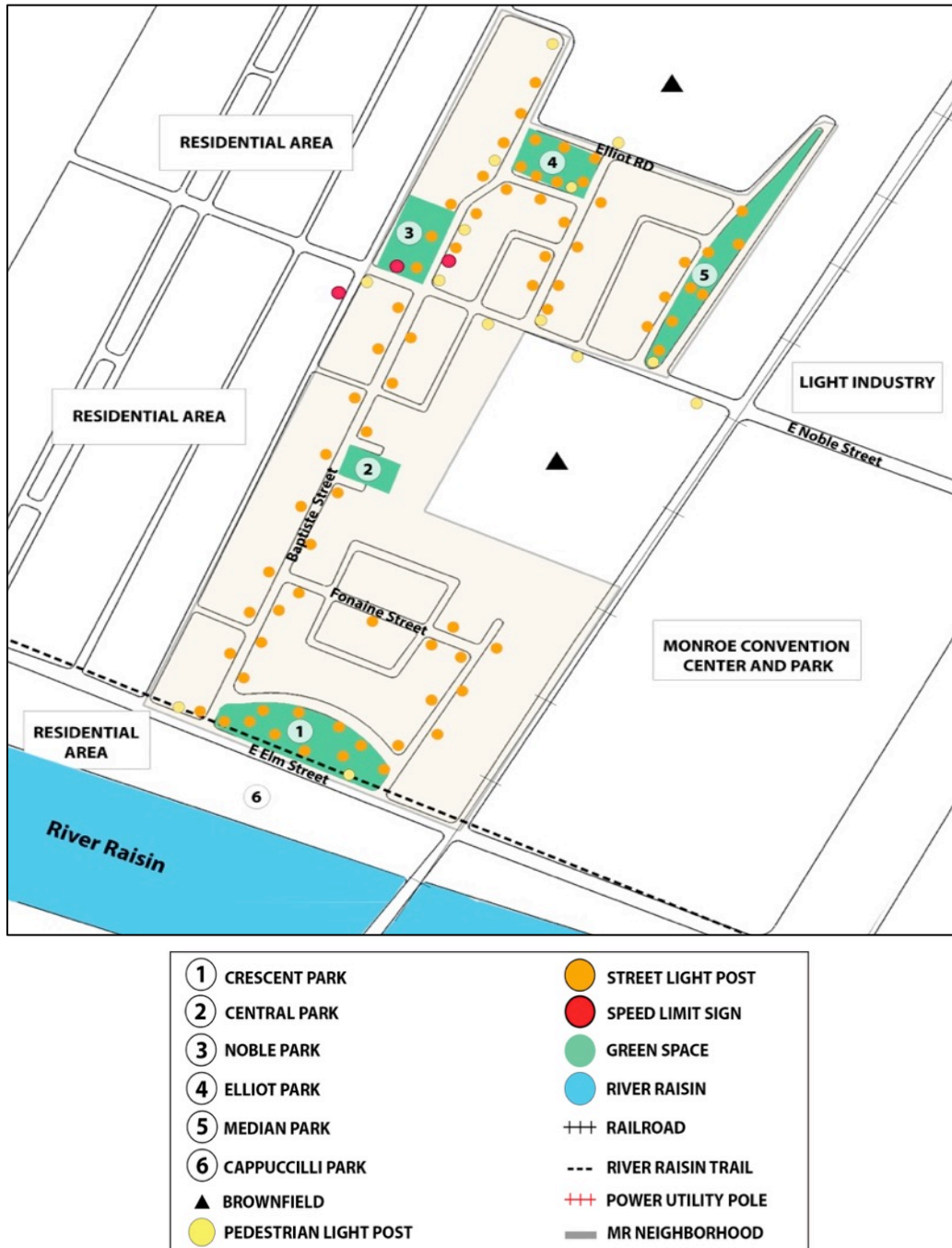
According to the neighborhood scorecard results as shown in Table 4.6, MR neighborhood scored a total of 37 points out of 62 in terms of the safety criterion. In terms of the neighborhood safety from crime, MR earned a total number of 6 points out of 10 points. As mentioned earlier in this Chapter, few entryways to the neighborhood, mixed-uses, active nodes, and active front streets, contribute to the safety of the neighborhood. MR neighborhood had a total of 5 entryways from main streets, which might not put the safety of the neighborhood in jeopardy.

In terms of active nodes, MR did not encompass any mixed-use center, unlike CHV neighborhood, but it had a total of five open green spaces, namely, Crescent Park, Central Park, Noble Park, Elliot Park, and Median Park (see Figure 4.35). The five open green spaces were mainly passive open spaces (see Figure 4.36-4.37). According to the field visits, residents of MR neighborhood frequently visited Crescent Park, unlike the other four parks. Accordingly, in terms of active nodes, Crescent Park could be considered the only active node in MR neighborhood.



**Table 4.6: Mason Run (MR) Scores Summary for Safety Criterion**

| <b>QoL criteria</b>                         | <b>MR score (points)</b> | <b>Possible points</b> |
|---------------------------------------------|--------------------------|------------------------|
| Neighborhood safety from crime              | 6                        | 10                     |
| Pedestrian safety from traffic              | 11                       | 19                     |
| Walking safety measures during the day      | 6                        | 8                      |
| Walking safety measures at night            | 9                        | 11                     |
| Public space safety measures during the day | 1                        | 3                      |
| Public space safety measures at night       | 2                        | 4                      |
| Public transit facilities safety measures   | 0                        | 3                      |
| Biking safety                               | 3                        | 4                      |



**Figure 4.35: On-site Safety Measures in Mason Run (MR) Neighborhood**  
(Figure credit to author)



**Figure 4.36: Crescent Park in MR Neighborhood**  
(Image credit to author)



**Figure 4.37: Passive Green Space in Central Park Surrounded by Under-developed Space**  
(Image credit to author)

As for active street fronts, all the residential houses in MR neighborhood had front porches with shallow front yards, which could play a role in boosting the overall safety of the neighborhood through the natural surveillance concept. On the other hand, massive areas of brownfields and vacant lands were in adjacency to the residential houses in MR neighborhood (see Figure 4.38). Approximately, 40% of the total area of MR neighborhood was brownfield and abandoned areas. Such high percentage of brownfield areas could put the safety of the neighborhood at risk (see Figure 4.38).

Massive areas of parking spaces could also affect the neighborhood's safety, but following the steps of NU neighborhoods, MR offered on street parking, on both sides of the streets, only (see Figure 4.39). MR did not have any grey areas that could affect the neighborhood's safety. The provision of adequate number of street light poles or any other type of light source in neighborhoods affects greatly its safety level at night. Unlike, CHV neighborhood, MR neighborhood had adequate number of streetlight poles, and also offered other sources of light at night. MR neighborhood was rich with not only streetlight poles, but also with pedestrian light poles, and mandatory front porch lights (see Figure 4.35). the provision of such numerous sources of light in the neighborhood could highly improve the safety of the neighborhood at night.

As shown in Figure 4.35, MR had a rectangular shaped layout, with a gridiron street network and very few curvilinear streets. The streets in MR neighborhood were two-way streets; main streets 25 feet wide, and secondary streets 22 feet wide. On street parking was allowed on both sides of the streets in MR neighborhood. The alleyways were 12 feet wide (see Figure 4.40). The narrow width of the streets and the alleys, and the on-street parking in MR neighborhood could play a crucial role in improving pedestrians' safety.





**Figure 4.38: Single-family houses Adjacent to Brownfields in MR**  
(Image credit to author)



**Figure 4.39: Typical Street Design in MR with On-street Parking**  
(Image credit to author)



**Figure 4.40: Alleyway in MR**  
(Image credit to author)

Despite the fact that speed limit in MR neighborhood was 25 miles/hour, there were speeding drives driving along Baptist Street. Baptist Street was considered a main vehicular spine in the neighborhood. The neighborhood lacked severely the provision of adequate number of speed limit signs and other traffic safety signs (See Figure 4.35). Also, MR did not provide any traffic safety signs for children along public spaces or residential streets, which could put the safety of the children at risk.

Stop intervals are also used as a technique to slow down moving traffic. The recommended stop intervals in residential areas are between 200m to 300m. This recommendation was fulfilled in MR neighborhood. Also, curb return radii of streets are recommended to be not more than 15 feet to force cars to slow down when they make the turn.

In MR neighborhood, the curb turns radii of the streets ranged between 18-25 feet, which surpassed the recommended measure for creating safer pedestrian crossings.

As mentioned before, shallow front yards of residential units with and street tree linings are usually utilized in NU neighborhoods as means to slow down traffic. The residential buildings in MR neighborhood had shallow fronts and the residential streets were lined up with trees, which might enhance the pedestrians' safety. The depth of the front yards in MR neighborhood ranged between 25 and 35 feet. Also, the tree linings along the streets and the on-street parking acted in MR neighborhood could improve pedestrians' safety, since they functioned as barriers from the moving traffic (see Figure 4.41).

According to the field visits to MR neighborhood, pedestrian's safety had been jeopardized along two streets, namely, East Elm, and East Noble streets (see Figures 4.42-43). Those two streets were busy streets with heavy traffic most of the day, and they did not provide enough safety measures for pedestrians. There were no adequate safety measures for pedestrians on East Elm Street to safely reach the open green space on River Raison (see Figure 4.32). The same scenario was also applied to East Noble Street, which did not offer adequate safety measures for pedestrians to cross the street to reach Noble Park (see Figure 4.32).





**Figure 4.41: Sidewalks with Buffer of Trees and Shallow Front Yards in MR**  
(Image credit to author)



**Figure 4.42: Absence of Safe Crossings for Pedestrians along East Elm Street**  
(Image credit to author)



In MR neighborhood, approximately, 90% of the residential buildings in MR had alleyways where car garages are located, which resulted in creating more active street fronts in the neighborhood. Also, natural surveillance through semi-public attachments to buildings is a salient feature of NU neighborhoods to improve the safety of pedestrians during the day and at night. All the residential buildings throughout MR neighborhood had front porches (see Figure 4.44).

As mentioned earlier in this section, MR provided adequate number of light sources, which in return could improve pedestrian's safety at night. Mandatory front porches, pedestrian and streetlight poles were the main sources of streetlights in MR neighborhood. At the meantime, according to the sites visits, the safety of pedestrians could be jeopardized when they walked alone at night due to the massive land of brownfields and abandoned areas. The vast areas of the bare brownfields and undeveloped land interrupted the continuity of the active street fronts of MR neighborhood, which could greatly impact the safety of pedestrians. Power lines located on Elm Street and Noble streets and a railway running along the Eastern edge of the community could also impose risk on the pedestrian's safety.

In terms of the safety level of public spaces, Crescent Park was considered as the safest public space in the neighborhood, since active streets surrounded its perimeter unlike the other open green areas. The close proximity of Central, Elliot, and Median Parks to the brownfields could put the safety of their users at risk (see Figure 4.45). In terms of light sources in the open green areas, Crescent Park, Elliot Park, Noble Park and Median Park provided an adequate number of light poles, unlike Central Park, which lacked did not have enough light poles.



**Figure 4.43: Absence of Safe Crossings for Pedestrians along Noble Street**  
(Image credit to author)



**Figure 4.44: Front Porches along Residential Streets in MR**  
(Image credit to author)



**Figure 4.45: Basketball Court in Central Park Surrounded by Brownfields and Abandoned Space (Image credit to author)**

In terms of the safety of residents when using transit services, MR neighborhood did not provide any public transit neither services nor it was close to any public transit services. Accordingly, the safety of the residents under this category could not be assessed under the current circumstances. On the other hand, MR neighborhood fulfilled almost all the design safety measures recommend for biking safety. MR neighborhood had well-maintained and well-connected bike lanes, located away from dangerous terrain. The only guideline that MR did not fulfill in terms of biking safety was the provision of adequate safety signs to protect bikers.

## 2. Comfort Criterion

Table 4.7 illustrates that MR earned a total of 21 points out of 42 points in terms of comfort. In terms of the neighborhood's comfort, MR earned only 6 points out of 14 points due to overlooking some of the recommended guidelines for creating comfortable neighborhoods.

For example, MR did not provide any trash receptacles or any recycling bins on its residential streets or in its open green public spaces. Also, MR neighborhood did not provide any type of signs or buffers to minimize noise from possible passing construction trucks and from the noise of the railway. Despite the fact that Median Park was intentionally designed to block noise from the railway, the noise of the railway was still loud.

**Table 4.7: Mason Run (MR) Scores Summary for Comfort Criterion**

| <b>QoL criteria</b>               | <b>MR score (points)</b> | <b>Possible points</b> |
|-----------------------------------|--------------------------|------------------------|
| Neighborhood comfort              | 6                        | 14                     |
| Pedestrian comfort                | 9                        | 10                     |
| Public space comfort              | 2                        | 5                      |
| Public transit facilities comfort | 1                        | 3                      |
| Biking comfort                    | 3                        | 4                      |

MR neighborhood did not provide adequate visual buffers to buffer visually and physically the on-premise vast brownfields, and abandoned land from the rest of the residential area. Brownfields also bordered the perimeters of some of the green spaces in MR neighborhood, which could result in making the open green spaces less desirable and less attractive to its residents.

In terms of way finding, MR had a coherent street names signage system, but did not offer any other type of signs or maps to direct pedestrians to the different destinations in the neighborhood. Despite the fact that single houses on the edge of the community had deeper front yards, approximately 35 feet, than the houses located at the center of the community, MR did not reflect clearly the idea of the Transect, in terms of rural edges, and urban center. The edge of MR neighborhood was ill defined and also the gradual transition of the public realm between the center and the edge was not clearly manifested in its physical fabric.

The location of MR neighborhood away from most of the public amenities, and convenience stores, could highly affect the comfort level of its residents. MR neighborhood did not provide any type of mixed-uses nor it was close to public schools. MR neighborhood failed to provide the following services within a walking distance, such as: public schools, grocery stores, library, and any type of public transit services.

In terms of distinguishable entryways, MR had a distinguishable entryway on East Elm Street, highlighted by Crescent Park, unlike the other entryways. Entryways to the neighborhood located on Noble Street were ill defined and unrecognizable. Accordingly, the lack of way finding signage, landmarks, active nodes, and the lack of a clear neighborhood edge, and distinguishable entryways could highly affect pedestrians' comfort in finding their way around the neighborhood.

MR neighborhood offered a comfortable living environment in terms of population and building densities. The average building block density was 11 residential units per acre, which fulfilled the recommended building density for comfortable residential projects on Greenfield projects. Finally, the dominant lot size in MR is 55feet x 140feet, which means MR provided limited housing sizes and types which could affect the comfort of residents in terms of accommodating their diverse housing needs and preferences of the public.

In terms of creating a comfortable experience for pedestrians', human scale was adequately addressed in the neighborhood. The residential streets in MR demonstrated an adequate spatial enclosure important for pedestrians' comfort. The residential streets were narrow with few lanes and had a comfortable building to street ratio. The typical ratio of the building height to street width in MR was 1:1.5, which fulfilled the recommended height to width ratio for residential streets. The sidewalks in MR were 4 feet wide, well connected and

well maintained. The sidewalks were lined up with trees to protect pedestrians from different weather events. Consequently, the sidewalks in MR were comfortable for all types of sidewalk users with different ages and also for all different physical abilities.

As mentioned before, block size also affects walking comfort; Short blocks with less than or equal to 330 feet x 330 feet allows for short cuts and comfort of use for pedestrians. Also, short blocks give a better sense of human scale and thus adding to the comfort of pedestrians. The average block size in CHV was 155feet x 475feet. The average depth of the blocks in MR was less than the recommended but at the mean time the average length of the blocks in MR surpassed the recommended block length. Consequently, the length of the blocks in MR neighborhood might affect pedestrian's comfort.

As mentioned earlier in this section, most of the open green spaces in MR neighborhood were passive green spaces with no programming. Most of the open green spaces were also connected to existing brownfields, which could highly affect their users' comfort. MR residents did not actively use the on-premise green spaces during the day or at night, which could be attributed to the lack of programming of these spaces and the lack of adequate furnishing as well (see Figure 4.32). All green spaces, except for Crescent Park, did not provide seating areas or playscapes. The lack of diverse outdoors activities and street furniture, coupled with the proximity of brownfields could highly affect the comfort of the green spaces in MR neighborhood.

In terms of comfort level when using public transit services, MR neighborhood provided well-connected and well-maintained sidewalks to comfortably accommodate pedestrians and public transit users to public transit stations. At the meantime, MR neighborhood did not offer any type of public transit services or located at close proximity to any public transit station.

As for biking comfort, MR neighborhood comfortably accommodated bikers. MR neighborhood earned a total of 3 points out of 4. The only design guideline that was overlooked in MR under this category was providing adequate bike storage facilities around the neighborhood.

### 3. Connectivity Criterion

As mentioned before, the connectivity criterion of neighborhoods was assessed in this research study according to the degree of the internal connectivity of the physical mesh of the neighborhood and the neighborhood's connectivity degree to the surrounding public facilities and convenience stores. MR earned a total of 12 points out of 20 points in the scorecard regarding the connectivity criterion (see Table 4.8). In terms of the internal connectivity of MR neighborhood, despite having well-connected sidewalks, the size of the residential blocks of MR combined with the busy traffic on East Noble Street and the dominance of T-junctions in the MR street network could negatively affect the internal connectivity of the physical mesh of the neighborhood (see Figure 4.46). The block sizes of MR did not follow the recommended block size for encouraging walkability, and thus the block sizes decreased the internal spatial connection between residential blocks and the on-premise green spaces.

**Table 4.8: Mason Run (MR) Scores Summary for Connectivity Criterion**

| <b>QoL criteria</b>   | <b>MR score (points)</b> | <b>Possible points</b> |
|-----------------------|--------------------------|------------------------|
| Internal connectivity | 6                        | 9                      |
| External connectivity | 6                        | 11                     |



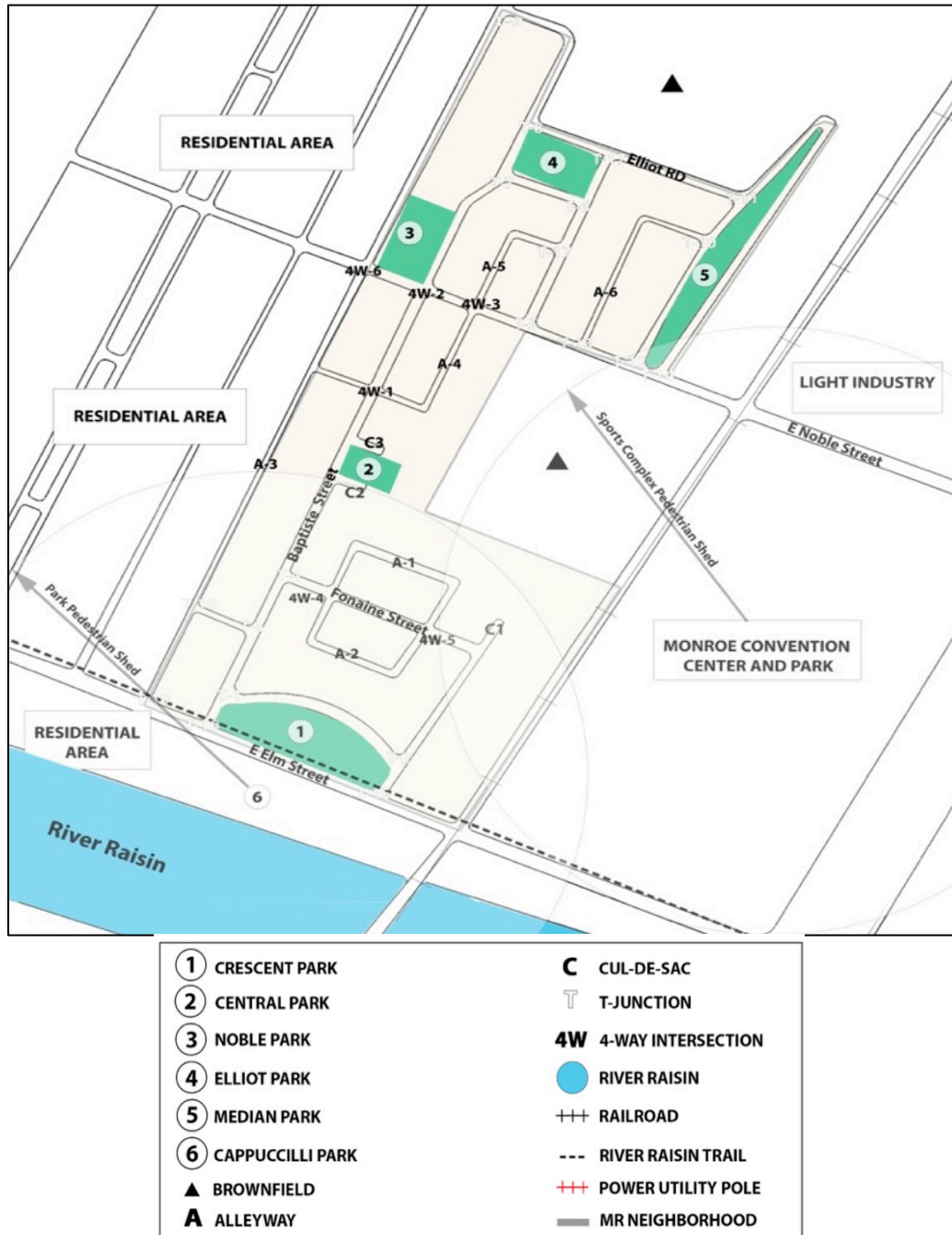


Figure 4.46: On-site Connectivity Measures in Mason Run (MR) Neighborhood  
(Figure credit to author)



According to the field investigation, the heavy traffic on East Noble Street affected the physical connection between the two residential parts of MR, and thus affecting the overall internal connective of the neighborhood. T-junctions dominated the pattern of the street intersections in MR. There was a total of 25 intersections in MR and 19 intersections were T-junctions, and only 6 intersections were 4-way. Even those 4-way intersections were mostly intersections that fall between the alleyways and main streets. The absence of 4-way intersections weakened the physical connection of the neighborhood and made it difficult to navigate around either on foot or by automobiles. On the other hand, the well-connected streets and sidewalks in MR neighborhood enhanced the internal connectivity of the neighborhood. Also, all residential units in MR neighborhood had easy access and comfortable access to the on-premise open green spaces.

The external connectivity of MR neighborhood is weaker than its internal connectivity. The location of MR neighborhood affected its external connectivity. MR neighborhood did not offer any on-premise public transit services, and the neighborhood was not in close proximity to any other type of public transit services. MR neighborhood was located approximately 2 miles away from Monroe Street, which was considered the main commercial spine in the city. Such long distance between the neighborhood and the commercial corridor would require residents to drive daily and/or weekly to acquire their needs.

The only public service that could be reached on foot by all MR residents was Monroe Sports Center, but the railroad made it impossible to reach the sports facility on foot. Cappuccilli Park was a public park located right along River Raisin (see Figure 4.46). Most of the residential units in MR fell within the recommended walking distance from Cappuccilli Park. The park provided picnic areas, seating areas, walkways, and passive greens. Despite the fact that this park

was within walking distance from MR neighborhood, the heavy traffic combined with the lack of safe pedestrian crossings weakened the spatial connection between the MR neighborhood and Cappuccilli Park.

MR offered a well-connected street and sidewalks network, it offered also a well-connected network of bike lanes with the surrounding infrastructure. As shown in Figure 4.46 River Raisin Trail was well connected to MR sidewalk network. The trail connected between different green spaces in Monroe, and provided a spatial connection, especially on bike, between MR and the surrounding parks, such as River Raisin National Battlefield Park.

#### 4. Place-making

MR neighborhood earned a total of 6 points out of 15 points in terms of place-making. According to the site visits, MR did not provide a unique sense of place, which could be greatly attributed to the lack of on-premise mixed-use, diverse public spaces, recreational venues, historic buildings, and landmarks. Also, the neighborhood did not contribute much to the community in terms of place-making. The limited programming of the on-premise green spaces resulted in making the open spaces less desirable and less used by MR residents (see Figure 4.47 & 4.48). MR neighborhood did not have any playscapes, which made such open spaces less desirable for children and their parents.



**Figure 4.47: Passive Green Space in Noble Park**  
(Image credit to author)



**Figure 4.48: Seating Area in Elliot Park**  
(Image credit to author)

Another aspect that was lacking in MR neighborhood in terms of place-making was the provision of different housing types and affordable housing. According to Zillow (2020), a real estate website, the current housing prices listings in MR ranged between \$128,000 - \$194,000 for 1,008 - 1,992 square feet single-family house, and the current monthly renting prices ranges between \$975- \$1,400 per month. Such high prices were considered not affordable for low-income population.

On the other hand, MR succeeded to create lifelong occupancy and thus enhancing the residents' sense of belonging. All residential units included backdoors to the alleyways that could be retrofitted to adapt easier accessibility techniques to the units. As mentioned before, the limited lot sizes in MR neighborhood did not allow for the provision of an array of housing types, and thus MR failed to attract people with different incomes and housing needs. On the other hand, the Victorian architecture of MR neighborhood helped in creating a sense of place. MR neighborhood also provided active public realms on its streets. MR streets were sensitive to human scale and the sidewalks were comfortably lined-up with trees, well-connected, and well-maintained, which in return could encourage residents to walk and socialize, and thus enhancing their sense of belonging.

## 5. Aesthetics

Although the Victorian architectural style of the buildings in MR neighborhood had added to aesthetics of the neighborhood, the massive areas of brownfields disrupted the continuous visual and spatial vistas of streets. The on-site brownfields played a role in dwindling the physical and visual connections of the entire neighborhood. The continuous visual and physical street vistas of MR were often interrupted by the brownfields, as Figure 4.46 shows. MR did not provide adequate types of buffers, such as tree linings, to block the views of the bare

lands of the brownfields and the abandoned areas. MR neighborhood lacked the provision of a coherent system of signage system, for example, the design of the real estate signs did not match the other types of signs in the neighborhood, such as street names signs. Such mismatched signs affected the overall aesthetics of the neighborhood and interrupted the coherency of the traditional charm of the neighborhood. In terms of street furniture, MR had coherent designs for seating areas in its green spaces, and pedestrian lighting poles. On the other hand, there was a great mismatch between streetlight poles design and the pedestrian light poles design.

Alleyways played a crucial role in enhancing the visual esthetics of the neighborhood. As mentioned before, most of the single-family houses had alleyways, which provided access for trash removal, and rear car garages. Alleyways housed all the undesirable elements that could affect the visual and social aspects of the neighborhood. In terms of the aesthetic appeal of entryways, the main entryway to MR is located on East Elm Street and it is inviting and is esthetically appealing, on the other hand, the other entryways from Noble Street are not distinguishable and are aesthetically poor and not inviting. At the meantime, there are no welcoming signs for residents found on any entryway.

MR neighborhood lacked visual interest in terms of diversity of house size, and ages. As mentioned earlier in this section, the standardized lot sizes in MR neighborhood did not allow for the provision of different housing types. In addition, the power lines running through Elm and Noble streets had affected the visual appeal of the neighborhood. In short, street tree linings, Victorian architectural style, and alleyways were the three main contributors of the overall visual appeal of MR.

#### 4.1.3 LEED-ND Certified Neighborhood Qualitative Analysis and Scorecard Results

Saint Luke (SL) neighborhood was a LEED-ND certified neighborhood built on approximately 28 acres of land (see Figure 4.49). This neighborhood had been LEED-ND certified in August 2010 and had achieved a total of 50 points. SL reflects the social and spatial ideals of NU traditional neighborhoods. SL was a non-gated community, and with its layout follows an iron grid pattern except for its curvilinear center. The center of the neighborhood was composed of a central open green, known as Britt Oval Park, that served as the only green area for SL neighborhood and it has a seating area, event stage, and some passive greens. Britt Oval Park was considered an active node because it hosted some local community festivals and outdoors workshops in Cleveland's Buckeye-Shaker neighborhood.

SL neighborhood also housed the former historic that is currently redeveloped and acts now as a mixed-use anchor in the Buckeye neighborhood. The hospital is currently known as Saint Luke's Manor that houses 139 units of independent senior housing, a K-8 public charter school, and offices of both Cleveland Neighborhood Progress (CNP) and Saint Luke's Foundation (see Figures 4.50-4.51). Also, SL currently houses 21 single-house units. Table 4.9 illustrates the results of the physical assessment of SL for according to the main five criteria in the neighborhood scorecard: safety, comfortable and desirable, sense of community and equity, physical connectedness, and finally aesthetics.



**Figure 4.49: Satellite Image of Saint Luke (SL) Neighborhood (Source: Google Maps)**



**Table 4.9: Saint Luke (SL) LEED-ND Certified Neighborhood Scorecard**

| <b>QoL Criteria</b>            | <b>Design Guideline</b>                                                                      | <b>Score</b>                        |
|--------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------|
| Neighborhood safety from crime | 11. Few number of entryways                                                                  | <input type="checkbox"/>            |
|                                | 12. Mixed-land use                                                                           | <input checked="" type="checkbox"/> |
|                                | 13. Active streets with active nodes/use                                                     | <input checked="" type="checkbox"/> |
|                                | 14. Minimum ratio of grey areas compared to the total residential area                       | <input type="checkbox"/>            |
|                                | 15. Minimum ratio of brownfields compared to the total residential area                      | <input type="checkbox"/>            |
|                                | 16. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 17. Active street frontages due to the semi-public attachments, such as: porches & balconies | <input checked="" type="checkbox"/> |
|                                | 18. Adequate lighting on streets                                                             | <input checked="" type="checkbox"/> |
|                                | 19. Adequate lighting for open green spaces                                                  | <input type="checkbox"/>            |
|                                | 20. Adequate lighting in parking areas                                                       | <input type="checkbox"/>            |
| Total points                   | 10                                                                                           | 5                                   |
| Pedestrian safety from traffic | 20. Narrow streets $\leq$ 25 feet                                                            | <input checked="" type="checkbox"/> |
|                                | 21. Boulevard/main streets lanes $<$ 4 lanes                                                 | <input checked="" type="checkbox"/> |
|                                | 22. Low traffic volumes on residential streets                                               | <input checked="" type="checkbox"/> |
|                                | 23. 200 m to 300 m stop intervals in residential areas                                       | <input checked="" type="checkbox"/> |
|                                | 24. Bulb out sidewalks and intersections                                                     | <input type="checkbox"/>            |
|                                | 25. Traffic calming techniques, such as speed bumps/ Roughened street material               | <input type="checkbox"/>            |
|                                | 26. Brightly painted crosswalks                                                              | <input type="checkbox"/>            |
|                                | 27. Roundabouts/traffic circles                                                              | <input type="checkbox"/>            |
|                                | 28. Turn curb radius $<$ or $=$ 15 feet                                                      | <input type="checkbox"/>            |
|                                | 29. On-street parallel parking                                                               | <input checked="" type="checkbox"/> |
|                                | 30. Traffic safety street signs                                                              | <input type="checkbox"/>            |
|                                | 31. Signs for children 's safety                                                             | <input type="checkbox"/>            |
|                                | 32. Other types of safety signs                                                              | <input type="checkbox"/>            |
|                                | 33. Sidewalks $=$ , $>$ 4 feet wide                                                          | <input checked="" type="checkbox"/> |
|                                | 34. Well-maintained sidewalks                                                                | <input checked="" type="checkbox"/> |
|                                | 35. Well-connected sidewalks                                                                 | <input checked="" type="checkbox"/> |
|                                | 36. Flat sidewalks                                                                           | <input checked="" type="checkbox"/> |
|                                | 37. Buffered sidewalks                                                                       | <input checked="" type="checkbox"/> |
|                                | 38. Sidewalks curb cuts                                                                      | <input checked="" type="checkbox"/> |
| Total points                   | 19                                                                                           | 11                                  |
| Walking safety during the day  | 9. Mixed-land use                                                                            | <input checked="" type="checkbox"/> |
|                                | 10. Narrow streets $\leq$ 25 feet                                                            | <input checked="" type="checkbox"/> |
|                                | 11. Active streets with active nodes/uses                                                    | <input checked="" type="checkbox"/> |
|                                | 12. Minimum ratio of grey areas compared to the total residential area                       | <input type="checkbox"/>            |
|                                | 13. Minimum ratio of brownfields/ abandoned compared to the total residential area           | <input type="checkbox"/>            |
|                                | 14. Minimum ratio of abandoned buildings compared to the total residential buildings         | <input checked="" type="checkbox"/> |
|                                | 15. Minimum length of blank walls along residential streets                                  | <input checked="" type="checkbox"/> |
|                                | 16. Active facades with porches & balconies                                                  | <input checked="" type="checkbox"/> |
| Total points                   | 8                                                                                            | 6                                   |



**Table 4.9 (cont'd)**

|                                        |                                                                                                           |                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------|
| Walking safety at night                | 1. Mixed-land use                                                                                         | <input checked="" type="checkbox"/> |
|                                        | 2. Narrow streets $\leq$ 25 feet                                                                          | <input checked="" type="checkbox"/> |
|                                        | 3. Active streets with active nodes/uses                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Minimum ratio of grey areas compared to the total residential area                                     | <input type="checkbox"/>            |
|                                        | 5. Minimum ratio of brownfields/ abandoned compared to the total residential area                         | <input type="checkbox"/>            |
|                                        | 6. Minimum ratio of abandoned buildings compared to the total residential buildings                       | <input checked="" type="checkbox"/> |
|                                        | 7. Minimum length of blank walls along residential streets                                                | <input checked="" type="checkbox"/> |
|                                        | 8. Active facades with porches & balconies                                                                | <input checked="" type="checkbox"/> |
|                                        | 9. Sufficient lighting for pedestrians /mandatory porch/garage lights                                     | <input checked="" type="checkbox"/> |
|                                        | 10. Street lighting                                                                                       | <input checked="" type="checkbox"/> |
|                                        | 11. Adequate lighting in parking areas                                                                    | <input type="checkbox"/>            |
| Total points                           | 11                                                                                                        | 8                                   |
| Safety in public spaces during the day | 1. Active facades with porches & balconies                                                                | <input type="checkbox"/>            |
|                                        | 2. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 3. Active public spaces due to diverse outdoors activities                                                | <input checked="" type="checkbox"/> |
| Total points                           | 3                                                                                                         | 2                                   |
| Safety in public spaces at night       | 1. Adequate lighting for open green spaces                                                                | <input type="checkbox"/>            |
|                                        | 4. Active facades with porches & balconies                                                                | <input type="checkbox"/>            |
|                                        | 5. Absence of long on-street blank walls                                                                  | <input checked="" type="checkbox"/> |
|                                        | 4. Active public spaces due to diverse outdoors activities                                                | <input checked="" type="checkbox"/> |
| Total points                           | 4                                                                                                         | 2                                   |
| Safety of public transit facilities    | 1. Continuous sidewalks to main public transit stops                                                      | <input type="checkbox"/>            |
|                                        | 2. Safe locations of public transit stops, for example having safe crossings to main public transit stops | <input checked="" type="checkbox"/> |
|                                        | 3. Safe shelters                                                                                          | <input checked="" type="checkbox"/> |
| Total points                           | 3                                                                                                         | 2                                   |
| Biking safety                          | 1. Flat bike trails                                                                                       | <input checked="" type="checkbox"/> |
|                                        | 2. Well maintained bike lanes                                                                             | <input type="checkbox"/>            |
|                                        | 3. Connected bike lanes                                                                                   | <input type="checkbox"/>            |
|                                        | 4. Biking safety signage                                                                                  | <input checked="" type="checkbox"/> |
| Total points                           | 4                                                                                                         | 2                                   |
| <b>QoL criteria</b>                    | <b>Design Guideline</b>                                                                                   | <b>Score</b>                        |
| Comfortable neighborhood               | 1. Well maintained neighborhood                                                                           | <input checked="" type="checkbox"/> |
|                                        | 2. Adequate number of trash receptacles on residential streets                                            | <input type="checkbox"/>            |
|                                        | 3. Clean air                                                                                              | <input checked="" type="checkbox"/> |
|                                        | 4. Adequate number and location of signs used to minimize noise                                           | <input type="checkbox"/>            |
|                                        | 5. Buffers to reduce traffic noise                                                                        | <input type="checkbox"/>            |
|                                        | 6. Easy and Legible layout with short blocks block size $\leq$ or = 330 feet X 330 feet                   | <input checked="" type="checkbox"/> |
|                                        | 7. Adequate way-finding signage system                                                                    | <input type="checkbox"/>            |
|                                        | 8. Clear center                                                                                           | <input checked="" type="checkbox"/> |
|                                        | 9. Clear edge                                                                                             | <input type="checkbox"/>            |
|                                        | 10. Distinguishable entry ways to the neighborhood                                                        | <input checked="" type="checkbox"/> |
|                                        | 11. Convenient access to public services                                                                  | <input checked="" type="checkbox"/> |

**Table 4.9 (cont'd)**

|                           |                                                                                      |                                     |
|---------------------------|--------------------------------------------------------------------------------------|-------------------------------------|
|                           | 12. Convenient access to convenience stores                                          | <input type="checkbox"/>            |
|                           | 13. Adequate population density                                                      | <input checked="" type="checkbox"/> |
|                           | 14. Adequate building density                                                        | <input checked="" type="checkbox"/> |
| Total points              | 14                                                                                   | 8                                   |
| Pedestrian comfort        | 1. Low traffic on residential streets                                                | <input checked="" type="checkbox"/> |
|                           | 2. Sidewalks =, > 4 feet wide                                                        | <input checked="" type="checkbox"/> |
|                           | 3. Flat sidewalks                                                                    | <input checked="" type="checkbox"/> |
|                           | 4. Comfortable sidewalks with closely spaced trees to protect from sun               |                                     |
|                           | 5. Comfortable sidewalks to accommodate different ages and physical capabilities     |                                     |
|                           | 6. Well-connected sidewalks                                                          |                                     |
|                           | 7. Well-maintained sidewalks                                                         | <input checked="" type="checkbox"/> |
|                           | 8. Streets that respect human scale. Streets' width does not exceed building heights | <input checked="" type="checkbox"/> |
|                           | 9. Pedestrian scale street furniture                                                 | <input checked="" type="checkbox"/> |
|                           | 10. Block does not exceed 330 feet x 330 feet                                        | <input type="checkbox"/>            |
| Total points              | 10                                                                                   | 6                                   |
| Comfortable public spaces | 1. Adequate number of public spaces that integrate all ages                          | <input type="checkbox"/>            |
|                           | 2. Adequate number of public spaces for all physical abilities                       | <input checked="" type="checkbox"/> |
|                           | 3. Provision of shaded areas in public spaces                                        | <input checked="" type="checkbox"/> |
|                           | 4. Adequate public space furniture                                                   | <input checked="" type="checkbox"/> |
|                           | 5. Adequate number of trash receptacles in public spaces                             | <input type="checkbox"/>            |
| Total points              | 5                                                                                    | 3                                   |
| Public transit comfort    | 1. Adequate number of public transit dry shelters                                    | <input checked="" type="checkbox"/> |
|                           | 2. Adequate number of transit stops                                                  | <input checked="" type="checkbox"/> |
|                           | 3. Connected sidewalks to public transit stops                                       | <input type="checkbox"/>            |
| Total points              | 3                                                                                    | 2                                   |
| Biking comfort            | 1. Flat bike trails                                                                  | <input checked="" type="checkbox"/> |
|                           | 2. Well-maintained bike lanes                                                        | <input type="checkbox"/>            |
|                           | 3. Well-connected bike lanes                                                         | <input type="checkbox"/>            |
|                           | 4. Adequate number of bike racks/bike storage facilities                             | <input type="checkbox"/>            |
| Total points              | 4                                                                                    | 1                                   |
| <b>QoL criteria</b>       | <b>Design Guideline</b>                                                              | <b>Score</b>                        |
| Internal connectivity     | 1. Short blocks block size < or = 330 feet X 330 feet                                | <input type="checkbox"/>            |
|                           | 2. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 3. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 4. Intersection density 140 intersections/square mile                                | <input checked="" type="checkbox"/> |
|                           | 5. Minimum number of cul-de-sacs                                                     | <input checked="" type="checkbox"/> |
|                           | 6. number of 4-way intersections > number of T-junctions                             | <input type="checkbox"/>            |
|                           | 7. Well-connected sidewalks                                                          | <input type="checkbox"/>            |
|                           | 8. Well-connected bike lanes                                                         | <input type="checkbox"/>            |
|                           | 9. Physical connection to historic sites/buildings                                   | <input checked="" type="checkbox"/> |
| Total points              | 9                                                                                    | 5                                   |
| External connectivity     | 1. Hierarchy of street network                                                       | <input checked="" type="checkbox"/> |
|                           | 2. Connected streets                                                                 | <input checked="" type="checkbox"/> |
|                           | 3. Well-connected sidewalks                                                          | <input type="checkbox"/>            |

**Table 4.9 (cont'd)**

|                                     |                                                                                   |                                     |
|-------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|
|                                     | 4. Well-connected bike lanes                                                      | <input type="checkbox"/>            |
|                                     | 5. Number of public transits stops in proportion to the residential area          | <input checked="" type="checkbox"/> |
|                                     | 6. Residential area located within a 10 min walk (800 m) from transit stops       | <input checked="" type="checkbox"/> |
|                                     | 7. Residential area located within a 10 min walk (800 m) from commercial stores   | <input type="checkbox"/>            |
|                                     | 8. Residential area located within a 10 min walk (800 m) from public school       | <input checked="" type="checkbox"/> |
|                                     | 9. Residential area located within a 10 min walk (800 m) from green spaces        | <input checked="" type="checkbox"/> |
|                                     | 10. Residential area located within a 10 min walk (800 m) from recreational areas | <input checked="" type="checkbox"/> |
|                                     | 11. Residential area located within a 10 min walk (800 m) from cultural services  | <input type="checkbox"/>            |
| Total points                        | 11                                                                                | 7                                   |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Place-making and sense of belonging | 1. Mixed-use                                                                      | <input checked="" type="checkbox"/> |
|                                     | 2. Pedestrian oriented streets                                                    | <input type="checkbox"/>            |
|                                     | 3. Close proximity of public spaces to residential areas                          | <input checked="" type="checkbox"/> |
|                                     | 4. Public spaces with all age-integrated outdoors activities                      | <input type="checkbox"/>            |
|                                     | 5. Recreational venues (e.g. tennis, soccer, baseball, etc.).                     | <input type="checkbox"/>            |
|                                     | 6. Easy access to outdoor living spaces / Universal design/ADA                    | <input checked="" type="checkbox"/> |
|                                     | 7. Clear center                                                                   | <input checked="" type="checkbox"/> |
|                                     | 8. Clear edge                                                                     | <input type="checkbox"/>            |
|                                     | 9. Historically preserved lands/buildings                                         | <input checked="" type="checkbox"/> |
|                                     | 10. Physical connection to historically preserved lands/buildings                 | <input checked="" type="checkbox"/> |
|                                     | 11. Visual connection to historically preserved lands/buildings                   | <input checked="" type="checkbox"/> |
|                                     | 12. Community garden or access to healthy food and farmers market                 | <input type="checkbox"/>            |
|                                     | 13. Unique neighborhood design                                                    | <input checked="" type="checkbox"/> |
|                                     | 14. Affordable housing                                                            | <input checked="" type="checkbox"/> |
|                                     | 15. Diverse housing types                                                         | <input checked="" type="checkbox"/> |
| Total points                        | 15                                                                                | 10                                  |
| <b>QoL criteria</b>                 | <b>Design Guideline</b>                                                           | <b>Score</b>                        |
| Aesthetics                          | 1. Diverse building types                                                         | <input checked="" type="checkbox"/> |
|                                     | 2. Diverse lot sizes                                                              | <input type="checkbox"/>            |
|                                     | 3. Various housing ages                                                           | <input checked="" type="checkbox"/> |
|                                     | 4. Various building materials                                                     | <input checked="" type="checkbox"/> |
|                                     | 5. Architectural details                                                          | <input checked="" type="checkbox"/> |
|                                     | 6. Landmarks                                                                      | <input checked="" type="checkbox"/> |
|                                     | 7. Hierarchy of public spaces                                                     | <input type="checkbox"/>            |
|                                     | 8. Diverse land use                                                               | <input checked="" type="checkbox"/> |
|                                     | 9. Unique features at night                                                       | <input type="checkbox"/>            |
|                                     | 10. Scenic views/unique street vistas                                             | <input checked="" type="checkbox"/> |
|                                     | 11. Buffers to block undesirable abandoned area/s                                 | <input type="checkbox"/>            |
|                                     | 12. Buffers to block undesirable building/s and or elements                       | <input type="checkbox"/>            |
|                                     | 13. Aesthetic treatment of parking area/s                                         | <input type="checkbox"/>            |

**Table 4.9 (cont'd)**

|              |                                                            |                                     |
|--------------|------------------------------------------------------------|-------------------------------------|
|              | 1. Coherent signage system                                 | <input type="checkbox"/>            |
|              | 2. Coherent building additions including fences/ mailboxes | <input checked="" type="checkbox"/> |
|              | 3. Coherent streetscape                                    | <input type="checkbox"/>            |
|              | 4. Well-maintained Street scape                            | <input type="checkbox"/>            |
|              | 5. Well-maintained neighborhood                            | <input checked="" type="checkbox"/> |
| Total points | 18                                                         | 9                                   |



**Figure 4.50: Saint Luke Manor Historic Building**  
(Image credit to author)



**Figure 4.51: Rice Elementary School in SL Neighborhood**  
(Image credit to author)

## 1. Safety criterion

According to the results in Table 4.10, SL scored a of total 37 points out of 62 in terms of the safety criterion. In terms of the neighborhood safety, the mixed-use block, where Saint Luke Manor was located, was considered an active node in neighborhood, which enhanced the safety of the surrounding residential units (see Figure 4.52). The same block of the Saint Luke's Manor block also hosted another use, including: Saint Luke's Health Care Center, Harvey Rice elementary School and Cleveland Public Library. This active mixed-used anchor played a role in enhancing the overall safety of the SL neighborhood.

At the same time, this mixed-use block provided massive parking spaces for, which could add risk to the overall safety of the neighborhood. The parking spaces for the medical facility and for the senior housing were mostly empty and under-used during the day and at night, which could put pedestrians' safety at risk (see Figure 4.52). In fact not only the huge empty parking spaces could place the residents' safety at risk, the SL neighborhood was an infill neighborhood, which was supposed to replace a former blighted neighborhood. A lot of the blighted buildings still share the same blocks with the new residential in SL neighborhood (see Figure 4.53). Some of the blighted buildings were vacant and few were occupied. Such issue could really affect the residents' safety during the day, and especially at night. Such abandoned buildings could be magnets for drawing the unwelcomed activities, and unwelcomed intruders to the neighborhood, and could put the lives of the residents at risk.

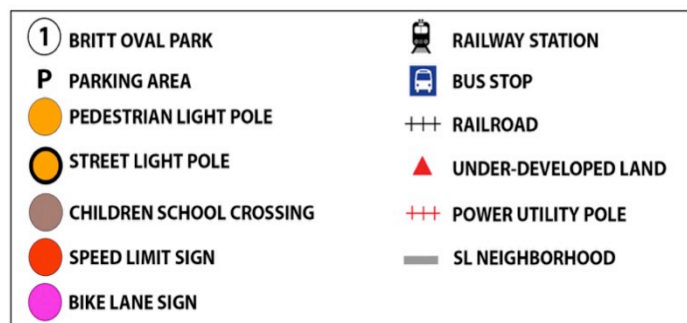
SL neighborhood was embedded in the existing physical mesh of the Buckeye district and it had two main entryways, located on 110th and 116th Streets. At the same time, it had several other secondary entrances from Woodland Avenue. The multiple entryways to the

neighborhood could decrease the overall safety of the neighborhood, since the entry of the unwanted intruders into the neighborhood could not be controlled or limited.

As Figure 4.54, mostly under-developed empty lands surrounded the Britt Oval Park. Accordingly, that space was considered partially safe for its users in terms of natural surveillance. In terms of lighting, Britt Oval Park lacked adequate light. The residential streets in SL neighborhood were adequately lit at night. Most of the residential streets in SL neighborhood had a combination of pedestrian and streetlight poles, which added to the safety of the neighborhood and pedestrians at night (see Figure 4.55). Some under-developed areas in SL neighborhood lacked proper lighting. Figure 4.56 illustrates the under-developed areas in SL neighborhood that represented a huge risk on the residents' safety. Table 4.10 illustrates the summary of safety scores earned in SL neighborhood.

**Table 4.10: Saint Luke (SL) LEED-ND Certified Neighborhood Scores Summary for Safety Criterion**

| <b>QoL criteria</b>                       | <b>SL score (points)</b> | <b>Possible points</b> |
|-------------------------------------------|--------------------------|------------------------|
| Neighborhood safety from crime            | 5                        | 10                     |
| Pedestrian safety from traffic            | 11                       | 19                     |
| Walking safety measures during the day    | 6                        | 8                      |
| Walking safety measures at night          | 8                        | 11                     |
| Public safety measures during the day     | 2                        | 3                      |
| Public safety measures at night           | 2                        | 4                      |
| Public transit facilities safety measures | 2                        | 3                      |
| Biking safety                             | 2                        | 4                      |



**Figure 4.52: On-site Safety Measures in Saint Luke (SL) LEED-ND Certified Neighborhood (Figure credit to author)**





**Figure 4.53: Blighted Houses in Close Juxtaposition to Saint Luke (SL) Housing Units**  
(Image credit to author)



**Figure 4.54: Under-developed areas Surrounding Britt Oval Park**  
(Image credit to author)



**Figure 4.55: Pedestrian and Street Light Poles on Saint Luke (SL) Residential Streets**  
(Image credit to author)



**Figure 4.56: Under-developed areas in SL Neighborhood**  
(Image credit to author)

In terms of pedestrians' safety, the sidewalks were 4 feet wide, which fulfilled the recommended width for pedestrians' safety. At the meantime, the under-developed lands in the neighborhood disrupted the continuity of the sidewalks, which required pedestrians to share the streets with vehicular movement to reach nearby destinations. Accordingly, the discontinued sidewalks could put the lives of pedestrians, especially children, at risk (see Figure 4.57).

Martin Luther King Junior Drive physically disconnect the single-family houses of SL from Luke's Health Care Center, Harvey Rice elementary School and Cleveland Public Library. Martin Luther King Junior Drive severely lacked the provision of adequate pedestrian safety measures for MR residents (see Figure 4.58). Despite the fact that Martin Luther King Junior Drive provided multiple traffic safety signs for pedestrians, it imposed a great risk on the pedestrians' safety due to the speeding cars and the lack of traffic calming techniques (see Figure 4.52). The other residential streets of SL neighborhood lacked traffic safety signs of pedestrians, which in turn could put the pedestrians' lives at risk.





**Figure 4.57: Absence of Sidewalks along Under-developed Areas in SL**  
(Image credit to author)



**Figure 4.58: Martin Luther King Junior Drive in SL Neighborhood**  
(Image credit to author)

Martin Luther Junior Drive also hosted bike lanes on both sides of the street. The street had designated bike lanes, and biking safety signs that illustrated the end and the beginning of bike lanes (see Figure 4.52). From the field investigations, the bike lanes, especially the ones near to the school, were usually used for on-street vehicular parking.

In terms of safe public transit routes and locations, the neighborhood had a railway station that was located behind the historic building of the Saint Luke's Manor on Shaker Boulevard (see Figure 4.52). The railway station was visually and physically disconnected from the physical mesh of SL neighborhood, which could add risk to the safety of its users. Accordingly, the disconnected sidewalks and the isolated location of the railway stop could put the public transit users' safety at risk. The same was true for bus stops. Although E 116th Street was rich with bus stops, the neighborhood did not provide the adequate pedestrian safety measures in terms of safe routes to the bus stops located on E 116th Street.

On the other hand, SL neighborhood had a narrow street network; the major thoroughfares were 25 feet in width, while alleyways and other secondary streets were 15 feet wide. The speed limit is 25 m/hr. Such narrow street network and low speed limit boosted the pedestrians' street crossings safety (see Figure 4.59). Also, on-street parking was allowed, on one side of the street, on all of the neighborhood's streets. On street parking on Martin Luther King Junior Drive was prohibited. In terms of stop intervals, which are crucial for slowing vehicular movement, SL fulfilled the recommended distance for the stop intervals in residential areas, which is between 200m to 300m.



**Figure 4.59: Typical Residential Street Design in SL Neighborhood**  
(Image credit to author)

In short, the neighborhood lacked providing adequate safety design techniques for its pedestrians and especially for children. The narrow street network might not be enough to assure pedestrians' safety. The neighborhood had to provide more safety measures for its residents and for the children to safely access the surrounding uses, and to safely walk around the neighborhood. Reaching the school on foot was risky for children because crossing Martin Luther King Junior Drive was very risky since it did not provide proper pedestrian safety measures.

## 2. Comfort Criterion

Comfort criterion includes major themes of comfort, which are: overall cleanness of the neighborhood, cleanness of public spaces and green areas, quiet environment, access to natural areas, comfortable population and building densities, pedestrians' comfort, biking comfort, and

the residents' comfortable experience when using public transit in the neighborhood. Table 4.11 illustrates the total points earned by SL neighborhood according to the scorecard.

In terms of overall cleanliness of the neighborhood, the streets of the neighborhood were clean except for the streets that included abandoned buildings. SL did not provide any trash receptacles; no trash receptacles were found on the residential streets or in Britt Oval Park. The sidewalks lacked adequate tree linings; the trees along the sidewalks were of different species and were haphazardly scattered along sidewalks (see Figure 4.59). The lack of equal spacing trees along the sidewalks affected negatively the comfort of the sidewalk users. The discontinued sidewalk network and the absence of curb cuts could make the sidewalks less comfortable by people of all ages and physical abilities. Accordingly, the sidewalks in SL neighborhood were not comfortable for its users.

**Table 4.11: Saint Luke (SL) Scores Summary for Comfort Criterion**

| <b>QoL criteria</b>               | <b>SL score (points)</b> | <b>Possible points</b> |
|-----------------------------------|--------------------------|------------------------|
| Neighborhood comfort              | 8                        | 14                     |
| Pedestrian comfort                | 6                        | 10                     |
| Public space comfort              | 3                        | 5                      |
| Public transit facilities comfort | 2                        | 3                      |
| Biking comfort                    | 1                        | 4                      |



**Figure 4.60: Sidewalks in SL Neighborhood Lacking Tree Linings**  
(Image credit to author)

The abandoned buildings were considered visual and physical nuisance in the neighborhood, which in return affect the waking experience of the pedestrians and disrupt the visual and physical comfort of the neighborhood. In terms of creating a comfortable experience for pedestrians', human scale was adequately addressed in the neighborhood. The residential streets in SL displayed an adequate spatial enclosure that was important for pedestrians' comfort. For example, SL residential streets were narrow with few lanes and had a comfortable building to street ratio. The typical building to street ratios in SL is 1:1, which made the street in SL fulfill the recommended ratio for residential projects. On the other hand, the length of the blocks in SL neighborhood exceeded the recommended measure for comfortable walkable streets. The average block size in SL neighborhood was 240feet x 570feet, which did not fulfill the recommended block length, which is 330 feet.



SL neighborhood had a clear center, the Britt Oval Park, which was demarcated by the former Saint Luke's hospital historic building. The hospital was considered a landmark locally and it had been visually and spatially respected through the physical arrangement of SL neighborhood. Also, the unique architecture of the library and the school added to the legibility of the physical mesh of the neighborhood. The residential units of SL neighborhood shared the same residential blocks with the other existing residential units, which made the edge of the neighborhood less clear.

In terms of way finding signage, SL did not provide adequate signs to direct residents and/or visitors to the different destinations around the neighborhood. The only sign that was found in Britt Oval Park was about disclosing some rules for the users. SL had an array of housing types; it houses apartment units, condos, and single-family houses. Such array of housing types gave more freedom to residents to select the housing type that corresponded to their housing needs, and thus enhancing the comfort level of their living standards. Also, building density is crucial to achieve a comfortable environment in neighborhoods for residents. The average building density of the single-housing clusters in SL neighborhood was approximately seven residential units per acre, which fulfilled the recommended density for housing.

Public transit stations were well provided along E 116th Street but the discontinued network of sidewalks made the trip uncomfortable for public transit users living in SL neighborhood. Adding to that, the lack of tree linings along the sidewalks could also make the walking trip uncomfortable to public transit stops. SL neighborhood provided dry shelters for the bus and the railway users. In terms of biking safety, the neighborhood provided designated bike lanes, along Martin Luther King Junior Drive, but the bike lanes in SL neighborhood were

not well-connected. Also, the neighborhood did not offer any other type of biking facilities; the neighborhood did not offer any bike racks or any bike storage facilities.

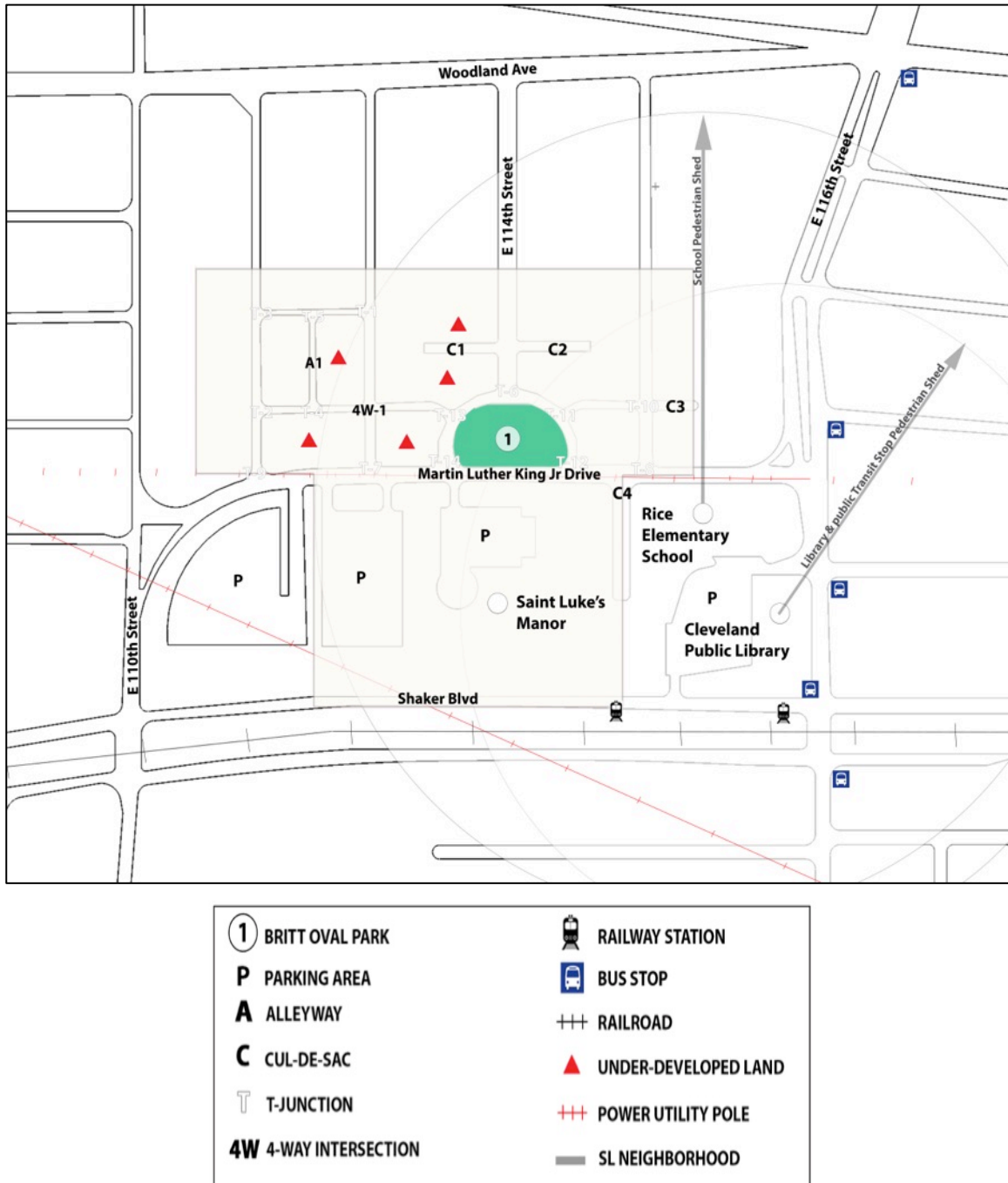
### 3. Connectivity

Table 4.12 illustrates the total points earned by SL neighborhood based on the design guidelines regarding connectivity in the neighborhood scorecard. SL had earned a total of 5 points out of 9 points in terms of internal connectivity. The lack of continuous sidewalks and bike lanes weakened the internal connectivity of SL neighborhood. The discontinued sidewalk network and the absence of curb cuts could make the sidewalks less accessible and less used by people of all ages and physical abilities.

**Table 4.12: Saint Luke (SL) Scores Summary for Connectivity Criterion**

| QoL criteria          | SL score (points) | Possible points |
|-----------------------|-------------------|-----------------|
| Internal connectivity | 5                 | 9               |
| External connectivity | 7                 | 12              |

The large blocks of SL neighborhood had also affected the internal connectivity of the neighborhood. As mentioned earlier, the lack of 4-way intersections in a street network lessens its permeability and thus lessens its internal connectivity. T-junctions dominated the street intersections in the neighborhood's street network, which could result in weakening its internal connectivity; only one 4-way intersection was found in the neighborhood (see Figure 4.61). Despite the fact that Martin Luther King Junior Drive had only four lanes, its width, 40 feet wide, its heavy traffic, and the absence of appropriate pedestrian safety measures greatly affected the internal connection between the two sides of the neighborhood. Martin Luther King Junior Drive physically and visually divided SL neighborhood into two parts.



**Figure 4.61: On-site Connectivity Measures in Saint Luke (SL) LEED-ND Certified Neighborhood** (Figure credit to author)

In terms of accessibility to public facilities and convenience stores, most of the residential units, approximately more than 85% of the total number of residential units, in SL neighborhood were within the recommended walking distance, quarter of a mile, to the surrounding public facilities, especially the Rice Elementary School. Only few single-family houses were within the recommended walking distance, quarter of a mile, to Cleveland Public Library, and the public transit stops. Also, the entire neighborhood did not fall within the recommended pedestrian shed to convenience stores and other public services (see Figure 4.61). On the other hand, all residents of SL neighborhood could easily access Britt Oval Park on foot, since the park was within the recommended walking distance of 5 minutes' walk.

#### 4. Place-making and sense of belonging

All of the residential buildings in SL neighborhood had semi-private attachments, such as front porches, and few residential units had balconies (see Figure 4.62). As mentioned before, these semi-public attachments enhance the sense of belonging through increasing socialization between the residents on the streets. In SL neighborhood, most of the car garages were placed at the rear of the single-family houses, to decrease the length of blank walls along its residential streets. As mentioned before, minimizing blank walls and adding semi-public attachments to buildings create an active street life, but in SL neighborhood those two design techniques were not sufficient to engender active street life. The discontinued sidewalk network, the absence of adequate street furnishing, and the absence of curb cuts dwindled the public realm on the streets in SL neighborhood.

On the other hand, The Victorian architecture of the single-family houses in SL neighborhood improved the sense of place and place identity and thus could increase the sense of belonging among its residents. The historic significance of Saint Luke Manor building also

increased sense of place. Also, according to New Urbanists, a neighborhood with a well-defined center strengthens place identity and the sense of belonging on the neighborhood level. Britt Oval Park played a central role in defining the neighborhood's center and it was considered a stage for communal bonding in the neighborhood. At the same time, the limited programming of the park and the absence of playscapes in this park could limit the number of its visitors and thus could dwindle its role as a community-oriented space.

SL neighborhood provided an array of housing types, which helped in creating a diverse community with diverse demographics and socioeconomic backgrounds and thus increased the sense of belonging among its residents. SL neighborhood provided affordable housing, approximately 60 units, 5 condos, and 20 Single-family houses (see Figure 4.63). SL neighborhood provided public amenities that were equally accessible by all ages and all diverse ethnic groups and socioeconomic backgrounds.



**Figure 4.62: Residential Buildings with Semi-public Attachments in SL Neighborhood**  
(Image credit to author)



**Figure 4.63: Condos in SL Neighborhood**  
(Image credit to author)

As mentioned before, designs that guarantee accessibility for the disabled within buildings and in other public spaces places, such as street corners and bus stops combined with the design intention for creating lifelong occupancy communities are crucial for enhancing sense of belonging. All single-family houses were raised above the ground by at least four steps, but the houses included side and or backdoors that can be retrofitted to serve the needs of the handicapped residents. But as mentioned before, the sidewalks lacked curb cuts could negatively affect the notion of the lifelong occupancy in SL neighborhood.

## 5. Aesthetics

The traditional architectural style of the housing units in SL neighborhood enhanced the overall aesthetics of the neighborhood. At the same time, the under-developed areas and the blighted buildings weakened such strength. The continuous street fronts with the traditional architecture were often disrupted with the views of the blighted houses, which affected negatively the overall visual appeal of the community. The parking areas around the historic buildings and its massive area of bare asphalt affected the visual of the neighborhood. SL failed to provide adequate visual and physical treatments to the parking areas and to the on-premise blighted buildings.

Also, the neighborhood did not have a coherent streetscape, in terms of light poles, trees, plantings, real estate signs, and other types of signs. Three mismatched designs for lighting poles were found on the residential streets in SL neighborhood, and all three were not coherent in style or material. Such incoherency in the streetscape designs affected the visual appeal of the neighborhood.

The residential streets were not lined up with coherent tree designs, species, which affected negatively the visual appeal of the residential streets. In addition, the streetscape along Martin Luther King Junior was totally incoherent with the rest of the neighborhood, which made Martin Luther King Junior function as visual and physical divider rather than a connector.

On the other hand, the architectural details of the historic building of Saint Luke Manor and the modern architecture of the elementary school added visual interest to the neighborhood. The location and size of the historic building of the former hospital helped in creating interesting street views from the residential streets of SL neighborhood.

#### 4.2 Qualitative Analysis Summary

Table 4.13 illustrates the total scores earned and percentages in each QoL criterion among the three neighborhoods. The NU greenfield neighborhood, CHV, had earned the highest number of total points in all of the five QoL criteria, in contrast to the NU brownfield neighborhood, MR, which earned the least number of points in terms of the five QoL criteria. Consequently, reviewing the guidelines of both NU movement and LEED-ND certification systems is recommended to yield better QoL for its residents.

In terms of the safety criterion, NU greenfield neighborhood had earned more points than the other two neighborhoods, followed by NU brownfield neighborhood. Table 4.14 summarizes the findings of the field visits and neighborhood scorecard in terms of the overlooked design elements and the physical weaknesses regarding the safety criterion in NU and LEED-ND certified neighborhoods.



**Table 4.13: Neighborhood Scorecard Results Summary for the Three Neighborhoods  
(frequency (%))**

| QoL criteria | Community Type                                                      |                                                          |                                                      |
|--------------|---------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------|
|              | Cherry Hill Village<br>(CHV) New Urbanist<br>Greenfield development | Mason Run (MR)<br>New Urbanist brownfield<br>development | Saint Luke (SL)<br>LEED-ND certified<br>neighborhood |
| Safety       | 49 (81.2)                                                           | 38(63.3)                                                 | 37(61.7)                                             |
| Total        | 60 (100.0)                                                          | 60 (100.0)                                               | 60 (100.0)                                           |
| Comfortable  | 27(75.0)                                                            | 21(58.3)                                                 | 21(58.3)                                             |
| Total        | 36(100.0)                                                           | 36(100.0)                                                | 36(100.0)                                            |
| Connectivity | 13(65.0)                                                            | 12(60.0)                                                 | 12(60.0)                                             |
| Total        | 20(100.0)                                                           | 20(100.0)                                                | 20(100.0)                                            |
| Place-making | 11(73.3)                                                            | 6(40.0)                                                  | 10(66.7)                                             |
| Total        | 15(100.0)                                                           | 15(100.0)                                                | 15(100.0)                                            |
| Aesthetics   | 14(77.7)                                                            | 8(44.4)                                                  | 9(50.0)                                              |
| Total        | 18(100.0)                                                           | 18(100.0)                                                | 18(100.0)                                            |

**Table 4.14: Findings for Safety Criterion**

| <b>Safety Criterion Findings for NU Neighborhoods</b>               |                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                                                  | Despite the provision of speed limit signs, on-street parking, narrow lanes, and shallow fronts, there were speeding cars along main streets. The provision of other traffic calming techniques, such as speed bumps, mini roundabouts, and different pavement materials had been overlooked in both NU greenfield and brownfield neighborhoods      |
| 2.                                                                  | NU brownfield neighborhood Lacked appropriate pedestrian safety signs                                                                                                                                                                                                                                                                                |
| 3.                                                                  | NU brownfield neighborhood had streets with curb turn radii of the streets ranged between 18-25 feet, which surpassed the recommended measure for creating safer crossings for pedestrians                                                                                                                                                           |
| 4.                                                                  | NU brownfield neighborhood included multiple entryways, five entryways, which could affect the safety of the neighborhood                                                                                                                                                                                                                            |
| 5.                                                                  | The absence of mixed-uses in NU brownfield neighborhood could impact the overall safety of the neighborhood. MR provided mainly residential use and passive greens spaces.                                                                                                                                                                           |
| 6.                                                                  | Lack of active nodes with diverse uses could affect the safety the residents. The dominance of passive public greens in NU brownfield neighborhood did not encourage residents to use the on-premise open green spaces.                                                                                                                              |
| 7.                                                                  | The location of massive areas of brownfields and abandoned lands in close proximity to the residential blocks in NU brownfield neighborhood could highly affect the safety of its residents. The brownfields and the abandoned lands were not adequately lit as well.                                                                                |
| 8.                                                                  | There was no adequate number of light sources along residential streets in NU greenfield neighborhood                                                                                                                                                                                                                                                |
| 9.                                                                  | There was no adequate number of light sources in open green spaces in NU greenfield neighborhood. The light poles in open green spaces were located mainly on the perimeters of the open green spaces away from the areas of activities. The number and the design of the light poles were not proportionate with the size of the open green spaces. |
| 10.                                                                 | Despite the multiple light sources in open green spaces in NU brownfield neighborhood the open green spaces were not safe since they primarily surrounded by brownfields and                                                                                                                                                                         |
| 11.                                                                 | Both NU greenfield and brownfield neighborhoods failed to provide brightly painted cross walks, or bulb outs, which could highly affect the safety of pedestrians                                                                                                                                                                                    |
| 12.                                                                 | Power Lines run through the residential blocks in both NU greenfield and brownfield neighborhoods could affect the safety of the residents                                                                                                                                                                                                           |
| 13.                                                                 | NU brownfield neighborhood Lacked the provision of safety signs for children along residential streets and public spaces                                                                                                                                                                                                                             |
| 14.                                                                 | Both NU greenfield and brownfield neighborhoods failed to provide adequate biking safety signs                                                                                                                                                                                                                                                       |
| 15.                                                                 | Both NU greenfield and brownfield neighborhoods failed to provide safe public transit services, such as dry shelters, safe routes to public transit stops/stations.                                                                                                                                                                                  |
| <b>Safety Criterion Findings for LEED-ND Certified Neighborhood</b> |                                                                                                                                                                                                                                                                                                                                                      |
| 1.                                                                  | The huge parking lots attached to the hospital could add risk to the safety of residents, since they were under-used and not adequately lit at night/ when re-suing former buildings redeveloping and redesigning under-used parking spaces should be considered                                                                                     |
| 2.                                                                  | Many Blighted houses are still on site and share the same residential blocks with the new houses of SL                                                                                                                                                                                                                                               |
| 3.                                                                  | bare lands of under-developed land surround the central public space                                                                                                                                                                                                                                                                                 |
| 4.                                                                  | Massive areas of brownfields and abandoned lands / Adjacency of brownfield and abandoned areas to residential blocks/ must provide guidelines for existing abandoned areas                                                                                                                                                                           |
| 5.                                                                  | Sidewalks are discontinued due to the under-developed lands. Pedestrians had to share streets with the moving traffic to reach different destinations                                                                                                                                                                                                |
| 6.                                                                  | The central open space lacked appropriate lighting                                                                                                                                                                                                                                                                                                   |

**Table 4.14 (cont'd)**

|                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. Traffic safety signs for pedestrians were not enough on Martin Luther King Junior Drive. Lack of traffic calming techniques on Martin Luther King Junior Drive could put the lives of the pedestrians, especially children, at risk / it is not enough to have two-way narrow streets or on street parking to slow the speed of vehicular movement |
| 8. Martin Luther King Junior Drive disconnected the flow of the pedestrian movement in the neighborhood/ major thoroughfares had to be carefully designed in terms of pedestrian safety and physical connection                                                                                                                                       |
| 9. Reaching the school and /or the library on foot was risky for children because crossing Martin Luther King Junior Drive was very risky since it did not provide proper pedestrian safety measures.                                                                                                                                                 |
| 10. Lack of safety signs for children along residential streets and public spaces                                                                                                                                                                                                                                                                     |
| 11. NU greenfield neighborhood did not provide adequate visual and physical connections to the surrounding iconic historic buildings                                                                                                                                                                                                                  |
| 12. Both NU greenfield and brownfield neighborhoods failed to provide any sort of bike storage facilities, such as bike racks.                                                                                                                                                                                                                        |
| 13. Location of open green spaces in safe areas surrounded by active streets and not under-developed lands.                                                                                                                                                                                                                                           |
| 14. Lack of traffic safety signs and traffic calming techniques on secondary streets                                                                                                                                                                                                                                                                  |
| 15. Designated bike lanes on Martin Luther King Junior Drive were used for on street parking.                                                                                                                                                                                                                                                         |

In terms of comfort criteria, the NU greenfield neighborhood, CHV, had also scored more points than the other two neighborhoods. Both NU brownfield neighborhood and the LEED-ND certified neighborhood had earned the same number of points under this criterion. Table 4.15 summarizes the findings of the field visits and neighborhood scorecard in terms of the overlooked design elements and the physical weaknesses regarding the comfort criterion in NU and LEED-ND certified neighborhoods.

CHV earned the highest number of points in terms of connectivity, while MR and SL earned the same number of points. Table 4.16 summarizes the findings of the field visits and neighborhood scorecard in terms of the overlooked design elements and the physical weaknesses regarding the connectivity criterion in NU and LEED-ND certified neighborhoods. In terms of place-making criterion, CHV neighborhood had also scored more points than the other two neighborhoods, followed by SL neighborhood. Simultaneously, MR earned the least number of points under this criterion. Table 4.17 summarizes the findings of the field visits and neighborhood scorecard in terms of the overlooked design elements and the physical weaknesses regarding place-making criterion in NU and LEED-ND certified neighborhoods.

In terms of the aesthetics, CHV earned again more points than the other two neighborhoods, followed by SL neighborhood. Table 4.18 summarizes the findings of the field visits and neighborhood scorecard in terms of the overlooked design elements and the physical weaknesses regarding the aesthetics criterion in NU and LEED-ND certified neighborhoods.

**Table 4.15: Findings for Comfort Criterion**

| <b>Comfort Criterion Findings for NU Neighborhoods</b>                |                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                                                    | Both NU greenfield and brownfield neighborhoods did not provide adequate type of buffers to block traffic noise on main streets                                                                                                                             |
| 2.                                                                    | NU brownfield neighborhood did not provide adequate buffers to block the undesirable views of the brown fields and abandoned land                                                                                                                           |
| 3.                                                                    | NU brownfield neighborhood did not provide adequate type of buffers to block noise from railroad/ The residential units in MR neighborhood were in close proximity to the railway                                                                           |
| 4.                                                                    | Both NU greenfield and brownfield neighborhoods failed to provide adequate number of trash receptacles on residential streets                                                                                                                               |
| 5.                                                                    | NU brownfield neighborhood failed to provide trash receptacles in open green spaces                                                                                                                                                                         |
| 6.                                                                    | NU brownfield neighborhood failed to provide diverse outdoors activities                                                                                                                                                                                    |
| 7.                                                                    | The location of the open green spaces in close proximity of brownfields and abandoned lands in NU brownfield neighborhood could make them less desirable, less attractive and thus less visited                                                             |
| 8.                                                                    | NU brownfield neighborhood lacked the provision of significant buildings in terms of architecture, size, age, or function, which could affect way finding                                                                                                   |
| 9.                                                                    | NU brownfield neighborhood lacked the provision of diverse housing options                                                                                                                                                                                  |
| 10.                                                                   | Both NU greenfield and brownfield neighborhoods failed to provide small size blocks. Block size in both neighborhoods surpassed the recommended size for comfortable walking experience                                                                     |
| 11.                                                                   | Both NU greenfield and brownfield neighborhoods failed to provide adequate way finding system which could cause confusion to pedestrians and drivers as well, and could impose some difficulty for them to reach different destinations in the neighborhood |
| 12.                                                                   | Both NU greenfield and brownfield neighborhoods failed to provide convenient access to public facilities and convenience stores                                                                                                                             |
| 13.                                                                   | NU greenfield neighborhood did not provide adequate visual and physical connections to the surrounding iconic historic buildings                                                                                                                            |
| 14.                                                                   | NU greenfield neighborhood did not provide adequate visual and physical connections to the surrounding iconic historic buildings                                                                                                                            |
| 15.                                                                   | Both NU greenfield and brownfield neighborhoods failed to provide any sort of bike storage facilities, such as bike racks.                                                                                                                                  |
| 16.                                                                   | NU brownfield neighborhood manifested a weak interpretation of the Transect in terms of urban center and rural edges                                                                                                                                        |
| <b>Comfort Criterion Findings for LEED-ND Certified Neighborhoods</b> |                                                                                                                                                                                                                                                             |
| 1.                                                                    | Trash receptacles missing in all open green spaces and on residential streets                                                                                                                                                                               |
| 2.                                                                    | No adequate visual or physical buffered were provided to block the sight of the blighted buildings.                                                                                                                                                         |
| 3.                                                                    | Lack of adequate network of continuous sidewalks                                                                                                                                                                                                            |
| 4.                                                                    | Lack of adequate network of continuous bike lanes                                                                                                                                                                                                           |
| 5.                                                                    | Lack of curb cuts made sidewalks less accessible and less comfortable for sidewalk users with different physical abilities                                                                                                                                  |
| 6.                                                                    | Lack of biking storage facilities                                                                                                                                                                                                                           |
| 7.                                                                    | Lack of adequate buffers to block noise from railways, and main streets                                                                                                                                                                                     |
| 8.                                                                    | Not clearly defined edge/ Demarcation of edges for infill developments                                                                                                                                                                                      |
| 9.                                                                    | Weak interpretation of the Transect in terms of urban center and rural edges                                                                                                                                                                                |
| 10.                                                                   | Block size surpassed the recommended size for comfortable walking experience                                                                                                                                                                                |
| 11.                                                                   | Failed to provide adequate way finding signage                                                                                                                                                                                                              |

**Table 4.16: Findings for Connectivity Criterion**

|                                                                           |                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Connectivity Criterion Findings for NU Neighborhoods</b>               |                                                                                                                                                                                                                                                     |
| 1.                                                                        | The number of T-junctions outweighed the number of 4-way intersections in Both NU greenfield and brownfield neighborhoods, which could affect the internal connectivity of the neighborhood and could give less choices for pedestrians and drivers |
| 2.                                                                        | NU greenfield neighborhood was not within a walking distance to nearby public schools                                                                                                                                                               |
| 3.                                                                        | NU greenfield neighborhood was not within a walking distance to nearby public transit services nor the on-premise grocery store                                                                                                                     |
| 4.                                                                        | The location of Both NU greenfield and brownfield neighborhoods miles away from main commercial corridors and public amenities affected their external connectivity.                                                                                |
| 5.                                                                        | Both NU greenfield and brownfield neighborhoods did not offer any public transit services to improve the physical connection between the neighborhood and the surrounding public services and other amenities                                       |
| 6.                                                                        | The heavy traffic on Noble Street in NU brownfield neighborhood affected the internal connectivity of the neighborhood                                                                                                                              |
| 7.                                                                        | The location of NU brownfield neighborhood in close proximity to the railroad made it impossible for MR residents to reach the sports facility on foot                                                                                              |
| 8.                                                                        | The heavy traffic on Elm street, in NU brownfield neighborhood, combined with the absence of adequate pedestrian's safety measures affected the physical connectivity between the neighborhood and Cappuccilli Park                                 |
| <b>Connectivity Criterion Findings for LEED-ND Certified Neighborhood</b> |                                                                                                                                                                                                                                                     |
| 1.                                                                        | The neighborhood was bisected by martin Luther King drive which affected the internal connectivity of the neighborhood/designing a neighborhood around busy streets                                                                                 |
| 2.                                                                        | Lack of curb cuts made sidewalks less accessible for sidewalk users with different physical abilities                                                                                                                                               |
| 3.                                                                        | Lack of proximity to surrounding public services                                                                                                                                                                                                    |

**Table 4.17: Findings for Place-making Criterion**

|                                                                                                  |                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Place-making and Sense of Belonging Criterion Findings for NU Neighborhoods</b>               |                                                                                                                                                                                                                                                                                       |
| 1.                                                                                               | The location of the Village Center on Cherry Hill Road away from the center of the NU greenfield neighborhood weakened its function as the central gathering place for the community. Village Center was not located within a walking distance from the majority of the housing units |
| 2.                                                                                               | Both NU greenfield and brownfield neighborhoods lacked the provision of recreational venues, and adequately furnished communal spaces                                                                                                                                                 |
| 3.                                                                                               | NU brownfield neighborhood did not provide any type of playscapes                                                                                                                                                                                                                     |
| 4.                                                                                               | NU brownfield neighborhood did not provide any type of mixed-use                                                                                                                                                                                                                      |
| 5.                                                                                               | Both NU greenfield and brownfield neighborhoods did not have any historically preserved buildings/lands                                                                                                                                                                               |
| 6.                                                                                               | NU greenfield neighborhood lacked visual and physical connections to the surrounding iconic historic buildings                                                                                                                                                                        |
| 7.                                                                                               | Both NU greenfield and brownfield neighborhoods did not provide any community gardens or any other local food production amenities                                                                                                                                                    |
| 8.                                                                                               | Both NU greenfield and brownfield neighborhoods did not provide affordable housing                                                                                                                                                                                                    |
| 9.                                                                                               | NU brownfield neighborhood did not provide diverse types of housing                                                                                                                                                                                                                   |
| <b>Place-making and Sense of Belonging Criterion Findings for LEED-ND Certified Neighborhood</b> |                                                                                                                                                                                                                                                                                       |
| 1.                                                                                               | SL lacked the provision of pedestrian oriented streets                                                                                                                                                                                                                                |
| 2.                                                                                               | The sidewalks were not accessible by all physical abilities                                                                                                                                                                                                                           |
| 3.                                                                                               | The blighted buildings affected the sense of place                                                                                                                                                                                                                                    |

**Table 4.18: Findings for Aesthetics Criterion**

|                                                                         |                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Aesthetics Criterion Findings for NU Neighborhoods</b>               |                                                                                                                                                                                                                          |
| 1.                                                                      | The width of alleyways, 18 feet wide, disrupts the visual and physical continuity of the street tree linings and sidewalks found in NU greenfield neighborhood                                                           |
| 2.                                                                      | The orientation of most of the alleyways within the residential blocks NU greenfield neighborhood had weakened their function as visual buffers for undesirable elements, such as trash receptacles, utility boxes, etc. |
| 3.                                                                      | The parking area of the Village Center in NU greenfield neighborhood lacked visual and physical coherency with the surroundings                                                                                          |
| 4.                                                                      | Most of the entryways in Both NU greenfield and brownfield neighborhoods were not visually appealing                                                                                                                     |
| 5.                                                                      | Both NU greenfield and brownfield neighborhoods did not provide any type of special visual features at night, such as lights along the lakes                                                                             |
| 6.                                                                      | The power lines running through Both NU greenfield and brownfield neighborhoods affected their visual appeal                                                                                                             |
| 7.                                                                      | There was no visual or physical connection between the neighborhood and the surrounding local historic icons in NU greenfield neighborhood                                                                               |
| 8.                                                                      | There was no distinction between buildings in terms of age, which could affect the visual appeal of the neighborhood in both NU greenfield and brownfield neighborhoods                                                  |
| 9.                                                                      | Brown fields and undeveloped land in NU brownfield neighborhood affected the overall visual appeal of the community                                                                                                      |
| 10.                                                                     | NU brownfield neighborhood did not provide adequate buffers to block the undesirable views of the brown fields and undeveloped land                                                                                      |
| 11.                                                                     | NU brownfield neighborhood lacked the provision of coherent streetscape                                                                                                                                                  |
| <b>Aesthetics Criterion Findings for LEED-ND certified Neighborhood</b> |                                                                                                                                                                                                                          |
| 1.                                                                      | Blighted buildings and undeveloped land affected the overall visual appeal of the community                                                                                                                              |
| 2.                                                                      | SL did not provide adequate buffers to block the undesirable views of the brown fields and undeveloped land                                                                                                              |
| 3.                                                                      | SL lacked the provision of coherent streetscape                                                                                                                                                                          |
| 4.                                                                      | Entryways were not visually appealing                                                                                                                                                                                    |
| 5.                                                                      | Most of the entryways to the neighborhood were not visually appealing or unique                                                                                                                                          |
| 6.                                                                      | There were no special visual features at night, such as lights along lakes                                                                                                                                               |
| 7.                                                                      | The power lines running through martin Luther King Drive affected the visual appeal of the neighborhood                                                                                                                  |
| 8.                                                                      | Martin Luther King Junior drive was a visual and physical divider                                                                                                                                                        |
| 9.                                                                      | The standardized lot size in NU brownfield neighborhood did not allow for the provision of different housing types                                                                                                       |
| <b>Aesthetics Criterion Findings for LEED-ND certified Neighborhood</b> |                                                                                                                                                                                                                          |
| 1.                                                                      | Blighted buildings and undeveloped land affected the overall visual appeal of the community                                                                                                                              |
| 2.                                                                      | SL did not provide adequate buffers to block the undesirable views of the brown fields and undeveloped land                                                                                                              |
| 3.                                                                      | SL lacked the provision of coherent streetscape                                                                                                                                                                          |
| 4.                                                                      | Entryways were not visually appealing                                                                                                                                                                                    |
| 5.                                                                      | Most of the entryways to the neighborhood were not visually appealing or unique                                                                                                                                          |
| 6.                                                                      | There were no special visual features at night, such as lights along lakes                                                                                                                                               |
| 7.                                                                      | The power lines running through martin Luther King Drive affecting its visual appeal                                                                                                                                     |



## CHAPTER 5

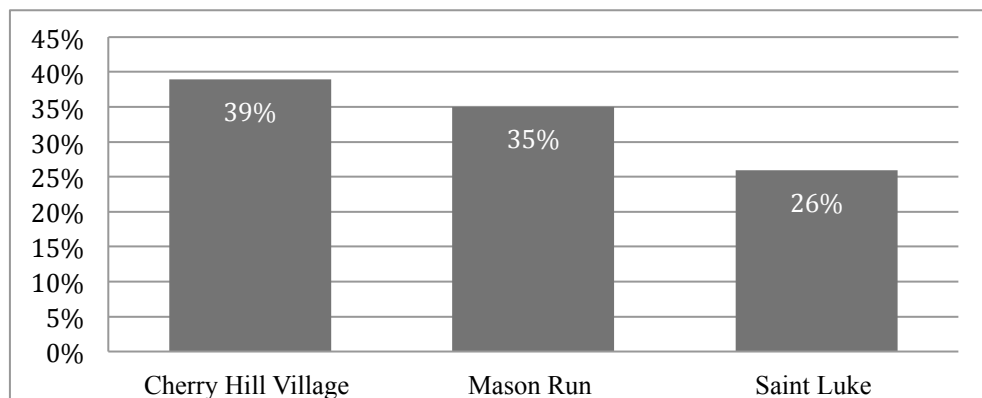
### QUANTITATIVE ANALYSIS AND FINDINGS FROM THE RESIDENT'S SURVEY

#### 5.1 Quantitative Analysis

##### General characteristics of respondents

##### 5.1.1 Demographic and Socioeconomic Characteristics

The total number of respondents to the resident survey is 154. Figure 5.1 illustrates the distribution of the total number of respondents among the three neighborhoods. The percentage of respondents in Cherry Hill Village (CHV) neighborhood compromises 38.9% (n=60) of the total number of respondents. The percentage of respondents in Mason Run (MR) neighborhood compromises 35.0% (n=54) of the total number of respondents. The percentage of respondents in Saint Like (SL) neighborhood compromises 25.9% (n=40) of the total number of respondents. The general characteristics of respondents include the following demographic aspects: gender, age of participant, ethnicity, number of family, number of children, and age of children. The socioeconomic characteristics include: educational attainment, employment status, and family annual income.



**Figure 5.1: Distribution of Respondents among the Three Neighborhoods**

## 1. Demographic characteristics

According to Table 5.1, the total number of respondents is 154, among them, 85% are female, 56 % are male. The age of the respondents is classified into five groups; 1.2% are in their 20s, 24.7% are in their 30s, 33.8% are in their 40s, 18.8% are in their 50s, and 20.8% are in their 60s or older. Also, the respondents are divided into six ethnic groups; 62.3% are White, 24.7% are Black, 7.1% are Hispanic, 4% are Asian. The majority of respondents are female. Also, the majori To adequately understand the demographic characteristics of the respondents, their household types, number of family members living with respondents, and the number and age of children are investigated.

Table 5.2 illustrates such demographic characteristics. The majority of respondents live with their partners and their children, they represent 54.5% of the total number of households. Followed by the percentage of households who live with their partners and with no children, they represent 18.8% of the total number of households. Among the 154 respondents, 12.3% live alone, and the same percentage is applied to households who live with children and no partner. Among the respondents, 2% live with their parents, and 2% live with a roommates/friend.

Table 5.3 illustrates the family size, percentage of children per household, and the age of children in the three neighborhoods. The majority of the respondents, 32.5% of respondents, have indicated that the total number of their family members is 4. At the same time, only 3.2% of the respondents have indicated that the total number of their family members is 6 or more. Also, most of the respondents have indicated that they have two children, and none of the respondents have indicated that they have 5 or more children. The common age respondents' children are between 6 and 11 years old.

**Table 5.1: Gender, Age and Ethnic Groups of Respondents (frequency (%))**

| Demographic characteristics |                        | Neighborhood Type                        |                                         |                                   | Total      |
|-----------------------------|------------------------|------------------------------------------|-----------------------------------------|-----------------------------------|------------|
|                             |                        | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |            |
| Gender                      | Female                 | 32 (64.0)                                | 30 (55.5)                               | 23(57.5)                          | 85(55.2)   |
|                             | Male                   | 15 (30.0)                                | 24 (44.5)                               | 17(42.5)                          | 56(36.4)   |
|                             | Prefer not to answer   | 3 (6.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 3(1.9)     |
|                             | Total                  | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Age                         | 20s                    | 2 (3.3)                                  | 0 (0.0)                                 | 0 (0.0)                           | 2(1.2)     |
|                             | 30s                    | 20(33.3)                                 | 14 (26.0)                               | 4(10.0)                           | 38(24.7)   |
|                             | 40s                    | 22(36.7)                                 | 21 (39.0)                               | 9(22.5)                           | 52(33.8)   |
|                             | 50s                    | 5(8.3)                                   | 16 (29.5)                               | 8(20.0)                           | 29(18.8)   |
|                             | 60s or over            | 11 (18.4)                                | 3 (5.5)                                 | 18(45.0)                          | 32(20.8)   |
|                             | Total                  | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Ethnic Group                | Caucasian/White        | 52(86.7)                                 | 41 (76)                                 | 3(7.5)                            | 96(62.3)   |
|                             | Black/African American | 1 (1.7)                                  | 3 (5.6)                                 | 34(85.0)                          | 38(24.7)   |
|                             | Hispanic/Latino        | 2 (3.3)                                  | 8 (14.8)                                | 1(2.5)                            | 11(7.1)    |
|                             | Native American        | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                             | Asian                  | 3 (5.0)                                  | 1 (1.8)                                 | 0 (0.0)                           | 4(2.6)     |
|                             | Other                  | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                             | Prefer not to answer   | 2 (3.3%)                                 | 1 (1.8%)                                | 0 (0.0)                           | 3(1.9)     |
|                             | Total                  | 60 (100.0)                               | 54 (100.0)                              | 40(100.0%)                        | 154(100.0) |

Note: In-complete responses were eliminated from the analysis

**Table 5.2: Household Characteristics (frequency (%))**

| Household Type                   | Neighborhood Type                        |                                         |                                   | Total      |
|----------------------------------|------------------------------------------|-----------------------------------------|-----------------------------------|------------|
|                                  | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |            |
| I live alone                     | 1 (1.7%)                                 | 0 (0.0)                                 | 18(45.0)                          | 19(12.3)   |
| I live with my parents           | 0 (0.0)                                  | 0 (0.0)                                 | 2(5.0)                            | 2(1.2)     |
| I live with children, no partner | 2 (3.3%)                                 | 8(14.8%)                                | 9(22.5)                           | 19(12.3)   |
| I live with partner, no children | 13(21.7%)                                | 12 (22.2%)                              | 4(10.0)                           | 29(18.8)   |
| I live with partner and children | 44 (73.3%)                               | 34 (63%)                                | 6(15.0)                           | 84(54.5)   |
| I live with roommate/friend      | 0 (0.0)                                  | 0 (0.0)                                 | 2(5.0)                            | 2(1.2)     |
| Other                            | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
| Total                            | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |

## 2. Socioeconomic characteristics

The socioeconomic characteristics of respondents include their educational attainment, employment status and their annual income. Table 5.4 illustrates the results of such characteristics. The majority of respondents, 52.6% of respondents, have bachelor's degrees. Approximately 22% of respondents have a graduate degree or higher, while only one respondent has Middle school education. In terms of employment status, approximately more than half of the respondents have full time jobs, and only 9.7% of respondents are part-time employees. Approximately, 15 % of the respondents are in the "other" category, which includes associate, technical, graduate equivalency degrees, and trade school. As for the annual household income, the majority of respondents have reported that they earn between \$100K-\$150K annually. In the meantime, approximately 19% of respondents have declined to enclose their annual household income.

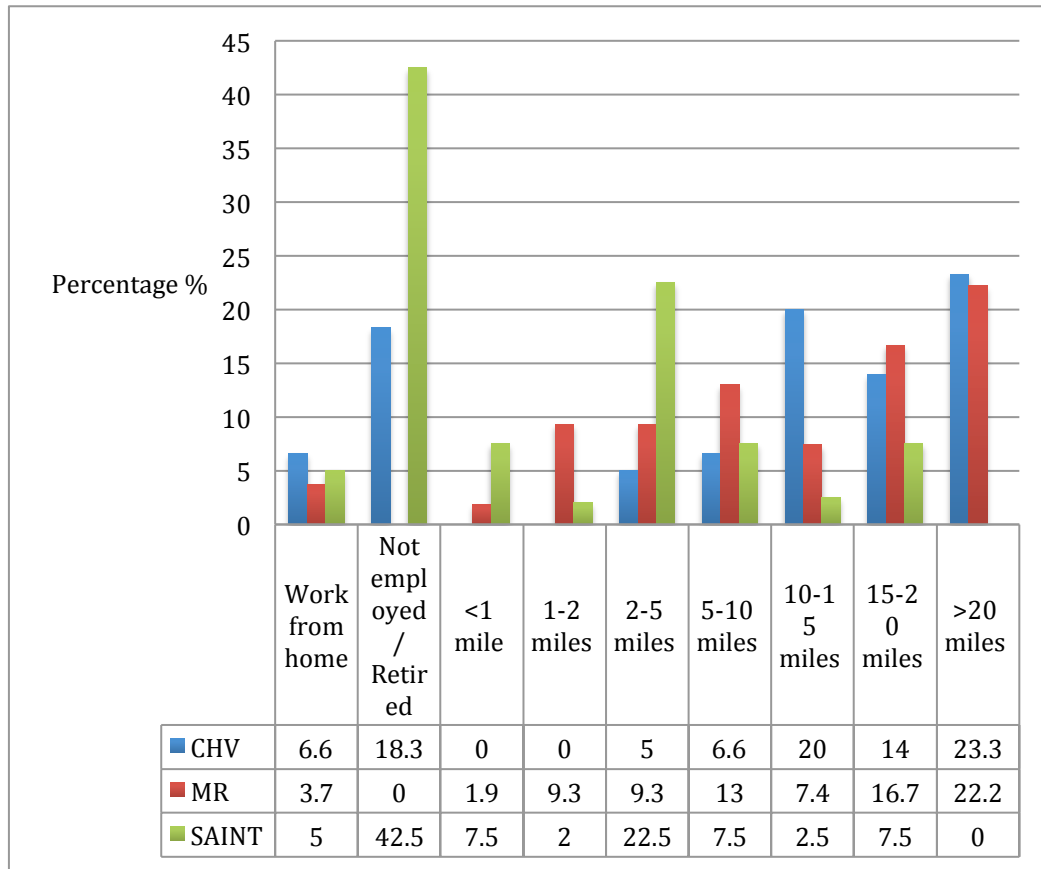
The participants were also asked to identify the distance between their current housing unit and their workplace. Figure 5.2 illustrates the distance between the respondents' dwellings and their workplaces distance. According to Figure 5.2, almost 45% of the total number of participants living in SL neighborhood was not employed/retired. Approximately 25% of the total number of participants living in CHV and MR neighborhoods lived more than 20 miles away from their workplace. Approximately 60% of participants living in CHV lived more than 10 miles away from their housing units. Approximately 50 % of participants living in MR neighborhood lived more than 10 miles away from their current housing units. On the other hand, most of the working participants living in MR neighborhood had workplaces that were located between 2 and 5 miles away from their homes.

**Table 5.3: Family Size, Number of Children, and Age of Children (frequency (%))**

| Demographic characteristics |              | Neighborhood Type                        |                                         |                                   | Total      |
|-----------------------------|--------------|------------------------------------------|-----------------------------------------|-----------------------------------|------------|
|                             |              | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |            |
| Family Size                 | 1            | 1 (1.7)                                  | 0 (0.0)                                 | 18(45.0)                          | 19(12.3)   |
|                             | 2            | 15 (25.0)                                | 13 (24.1)                               | 9(22.5)                           | 37(24.0)   |
|                             | 3            | 12 (20.0)                                | 11 (20.4)                               | 3(2.5)                            | 26(16.9)   |
|                             | 4            | 27(45.0)                                 | 19 (35.2)                               | 4(10.0)                           | 50(32.5)   |
|                             | 5            | 4(6.6)                                   | 9 (16.6)                                | 4(10.0)                           | 17(11.0)   |
|                             | 6 or more    | 1 (1.7)                                  | 2 (3.7)                                 | 2(5.0)                            | 5(3.2)     |
|                             | Total        | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| # of Children per household | No children  | 15 (25.0)                                | 12 (22.2)                               | 25(62.5)                          | 52(33.8)   |
|                             | 1            | 11 (18.3)                                | 7(13.0)                                 | 4(10.0)                           | 22(14.3)   |
|                             | 2            | 29 (48.3)                                | 23(42.6)                                | 2(5.0)                            | 54(35.0)   |
|                             | 3            | 4 (6.7)                                  | 11 (20.4)                               | 8(20.0)                           | 23(15.0)   |
|                             | 4            | 1 (1.7)                                  | 1 (1.8)                                 | 1(2.5)                            | 3(1.9)     |
|                             | 5 or more    | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                             | Total        | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Age of Children             | 0-5          | 17 (20.0)                                | 9 (9.9)                                 | 9(25.8)                           | 35(16.6)   |
|                             | 6-11         | 42 (49.4)                                | 24 (26.4)                               | 6(17.2)                           | 72(34.1)   |
|                             | 12-14        | 12 (14.1)                                | 21 (23.0)                               | 4(11.4)                           | 37(17.5)   |
|                             | 15-18        | 10 (11.8)                                | 19 (20.9)                               | 10(28.6)                          | 39(18.5)   |
|                             | 18 and older | 4 (4.7)                                  | 18 (19.8)                               | 6(17.2)                           | 28(13.3)   |
|                             | Total        | 85 (100.0)                               | 91(100.0)                               | 35(100)                           | 211(100.0) |

**Table 5.4: Socioeconomic Characteristics (frequency (%))**

| Socioeconomic Characteristics |                         | Neighborhood Type                        |                                         |                                   | Total      |
|-------------------------------|-------------------------|------------------------------------------|-----------------------------------------|-----------------------------------|------------|
|                               |                         | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist brownfield Neighborhood | SL LEED-ND Certified Neighborhood |            |
| Educational attainment        | Elementary school       | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                               | Middle school           | 0 (0.0)                                  | 0 (0.0)                                 | 1(2.5)                            | 1 (0.6)    |
|                               | High school             | 1 (1.7)                                  | 7 (13.0)                                | 7(17.5)                           | 15(9.7)    |
|                               | Bachelor's              | 33 (55.0)                                | 31 (57.4)                               | 17(42.5)                          | 81(52.6)   |
|                               | Graduate degree         | 24 (40.0)                                | 9 (16.6)                                | 1(2.5)                            | 34(22.1)   |
|                               | Other                   | 2 (3.3)                                  | 7 (13.0)                                | 14(35.0)                          | 23(14.9)   |
|                               | Total                   | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
|                               | Associate degree        | 2 (100.0)                                | 5 (71.4)                                | 6(42.9)                           | 13(56.5)   |
|                               | Technical degree        | 0 (0.0)                                  | 1 (14.3)                                | 2(14.3)                           | 3(13.0)    |
|                               | Trade school            | 0 (0.0)                                  | 1 (14.3)                                | 0 (0.0)                           | 1(4.3)     |
|                               | GED                     | 0 (0.0)                                  | 0 (0.0)                                 | 7(50.0)                           | 7(30.4)    |
|                               | Total                   | 2 (100.0)                                | 7(100.0)                                | 14(100.0)                         | 23(100.0)  |
| Employment status             | Employed full time      | 45 (75.0)                                | 49 (90.7)                               | 10 (25.0)                         | 104(67.5)  |
|                               | Employed part time      | 2 (3.3)                                  | 3 (5.5)                                 | 10 (25.0)                         | 15(9.7)    |
|                               | Self-employed           | 2(3.3)                                   | 1 (1.9)                                 | 1(2.5)                            | 4(2.6)     |
|                               | Homemaker               | 4 (6.7)                                  | 0 (0.0)                                 | 0 (0.0)                           | 4(2.6)     |
|                               | Student                 | 0 (0.0)                                  | 1 (1.9)                                 | 0 (0.0)                           | 1 (0.6)    |
|                               | Working student         | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                               | Military                | 0 (0.0)                                  | 0 (0.0)                                 | 0 (0.0)                           | 0 (0.0)    |
|                               | Retired                 | 5 (8.4)                                  | 0 (0.0)                                 | 16 (40.0)                         | 21(13.6)   |
|                               | Not employed            | 2 (3.3)                                  | 0 (0.0)                                 | 3(7.5)                            | 3(3.3)     |
|                               | Total                   | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Annual household income       | Below or equal \$10K    | 0 (0.0)                                  | 0 (0.0)                                 | 11(27.5)                          | 11(7.1)    |
|                               | More than \$10k-50K     | 0 (0.0)                                  | 0 (0.0)                                 | 23(57.5)                          | 23(14.9)   |
|                               | More than \$50K-\$100K  | 6 (10.0)                                 | 36 (66.6)                               | 4(10.0)                           | 26(16.9)   |
|                               | More than \$100K-\$150K | 17 (28.3)                                | 11 (20.4)                               | 0 (0.0)                           | 28(18.2)   |
|                               | More than \$150K-\$200K | 10 (16.7)                                | 1 (1.9)                                 | 0 (0.0)                           | 11(7.1)    |
|                               | More than \$200K-\$250K | 3(5.0)                                   | 1 (1.9)                                 | 0 (0.0)                           | 4(2.6)     |
|                               | Over \$250K             | 2(3.3)                                   | 0 (0.0)                                 | 0 (0.0)                           | 2(1.3)     |
|                               | Decline                 | 22 (36.7)                                | 5 (9.2%)                                | 2(5.0)                            | 29(18.8)   |
|                               | Total                   | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |

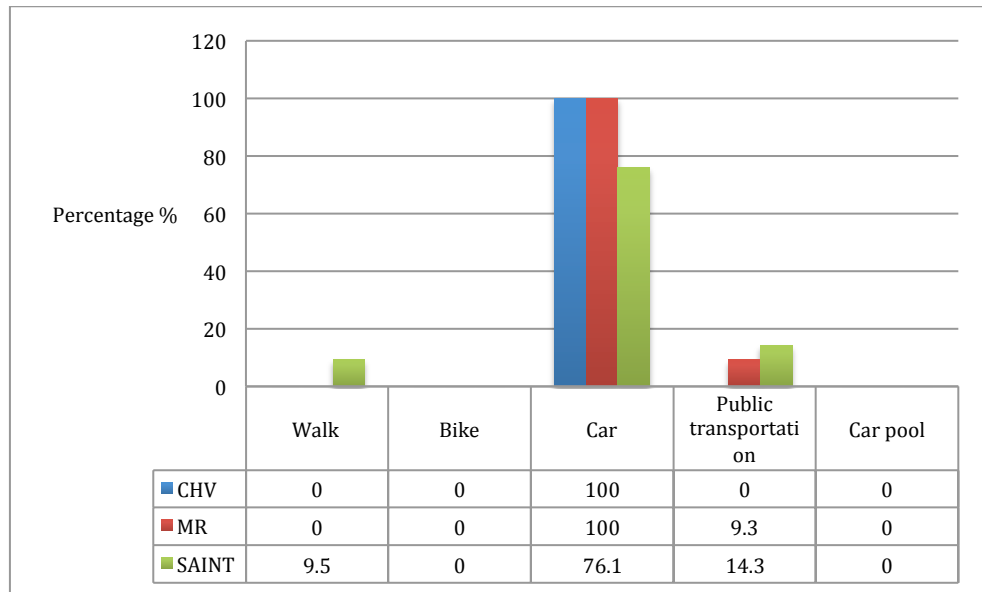


**Figure 5.2: The Distance between the Respondents' Place of Residence and their Place of Work (N=154)**

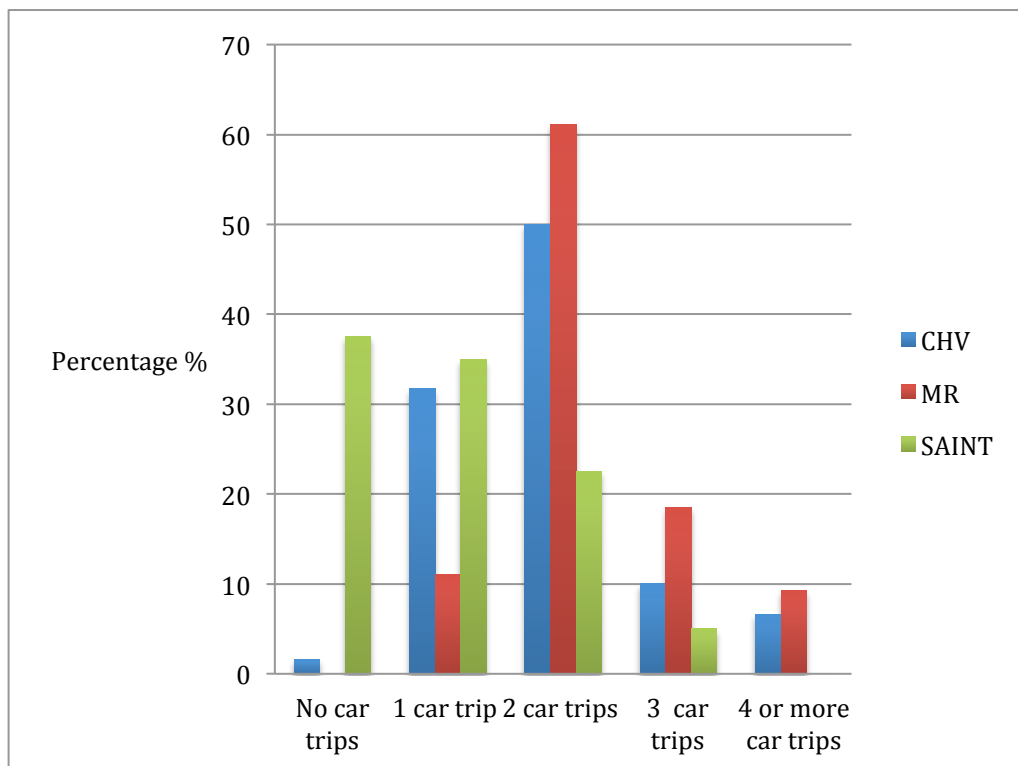
The participants were also asked to identify the usual type of commuting mode they take to go to their workplaces. Figure 5.3 shows the results of the responses among the three neighborhoods. As shown in Figure 5.3, all working participants who live in CHV and MR neighborhoods identified the use of cars as the usual mode of transportation to work. At the same time, working participants living in SL neighborhood identified some other modes of transportation to their workplace other than driving their own cars, such as going to workplace on foot, or taking some sort of public transportation. But approximately 70% of working participants in MR neighborhood still depend on driving their own cars as their usual mode of transportation to their workplace.

The participants were asked to report their average number of car trips they made per day from their place of residence to any other destinations. Figure 5.4 shows the percentage of participants who made no car trips at all per day, 1 car trip per day, 2 car trips per day, 3 car trips per, and 4 or more car trips per day. According to the results as shown in Figure 5.4, approximately 60% of participants living in CHV neighborhood made 2 car trips per day. Also, approximately half of the participants who lived in MR neighborhood made 2 car trips per day as well. Approximately less than 10% of the participants who live in CHV neighborhood made 4 or more car trips per day. The same is true for participants who lived in MR neighborhood. On the other hand, approximately 40 % of participants who lived in SL neighborhood did not make any car trips at all per day, and approximately 30% of the same group of participants made 1 car trip per day.





**Figure 5.3: The Usual Transportation Mode Taken by Participants to their Workplace (N=109)**



**Figure 5.4: Average Number of Car Trips Taken by Participants in the Three Neighborhoods (N=154)**

### 5.1.2 Housing and Neighborhood Characteristics

#### 1. Housing Characteristics

Housing characteristics in this study include: the type of housing dwelling, number of bedrooms per dwelling, and number of bathrooms per dwelling. Table 5.6 shows the respondents' different types of dwellings in the three neighborhoods. The majority of respondents, approximately 70%, live in 2-story single houses, while very few respondents, approximately 8%, live in 3-story single houses. Also, the majority of respondents live in dwellings that have 3 bedrooms, while few respondents, approximately 2%, have reported that they live in dwellings with 5 bedrooms or more. In terms of the number of bathrooms per dwelling, approximately 50% of the respondents live in dwellings with 3-4 bathrooms, while only 3.2% of the respondents have reported to live in dwellings with 4 or more bathrooms.

Also, the respondents have reported their length of residency in their current neighborhoods. The maximum length of residency is 240 months. The average length of residence for all respondents is 22 months. The respondents are also asked about their move out plans from their current neighborhoods to better understand their residential experiences in their neighborhoods. The majority of residents, approximately 32% of the respondents, have reported that they are planning to stay in their current neighborhoods for duration between 5-10 years (see Table 5.7). At the same time, approximately, 7% of the respondents do not know their future-moving plan yet.

Also, respondents were asked to report their reasons for moving out, approximately 30% of the respondents have reported their moving out reasons, while 70% did not report their moving out reason from their current neighborhoods. Table 5.7 illustrates the reasons the respondents have reported for moving out from their current neighborhoods. The most reported

reason for moving out is to be able to walk to convenience stores. Also, based on the respondents' answers, to be able to walk to convenience stores is the main reason why respondents are planning to move out from their current neighborhood(see Table 5.8). among the 45 respondents, approximately 35% of respondents are planning to move out to be able to reach convenience stores on foot within a reasonable walking distance. Also, approximately 30% of respondents are planning to move out to be able to pay either less rent or mortgage.

**Table 5.5: Housing Characteristics (frequency (%))**

| Housing characteristics               |                      | Neighborhood Type                        |                                         |                                   | Total      |
|---------------------------------------|----------------------|------------------------------------------|-----------------------------------------|-----------------------------------|------------|
|                                       |                      | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |            |
| Dwelling type                         | Apartment unit       | 0 (0.0)                                  | 0 (0.0)                                 | 21 (52.5)                         | 21(13.6)   |
|                                       | Row house/condo      | 13 (21.7)                                | 0 (0.0)                                 | 3(7.5)                            | 16(10.4)   |
|                                       | 2-story single house | 35 (58.3)                                | 54 (100.0)                              | 16 (40.0)                         | 105(68.2)  |
|                                       | 3-story single house | 12 (20.0)                                | 0 (0.0)                                 | 0 (0.0)                           | 12(7.8)    |
|                                       | Total                | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Number of bedrooms per dwelling type  | 1 bedroom            | 0 (0.0)                                  | 0 (0.0)                                 | 18 (45.0)                         | 18(11.7)   |
|                                       | 2 bedrooms           | 10(16.7)                                 | 3 (5.5)                                 | 8 (20.0)                          | 21(13.6)   |
|                                       | 3 bedrooms           | 16 (26.7)                                | 40 (74.1)                               | 9 (22.5)                          | 65(42.2)   |
|                                       | 4 bedrooms           | 31 (51.6)                                | 11 (20.4)                               | 5 (12.5)                          | 47(30.5)   |
|                                       | 5 or more bedrooms   | 3(5.0)                                   | 0 (0.0)                                 | 0 (0.0)                           | 3(1.9)     |
|                                       | Total                | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |
| Number of bathrooms per dwelling type | 1-2 bathrooms        | 17 (28.3)                                | 18 (33.3)                               | 38 (95.0)                         | 73(47.4)   |
|                                       | 3-4 bathrooms        | 38(63.3)                                 | 36 (66.7)                               | 2(5.0)                            | 76(49.4)   |
|                                       | 4 or more bathrooms  | 5 (8.3)                                  | 0 (0.0)                                 | 0 (0.0)                           | 5(3.2)     |
|                                       | Total                | 60 (100.0)                               | 54 (100.0)                              | 40(100.0)                         | 154(100.0) |

**Table 5.6: Moving Plans (frequency (%))**

| Housing characteristics               |                       | Name of Community                        |                                         |                                   | Total       |
|---------------------------------------|-----------------------|------------------------------------------|-----------------------------------------|-----------------------------------|-------------|
|                                       |                       | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |             |
| Moving out plans                      | Less than 2 years     | 5 (8.3)                                  | 3 (5.6)                                 | 6(15.0)                           | 14(9.1)     |
|                                       | Between 2-5 years     | 4 (6.7)                                  | 5 (9.2)                                 | 6 (15.0)                          | 15(9.7)     |
|                                       | Between 5-10 years    | 16 (26.6)                                | 17 (31.5)                               | 16 (40.0)                         | 49(31.9)    |
|                                       | Between 10-15 years   | 21(35.0)                                 | 17 (31.5)                               | 4(10.0)                           | 42(27.3)    |
|                                       | More than 15 years    | 10 (16.7)                                | 10 (18.5)                               | 4(10.0)                           | 24(15.6)    |
|                                       | I don't know          | 4 (6.7)                                  | 2 (3.7)                                 | 4(10.0)                           | 10(6.5)     |
|                                       | Total                 | 60 (100.0)                               | 54 (100.0)                              | 40 (100.0)                        | 154 (100.0) |
| People explain reasons for moving out | People explain reason | 19 (31.7)                                | 12 (22.2)                               | 14(35.0)                          | 45(29.2)    |
|                                       | People didn't explain | 41 (68.3)                                | 42 (77.8)                               | 26(65.0)                          | 109(70.8)   |
|                                       | Total                 | 60 (100.0)                               | 54 (100.0)                              | 40 (100.0)                        | 154 (100.0) |

**Table 5.7: Reasons Respondents for Moving (frequency (%))**

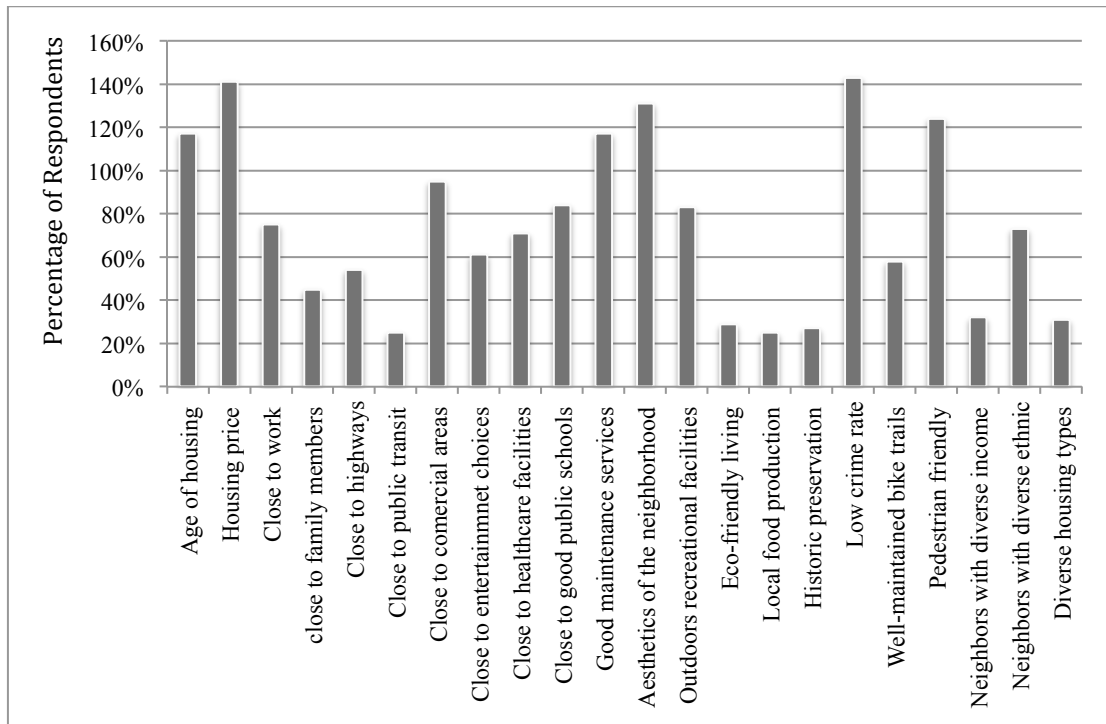
| Reasons                                  | Name of Community                        |                                         |                                   | Total     |
|------------------------------------------|------------------------------------------|-----------------------------------------|-----------------------------------|-----------|
|                                          | CHV New Urbanist Greenfield Neighborhood | MR New Urbanist Brownfield Neighborhood | SL LEED-ND Certified Neighborhood |           |
| To pay less rent/mortgage                | 5 (26.3)                                 | 0 (0.0)                                 | 8(57.1)                           | 13(28.9)  |
| To be able to walk to convenience stores | 13 (68.4)                                | 3(25.0)                                 | 0 (0.0)                           | 16(35.6)  |
| To be close to my job                    | 4 (21.0)                                 | 5(41.7)                                 | 3(21.4)                           | 12(26.7)  |
| To be close to my family/relatives       | 3(15.8)                                  | 0 (0.0)                                 | 4(28.6)                           | 7(15.6)   |
| To be close to leisure services          | 0 (0.0)                                  | 3(25.0)                                 | 2(14.3)                           | 5(11.1)   |
| To be close to better school             | 1(5.3)                                   | 0 (0.0)                                 | 0 (0.0)                           | 1(2.2)    |
| To live around neighbors like me         | 3(15.8)                                  | 0 (0.0)                                 | 0 (0.0)                           | 3(6.7)    |
| Better neighborhood maintenance services | 0 (0.0)                                  | 6 (50.0)                                | 3(21.4)                           | 12(26.7)  |
| Bigger dwelling                          | 7(36.8)                                  | 0 (0.0)                                 | 2(14.3)                           | 9(20.0)   |
| Smaller dwelling                         | 5 (26.3)                                 | 0 (0.0)                                 | 0 (0.0)                           | 5(11.1)   |
| Bigger housing lot                       | 1(5.3)                                   | 11(91.7)                                | 0 (0.0)                           | 12(26.7)  |
| Total                                    | 19(100.0)                                | 12(100.0)                               | 14(100.0)                         | 45(100.0) |

## 2. Neighborhood Characteristics

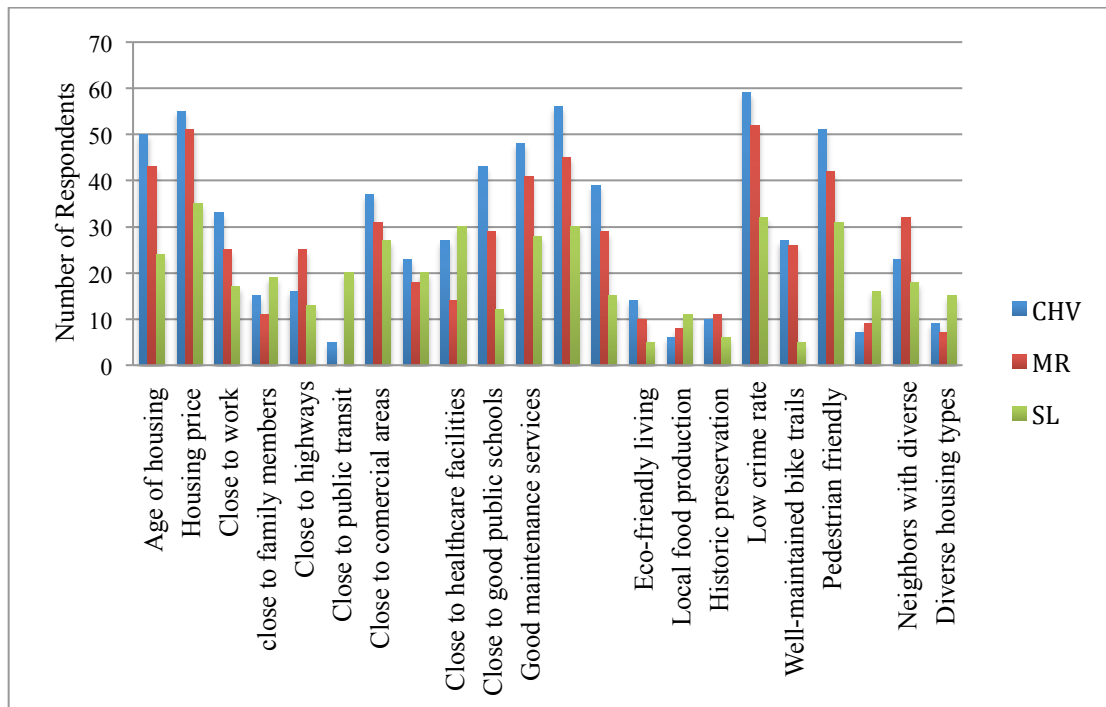
The survey also included some questions that were crucial to the findings and the suggestions of this research study. In the survey, the respondents were also asked to rank the importance of some of the factors they considered when selecting their current neighborhoods on a 5-point Likert scale. Figure 5.5 shows the most important factors reported by all respondents. Approximately 90 % of the respondents reported that the low crime rate was the most important factor when considering selecting a neighborhood, followed by housing price. Among the total number of respondents, approximately 85% indicated that the overall aesthetics of a neighborhood was also an important factor. Figure 5.6 shows the most important factors reported by group.

Figure 5.7 shows the least important factors reported by all respondents. Figure 5.8 illustrate the least important factors for each group. Approximately 60% of the total number of respondents have indicated that proximity to public transit services is the least important factor for them when considering selecting a neighborhood and followed by local food production options. Among the total number of respondents, approximately 50% have indicated that local food production is not an important factor for them.

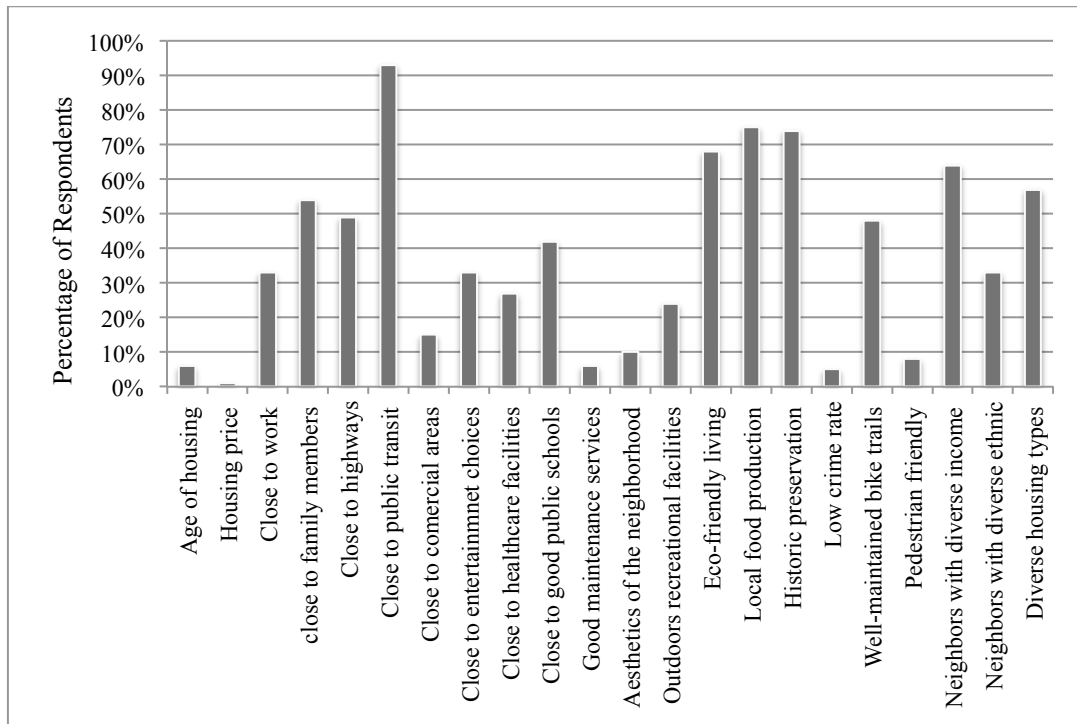
In the survey, the respondents were also asked to rank ten services according to their frequent visits to such services. The services that were listed in the survey question included: grocery store, bank, doctor, pharmacy, church/religious destinations, beauty shop/salon, post office, library, restaurants, and finally athletic club. Figure 5.9 shows the respondents' most visited in each neighborhood and Figure 5.10 shows the least visited services in each neighborhood.



**Figure 5.5: The Most Important Factors for Respondents when Selecting Neighborhoods (N=154)**

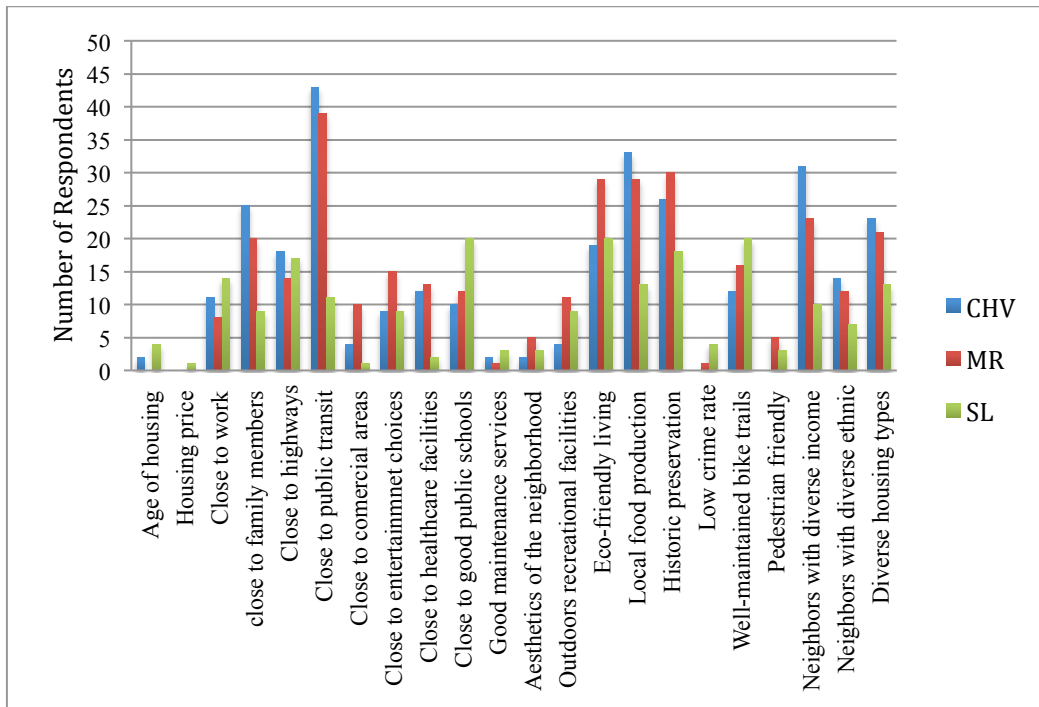


**Figure 5.6: The Most Important Factors for Respondents in each neighborhood when Selecting Neighborhood**

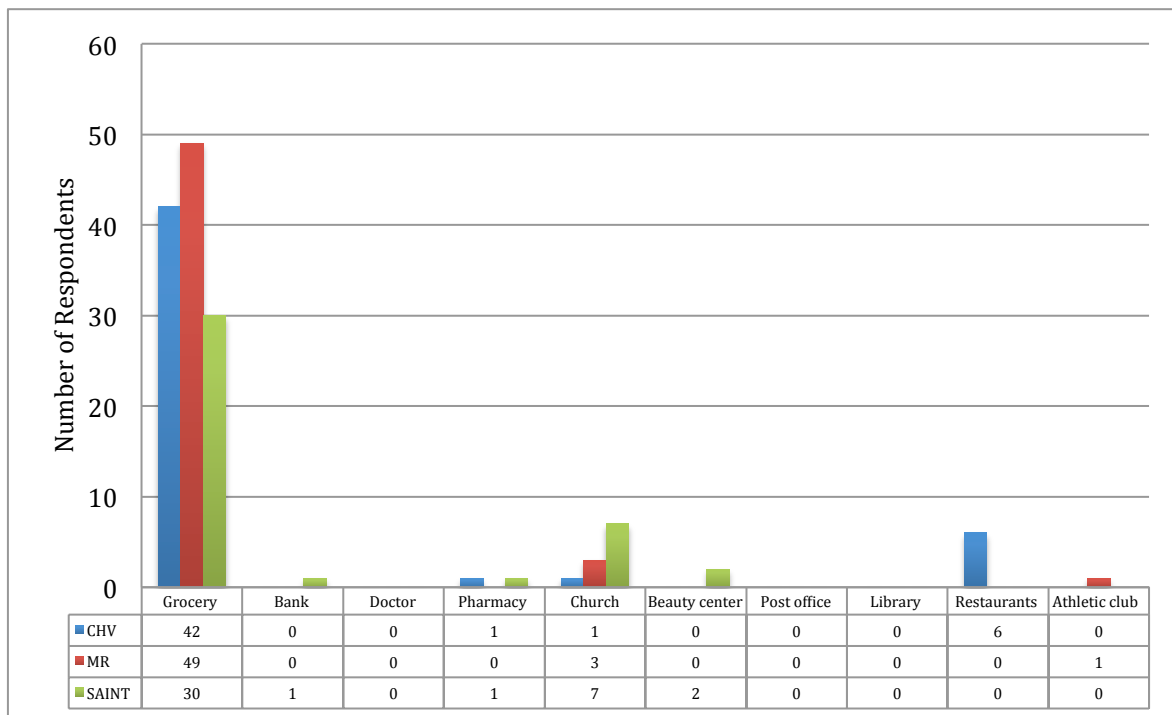


**Figure 5.7: The Least Important Factors for Respondents when Selecting Neighborhoods (N=154)**

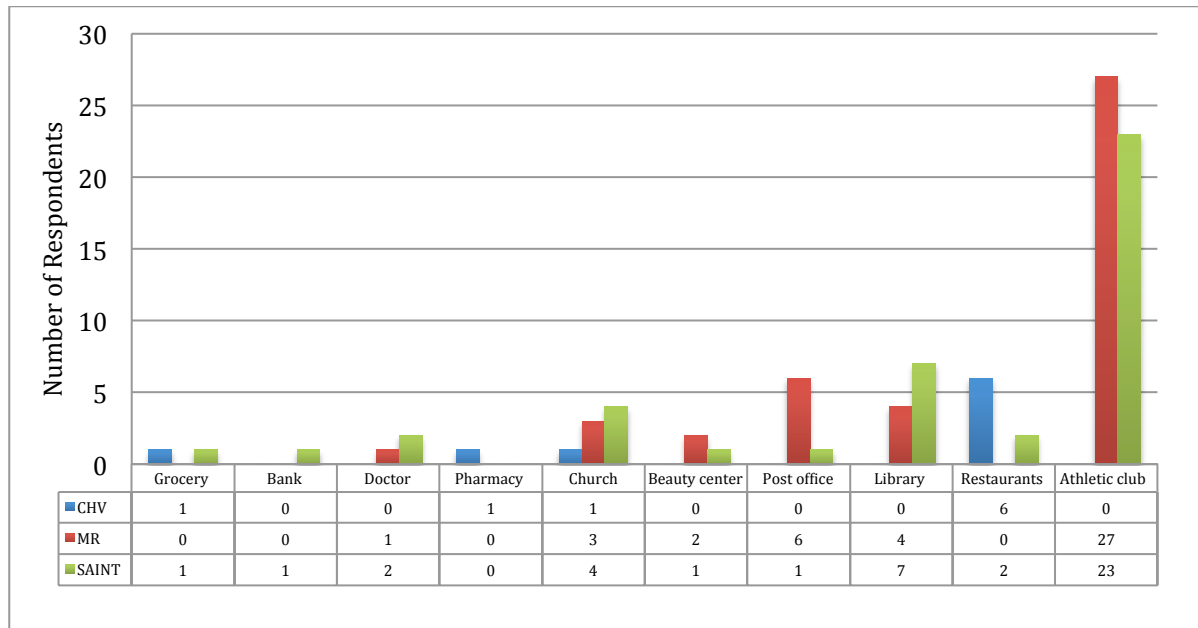




**Figure 5.8: The Least Important Factors for Respondents in each neighborhood when Selecting Neighborhoods**



**Figure 5.9: The Most Visited Services among Respondents in each Neighborhood (N=154)**



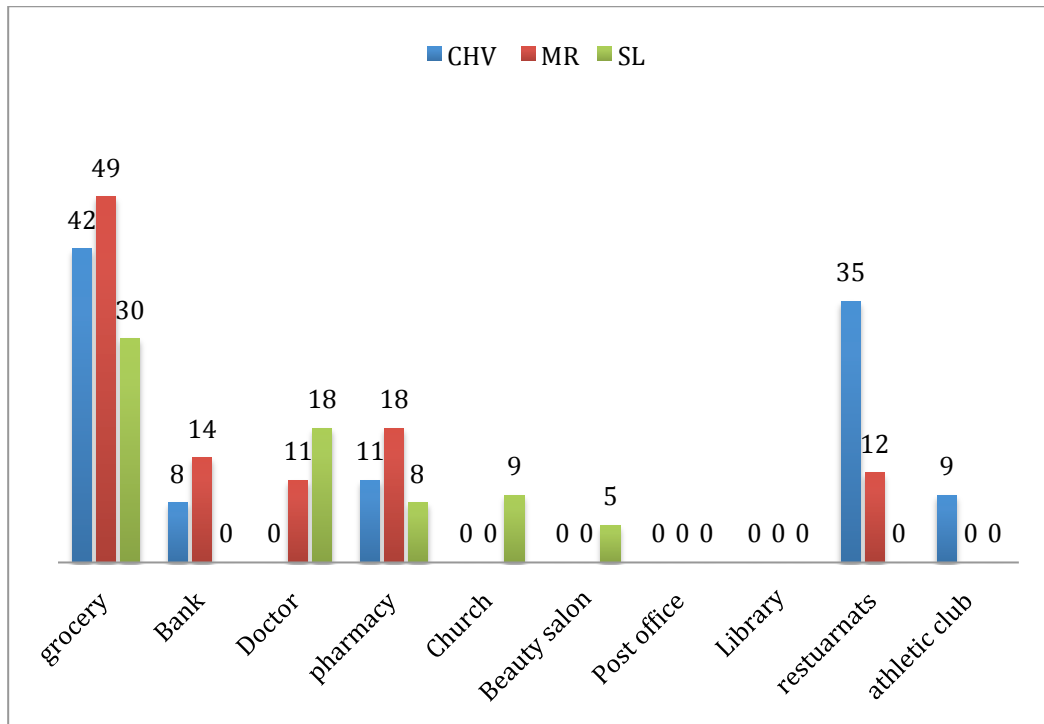
**Figure 5.10: The Least Visited Services among Respondents in each Neighborhood (N=154)**

Figure 5.11 illustrates the most visited five services during the week according to respondents living in the three neighborhoods. Libraries and post offices were not identified as the most five visited services during the week among the three groups. In contrast, grocery stores and pharmacies were recognized as the most five visited services during the week among the three groups. Respondents living in the NU neighborhoods, CHV and MR, identified groceries, banks, pharmacies, and restaurants as the most four visited services during the week. At the same time, the same groups of respondents did not identify services such as: churches/religious destinations, beauty salons, post offices, or libraries among the five most visited services during the week. Also, only respondents living the LEED-ND certified neighborhood identified beauty salons and churches as two of the five most visited services during the week. Respondents living the LEED-ND certified neighborhood did not identify banks, post office, library, restaurants or athletic clubs as the most visited services during the week.

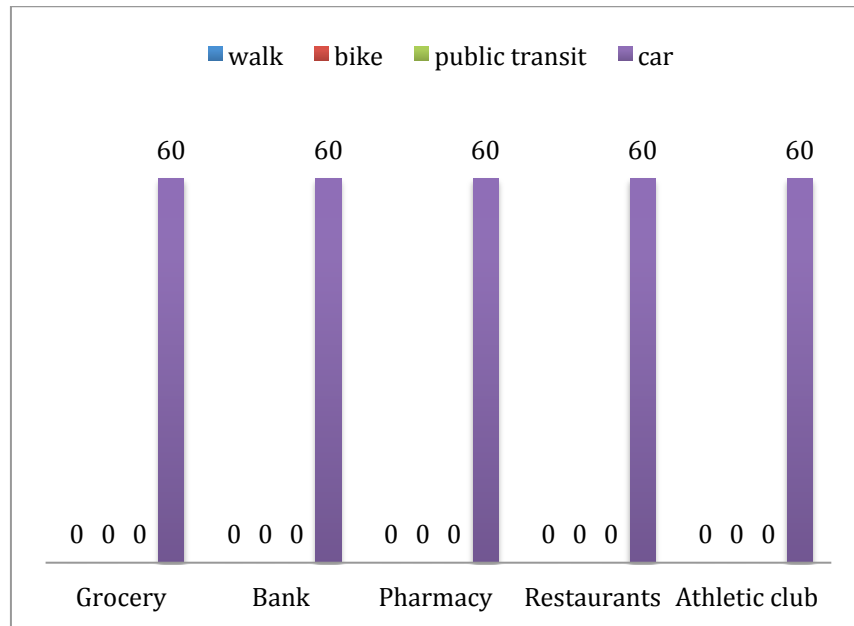
Respondents were also asked to identify the common transportation mode they usually took to the five most visited services. The respondents had to select one of the following options: walk, bike, public transit, car, or other. Respondents who selected the other option were asked to specifically identify the type of the transportation mode they usually took to the five most visited services. Figure 5.12 illustrates the responses of respondents living in CHV regarding the common type of transportation mode they took to the five most visited services.

All respondents in CHV neighborhood used cars to reach the five most visited services. None of the respondents walked, bikes, or took public transit to reach such destinations. Figure 5.13 shows the responses of participants living in MR regarding the common type of transportation mode they took to the five most visited services.

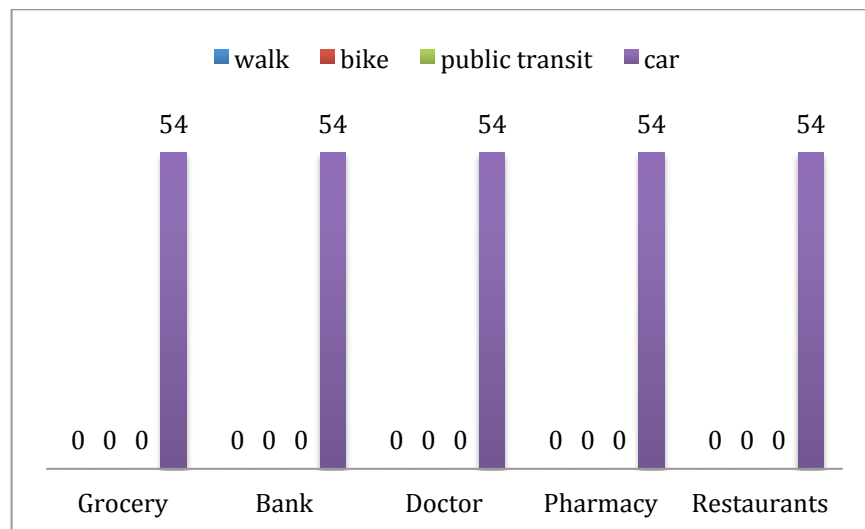
All respondents living in MR claimed that they used cars to reach the five most visited services. None of the respondents walked, bikes, or took public transit to reach such destinations. Thus, all respondents living in the NU neighborhoods used their cars to reach needed services. Figure 5.14 shows the responses of participants living in the LEED-ND certified neighborhood regarding the common type of transportation mode they took to the five most visited services.



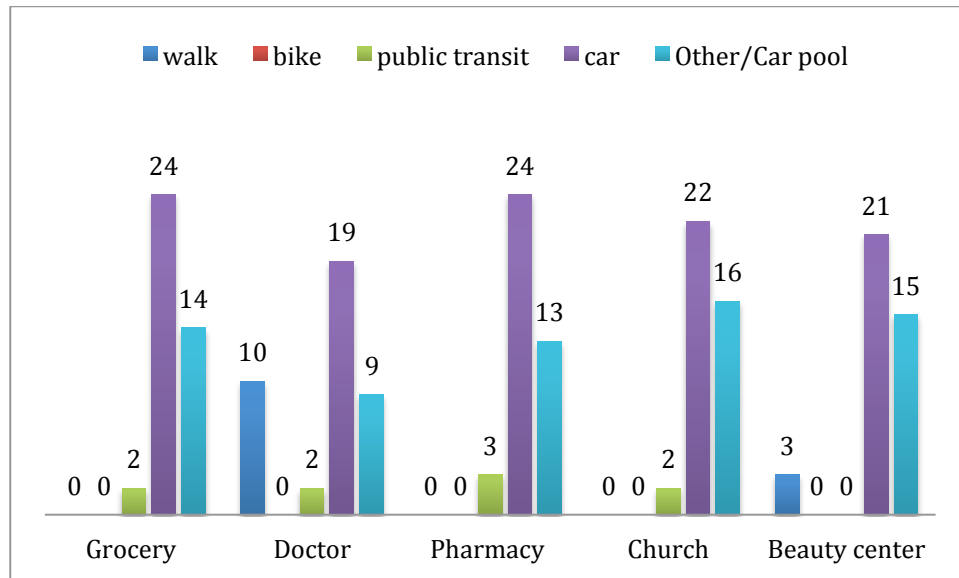
**Figure 5.11: The Most Visited Five Services during the Week (N=154)**



**Figure 5.12: The Common Transportation Mode to the Five Most Visited Services in Cherry Hill Village (N=60)**



**Figure 5.13: The Common Transportation Mode to the Five Most Visited Services in Mason Run (N=54)**



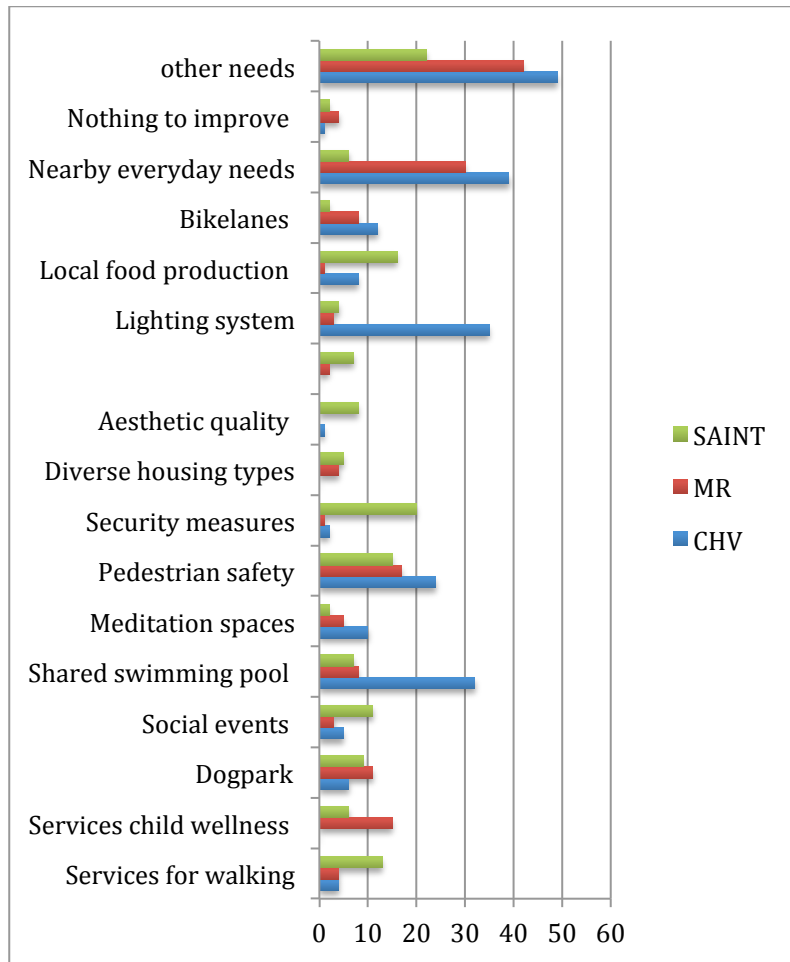
**Figure 5.14: The Common Transportation Mode to the Five Most Visited Services in Saint Luke (N=54)**

Figure 5.14 illustrates that most of the respondents living in the LEED certified neighborhood used their cars to reach the five most visited services. Simultaneously, some other respondents used car-pooling to such destinations. In the survey, the participants were asked to select one or more services from a list of services that they thought will help in improving their QoL in their current neighborhoods. Figure 5.15 shows that approximately 65% of patricians living in CHV identified the need for nearby services that provide everyday needs. Also, approximately 60% of participants from the same group identified the need for better lighting system in their neighborhood. Also, approximately half of the participants of the same type of group identified the need for a shared swimming pool.

In terms of selecting other types of needs, approximately 80% of participants living in CHV neighborhood identified some other types of services other than the services that were listed. In terms of participants living in MR neighborhood, approximately 55 % of the participants identified the need for nearby services that provide everyday essentials as a

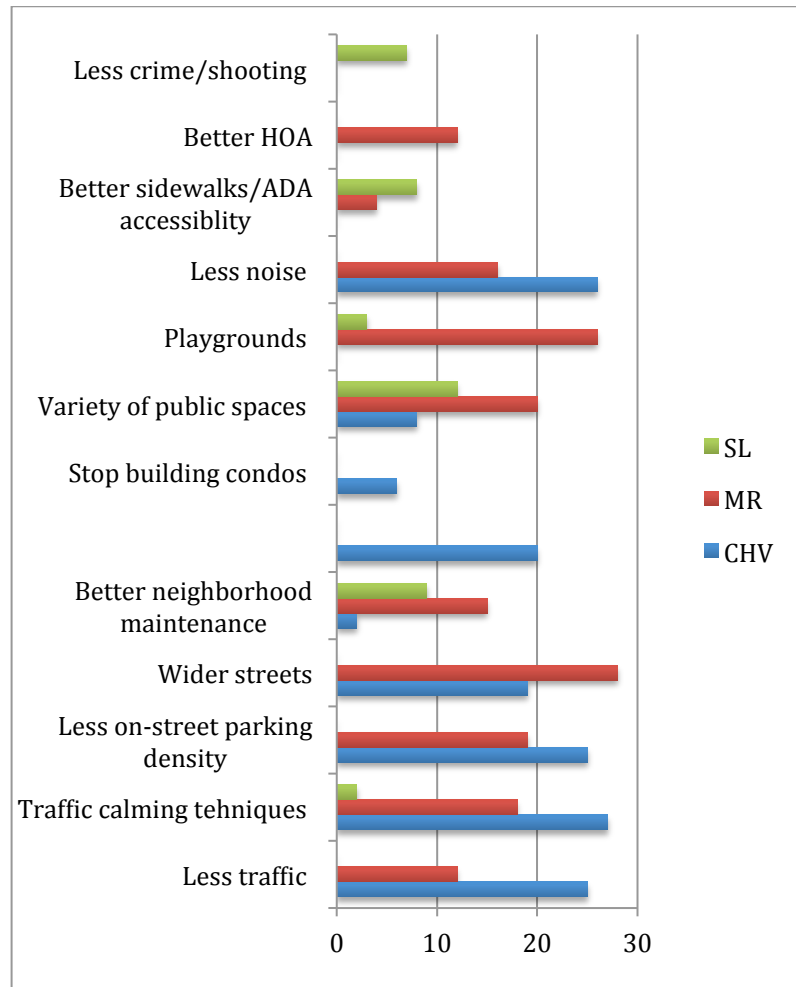
contributor to improve their QoL. Approximately 30% identified the need to traffic calming techniques to improve their QoL. Approximately 75% of participants from the same type of group identified some other types of services other than the ones that were listed. On the other hand, approximately 50% of participants living in the LEED-ND certified neighborhood identified the need for better security measures in their neighborhood. Also, approximately half of the participants of the same group identified the need for some other types of services other than the ones that were listed.

Figure 5.16 illustrates the other services needed according to respondents in their neighborhood in order to improve their QoL. According to Figure 5.16 traffic calming techniques and less noise from traffic were identified as needed aspects in CHV neighborhood. While wider streets and wider alleyways and playgrounds were identified as services needed in MR neighborhood. On the other hand, both variety of outdoors activities in public spaces and better neighborhood maintenance were identified by participants as services needed in the LEED-ND certified neighborhood.



**Figure 5.15: Services Needed in Neighborhoods Improve QoL**





**Figure 5.16: Other Services Needed in Neighborhoods Improve QoL**

## 5.2 Residents' Perception of QoL in Three Types of Neighborhoods

### 5.2.1 Assumptions and Prerequisite Tests for Statistical Analysis

#### 1. Assumptions of Parametric Tests

Assessing residents' perception of QoL in three types of neighborhoods: New Urbanist (NU) greenfield neighborhood, Cherry Hill Village (CHV), New Urbanist (NU) brownfield neighborhood, Mason Run (MR), and LEED-ND certified neighborhood, Saint Luke (SL), is crucial for this research study. Such assessment is based on the survey results. RStudio program is used for the statistical analysis of data of this study. RStudio is a code editor and statistical

computing program. Parametric tests are applied to this study to analyze its ordinal data. In order to satisfy the assumptions of parametric tests, the data has to be: 1- normally distributed, 2- variance is homogenous, 3- data are measured at interval level, 4-independence.

In order to check the normal distribution of the data in this study, Shapiro-Wilk test has been run in RStudio before conducting each parametric test. The data in this study was assumed to be normally distributed. In order to fulfill the second assumption of the parametric test, the variances within each group of participants is assumed be homogeneous. This research data is an interval data as it includes 5-point Likert Scales, which have equal intervals for measuring the respondents' perception of their QoL in their current neighborhoods according to some spatial and social aspects. Finally, in this study, all the responses are assumed to be independent of one another. Satisfying these four assumptions validates the use of parametric tests for the ordinal data from the survey results.

## 2. Reliability test

The reliability of the survey data is verified by Cronbach's\_alpha value. Cronbach's\_alpha value measures the internal consistency of data to assure the reliability of the responses, and it is calculated for each group of questions. The questions are grouped according to the five main criteria of neighborhood design that improve the residents' QoL. The set of question groups assess the residents' perception of neighborhood safety, 2- neighborhood design comfort, 3-sense of belonging and social equity, 4-the internal physical connectedness of the neighborhood and its physical connections with the surroundings, and finally 5-the neighborhood's aesthetics. Table 5.8 illustrates the aspects from the questionnaire that are related to the QoL criteria and the Cronbach's-alpha values for each criterion.

**Table 5.8: Reliability Test Results Related to Residents' Perception of QoL Criteria**

| <b>QoL criteria</b>                         | <b>Elements</b>                                      | <b>Cronbach's-alpha value</b> |
|---------------------------------------------|------------------------------------------------------|-------------------------------|
| Neighborhood safety from crime              | Few entryways                                        | 0.76                          |
|                                             | Active nodes/diverse land uses                       |                               |
|                                             | Active street fronts                                 |                               |
|                                             | Minimum grey areas/brownfields                       |                               |
|                                             | Adequate neighborhood light at night                 |                               |
| Pedestrian safety from traffic              | Traffic calming techniques                           | 0.96                          |
|                                             | Narrow streets                                       |                               |
|                                             | On-street parking                                    |                               |
|                                             | Buffer from traffic                                  |                               |
| Perception of walking safety during the day | Balconies                                            | 0.92                          |
|                                             | Shallow fronts                                       |                               |
|                                             | Minimum blank walls                                  |                               |
|                                             | Active destinations                                  |                               |
| Walking safety night                        | Balconies                                            | 0.92                          |
|                                             | Shallow fronts                                       |                               |
|                                             | Minimum blank walls                                  |                               |
|                                             | Active destinations                                  |                               |
|                                             | Mandatory lights                                     |                               |
| Perception of bike safety                   | Well-connected bike lanes                            | 0.80                          |
|                                             | Well-maintained bike lanes                           |                               |
|                                             | Away from dangerous terrain                          |                               |
| Morning public space safety                 | Natural surveillance through semi-public attachments | 0.89                          |
|                                             | Minimum blank wall along public spaces               |                               |
|                                             | Natural surveillance through shallow street fronts   |                               |
| Pubic space safety night                    | Natural surveillance through semi-public attachments | 0.83                          |
|                                             | Minimum blank wall along public spaces               |                               |
|                                             | Natural surveillance through shallow street fronts   |                               |
|                                             | Adequate lighting in public spaces                   |                               |
| Safe public transit                         | Safe routes to public transit stops                  | 0.80                          |
|                                             | Safe locations of public transit stops               |                               |
|                                             | Safe shelters                                        |                               |
| Neighborhood comfort                        | Well maintained neighborhood                         | 0.82                          |
|                                             | Clean                                                |                               |
|                                             | Buffers to limit noise                               |                               |
|                                             | Low traffic residential streets                      |                               |
|                                             | Convenient access to services                        |                               |
|                                             | Legible layout                                       |                               |
|                                             | Clear center and edge                                |                               |
|                                             | Way finding system                                   |                               |
|                                             | Comfortable building density                         |                               |
|                                             | Comfortable population density                       |                               |
| Pedestrian comfort                          | Tree-linings along sidewalks                         | 0.92                          |
|                                             | Human scale                                          |                               |

**Table 5.8 (cont'd)**

|                                                                                                            |                                                                                                                                                                                      |      |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                                                                                            | Wide sidewalks                                                                                                                                                                       |      |
|                                                                                                            | Connected sidewalks                                                                                                                                                                  |      |
|                                                                                                            | Well-maintained sidewalks                                                                                                                                                            |      |
|                                                                                                            | Accessible by all ages and different physical abilities                                                                                                                              |      |
| Biking comfort                                                                                             | Connected bike lanes                                                                                                                                                                 | 0.95 |
|                                                                                                            | Well-maintained bike lanes                                                                                                                                                           |      |
|                                                                                                            | Adequate number of bike racks and other bike facilities                                                                                                                              |      |
| Comfortable public spaces                                                                                  | Adequate number of public spaces                                                                                                                                                     | 0.93 |
|                                                                                                            | Adequate street furniture                                                                                                                                                            |      |
|                                                                                                            | Clean public spaces                                                                                                                                                                  |      |
|                                                                                                            | Accessible by all ages and different physical abilities                                                                                                                              |      |
| Perception of sense of belonging                                                                           | The traditional architectural style enhanced my sense of belongings                                                                                                                  | 0.95 |
|                                                                                                            | The traditional layout design enhanced my sense of belongings                                                                                                                        |      |
|                                                                                                            | Perception of social activity: I feel I am more socially active because of decreasing the amount of blank walls on residential streets                                               |      |
|                                                                                                            | Perception of social activity: I feel I am more socially active because of the design features found along residential streets, such as balconies, porches, and shallow front yards. |      |
|                                                                                                            | My neighborhood has outdoors facilities that are accessible by people with different ethnicities, incomes, physical abilities, and ages                                              |      |
|                                                                                                            | Arch review                                                                                                                                                                          |      |
| Perception of neighborhood spatial internal connectedness                                                  | The layout of my neighborhood makes me reach different destinations easily on foot                                                                                                   | 0.80 |
|                                                                                                            | My neighborhood has a well-connected sidewalks                                                                                                                                       |      |
|                                                                                                            | Bike lanes                                                                                                                                                                           |      |
| Perception of neighborhood spatial connectedness with surrounding public facilities and convenience stores | Street network                                                                                                                                                                       | 0.81 |
|                                                                                                            | sidewalks                                                                                                                                                                            |      |
|                                                                                                            | Bike lanes                                                                                                                                                                           |      |
|                                                                                                            | Convenience stores                                                                                                                                                                   |      |
|                                                                                                            | Public facilities                                                                                                                                                                    |      |
|                                                                                                            | Transit                                                                                                                                                                              |      |
| Perception of neighborhood's aesthetic quality                                                             | Street network                                                                                                                                                                       | 0.94 |
|                                                                                                            | Alleys help in improving aesthetic quality of the neighborhood                                                                                                                       |      |
|                                                                                                            | Traditional architecture helped in improving the aesthetic quality of the neighborhood                                                                                               |      |
|                                                                                                            | Adequate buffers to lock undesirable views/buildings help in improving the overall visual appeal of the neighborhood                                                                 |      |
|                                                                                                            | The rules imposed by home association improve the visual appeal of the neighborhood                                                                                                  |      |

### 5.2.2 Quality of Life Variables and Residents' Perceptions

#### 1. Variables Correlated with QoL Criteria

In this section, main criteria for improving QoL in neighborhoods are assessed according to the residents' perception. As mentioned before, there is five criteria necessary in a neighborhood design in elevate the residents' QoL, namely: safe, comfortable, sense of community and equity, physical connectedness, and finally aesthetics. The following section unfolds the relationship between the variables of each criteria and the residents' perception for each variable. Sets of independent variables are identified for each criterion. Multiple One-way ANOVA tests are being used to compare the means of the residents' perception regarding general issues in relation to their quality of living in their current neighborhoods, and also regarding their perception to the five main criteria of QoL.

#### 2. Residents' perceptions of QoL

In terms of the respondents' perceptions about their satisfaction with their QoL in their neighborhoods, respondents were asked in the survey if the QoL in their neighborhoods satisfied them. The respondents had to select a satisfaction level according to 5-point Likert scale. One-way ANOVA test was used to compare the means of the residents' perceptions in each neighborhood regarding this issue as illustrated in Table 5.9.

The results from one-way ANOVA test revealed that there was a significant indifference between the means of the three groups. According to Table 5.9, CHV neighborhood had the highest mean in terms of the respondents' satisfaction with their quality of life in CHV, followed by MR neighborhood. For more elaborate analysis of the differences in respondents' perceptions of QoL in the three neighborhoods, Tukey's post hoc test was applied. Table 5.10 illustrates the

mean differences in respondents' perception regarding their satisfaction perception of the QoL in their neighborhoods.

**Table 5.9: Respondents' Perception about QoL in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) neighborhoods Results from One-way ANOVA**

| Perception      | Type of community | N  | Mean  | F-value | P-value   |
|-----------------|-------------------|----|-------|---------|-----------|
| Quality of life | CHV               | 60 | 4.133 | 13.00   | 0.000 *** |
|                 | MR                | 54 | 3.815 |         |           |
|                 | SL                | 40 | 3.50  |         |           |

NOTE: 1= Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly agree.

Significant codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05

**Table 5.10: Respondents' Perception about QoL in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) neighborhoods Results from Tukey's Post-Hoc Test**

| Perception      | Type of community | Mean difference | P-value |
|-----------------|-------------------|-----------------|---------|
| Quality of life | MR - CHV          | -0.300          | 0.087   |
|                 | SL - CHV          | -0.716*         | 0.000   |
|                 | SL - MR           | -0.416*         | 0.010   |

Note: P-values smaller than 0.05 illustrated statistically significant differences between two groups.

\* The mean difference is significant at .05 level

The grouping of the results in Table 5.11 illustrates that there are significant differences between the respondents' perceptions of QoL who lived in both NU neighborhoods, and the respondents' perceptions of QoL who lived in the LEED-ND certified neighborhood, SL neighborhood. Whilst, there was no significant difference found between the respondents' perception of QoL who lived in CHV neighborhood and respondents living in MR neighborhood.

### 3. Residents' Perception of Safety

Safety is a major contributor to improve people's QoL as mentioned before. The safety criterion is tested among the three types of neighborhoods CHV, MR, and SL. In this study, residents' perception of safety is assessed according to some safety measures, including: overall neighborhood safety perception from crime, perception of pedestrians' safety from traffic,

perception of safety when walking alone around the neighborhood in the morning and at night, perception of safety when visiting public spaces during the day and at night, perception of safety when using public transit stops, perception of biking safety.

There are eight hypotheses associated with this criterion of QoL: 1) Residents' perception of neighborhood safety from crime is the same in the three neighborhoods, CHV, MR, and SL, 2) Residents' perception of pedestrians' safety measures from traffic is the same in the three neighborhoods, CHV, MR, and SL, 3) Residents' general perception of safety walking alone around their neighborhood in the morning is the same in the three neighborhoods, CHV, MR, and SL, 4) Residents' perception of safety walking alone around their neighborhood at night is the same in the three neighborhoods, CHV, MR, and SL, 5) Residents' perception of safety when visiting public spaces during the day is the same in the three neighborhoods, CHV, MR, and SL, 6) Residents' perception of safety when visiting public spaces at night is the same in the three neighborhoods, CHV, MR, and SL, 7) Residents' perception of safety when using public transit stops is the same among the three neighborhoods, 8) Residents' perception of biking safety is the same in the three neighborhoods, CHV, MR, and SL.

One-way ANOVA (Analysis of Variance) test is performed to examine these hypotheses concerning more than two groups. One-way ANOVA test is a useful parametric approach to analyzing approximately normally distributed data with more than two groups (add a citation). However, one-way ANOVA test does not provide elaborate insights into comparisons between the groups. Accordingly, Tukey's post-hoc test was performed to add deeper insights to the analysis by comparing the difference of means of the three groups. Table 5.11 demonstrates the results of the respondents' perception of safety according to the identified types of safety. (see Appendix A)

**Table 5.11: Residents’ Perception of Safety in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from One-way ANOVA**

| Perception                                                      | Type of community | N  | Mean  | F-value | P-value   |
|-----------------------------------------------------------------|-------------------|----|-------|---------|-----------|
| Overall neighborhood safety perception from crime               | CHV               | 60 | 4.467 | 12.69   | 0.000 *** |
|                                                                 | MR                | 54 | 4.130 |         |           |
|                                                                 | SL                | 40 | 2.975 |         |           |
| Perception of pedestrians’ safety from traffic                  | CHV               | 60 | 3.300 | 2.866   | 0.059     |
|                                                                 | MR                | 54 | 3.167 |         |           |
|                                                                 | SL                | 40 | 3.250 |         |           |
| Perception of safety when walking alone in the morning          | CHV               | 60 | 4.417 | 27.95   | 0.000 *** |
|                                                                 | MR                | 54 | 4.148 |         |           |
|                                                                 | SL                | 40 | 3.50  |         |           |
| Perception of safety when walking alone at night                | CHV               | 60 | 3.350 | 12.69   | 0.000 *** |
|                                                                 | MR                | 54 | 3.889 |         |           |
|                                                                 | SL                | 38 | 3.000 |         |           |
| Perception of individuals’ safety in open spaces in the morning | CHV               | 60 | 4.300 | 36.26   | 0.000 *** |
|                                                                 | MR                | 54 | 3.167 |         |           |
|                                                                 | SL                | 40 | 3.800 |         |           |
| Perception of individuals’ safety in open spaces at night       | CHV               | 60 | 3.133 | 2.866   | 0.059     |
|                                                                 | MR                | 54 | 2.907 |         |           |
|                                                                 | SL                | 40 | 3.175 |         |           |
| Perception of safety when using public transit facilities       | CHV               | 55 | 2.817 | 2.633   | 0.074     |
|                                                                 | MR                | 50 | 2.426 |         |           |
|                                                                 | SL                | 34 | 2.800 |         |           |
| Perception of biking safety                                     | CHV               | 48 | 3.062 | 3.973   | 0.021*    |
|                                                                 | MR                | 47 | 3.426 |         |           |
|                                                                 | SL                | 17 | 2.882 |         |           |

NOTE: 1= Not all safe, 2= Unsafe, 3= Neutral, 4= Safe, 5= Very safe.

Significant codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05

Based on the one-way ANOVA results in Table 5.11, the respondents’ perceptions of the neighborhood’s safety from crime differ significantly among the three neighborhoods. Respondents’ perception of neighborhood safety in CHV is higher than the residents’ perceptions of neighborhood safety in the other two neighborhoods. On the other hand, according to the results in Table 5.11, respondents living in SL neighborhood perceived that their neighborhood was the least safe neighborhood. In terms of the respondents’ perceptions of safety when walking alone during the day in the neighborhood differ significantly among the three neighborhoods. Respondents’ perception of neighborhood safety in CHV is higher than the residents’ perceptions



of safety walking alone in the morning in the other two neighborhoods. In terms of perception of safety when walking alone at night, the one-way ANOVA test results, the respondents' perceptions of safety when walking alone at night also differ significantly among the three neighborhoods. Residents of MR feel safer when walking alone at night than the residents' of CHV and SL.

Respondents' perception of safety in open spaces also differs significantly among the three neighborhoods. In terms of perception of children's safety in open spaces, the results of the one-way ANOVA test show that this perception differ significantly between the three neighborhoods. Residents of CHV record higher mean for children's safety in open spaces than the other two neighborhoods. Also, according to the one-way ANOVA results, respondents' perceptions of safety when using public transit stops differ significantly among the three neighborhoods. In terms of biking safety, the one-way ANOVA test results show that the residents' perception of biking safety around their neighborhoods differ significantly among the three neighborhoods. MR residents feel safer when biking around their neighborhood than the CHV and MR residents. On the other hand, the statistical results in Table 5.11 show that there are no significant differences between the three neighborhoods in terms of the residents' perceptions of pedestrians' safety from traffic, residents' perceptions of safety when walking along alleyways, and residents' perception of children's safety on sidewalks.

For more elaborate analysis regarding the safety criterion and its different types of safety measures, Tukey's post hoc test is applied on the variables that indicate a significant difference in P values only from the one-way ANOVA test. Table 5.12 summarizes the differences in respondents' perceptions of safety between CHV and MR, CHV and SL, and MR and SL neighborhoods.

**Table 5.12: Residents’ Perception of Safety in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) neighborhoods Results from Tukey’s Post-Hoc Test**

| Perception                                                      | Type of community | Mean difference | P-value |
|-----------------------------------------------------------------|-------------------|-----------------|---------|
| Overall neighborhood safety perception from crime               | MR - CHV          | -0.333          | 0.074   |
|                                                                 | SL - CHV          | -1.550          | 0.000   |
|                                                                 | SL – MR           | -1.216          | 0.000   |
| Perception of safety when walking alone in the morning          | MR - CHV          | -0.233          | 0.185   |
|                                                                 | SL - CHV          | 2-0.616*        | 0.000   |
|                                                                 | SL – MR           | -0.383*         | 0.011   |
| Perception of safety when walking alone at night                | MR - CHV          | 0.783*          | 0.000   |
|                                                                 | SL - CHV          | -0.416          | 0.085   |
|                                                                 | SL – MR           | -1.200*         | 0.000   |
| Perception of individuals’ safety in open spaces in the morning | MR - CHV          | -1.116*         | 0.000   |
|                                                                 | SL - CHV          | 0.566*          | 0.000   |
|                                                                 | SL – MR           | -0.550          | 0.000   |
| Perception of biking safety                                     | MR - CHV          | 0.367           | 0.148   |
|                                                                 | SL - CHV          | -0.204          | 0.551   |
|                                                                 | SL – MR           | -0.571*         | 0.011   |

NOTE: P-values smaller than 0.05 illustrated statistically significant differences between two groups.

\*The mean difference is significant at the 0.05 level.

\*\*The mean difference is significant at the 0.01 level.

\*\*\* The mean difference is significant at the 0.001 level.

The results from Tukey’s test, as shown in Table 5.12, verify the significant differences between safety perceptions in the three neighborhoods regarding the residents’ perception of the overall neighborhood safety. There is a significant difference between MR residents’ perception of the overall neighborhood safety and both CHV and SL residents’ perception. Simultaneously, there is no significant difference between the residents’ perception of both CHV and MR regarding the overall neighborhood safety. These results show a significant difference between SL residents’ perception of safety when walking alone in the morning and CHV and MR residents’ perception. No significant difference is found between CHV and MR regarding this safety issue.

Significant differences in responses between responses of MR residents and the residents of CHV and SL were found when asked about their perception of safety in open spaces. In this type of safety measure, there is a significant difference in the means between the three neighborhoods. This is true for the differences in the means between the three neighborhoods regarding the residents' perception of children's safety in open spaces.

The results in Table 5.12 shows that there is only significant difference in the means between the responses of residents of MR and SL regarding biking safety, and there is no significant difference detected between the perception of biking safety between the residents' of CHV and the other two neighborhoods. On the other hand, Tukey's test does not show any significant differences between the three neighborhoods regarding the residents' perception of safety when using transit stops.

Regression models were used to further analyze the relationship between key design elements in NU neighborhoods and the main criteria of QoL. Multiple regression models were applied to determine the effect of each key design element on each criterion. This type of statistical analysis is crucial to identify the design elements that highly contribute to enhance safety in each neighborhood. Table 5.13 illustrates the results of the multiple regression models applied for CHV neighborhood in terms of safety criterion. Table 5.15 illustrates the results of the stepwise multiple regression analyses applied for CHV neighborhood in terms of safety criterion. (see Appendix A)

**Table 5.13: Multiple Regression Models for Residents' Perceptions of Safety in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                     | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|------------------------------------------------------|---------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                        | 0.213               | 0.075          | 0.502           |
|                                                                 | Active nodes                                         | 0.109               | 0.356          |                 |
|                                                                 | Active street fronts                                 | 0.228               | 0.183          |                 |
|                                                                 | Minimum grey areas                                   | 0.371               | 0.048 *        |                 |
|                                                                 | Adequate Lighting                                    | -0.031              | 0.693          |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                           | 0.209               | 0.117          | 0.874           |
|                                                                 | Traffic calming techniques                           | 0.128               | 0.121          |                 |
|                                                                 | Narrow streets                                       | 0.108               | 0.325          |                 |
|                                                                 | Sidewalk buffers                                     | 0.453               | 0.001 **       |                 |
| Perception of safety walking in the morning                     | Minimum blank wall length                            | 0.031               | 0.804          | 0.426           |
|                                                                 | Shallow fronts                                       | -0.055              | 0.714          |                 |
|                                                                 | Natural surveillance                                 | 0.617               | 0.000***       |                 |
|                                                                 | Active nodes                                         | 0.267               | 0.049 *        |                 |
| Perception of safety walking at night                           | Minimum blank wall length                            | -0.067              | 0.615          | 0.410           |
|                                                                 | Shallow fronts                                       | 0.528               | 0.039 *        |                 |
|                                                                 | Natural surveillance                                 | 0.383               | 0.194          |                 |
|                                                                 | Active nodes                                         | -0.064              | 0.775          |                 |
|                                                                 | Mandatory lights                                     | -0.284              | 0.115          |                 |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through semi-public attachments | 0.297               | 0.100          | 0.640           |
|                                                                 | Minimum blank wall length                            | 0.078               | 0.610          |                 |
|                                                                 | Natural surveillance through shallow fronts          | 0.005               | 0.967          |                 |
| Perception of individuals' safety in open spaces at night       | Natural surveillance through semi-public attachments | 0.500               | 0.000 ***      | 0.728           |
|                                                                 | Minimum blank wall length                            | 0.285               | 0.000 ***      |                 |
|                                                                 | Natural surveillance through shallow street fronts   | 0.064               | 0.405          |                 |
|                                                                 | Lighting in public spaces                            | -0.072              | 0.215          |                 |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                  | 0.990               | 0.000 ***      | 0.892           |
|                                                                 | Safe locations of public transit stops               | 0.036               | 0.730          |                 |
|                                                                 | Safe shelters                                        | 0.030               | 0.617          |                 |
| Perception of biking safety                                     | Well-connected bike lanes                            | 0.128               | 0.083          | 0.820           |
|                                                                 | Well-maintained bike lanes                           | 0.233               | 0.010 *        |                 |
|                                                                 | Away from dangerous terrain                          | 0.620               | 0.000 ***      |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to Table 5.14, the provision of a neighborhood with few entryways and minimum areas contributed significantly in enhancing the safety of respondents living in CHV. In terms of pedestrian's safety, on-street parking and traffic calming techniques provided in CHV neighborhood contributed significantly in enhancing pedestrians' safety from traffic. The provision of the semi-public attachments to the buildings and the provision of active nodes in CHV neighborhood contributed significantly in enhancing the respondents' perceptions of safety when walking alone during the day around their neighborhood. On the other hand, the provision of shallow street fronts through placing buildings close to streets in CHV neighborhood contributed significantly in enhancing the respondents' perceptions of safety when walking alone around their neighborhood at night.

Also, the provision of semi-public attachments to the buildings in CHV neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces during the day. On the other hand, minimizing the length of blank walls along the parameters of the public spaces and providing streetlights in public spaces in CHV neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces at night. The provision of well-maintained bike trails located away from dangerous slopes in CHV neighborhood contributed significantly to enhancing the respondents' biking safety perceptions.

Table 5.15 illustrates the results of the multiple regression models applied for MR neighborhood in terms of safety criterion. Table 5.16 illustrates the results of the stepwise multiple regression analyses applied for MR neighborhood in terms of safety criterion.

**Table 5.14: Stepwise Multiple Regression Analyses for Residents' Perceptions of Safety in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                     | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|------------------------------------------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                        | 0.042 *        | 0.504           |
|                                                                 | Minimum grey areas                                   | 0.048 *        |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                           | 0.028*         | 0.872           |
|                                                                 | Traffic calming techniques                           | 0.013 *        |                 |
|                                                                 | Sidewalks buffers                                    | 0.001 **       |                 |
| Perception of safety walking in the morning                     | Natural surveillance                                 | 0.000***       | 0.425           |
|                                                                 | Active nodes                                         | 0.049 *        |                 |
| Perception of safety walking at night                           | Shallow fronts                                       | 0.004 **       | 0.639           |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through semi-public attachments | 0.100          | 0.640           |
| Perception of individuals' safety in open spaces at night       | Natural surveillance through semi-public attachments | 0.000 ***      | 0.729           |
|                                                                 | Minimum blank wall length                            | 0.000 ***      |                 |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                  | 0.000 ***      | 0.892           |
| Perception of biking safety                                     | Well-maintained bike lanes                           | 0.010 *        | 0.820           |
|                                                                 | Away from dangerous terrain                          | 0.000 ***      |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.15: Multiple Regression Models for Residents' Perceptions of Safety in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                     | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|------------------------------------------------------|---------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                        | 0.378               | 0.009 **       | 0.500           |
|                                                                 | Active nodes                                         | 0.195               | 0.160          |                 |
|                                                                 | Active street fronts                                 | 0.376               | 0.063          |                 |
|                                                                 | Minimum grey areas                                   | 0.094               | 0.378          |                 |
|                                                                 | Adequate lighting                                    | 0.019               | 0.924          |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                           | 0.675               | 0.000***       | 0.963           |
|                                                                 | Traffic calming techniques                           | 0.043               | 0.509          |                 |
|                                                                 | Narrow streets                                       | 0.219               | 0.000***       |                 |
|                                                                 | Sidewalks buffers                                    | 0.041               | 0.561          |                 |
| Perception of safety walking in the morning                     | Minimum blank wall length                            | 0.179               | 0.210          | 0.520           |
|                                                                 | Shallow fronts                                       | 0.179               | 0.317          |                 |
|                                                                 | Natural surveillance                                 | 0.078               | 0.649          |                 |
|                                                                 | Active nodes                                         | 0.227               | 0.139          |                 |
| Perception of safety walking at night                           | Minimum blank wall length                            | 0.012               | 0.014 *        | 0.700           |
|                                                                 | Shallow fronts                                       | 0.495               | 0.908          |                 |
|                                                                 | Natural surveillance                                 | 0.148               | 0.420          |                 |
|                                                                 | Active nodes                                         | 0.114               | 0.066          |                 |
|                                                                 | Mandatory lights                                     | 0.236               | 0.549          |                 |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through semi-public attachments | 0.664               | 0.000***       | 0.700           |
|                                                                 | Minimum blank wall length                            | 0.078               | 0.449          |                 |
|                                                                 | Natural surveillance through shallow street fronts   | 0.033               | 0.740          |                 |
| Perception of individuals' safety in open spaces at night       | Natural surveillance through semi-public attachments | 0.159               | 0.088          | 0.646           |
|                                                                 | Minimum blank wall length                            | 0.214               | 0.029 *        |                 |
|                                                                 | Natural surveillance through shallow street fronts   | 0.050               | 0.509          |                 |
|                                                                 | Lighting in public spaces                            | 0.364               | 0.000***       |                 |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                  | 0.438               | 0.004 **       | 0.724           |
|                                                                 | Safe locations of public transit stops               | 0.304               | 0.043*         |                 |
|                                                                 | Safe shelters                                        | 0.089               | 0.392          |                 |
| Perception of biking safety                                     | Well-connected bike lanes                            | 0.181               | 0.105          | 0.835           |
|                                                                 | Well-maintained bike lanes                           | 0.318               | 0.012 *        |                 |
|                                                                 | Away from dangerous terrain                          | 0.482               | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.16: Stepwise Multiple Regression Models for Residents' Perceptions of Safety of Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                     | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|------------------------------------------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                        | 0.006 **       | 0.499           |
|                                                                 | Active street fronts                                 | 0.007 **       |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                           | 0.000***       | 0.962           |
|                                                                 | Narrow streets                                       | 0.000***       |                 |
| Perception of safety walking at night                           | Minimum blank wall length                            | 0.023 *        | 0.712           |
|                                                                 | Natural surveillance                                 | 0.007**        |                 |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through semi-public attachments | 0.000 ***      | 0.700           |
| Perception of individuals' safety in open spaces at night       | Minimum blank wall length                            | 0.005 **       | 0.643           |
|                                                                 | Lighting in public spaces                            | 0.000***       |                 |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                  | 0.001 **       | 0.720           |
|                                                                 | Safe locations of public transit stops               | 0.021 *        |                 |
| Perception of biking safety                                     | Well-maintained bike lanes                           | 0.012 *        | 0.835           |
|                                                                 | Away from dangerous terrain                          | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to Table 5.17, the provision of a neighborhood with few entryways and active street fronts through the semi-public attachments to buildings in MR neighborhood contributed significantly in enhancing the respondents' perceptions of neighborhood. In terms of pedestrian's safety, on-street parking and narrow streets provided in MR neighborhood contributed significantly in enhancing pedestrians' safety from traffic. Providing shallow street fronts and minimizing the length of blank walls along sidewalks contributed significantly in enhancing the respondents' perceptions of safety when walking alone around their neighborhood at night.

Also, the provision of semi-public attachments to the buildings in MR neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces during the day. On the other hand, minimizing the length of blank walls along the parameters of the public spaces and providing streetlights in public spaces in MR neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces at night. Table 5.17 illustrates the results of the multiple regression models applied



for SL neighborhood in terms of safety criterion. Table 5.18 illustrates the results of the stepwise multiple regression analyses applied for SL neighborhood in terms of safety criterion.

**Table 5.17: Multiple Regression Models for Residents' Perceptions of Safety in Saint Luke (SL) LEED-ND Certified Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                     | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|------------------------------------------------------|---------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                        | 0.462               | 0.000***       | 0.727           |
|                                                                 | Active nodes                                         | 0.032               | 0.851          |                 |
|                                                                 | Active street fronts                                 | 0.411               | 0.0015 **      |                 |
|                                                                 | Minimum grey areas                                   | 0.060               | 0.545          |                 |
|                                                                 | Adequate lighting                                    | 0.047               | 0.708          |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                           | 0.277               | 0.044 *        | 0.788           |
|                                                                 | Traffic calming techniques                           | 0.109               | 0.197          |                 |
|                                                                 | Narrow streets                                       | 0.149               | 0.139          |                 |
|                                                                 | Sidewalks buffers                                    | 0.185               | 0.062          |                 |
| Perception of safety walking in the morning                     | Minimum blank wall length                            | 0.263               | 0.194          | 0.818           |
|                                                                 | Shallow fronts                                       | -0.130              | 0.527          |                 |
|                                                                 | Natural surveillance                                 | 0.202               | 0.323          |                 |
|                                                                 | Active nodes                                         | 0.626               | 0.001**        |                 |
| Perception of safety walking at night                           | Minimum blank wall length                            | 0.427               | 0.006**        | 0.802           |
|                                                                 | Shallow fronts                                       | 0.212               | 0.067          |                 |
|                                                                 | Natural surveillance                                 | 0.235               | 0.201          |                 |
|                                                                 | Active nodes                                         | -0.029              | 0.637          |                 |
|                                                                 | Mandatory lights                                     | 0.319               | 0.007 **       |                 |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through semi-public attachments | 0.112               | 0.510          | 0.424           |
|                                                                 | Minimum blank wall length                            | 0.259               | 0.268          |                 |
|                                                                 | Natural surveillance through shallow street fronts   | 0.132               | 0.423          |                 |
| Perception of individuals' safety in open spaces at night       | Natural surveillance through semi-public attachments | -0.023              | 0.890          | 0.664           |
|                                                                 | Minimum blank wall length                            | -0.095              | 0.680          |                 |
|                                                                 | Natural surveillance through shallow street fronts   | -0.018              | 0.911          |                 |
|                                                                 | Lighting in public spaces                            | 0.905               | 0.000***       |                 |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                  | 0.284               | 0.013 *        | 0.751           |
|                                                                 | Safe locations of public transit stops               | 0.009               | 0.934          |                 |
|                                                                 | Safe shelters                                        | 0.585               | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.18 Stepwise Multiple Regression Models for Residents' Perceptions of Safety in Saint Luke (SL) LEED-ND Certified Neighborhood**

| <b>Dependent variable (Y)</b>                                   | <b>Independent Variables (X)</b>                   | <b>P-value</b> | <b>R-square</b> |
|-----------------------------------------------------------------|----------------------------------------------------|----------------|-----------------|
| Overall neighborhood safety perception from crime               | Few entryways                                      | 0.000***       | 0.720           |
|                                                                 | Active street fronts                               | 0.000***       |                 |
| Perception of pedestrians' safety measures from traffic         | On-street parallel parking                         | 0.017*         | 0.777           |
|                                                                 | Sidewalk buffers                                   | 0.026 *        |                 |
| Perception of safety walking in the morning                     | Active nodes                                       | 0.000***       | 0.813           |
| Perception of safety walking at night                           | Minimum blank wall length                          | 0.005**        | 0.800           |
|                                                                 | Mandatory lights                                   | 0.006**        |                 |
| Perception of individuals' safety in open spaces in the morning | Natural surveillance through shallow street fronts | 0.011 *        | 0.410           |
| Perception of individuals' safety in open spaces at night       | Lighting in public spaces                          | 0.000***       | 0.660           |
| Perception of safety when using transit stops                   | Safe routes to public transit stops                | 0.000***       | 0.750           |
|                                                                 | Safe locations of public transit stops             | 0.013 *        |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to Table 5.18, the provision of a neighborhood with few entryways and active street fronts through the semi-public attachments to buildings in SL neighborhood contributed significantly in enhancing the respondents' perceptions of neighborhood. In terms of pedestrian's safety, on-street parking and the provision of buffers along sidewalks in SL neighborhood contributed significantly in enhancing pedestrians' safety from traffic. The provision of semi-public attachments to the buildings in SL neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces during the day. On the other hand, the provision of streetlights in public spaces in SL neighborhood contributed significantly in enhancing the respondents' perceptions of safety when visiting public spaces at night.

#### 4. Perception of Comfort

To achieve a comfortable living environment for people, neighborhoods have to fulfill some related aspects, such as a comfortable, pedestrian comfort, biking comfort, comfortable public spaces, and comfortable use of public transit facilities. There are five hypotheses associated with this criterion of QoL: 1) The overall comfort level of neighborhood is the same among the three neighborhoods, 2) The pedestrian comfort level is the same among the three neighborhoods, 3) The comfort level of public spaces is the same among the three neighborhoods, 4) The biking comfort level is the same among the three neighborhoods, and 5) The comfort level of public transit stops is the same among the three neighborhoods.

One-way ANOVA (Analysis of Variance) test is performed to test these hypotheses concerning more than two groups. Respondents' were asked to report their satisfaction with the comfort level in their neighborhoods for each mentioned aspect. Respondents' perception of comfort was analyzed using one-way ANOVA tests, followed by Tukey's post hoc tests for further analysis. Table 5.19 illustrates the results from the ANOVA tests among the three neighborhoods.

The results in Table 5.19 show statically significant mean differences between all aspects of comfort among the three neighborhoods. For example, respondents living in CHV neighborhood feel more comfortable when using public spaces than respondents living in MR, and SL neighborhoods. The same is true for the overall neighborhood comfort; CHV residents were more stratified with their neighborhood's comfort more than the other two neighborhoods. On the other hand, respondents living in CHV were less satisfied than the respondents living in the other two neighborhoods with their biking experience in terms of comfort and were also not highly satisfied with comfort level when using public transit facilities. To further analyze the

differences between the three neighborhoods, Tukey's post hoc tests are applied. Table 5.20 summarizes the mean differences in respondents' perception of the level of comfort in their neighborhoods.

In terms of the neighborhood comfort level, Tukey's post-hoc test results verify the differences in means among the three neighborhoods. Respondents living in CHV feel that their neighborhood is comfortable more than the respondents living in the other two neighborhoods. Also, the results from Table 5.17 show that the biggest difference in means is between respondents' living in SL and CHV neighborhoods in terms of biking comfort. The mean difference between the two neighborhood is 0.883, which means that respondents' living in SL neighborhood feel more comfortable when biking around their neighborhood more that respondents living in CHV neighborhood. In terms of comfort when using public transit facilities, Tukey's test results show that there is a significant difference in means between respondents' living in MR and respondents' perceptions of comfort when using public transit facilities in the other two neighborhoods.

**Table 5.19: Residents' Perception of Comfort in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) neighborhoods  
Results from One-way ANOVA**

| Perception                            | Type of community | N  | Mean  | F-value | P-value   |
|---------------------------------------|-------------------|----|-------|---------|-----------|
| Comfortable neighborhood              | CHV               | 60 | 3.933 | 16.45   | 0.000 *** |
|                                       | MR                | 54 | 3.10  |         |           |
|                                       | SL                | 40 | 3.15  |         |           |
| Pedestrian Comfort                    | CHV               | 60 | 4.06  | 12.78   | 0.000 *** |
|                                       | MR                | 54 | 3.83  |         |           |
|                                       | SL                | 40 | 3.22  |         |           |
| Comfortable public spaces             | CHV               | 60 | 3.96  | 27.28   | 0.000 *** |
|                                       | MR                | 54 | 2.82  |         |           |
|                                       | SL                | 40 | 3.27  |         |           |
| Comfortable public transit facilities | CHV               | 39 | 3.02  | 13.18   | 0.000 *** |
|                                       | MR                | 50 | 2.77  |         |           |
|                                       | SL                | 34 | 3.55  |         |           |
| Biking Comfort                        | CHV               | 48 | 2.833 | 5.527   | 0.005 **  |
|                                       | MR                | 46 | 3.167 |         |           |
|                                       | SL                | 17 | 4.125 |         |           |

NOTE: 1= Totally disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Totally agree.

Significant codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05

**Table 5.20: Residents' Perception of Comfort in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from Tukey's Post-Hoc Test**

| Perception                            | Type of community | Mean difference | P-value   |
|---------------------------------------|-------------------|-----------------|-----------|
| Comfortable neighborhood              | MR - CHV          | -0.55           | 0.008**   |
|                                       | SL - CHV          | -1.05           | 0.000 *** |
|                                       | SL - MR           | -0.50           | 0.019**   |
| Pedestrian Comfort                    | MR - CHV          | 0.033           | 0.969     |
|                                       | SL - CHV          | -0.600          | 0.000 **  |
|                                       | SL - MR           | -0.633          | 0.000 **  |
| Comfortable public spaces             | MR - CHV          | -1.166          | 0.000 *** |
|                                       | SL - CHV          | -0.716          | 0.000 **  |
|                                       | SL - MR           | 0.450           | 0.014 **  |
| Comfortable public transit facilities | MR - CHV          | 0.260           | 0.180     |
|                                       | SL - CHV          | 0.740           | 0.000 **  |
|                                       | SL - MR           | 0.480           | 0.003**   |
| Biking Comfort                        | MR - CHV          | 0.500           | 0.001     |
|                                       | SL - CHV          | 0.883           | 0.000 *** |
|                                       | SL - MR           | 0.383           | 0.022     |

NOTE: P-values smaller than 0.05 illustrated statistically significant differences between two groups.

\*The mean difference is significant at the 0.05 level.

\*\*The mean difference is significant at the 0.01 level.

\*\*\* The mean difference is significant at the 0.001 level.

To further analyze the factors that affect the five aspects of comfort: neighborhood comfort, pedestrian comfort, biking comfort, comfortable public spaces, and comfortable public transit facilities, multiple regression statistical analysis was applied for each neighborhood. A set of elements, independent variables, was identified per each comfort aspect to better assess the influence of the neighborhood's urban design and architectural elements on the respondents' perception of comfort. For example, tree-linings along sidewalks was identified as an element that contribute to pedestrian's comfort because shading protects pedestrians from the negative impacts of urban heat islands and thus making the walking experience more comfortable for pedestrians. Table 5.21 illustrates the results of the multiple regression models applied for CHV neighborhood in terms of comfort criterion. Table 5.22 illustrates the results of the stepwise multiple regression analyses applied for CHV neighborhood in terms of comfort criterion.

**Table 5.21: Multiple Regression Models for Residents' Perceptions of Comfort in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>                                  | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|-------------------------------------------------------------------|---------------------|----------------|-----------------|
| Perception of the neighborhood's comfort        | Well-maintained                                                   | 0.269               | 0.010 **       | 0.675           |
|                                                 | Clean                                                             | 0.317               | 0.000***       |                 |
|                                                 | Buffers to limit noise                                            | 0.064               | 0.406          |                 |
|                                                 | Low traffic streets                                               | -0.027              | 0.751          |                 |
|                                                 | Access to services                                                | 0.068               | 0.276          |                 |
|                                                 | Legible layout                                                    | 0.079               | 0.270          |                 |
|                                                 | Clear center and edge                                             | 0.171               | 0.061          |                 |
|                                                 | Way finding signage                                               | -0.031              | 0.673          |                 |
|                                                 | Comfortable building density                                      | 0.077               | 0.243          |                 |
|                                                 | Comfortable population density                                    | 0.100               | 0.259          |                 |
| Perception of pedestrian's comfort              | Tree-linings along sidewalks                                      | 0.313               | 0.003 **       | 0.888           |
|                                                 | Human scale                                                       | 0.368               | 0.000***       |                 |
|                                                 | Wide sidewalks                                                    | 0.049               | 0.192          |                 |
|                                                 | Connected sidewalks                                               | 0.062               | 0.558          |                 |
|                                                 | Well-maintained sidewalks                                         | 0.049               | 0.637          |                 |
|                                                 | Accessible sidewalks by all ages and different physical abilities | 0.144               | 0.169          |                 |
| Perception of public space comfort              | Adequate number of public spaces                                  | 0.411               | 0.000***       | 0.834           |
|                                                 | Adequate street furniture                                         | 0.057               | 0.509          |                 |
|                                                 | Clean                                                             | 0.509               | 0.000***       |                 |
|                                                 | Accessible by all ages and different physical abilities           | 0.129               | 0.321          |                 |
| Perception of public transit facilities comfort | Dry shelters                                                      | 0.224               | 0.0289 *       | 0.736           |
|                                                 | Comfortable routes to public transit stops                        | 0.603               | 0.000***       |                 |
| Perception of biking comfort                    | Connected bike trails/lanes                                       | 1.198               | 0.001**        | 0.740           |
|                                                 | Well-maintained bike trails/lanes                                 | -0.387              | 0.173          |                 |
|                                                 | Adequate number of bike racks and other bike facilities           | 0.115               | 0.345          |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.22: Stepwise Multiple Regression Models for Residents' Perceptions of Comfort in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>           | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|--------------------------------------------|----------------|-----------------|
| Perception of the neighborhood's comfort        | Well-maintained                            | 0.001 **       | 0.653           |
|                                                 | Clean                                      | 0.000***       |                 |
|                                                 | Clear center and edge                      | 0.025*         |                 |
| Perception of pedestrian's comfort              | Tree-linings along sidewalks               | 0.000***       | 0.881           |
|                                                 | Human scale                                | 0.000***       |                 |
| Perception of public space comfort              | Adequate number of public spaces           | 0.000***       | 0.828           |
|                                                 | Clean                                      | 0.000***       |                 |
| Perception of public transit facilities comfort | Dry shelters                               | 0.0289 *       | 0.735           |
|                                                 | Comfortable routes to public transit stops | 0.000***       |                 |
| Perception of biking comfort                    | Connected bike trails/lanes                | 0.000***       | 0.802           |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to the results of the multiple regression tests and stepwise analyses as shown in Table 5.21 and Table 5.22, living in a well-maintained and clean neighborhood that have clear center and edge contributed significantly to the respondents' perceptions neighborhood comfort in CHV neighborhood. The provision of residential streets with equally spaced tree-linings and respect human scale contributed significantly to the respondents' perceptions of walking comfort in CHV. The provision of well-connected bike trails contributed significantly to the respondents' perceptions of biking comfort in CHV.

Table 5.23 illustrates the results of the multiple regression models applied for MR neighborhood in terms of comfort criterion. Table 5.24 illustrates the results of the stepwise multiple regression analyses applied for MR neighborhood in terms of comfort criterion.



**Table 5.23: Multiple Regression Models for Residents' Perceptions of Comfort in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>                                  | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|-------------------------------------------------------------------|---------------------|----------------|-----------------|
| Perception of the neighborhood comfort          | Well-maintained                                                   | 0.070               | 0.781          | 0.800           |
|                                                 | Clean                                                             | 0.194               | 0.061          |                 |
|                                                 | Buffers to limit noise                                            | 0.043               | 0.630          |                 |
|                                                 | Low traffic streets                                               | 0.339               | 0.201          |                 |
|                                                 | Access to services                                                | 0.010               | 0.923          |                 |
|                                                 | Legible layout                                                    | 0.350               | 0.007 **       |                 |
|                                                 | Clear center and edge                                             | 0.203               | 0.091          |                 |
|                                                 | Way finding signage                                               | 0.071               | 0.555          |                 |
|                                                 | Comfortable building density                                      | 0.157               | 0.183          |                 |
|                                                 | Comfortable population density                                    | 0.149               | 0.234          |                 |
| Perception of pedestrian's comfort              | Tree-linings along sidewalks                                      | 0.041               | 0.589          | 0.740           |
|                                                 | Human scale                                                       | 0.151               | 0.121          |                 |
|                                                 | Wide sidewalks                                                    | 0.142               | 0.061          |                 |
|                                                 | Connected sidewalks                                               | 0.081               | 0.185          |                 |
|                                                 | Well-maintained sidewalks                                         | -0.120              | 0.244          |                 |
|                                                 | Accessible sidewalks by all ages and different physical abilities | 0.597               | 0.000***       |                 |
| Perception of public space comfort              | Adequate number of public spaces                                  | 0.154               | 0.079          | 0.743           |
|                                                 | Adequate street furniture                                         | 0.127               | 0.143          |                 |
|                                                 | Clean                                                             | 0.566               | 0.000***       |                 |
|                                                 | Accessible by all ages and different physical abilities           | 0.131               | 0.262          |                 |
| Perception of public transit facilities comfort | Dry shelters                                                      | -0.011              | 0.933          | 0.970           |
|                                                 | Comfortable routes to public transit stops                        | 0.988               | 0.000***       |                 |
| Perception of biking comfort                    | Connected bike trails/lanes                                       | 0.390               | 0.001**        | 0.973           |
|                                                 | Well-maintained bike trails/lanes                                 | 0.611               | 0.000***       |                 |
|                                                 | Adequate number of bike racks and other bike facilities           | 0.031               | 0.287          |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.24: Stepwise Multiple Regression Models for Residents' Perceptions of Comfort in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>                                  | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|-------------------------------------------------------------------|----------------|-----------------|
| Perception of the neighborhood's comfort        | Clean                                                             | 0.024 *        | 0.793           |
|                                                 | Low traffic streets                                               | 0.000 ***      |                 |
|                                                 | Legible layout                                                    | 0.000 ***      |                 |
|                                                 | Clear center and edge                                             | 0.046 *        |                 |
|                                                 | Comfortable population density                                    | 0.001 **       |                 |
| Perception of pedestrian's comfort              | Accessible sidewalks by all ages and different physical abilities | 0.000***       | 0.740           |
| Perception of public space comfort              | Adequate street furniture                                         | 0.045*         | 0.736           |
|                                                 | Clean                                                             | 0.000***       |                 |
| Perception of public transit facilities comfort | Comfortable routes to public transit stops                        | 0.000***       | 0.970           |
| Perception of biking comfort                    | Connected bike trails/lanes                                       | 0.000***       | 0.973           |
|                                                 | Well-maintained bike trails/lanes                                 | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to the results of the stepwise multiple regression models in Table 5.24, living in a clean neighborhood with well-defined center, edge and layout, with comfortable population density, and with low traffic residential streets contributed significantly to the perception of neighborhood comfort among respondents living in MR neighborhood. In terms of pedestrian comfort, the provision of accessible sidewalks contributed significantly to the respondents' perception of pedestrian comfort in MR neighborhood. Also, the provision of a connected network of well-maintained bike trails contributed significantly to the perception of biking comfort among respondents living in MR neighborhood.

Table 5.25 shows results for the multiple regression models in SL neighborhood regarding the perception of comfort among the respondents living in SL neighborhood. Table 2.6 illustrates the results from the stepwise multiple regression analyses regarding the perception of comfort among the respondents living in SL neighborhood.

**Table 5.25: Multiple Regression Models for Residents' Perceptions of Comfort in Saint Luke (SL) LEED-ND Certified Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>                                  | <b>Coefficients</b> | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|-------------------------------------------------------------------|---------------------|----------------|-----------------|
| Perception of the neighborhood comfort          | Well-maintained                                                   | 0.648               | 0.000 ***      | 0.930           |
|                                                 | Clean                                                             | 0.004               | 0.966          |                 |
|                                                 | Buffers to limit noise                                            | 0.327               | 0.022 *        |                 |
|                                                 | Low traffic streets                                               | 0.248               | 0.217          |                 |
|                                                 | Access to services                                                | -0.196              | 0.234          |                 |
|                                                 | Legible layout                                                    | 0.234               | 0.029*         |                 |
|                                                 | Clear center and edge                                             | 0.093               | 0.544          |                 |
|                                                 | Way finding signage                                               | 0.160               | 0.023 *        |                 |
|                                                 | Comfortable building density                                      | 0.112               | 0.411          |                 |
|                                                 | Comfortable population density                                    | -0.079              | 0.633          |                 |
| Perception of pedestrian's comfort              | Tree-linings along sidewalks                                      | 0.509               | 0.983          | 0.500           |
|                                                 | Human scale                                                       | 0.583               | 0.007 **       |                 |
|                                                 | Wide sidewalks                                                    | 0.027               | 0.875          |                 |
|                                                 | Connected sidewalks                                               | 0.276               | 0.138          |                 |
|                                                 | Well-maintained sidewalks                                         | 0.089               | 0.538          |                 |
|                                                 | Accessible sidewalks by all ages and different physical abilities | -0.127              | 0.594          |                 |
| Perception of public space comfort              | Adequate number of public spaces                                  | 0.092               | 0.279          | 0.750           |
|                                                 | Adequate street furniture                                         | 0.000               | 0.995          |                 |
|                                                 | Clean                                                             | 0.478               | 0.000***       |                 |
|                                                 | Accessible by all ages and different physical abilities           | 0.423               | 0.000***       |                 |
| Perception of public transit facilities comfort | Dry shelters                                                      | 0.442               | 0.000***       | 0.956           |
|                                                 | Comfortable routes to public transit stops                        | 0.566               | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.26: Stepwise Multiple Regression Models for Residents' Perceptions of Comfort in Saint Luke (SL) LEED-ND Certified Neighborhood**

| <b>Dependent variable (Y)</b>                   | <b>Independent Variables (X)</b>                        | <b>P-value</b> | <b>R-square</b> |
|-------------------------------------------------|---------------------------------------------------------|----------------|-----------------|
| Perception of the neighborhood comfort          | Well-maintained                                         | 0.000 ***      | 0.926           |
|                                                 | Buffers to limit noise                                  | 0.006**        |                 |
|                                                 | Legible layout                                          | 0.020*         |                 |
|                                                 | Way finding signage                                     | 0.024*         |                 |
| Perception of pedestrian's comfort              | Human scale                                             | 0.000 ***      | 0.478           |
| Perception of public space comfort              | Clean                                                   | 0.000***       | 0.748           |
|                                                 | Accessible by all ages and different physical abilities | 0.000***       |                 |
| Perception of public transit facilities comfort | Dry shelters                                            | 0.000***       | 0.956           |
|                                                 | Comfortable routes to public transit stops              | 0.000***       |                 |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to the results of the stepwise multiple regression analyses in Table 5.26, living in a well-maintained neighborhood that offered buffers to limit noise from traffic, navigable layout, and way finding signage system contributed significantly to the perception of neighborhood comfort among respondents living in SL neighborhood. In terms of pedestrians' comfort, the provision of streets that respect human scale in SL neighborhood contributed significantly to their perception of pedestrian comfort. Also, the provision of dry shelters and comfortable routes to public transit stops in SL neighborhood contributed significantly to the respondents' perceptions of comfort when using public transit facilities.

## 5. Perception of Connectivity

As mentioned before, the physical connectivity of the inner streets of a neighborhood and the neighborhood's physical connectivity to the surrounding public facilities and convenience stores are considered important aspects to improve people's QoL. In general, in terms of the physical internal connectivity of a neighborhood, it is important to design a street network in a neighborhood that provides short cuts and easy access to different destinations for pedestrians as

well as automobile drivers. Also, the provision of a network of connected sidewalks is recommended to enhance the accessibility of the diverse destinations in a neighborhood and thus enhancing its internal connectivity. External connectivity is about the degree of connectivity between the neighborhood and the surrounding public services, and convenience stores. In order to provide better external connections with such surrounding services, the neighborhood's street and sidewalk networks has to be well connected with the neighboring street and sidewalk network. Also, the neighborhood is recommended to be located not further than a quarter mile, 10 minute walking distance, from some public and private facilities, such as libraries, and grocery stores.

Accordingly, respondents were asked about their perception regarding the internal connectivity of their neighborhoods, and the neighborhood's proximity and connectivity to the surrounding facilities. One-way ANOVA test is performed to compare the means between the different groups of respondents. Table 5.27 summarizes the respondents' perceptions regarding connectivity in their current neighborhoods.

According to the one-way ANOVA test results, there is a significant difference in means between the three groups. The internal connectivity of CHV neighborhood is higher than the other two neighborhoods according to respondents' perception of connectivity. SL neighborhood has the highest mean in terms of external connectivity, which means that respondents living in SL perceived that their neighborhood is well-connected to the surrounding facilities, unlike the perception of respondents living in CHV and MR neighborhoods. To elaborate further the differences in means between the three neighborhoods, Tukey's post hoc test was applied as shown in Table 5.28.

Table 5.28 verified the significant differences among neighborhoods in terms of both the perception of respondents regarding internal and external connectivity. The results showed that there is a significant difference in means between perception of respondents living in SL neighborhood and those who live in CHV neighborhood in terms of both internal and external connectivity. Also, there is a significant difference in the means between the respondents' perception regarding external connectivity living in SL neighborhood and the perception of respondents living in MR neighborhood in terms of external connectivity. Table 5.29 illustrates the relationship between the aspects that enhance internal and external connectivity of neighborhoods and the perceptions of respondents living in CHV neighborhood regarding each aspect. Table 5.30 illustrates the results of the stepwise multiple regression analyses applied for CHV neighborhood in terms of connectivity criterion.

According to the stepwise multiple regression analyses in Table 5.30, a well-connected network of sidewalks and residential streets significantly contributed to the perceptions of respondents of the internal connectivity of CHV neighborhood. In terms of their perception of external connectivity, respondents living in CHV neighborhood identified that the provision of well-connected network of sidewalks, streets, and bike lanes with the surroundings contributed significantly to their perception of external connectivity. Table 5.31, illustrates the multiple regression models for explaining residents' perceptions of connectivity criterion in MR Neighborhood. Table 5.32, illustrates stepwise multiple regression analyses for explaining residents' perceptions of connectivity criterion in MR Neighborhood.

**Table 5.27: Residents' Perception of Connectivity in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods  
Results from One-way ANOVA**

| Perception            | Type of community | N  | Mean  | F-value | P-value   |
|-----------------------|-------------------|----|-------|---------|-----------|
| Internal connectivity | CHV               | 60 | 3.833 | 4.893   | 0.000 **  |
|                       | MR                | 54 | 3.463 |         |           |
|                       | SL                | 40 | 3.400 |         |           |
| External connectivity | CHV               | 60 | 2.383 | 38.54   | 0.000 *** |
|                       | MR                | 54 | 2.870 |         |           |
|                       | SL                | 40 | 3.825 |         |           |

NOTE: 1= Totally disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Totally agree.  
Significant codes: 0 '\*\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05

**Table 5.28: Residents' Perception of Connectivity in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from Tukey's Post-Hoc Test**

| Perception            | Type of community | Mean difference | P-value   |
|-----------------------|-------------------|-----------------|-----------|
| Internal connectivity | MR - CHV          | -0.333          | 0.103     |
|                       | SL - CHV          | -0.500          | 0.006 **  |
|                       | SL - MR           | -0.166          | 0.562     |
| External connectivity | MR - CHV          | 0.433           | 0.019     |
|                       | SL - CHV          | 1.366           | 0.000 *** |
|                       | SL - MR           | 0.933           | 0.000 *** |

NOTE: P-values smaller than 0.05 illustrated statistically significant differences between two groups.  
\*The mean difference is significant at the 0.05 level.  
\*\*The mean difference is significant at the 0.01 level.  
\*\*\* The mean difference is significant at the 0.001 level.

**Table 5.29: Multiple Regression Models for Residents' Perceptions of Connectivity in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.158        | 0.051     | 0.680    |
|                        | Connected sidewalks                                       | 0.619        | 0.000 *** |          |
|                        | Connected bike trails/lanes                               | 0.014        | 0.697     |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.336        | 0.083     | 0.700    |
|                        | Connected sidewalk network with the surrounding sidewalks | -0.218       | 0.233     |          |
|                        | Connected bike trails/lanes                               | 0.215        | 0.056     |          |
|                        | Close to grocery stores                                   | 0.142        | 0.199     |          |
|                        | Close to public facilities                                | 0.162        | 0.188     |          |
|                        | Close to public transit stops                             | 0.124        | 0.364     |          |
|                        |                                                           |              |           |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.30: Stepwise Multiple Regression Analyses for Explaining Residents' Perceptions of Connectivity in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | P-value   | R-square |
|------------------------|-----------------------------------------------------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.000 *** | 0.675    |
|                        | Connected sidewalks                                       | 0.043 *   |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.005**   | 0.548    |
|                        | Connected sidewalk network with the surrounding sidewalks | 0.000***  |          |
|                        | Connected bike trails/lanes                               | 0.028 *   |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.31: Multiple Regression Models for Residents' Perceptions of Connectivity in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.078        | 0.027 *   | 0.970    |
|                        | Connected sidewalks                                       | 0.946        | 0.000 *** |          |
|                        | Connected bike trails/lanes                               | -0.048       | 0.015 *   |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.611        | 0.004**   | 0.670    |
|                        | Connected sidewalk network with the surrounding sidewalks | -0.179       | 0.405     |          |
|                        | Connected bike trails/lanes                               | 0.0239       | 0.483     |          |
|                        | Close to grocery stores                                   | 0.229        | 0.021*    |          |
|                        | Close to public facilities                                | 0.023        | 0.802     |          |
|                        | Close to public transit stops                             | 0.125        | 0.136     |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.32: Stepwise Multiple Regression Models for Residents' Perceptions of Connectivity in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | P-value   | R-square |
|------------------------|-----------------------------------------------------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.027 *   | 0.968    |
|                        | Connected sidewalks                                       | 0.000 *** |          |
|                        | Connected bike trails/lanes                               | 0.015 *   |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.004**   | 0.670    |
|                        | Connected sidewalk network with the surrounding sidewalks | 0.405     |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005



According to the stepwise analyses results in Table 5.32, respondents living in MR neighborhood identified all the elements listed as significant contributors that enhanced their perception of the internal connectivity of their neighborhood. Respondents living in MR neighborhood perceived the neighborhood's street network and the well connected network of sidewalks contributed significantly to their perception of the external connectivity of their neighborhood.

Table 5.33 shows the results of the multiple regression models for explaining residents' perceptions of connectivity criterion in SL neighborhood. Table 5.34 shows the results of the stepwise multiple regression analyses for explaining residents' perceptions of connectivity criterion in SL neighborhood.

The statistical results in Table 5.34 show that respondents living in SL neighborhood identified the street network of their neighborhood and its sidewalks as significant contributors that enhanced their perception of the internal connectivity of their neighborhood. Also, the same respondents identified that the neighborhood's street network, sidewalks and the neighborhood's proximity to public facilities, such as Cleveland Public library, significantly contributed to their perception of the external connectivity of their neighborhood.

**Table 5.33: Multiple Regression Models for Residents' Perceptions of Connectivity in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.528        | 0.000 *** | 0.887    |
|                        | Connected sidewalks                                       | 0.381        | 0.000 *** |          |
|                        | Connected bike trails/lanes                               | 0.020        | 0.477     |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.693        | 0.000 *** | 0.890    |
|                        | Connected sidewalk network with the surrounding sidewalks | -0.000       | 0.985     |          |
|                        | Connected bike trails/lanes                               | -0.047       | 0.484     |          |
|                        | Close to grocery stores                                   | -0.058       | 0.349     |          |
|                        | Close to public facilities                                | 0.181        | 0.031 *   |          |
|                        | Close to public transit stops                             | 0.147        | 0.059     |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.34: Stepwise Multiple Regression Models for Residents' Perceptions of Connectivity in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | P-value   | R-square |
|------------------------|-----------------------------------------------------------|-----------|----------|
| Internal connectivity  | Street network with short blocks                          | 0.000 *** | 0.885    |
|                        | Connected sidewalks                                       | 0.000 *** |          |
| External connectivity  | Connected street network with the surrounding streets     | 0.000 *** | 0.894    |
|                        | Connected sidewalk network with the surrounding sidewalks | 0.009**   |          |
|                        | Close to public facilities                                | 0.032*    |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

## 6. Perception of Place-making and Sense of Belonging

Sense of belonging is an aspect that contributes to improve people's QoL as mentioned before. The sense of belonging criterion is tested among the three types of neighborhoods CHV, MR, and SL. The respondents' have been asked to report their perceptions of sense of place, and unique sense of place in their neighborhoods. Also, they have been asked to report if their social life have been improved since they move to their current neighborhoods or not. Improved social life increases the sense of communal bonding, and thus enhances the sense of belonging.

One-way ANOVA test is performed to compare the means between the different groups of respondents. Table 5.35 summarizes the respondents' perceptions regarding sense of place, sense of belonging, and social life in their current neighborhoods. According to Table 5.36, there is a significant difference in the means among the three neighborhoods according to the respondents' perception of sense of belonging. Respondents living in SL neighborhood had more sense of belonging in their neighborhood more than the respondents living in the other two neighborhoods. In order to provide more insights into the comparisons between the three groups, Tukey's post-hoc test was applied. Table 5.36 demonstrates Tukey's tests results of the respondents' perception of sense of belonging, uniqueness of place, and social life.

**Table 5.35: Residents' Perception of Sense of Belonging in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from One-way ANOVA**

| Perception         | Type of community | N  | Mean | F-value | P-value   |
|--------------------|-------------------|----|------|---------|-----------|
| Sense of belonging | CHV               | 60 | 3.87 | 10.45   | 0.000 *** |
|                    | MR                | 54 | 3.26 |         |           |
|                    | SL                | 40 | 3.98 |         |           |

NOTE: 1= Totally disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Totally agree.

Significant codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05

**Table 5.36: Residents' Perception of Sense of Belonging in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from Tukey's Post-Hoc Test**

| Perception         | Type of community | Mean difference | P-value  |
|--------------------|-------------------|-----------------|----------|
| Sense of belonging | MR - CHV          | -0.616          | 0.000 ** |
|                    | SL - CHV          | -0.016          | 0.002    |
|                    | SL - MR           | 0.633           | 0.000 ** |

NOTE: P-values smaller than 0.05 illustrated statistically significant differences between two groups.

\*The mean difference is significant at the 0.05 level.

\*\*The mean difference is significant at the 0.01 level.

\*\*\* The mean difference is significant at the 0.001 level.

Table 5.36 verified the significant differences among the three neighborhoods. The results showed that there is a significant difference between SL neighborhood and the other two neighborhoods, CHV and MR in terms of the perception of sense of belonging. On the other hand, there was no significant difference in the means between SL and CHV neighborhoods in terms of the perception of sense of belonging.

The provision of unique architecture and spatial arrangement of neighborhoods, active residential streets, active nodes, and inclusive public spaces with all age-integrated outdoors activities are aspects that contribute to the sense of belonging. Accordingly, multiple regression models were applied to further understand the impact of those design elements on the sense of belonging among the three groups. In order to assess the sense of belonging criterion, respondents were asked to report their degree of agreement with the following: 1-the traditional architecture of my neighborhood enhanced my sense of belonging, 2- the traditional layout design of my neighborhood enhanced my sense of belonging, 3- The semi-public attachments to the buildings, including porches, balconies, etc., enhanced my sense of belonging, 4- creating a socially active street through minimizing blank walls along residential by placing car garages at the rear of the buildings enhanced my sensing of belonging, 5-The public spaces in my neighborhood improved my communal bonding and enhanced my sense of belonging, 6- the design restrictions imposed by Home Owners Association helped in creating coherent streetscape and architecture that improved my sense of place, and thus my sense of belonging.

Table 5.37 illustrates the multiple regression models for explaining the residents' perceptions of sense of belonging in CHV neighborhood. Table 5.38 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of sense of belonging in CHV neighborhood.

**Table 5.37: Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Sense of belonging     | Traditional architecture                                  | 0.503        | 0.000 *** | 0.940    |
|                        | Traditional layout design                                 | -0.156       | 0.023 *   |          |
|                        | Active streets through semi-public minimizing blank walls | 0.026        | 0.668     |          |
|                        | Active streets through semi-public attachments            | 0.289        | 0.000 *** |          |
|                        | Architectural review board                                | 0.161        | 0.026 *   |          |
|                        | Accessible outdoors facilities                            | 0.131        | 0.019*    |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.38: Stepwise Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                      | P-value   | R-square |
|------------------------|------------------------------------------------|-----------|----------|
| Sense of belonging     | Traditional architecture                       | 0.000 *** | 0.940    |
|                        | Traditional layout design                      | 0.023 *   |          |
|                        | Active streets through semi-public attachments | 0.000 *** |          |
|                        | Architectural review board                     | 0.026 *   |          |
|                        | Accessible outdoors facilities                 | 0.019*    |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

According to Table 5.38, the traditional architecture of the buildings, their semi-public attachments contributed significantly in enhancing the sense of belonging among respondents' living in CHV neighborhood. Also, the traditional design of CHV layout, the inclusive public spaces, and the design restrictions imposed by the neighborhood's board of architecture significantly contributed as well to increasing the sense of belonging among respondents' living in CHV neighborhood.

Table 5.39, illustrates the relationship between the design elements for enhancing sense of belonging and the respondents' perception of the impact of such design elements on their sense of belonging in MR neighborhood. Table 5.40 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of sense of belonging in MR neighborhood.

According to Table 5.40, the traditional architecture of the buildings, and the design restrictions imposed by the neighborhood's board of architecture contributed significantly in enhancing the sense of belonging among respondents' living in MR neighborhood. Also, the traditional design of MR layout contributed as well to increasing the sense of belonging among respondents' living in MR neighborhood.

Table 5.41 illustrates the relationship between the design elements for enhancing sense of belonging and the respondents' perception of the impact of such design elements on their sense of belonging in SL neighborhood. Table 5.42 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of sense of belonging in SL neighborhood.

According to Table 5.42, respondents living in SL neighborhood identified the traditional architecture of the buildings as the only main design elements that significantly contributed in enhancing their sense of belonging.

**Table 5.39: Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Sense of belonging     | Traditional architecture                                  | 0.932        | 0.000 *** | 0.974    |
|                        | Traditional layout design                                 | -0.104       | 0.047 *   |          |
|                        | Active streets through semi-public minimizing blank walls | -0.034       | 0.487     |          |
|                        | Active streets through semi-public attachments            | 0.067        | 0.222     |          |
|                        | Architectural review board                                | 0.206        | 0.000 *** |          |
|                        | Accessible outdoors facilities                            | -0.053       | 0.257     |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.40: Stepwise Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | P-value   | R-square |
|------------------------|----------------------------|-----------|----------|
| Sense of belonging     | Traditional architecture   | 0.000 *** | 0.973    |
|                        | Traditional layout design  | 0.027 *   |          |
|                        | Architectural review board | 0.000 *** |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.41: Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X)                                 | Coefficients | P-value   | R-square |
|------------------------|-----------------------------------------------------------|--------------|-----------|----------|
| Sense of belonging     | Traditional architecture                                  | 0.821        | 0.000 *** | 0.926    |
|                        | Traditional layout design                                 | 0.056        | 0.309     |          |
|                        | Active streets through semi-public minimizing blank walls | 0.043        | 0.581     |          |
|                        | Active streets through semi-public attachments            | 0.055        | 0.334     |          |
|                        | Architectural review board                                | -0.038       | 0.627     |          |
|                        | Accessible outdoors facilities                            | 0.020        | 0.747     |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.42: Stepwise Multiple Regression Models for Residents' Perceptions of Place-making and Sense of Belonging in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X) | P-value   | R-square |
|------------------------|---------------------------|-----------|----------|
| Sense of belonging     | Traditional architecture  | 0.000 *** | 0.921    |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

## 7. Perception of aesthetic quality of neighborhood

In the survey, the respondents were asked about their perception of the visual appeal of their neighborhoods. One-way ANOVA test was performed to compare the means between the different groups of respondents regarding this issue. Table 5.43 summarizes the respondents' perceptions of the aesthetic quality in their current neighborhoods.

According to the one-way ANOVA test results, there is a significant difference between the means of the three groups. Respondents living in CHV neighborhood perceived their neighborhood as more visually appealing than the other two neighborhoods. Respondents living in MR neighborhood perceived their neighborhood as the least visual appealing neighborhood. To further analyze the differences in means between the three neighborhoods, Tukey's post-hoc test was applied. Table 5.44 shows the test results.

The results of Tukey's test results in Table 5.44 regarding visual appeal support the differences in means among the three neighborhoods. There is significant difference in means between the perception of respondents living in CHV regarding aesthetic quality of their neighborhood and the perception of respondents living in MR regarding neighborhood aesthetic quality. Also, there is significant difference in means between the perception of respondents living in CHV regarding aesthetic quality of their neighborhood and the perception of respondents living in SL regarding neighborhood aesthetic quality. No significant difference in means is found among the respondents living in SL and MR neighborhoods regarding their perception of aesthetic quality of their neighborhoods.

In the survey, respondents were asked about their perception of the impact of some aspects on the visual appeal of neighborhoods, including: the Victorian architecture of buildings, the provision of alleys to house visually undesirable elements, the provision of adequate buffers



to screen visually undesirable scenes, and the coherence of streetscape due to the design rules imposed by the board of architecture. Table 5.45 illustrates the multiple regression results for explaining the residents' perceptions of visual appeal of CHV neighborhood. Table 5.46 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of the aesthetic quality of CHV neighborhood.

**Table 5.43: Residents' Perception of Aesthetic Quality in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from One-way ANOVA**

| Perception        | Type of community | N  | Mean | F-value | P-value   |
|-------------------|-------------------|----|------|---------|-----------|
| Aesthetic quality | CHV               | 60 | 4.60 | 53.87   | 0.000 *** |
|                   | MR                | 54 | 3.02 |         |           |
|                   | SL                | 40 | 3.50 |         |           |

NOTE: 1= Totally disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Totally agree.  
Significant codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05

**Table 5.44: Residents' Perception of Aesthetic Quality in Cherry Hill Village (CHV), Mason Run (MR), and Saint Luke (SL) Neighborhoods Results from Tukey's Post-Hoc Test**

| Perception        | Type of community | Mean difference | P-value   |
|-------------------|-------------------|-----------------|-----------|
| Aesthetic quality | MR - CHV          | -1.567          | 0.000 *** |
|                   | SL - CHV          | -1.233          | 0.000 *** |
|                   | SL - MR           | 0.333           | 0.093     |

NOTE: P-values smaller than 0.05 illustrated statistically significant differences between two groups.

\*The mean difference is significant at the 0.05 level.

\*\*The mean difference is significant at the 0.01 level.

\*\*\* The mean difference is significant at the 0.001 level.

**Table 5.45: Multiple Regression Models for Residents' Perception of Aesthetic Quality in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | Coefficients | P-value | R-square |
|------------------------|----------------------------|--------------|---------|----------|
| Aesthetic quality      | Traditional architecture   | 0.255        | 0.023 * | 0.510    |
|                        | Alleyways                  | 0.115        | 0.177   |          |
|                        | Visual buffers             | 0.080        | 0.510   |          |
|                        | Architectural review board | 0.249        | 0.024 * |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

The statistical results in Table 5.46 show that respondents perceived both the Victorian architecture of the buildings and the rules imposed by their neighborhood's board of architecture as significant contributors to the visual appeal of their neighborhood. On the other hand, respondents did not perceive the provision of alleys, and visual buffers as contributors to the aesthetic quality of CHV neighborhood. Table 5.47 illustrates the multiple regression models for explaining residents' perceptions of visual appeal of MR neighborhood. Table 5.48 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of aesthetic quality of MR neighborhood.

The statistical results in Table 5.48 show that respondents had also perceived both the Victorian architecture of the buildings and the rules imposed by the board of architecture as significant contributors to the visual appeal of their neighborhood. Also, they perceived alleyways as significant contributors to the visual appeal of their neighborhood.

Table 5.49 illustrates the multiple regression models for explaining residents' perceptions of aesthetic quality of SL neighborhood. Table 5.50 illustrates the results from stepwise multiple regression analyses for explaining the residents' perceptions of the aesthetic quality of SL neighborhood.

According to the statistical results in Table 5.50, respondents living in SL neighborhood perceived both the Victorian architecture of the buildings and alleyways as significant contributors to the visual appeal of their neighborhood.

**Table 5.46: Stepwise Multiple Regression Models for Residents' Perception of Aesthetic Quality in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | P-value  | R-square |
|------------------------|----------------------------|----------|----------|
| Aesthetic quality      | Traditional architecture   | 0.023 *  | 0.502    |
|                        | Architectural review board | 0.007 ** |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.47: Multiple Regression Models for Residents' Perception of Aesthetic Quality in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | Coefficients | P-value   | R-square |
|------------------------|----------------------------|--------------|-----------|----------|
| Aesthetic quality      | Traditional architecture   | 0.850        | 0.000 *** | 0.960    |
|                        | Alleyways                  | 0.064        | 0.007**   |          |
|                        | Visual buffers             | -0.291       | 0.428     |          |
|                        | Architectural review board | 0.384        | 0.000 *** |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.48: Stepwise Multiple Regression Models for Residents' Perception of Aesthetic Quality in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | Coefficients | P-value   | R-square |
|------------------------|----------------------------|--------------|-----------|----------|
| Aesthetic quality      | Traditional architecture   | 0.850        | 0.000 *** | 0.960    |
|                        | Alleyways                  | 0.064        | 0.007**   |          |
|                        | Visual buffers             | -0.291       | 0.428     |          |
|                        | Architectural review board | 0.384        | 0.000 *** |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.49: Multiple Regression Models for Residents' Perception of Aesthetic Quality in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X)  | Coefficients | P-value  | R-square |
|------------------------|----------------------------|--------------|----------|----------|
| Aesthetic quality      | Traditional architecture   | 0.733        | 0.000*** | 0.700    |
|                        | Alleyways                  | 0.237        | 0.006 ** |          |
|                        | Visual buffers             | 0.244        | 0.137    |          |
|                        | Architectural review board | -0.086       | 0.461    |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

**Table 5.50: Stepwise Multiple Regression Models for Residents' Perception of Aesthetic Quality in Saint Luke (SL) LEED-ND Certified Neighborhood**

| Dependent variable (Y) | Independent Variables (X) | P-value  | R-square |
|------------------------|---------------------------|----------|----------|
| Aesthetic quality      | Traditional architecture  | 0.000*** | 0.672    |
|                        | Alleyways                 | 0.005 ** |          |

NOTE: \*p<0.05 \*\* p<0.05 \*\*\* p<0.005

### 5.3 Hypotheses Testing and Discussions

Participants' perceptions of the five main criteria, namely safety, comfort, sense of belonging, connectivity, and aesthetics, for improving QoL in neighborhoods were investigated. Based on the neighborhood scorecard, and statistical analysis in the previous sections, the research hypotheses of this research study were finally assessed as follows:

#### 1. General criterion

1) Hypothesis I. Residents who live in both New Urbanist and LEED-ND certified neighborhoods are highly satisfied by their QoL in their neighborhoods.

According to the statistical analysis, respondents living in both NU neighborhoods were highly satisfied by their neighborhood more than the respondents living in the LEED-ND certified neighborhood. The results from one-way ANOVA test revealed that there was a significant difference between the mean among the three neighborhoods. Results of Tukey's test also confirmed such differences, especially between both NU neighborhoods and the LEED-ND certified neighborhood. Residents living in NU neighborhoods were more satisfied with their QoL more than residents living in the LEED-ND certified neighborhood. In terms of the results from the neighborhood scorecard, NU greenfield neighborhood, had earned the highest points in terms of the five QoL criteria, followed by the LEED-ND certified neighborhood.

#### 2. Safety criterion

2) Hypothesis I. Residents who live in New Urbanist neighborhoods feel as safe as residents who live in LEED-ND certified neighborhood in terms of crime.

According to the statistical analysis applied on the respondents' perceptions of their neighborhood safety from crime, the one-way ANOVA test results revealed that there was a significant difference in the means among the three neighborhoods under this category. Respondents living in NU greenfield neighborhood perceived their neighborhood as the safest

neighborhood in terms of crime among the three neighborhoods, followed by NU brownfield neighborhood. The differences in means between the three neighborhoods were verified by Tukey's test results. The results from Tukey's tests revealed that there was a significant difference in means between the NU brownfield neighborhood and the other two neighborhoods in terms of neighborhood safety from crime.

According to the statistical analysis, respondents living in the LEED-ND certified neighborhood perceived their neighborhood as the least safe neighborhood in terms of safety from crime. According to the qualitative analysis and the findings in Chapter IV, the multiple entryways to the neighborhood, the blighted buildings, massive areas of abandoned lands and grey areas, and the insufficient number of light sources in the abandoned and grey areas as well could have greatly impacted the perception of safety of the respondents living in the LEED-ND certified neighborhood.

As mentioned before in Chapter IV, CHV neighborhood earned the highest score for the same category followed by MR neighborhood, which also verified statistical analysis of the respondents' perception regarding neighborhood safety from crime. According to the previous findings from the qualitative analysis in Chapter IV, the physical weaknesses of MR neighborhood, NU neighborhood, in terms of neighborhood safety were that the neighborhood had multiple entryways, massive areas of brownfields and abandoned areas, and lack of mix-uses and active nodes. Such physical weaknesses could have impacted the perceptions of respondents' living in MR regarding neighborhood safety.

According to the multiple regression analysis that was applied to explain the reasons of the respondents' perceptions for safety from crime, SL respondents indicated that the adequate number of streetlight poles and the few entries of their neighborhood enhanced their perception

of safety from crime. Also, according to the multiple regression applied on the responses from participants who live in CHV, the respondents indicated that the absence of brownfields and abandoned areas strengthened their perceptions of the neighborhood safety from crime. Accordingly, to create safer neighborhoods, the neighborhood must provide adequate lighting and must also utilize the appropriate physical interventions when developing brownfields into housing projects and in the case of revitalization projects as well.

3) Hypothesis II. Residents who live in New Urbanist neighborhoods feel as safe as residents who the LEED-ND certified neighborhood in terms of traffic safety.

According to the statistical analysis applied on the respondents' perceptions of their safety from traffic, the one-way ANOVA test results revealed that there was no significant difference in the means between the three groups. However, the mean of CHV neighborhood was higher than the mean of the other two neighborhoods under this category, followed by SL neighborhood. According to the multiple regression analyses that were applied to explain the reasons of the respondents' perceptions for pedestrians' safety from traffic in their neighborhoods, respondents living in MR and SL neighborhoods indicated that providing narrow streets with on-street parking significantly enhanced their perceptions of safety from traffic in their neighborhoods. On the other hand, respondents living in CHV neighborhood indicated that the provision of physical buffers along sidewalks, such as sidewalks lined up with trees, significantly enhanced their perception of safety from traffic.

According to the results of the neighborhood scorecard, CHV neighborhood had earned the highest points in terms of providing most of the guidelines recommended for pedestrian's safety. According to the findings from the qualitative analysis in Chapter IV, the three neighborhoods lacked the provision of some of the recommended safety measures for pedestrians

from traffic, including bulb out sidewalks and intersections, speed bumps, roughened street material, brightly painted crosswalks, and mini roundabouts. Such pedestrian safety measures might have significantly enhanced the respondents' perception of safety from traffic in their neighborhoods. Further, both MR and SL neighborhoods did not provide adequate pedestrian safety signs from traffic, which could also explain the reason behind the low means for the residents' perceptions of pedestrians' safety in both MR and SL neighborhoods.

Therefore, in order to provide safe pedestrian environments from traffic, neighborhoods should consider providing bulb out sidewalks and intersections, speed bumps, roughened street material, brightly painted crosswalks, roundabouts/traffic circles, adequate pedestrian safety signs, narrow residential streets with on-street parking, and also adequate buffers on sidewalks to function as a barrier between pedestrians and vehicular movement.

4) Hypothesis III. Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods during the day.

According to the statistical analysis applied on the respondents' perceptions of their safety when walking alone around their neighborhoods during the day, the one-way ANOVA test results revealed that there was a significant difference in the means among the three neighborhoods. Results from Tukey's post hoc test verified that and revealed that there was a significant difference in the means especially between the respondents' perception of safety when walking alone in the morning in SL neighborhood and between the respondents' perceptions living in CHV and MR in terms of safety when walking alone in the morning. Respondents living in CHV neighborhood felt the safest in terms of walking alone around their neighborhood in the morning.

According to the statistical analysis, respondents living in CHV indicated that both the semi-public attachments to buildings and the active nodes significantly enhanced their safety when they walk around their neighborhood in the morning. Despite the provision of both semi-public attachments and active nodes in SL neighborhood, respondents living in SL neighborhood felt the least safe in terms of walking alone around their neighborhoods.

According to the neighborhood scorecard, CHV neighborhood scored the highest in terms of the provision of safety measures for residents when walking alone in the morning. On the other hand, both MR and SL neighborhoods earned the same number of points under this category of safety. According to the scorecard, SL neighborhood had a higher ratio of parking and abandoned areas more than the residential ratio, which could be the reason for the low safety perception in terms of walking alone in the morning among residents who live in SL neighborhood.

Therefore, in order to provide a safe walking environment for residents during the morning, neighborhoods should provide semi-public attachments to the buildings, and active nodes and also should limit the provision of huge areas of parking spaces. Also, when redeveloping brownfields into residential projects, the location of the new residential units and their public amenities should be carefully selected to deliver safe neighborhoods streets and safe public amenities.

5) Hypothesis IV. Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods at night.

According to the statistical analysis applied on the respondents' perceptions of their safety walking alone around their neighborhood at night, the one-way ANOVA test results



revealed that there is a significant difference between the means among the three neighborhoods. Results from Tukey's post hoc test verified that and revealed that there was a significant difference in the means between the perception of the respondents especially between the respondents living in MR, NU neighborhood, and between the respondents living in CHV, NU neighborhood, and SL, LEED-ND certified neighborhood.

According to the statistical analysis, respondents living in NU neighborhoods felt safer in terms of walking alone around their neighborhoods at night than respondents living in the LEED-ND certified neighborhood. Respondents who in NU neighborhoods indicated that the provision of shallow front yards and placing buildings closer to streets significantly enhanced their safety when they walked around their neighborhood at night. Respondents living in the LEED-ND certified neighborhood indicated that mandatory lights and the placement of garages to the rear of the buildings significantly enhanced their perception of safety when walking alone around their neighborhood.

According to the qualitative analysis and findings the NU neighborhoods earned higher scores than the LEED-ND certified neighborhood, which accorded the statistical results. The LEED-ND certified neighborhood had massive amounts of parking and abandoned areas in comparison, and also the parking areas in SL neighborhood lacked adequate lighting. Accordingly, those two issues could be the reason for the low safety perceptions in terms of walking alone at night among residents who live in SL neighborhood.

According to the scorecard, CHV neighborhood did not provide adequate number of streetlight poles. MR neighborhood did not provide mixed uses, which could have affected its residents' perception of safety when walking alone during the night. Therefore, in order to provide a safe walking experience for residents at night, neighborhoods should consider

designing shallow fronts with buildings placed close to the streets, mandatory lights in semi-public spaces attached to the buildings, mixed-use nodes, minimizing blank walls along streets, limit the size of parking spaces, and avoid locating building residential units in close proximity to abandoned areas.

6) Hypothesis V. The perception of safety when visiting public spaces in the morning is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of their safety when visiting public spaces in the morning, the one-way ANOVA test revealed that there was a significant difference between the means between the two types of neighborhoods. Under this safety category, respondents living in CHV, NU neighborhood, felt the safest when visiting the public spaces in their neighborhood in the morning. On the other hand, respondents living in the other NU neighborhood, MR neighborhood, felt the least safe when using visiting public spaces in their neighborhood during the day. Results from Tukey's post hoc test result verified the significant differences in the means between the three neighborhoods.

According to the multiple regression models utilized to explain the reasons for respondents' perception safety in public spaces during the day, respondents living in MR, NU neighborhood indicated that natural surveillance through the semi-public attachments to buildings contributed significantly to their perception of safety when visiting public spaces in their neighborhood during the day. On the other hand, respondents in, CHV, NU neighborhood, and SL, LEED-ND neighborhoods, did not identify any of design elements that significantly affected their perception of safety in public spaces during the day.

According to the results and finding of the qualitative analysis, CHV, NU neighborhood, earned full points in terms of the provision of adequate design safety measures for users of public

spaces in the morning, which accorded the statistical results. MR, the other NU neighborhood, MR scored the least under the same safety category, which also was verified by the statistical analysis. Both MR and SL failed to provide natural surveillance along the sides of its public spaces, which could be one of the reasons that affected negatively the perception of safety in public spaces during the day among its residents. On the other hand, CHV neighborhood provided active streets along the perimeters of the public spaces, and also offered diverse number of outdoors activities.

Therefore, in order to provide safe public spaces for residents to visit during the day, public spaces in residential neighborhoods should be surrounded by active streets through semi-public attachments to the buildings, minimizing blank walls through placing car garages at the rear of the buildings, and provide an adequate number of outdoors activities to attract more visitors.

7) Hypothesis VI. The perception of safety when visiting public spaces at night is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of their safety when visiting public spaces at night, the results of one-way ANOVA test revealed that there was no significant difference between the means between the two types of neighborhoods. Surprisingly, respondents living the LEED-ND certified neighborhood perceived the public spaces in SL neighborhood as the safest in terms of visiting the public spaces at night. On the other hand, respondents living in MR, NU neighborhood, felt the least safe when using visiting public spaces in their neighborhood at night.

According to the multiple regression models applied to explain the reasons for respondents' perception safety in public spaces at night, respondents living in the LEED-ND

certified neighborhood indicated that the provision of that natural surveillance through the semi-public attachments to buildings contributed significantly to their perception of safety when visiting public spaces in their neighborhood at night. Respondents living in CHV neighborhood indicated that natural surveillance through the semi-public attachments to buildings and minimizing the number of blank walls around the borders of public spaces significantly enhanced their safety perceptions when visiting public spaces in their neighborhood at night. Respondents living in LEED-ND certified neighborhood indicated placing buildings close to the streets significantly enhanced their safety perceptions when visiting public spaces in their neighborhood at night.

According to the scorecard results, CHV, NU neighborhood, earned the highest number of points in terms of providing safety measures for public space users at night. On the other hand, both MR and SL neighborhoods earned the same number of number of points regarding this category. Both MR and SL neighborhoods failed to provide natural surveillance along the sides of its public spaces and failed to provide adequate number of light poles in its public spaces.

Therefore, in order to provide safe public spaces for residents to visit during at night, public spaces in residential neighborhoods should be surrounded by active residential streets through adding semi-public attachments to the buildings, minimizing blank walls through placing car garages at the rear of the buildings, hosting diverse activities, and providing adequate number of light sources.

8) Hypothesis VIII. The perception of safety when using public transit services is the same is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of their safety when using public transit services, the one-way ANOVA test revealed that there was no significant difference between the means among the three neighborhoods. Meanwhile, respondents who live in CHV neighborhood felt the safest when using public transit stops. On the other hand, respondents who live in MR neighborhood felt the least safe when using public transit services. According to the multiple regression models applied to explain the reasons for respondents' perception of safety when using public transit services, respondents living in CHV neighborhood indicated that the provision of safe routes to public transit services contributed significantly to their perception of safety under this category. At the meantime, respondents who living in the LEED-ND certified neighborhood indicated that the provision of safe routes to public transit, safe locations of public transit stops, and the provision of safe shelters contributed significantly to their perception of safety under this category.

According to the qualitative analysis and findings, MR neighborhood earned no points in terms of safe public transit services, which was in accordance with the analytical results. MR neighborhood failed to provide all the recommended design elements that could enhance the safety of users when using public transit stops and it could be the reason for making respondents who lived in MR neighborhood felt the least safe when using public transit stops. MR failed to provide safe routes to public transit stops, and failed to provide safe locations for public transit stops and safe shelters as well.

Therefore, in order to ensure the safety of public transit users, neighborhood should provide safe routes to public transit stops through providing a network of well-connected sidewalks from the housing areas to the public transit stop station. Also, neighborhoods should provide public transit stops with safe locations away from any hazardous terrain or any

hazardous areas. The provision of safe shelters should also be considered to boost the safety of public transit users.

9) Hypothesis VII. The perception of biking safety is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of their biking safety, the results of one-way ANOVA test revealed that there was significant difference between the means between the two types of neighborhoods. Meanwhile, respondents who lived in NU neighborhoods felt safer when they biked around their neighborhood than those living in the LEED-ND certified neighborhood. Results from Tukey's post hoc test result verified the occurrence of such significant differences in the means, especially between the SL and MR neighborhoods.

According to the multiple regression models applied to explain the reasons for respondents' perception of biking safety, respondents who lived in NU neighborhoods indicated that the provision of well-maintained bike lanes and locating bike trails away from dangerous terrain contributed significantly to their perception of safety when they biked around their neighborhood.

According to the qualitative analysis and findings scorecard, the LEED-ND certified neighborhood had earned the least number of points in terms of biking safety, which was in accordance to the statistical results. The two NU neighborhoods, CHV and MR neighborhoods, earned the same number of points for biking safety category. According to the qualitative analysis and findings scorecard, CHV and MR neighborhoods provided well-maintained, and well-connected bike trails, located away from dangerous terrains. Simultaneously, both neighborhoods failed to provide adequate biking safety. On the other hand, the LEED-ND

certified neighborhood provided an adequate number of signs for biking safety, simultaneously, failed to provide well-connected and well-maintained bike lanes. Thus, in order to provide safe biking experience in neighborhoods, neighborhood should provide well-connected and well-maintained bike lanes, adequate biking safety signage, locating biking trails away from dangerous terrain.

### 3. Comfort criterion

10) Hypothesis I. New Urbanist and LEED-ND certified neighborhoods are comfortable neighborhoods for their residents.

According to the statistical analyses applied on the respondents' perceptions of the level of comfort of their neighborhoods, the results from one-way ANOVA test revealed that there was significant difference between the means among the three neighborhoods. Respondents who lived in CHV, NU neighborhood, perceived their neighborhood as the most comfortable neighborhood. On the other hand, Respondents who lived in the other NU neighborhood, MR, perceived their neighborhood as the least comfortable neighborhood. Tukey's post hoc test results verified the differences in means; they showed significant differences in the means between the three groups.

According to the multiple regression models applied to explain the reasons for the respondents' perception of comfortable neighborhood, respondents who lived in CHV neighborhood indicated that neighborhood characteristics, such as clean, well-maintained, with clear center and edge significantly enhanced their perception of comfort in their neighborhood. Respondents who lived in the LEED-ND certified neighborhood indicated that the provision of way finding signage, adequate buffers to limit noise, and also the provision of short blocks and legible neighborhood layout significantly enhanced their perception of comfort in their

neighborhood. Respondents who lived in MR neighborhood indicated that the provision of short blocks and legible neighborhood layout significantly enhanced their perception of comfort in their neighborhood.

The results of the neighborhood scorecard verified the quantitative findings, since CHV neighborhood earned the highest number of points in terms of neighborhood comfort, followed by SL, the LEED-ND certified neighborhood. Also, MR neighborhood scores the least in terms of neighborhood comfort. According to the qualitative analysis and findings, MR failed to provide most of the recommended design guidelines recommended for creating comfortable neighborhoods, including: adequate number of trash receptacles on residential streets and in public spaces, adequate noise and visual buffers to reduce noises and block undesirable views, short blocks to enhance legibility of the neighborhood, clear edge, way finding signage, convenient access to public services and convenience stores.

Hence, in order to create comfortable neighborhoods, neighborhoods should be clean and should provide low noise environments. It is also important to consider designing neighborhoods that are easy to navigate through adopting layouts that has clear central communal space, and defined edge. Also, a layout with short residential blocks and with adequate way finding signage is crucial for enhancing the overall comfort of neighborhoods.

11) Hypothesis II. The perception of pedestrian comfort level is the same among the residents living in NU and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of pedestrian comfort in their neighborhoods, results of one-way ANOVA test revealed that there was significant difference between the means among the three neighborhoods. Tukey's post hoc test results verified the differences in means, especially between the LEED-ND certified



neighborhood and the two NU neighborhoods. According to the statistical analysis, respondents who lived in the two NU neighborhoods indicated that their pedestrian comfort level was higher than the perceptions of respondents living in the LEED-ND certified neighborhood. In other words, residents living in the LEED-ND certified neighborhood perceived their pedestrian comfort as the lowest amongst the three groups of respondents.

According to the multiple regression models applied to explain the reasons for the respondents' perception of comfortable neighborhood, respondents who lived in CHV neighborhood indicated that having residential streets that respect human scale, and wide sidewalks significantly contributed to their perception of pedestrians' comfort. Respondents who live in MR neighborhood indicated that having sidewalks that are accessible by all ages and all physical abilities significantly contributed to their perception of pedestrians' comfort. Respondents who lived in the LEED-ND certified neighborhood indicated that having residential streets that respect human scale significantly contributed to their perception of pedestrians' comfort.

The results from the scorecard accorded the results from the statistical analysis regarding pedestrian's comfort. Both CHV and MR neighborhoods, NU neighborhoods, had earned the highest number of points in terms of pedestrian comfort. Whilst the LEED-ND certified neighborhood earned the lowest number of points for the same category. SL neighborhood failed to provide the following: a well-connected network of sidewalks, adequate tree linings along sidewalks to protect pedestrians from the impacts of urban heat island, accessible sidewalks for all different ages and all physical abilities. On the other hand, both NU neighborhoods, CHV and MR, had provided all the recommended design guidelines for creating comfortable walking experience for their residents.

Thus, in order to create comfortable pedestrian experience in neighborhoods, a connected network of sidewalks that are accessible by all ages and all physical abilities should be considered to boost the comfort of pedestrians. Also, providing appropriate shading devices and tree linings along sidewalks should also be considered to enhance the pedestrians' comfort.

12) Hypothesis III. The perception of comfort level when visiting public places is the same among the residents living in NU and LEED-ND certified neighborhoods.

According to the statistical analysis applied on the respondents' perceptions of the level of comfort of public spaces in their neighborhoods, the results of the one-way ANOVA test revealed that there was significant difference between the means among the three groups. Tukey's post hoc test results verified the differences in means. Respondents who lived in CHV, NU neighborhood, identified the comfort level of the public spaces in their neighborhood as the highest compared to the other two neighborhoods. On the other hand, the perception of the comfort level of the public spaces was lowest amongst respondents who lived in the other NU neighborhood, MR.

According to the multiple regression models applied to explain the reasons for respondents' perceptions of the level of comfort of public spaces in their neighborhoods, respondents who lived in CHV neighborhood indicated that the provision of public spaces that integrated different activities and were easily accessible by all different ages and physical abilities significantly contributed to their perception of the comfort level of public spaces. Also, the same group of respondents identified that the provision of adequate number of trash receptacles significantly contributed to their perception of the comfort level in public spaces.

Respondents who lived in the LEED-ND certified neighborhood indicated that the provision of public spaces that integrated different activities and public spaces that are accessible

by all different ages and physical abilities significantly contributed to their perception of the comfort level in public spaces. Respondents who lived in MR neighborhood indicated that the provision of adequate number of public spaces significantly contributed to their perception of the comfort level regarding the use of public spaces.

The results from the scorecard accorded the results from the statistical analysis regarding the same comfort criterion. CHV, NU neighborhood, had earned the highest number of points in terms of the provision of the recommended guidelines to enhance its public space's comfort level. The high satisfaction of respondents living in CHV regarding public spaces comfort could be attributed to the provision of all the elements needed in the scorecard to deliver comfortable public spaces. On the other hand, MR neighborhood failed to provide most of the recommended design guidelines to deliver comfortable public spaces. MR failed to deliver the following aspects: adequate street furniture for public spaces, adequate number of trash receptacles, and adequate number of public spaces to integrate all ages.

Consequently, the following aspects should be considered for creating comfortable public spaces in neighborhoods: adequate number of public spaces to integrate all ages, and accessible by all physical abilities, adequate street furniture and finally adequate number of trash receptacles.

13) Hypothesis IV. The perception of comfort level when using public transit services is the same among the residents living in NU and LEED-ND certified neighborhoods.

The one-way ANOVA test applied on the respondents' perceptions of the level of comfort of public spaces in their neighborhoods revealed that there was significant difference between the means among the three groups. Tukey's post-hoc test results verified the differences in means, especially between MR neighborhood and the other two neighborhoods. Respondents

who lived in MR, NU neighborhood, identified their comfort level when using public transit facilities in their neighborhood as the least comfortable compared to the other two neighborhoods. On the other hand, respondents who lived in SL, LEED-ND certified neighborhood, identified their comfort level when using public transit facilities in their neighborhood as most comfortable compared to the other two neighborhoods.

According to the statistical analyses applied on the data for this comfort category, respondents living in the LEED-ND certified indicated that the provision of both comfortable routes to public transit stops and the provision of dry shelters significantly contributed to their comfort perception when using public transit facilities in their neighborhood.

The results and findings from the statistical analysis of this comfort category had been verified again by the results of the neighborhood scorecard. According to the neighborhood scorecard, the LEED-ND certified neighborhood scored the highest score in comparison to the NU neighborhoods regarding the provision of the recommended design guidelines for yielding comfortable experience for residents when using public transit services. The provision of most of the recommended design guidelines in SL neighborhood could be the reason behind the high satisfaction of its respondents regarding their comfort level when using public transit facilities. On the other hand, MR neighborhood had earned the least number of points in this category, which also could be attributed to the respondents' perceptions of low comfort level when using public transit facilities. As such, the following aspects should be considered to create comfortable public transit facilities in neighborhoods: adequate number of public transits stops, dry shelters, and connected network of sidewalks to public transit stops.

14) Hypothesis VI. The perception of biking comfort level is the same among the residents living in NU and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of the level of biking comfort in their neighborhoods, the one-way ANOVA test revealed that there was significant difference between the means among the three groups. Tukey's post hoc test results verified the differences in means, especially between SL and CHV neighborhoods. Respondents who lived in the LEED-ND certified neighborhood identified their biking comfort level as the highest. On the other hand, the perception of biking comfort was the lowest amongst respondents who lived in CHV, NU neighborhood.

According to the multiple regression models applied to explain the reasons for the respondents' perception of biking comfort, respondents who lived in the LEED-ND certified neighborhood did not indicate any specific design element as significant contributors to their perception of biking comfort. While respondents living in NU neighborhoods indicated that the provision of well-connected and well-maintained bike lanes significantly contributed to their perception of biking comfort.

According to the neighborhood scorecard, the LEED-ND certified neighborhood had earned the lowest number of points in terms of the provision of design aspects that enhance the comfort of the biking experience in neighborhoods. On the other hand, the NU neighborhoods earned the highest number of points for the same category. NU neighborhoods failed to provide designated bike lanes along streets, adequate number of bike storage facilities, and adequate buffers to bike lanes.

Consequently, in order to create comfortable biking experience in neighborhoods, a well-connected and well-maintained network of bike lanes should be considered. Also, the provision of adequate number of bike storage facilities should be considered for comfortable biking experience in neighborhoods.

#### 4. Connectivity criterion

15) Hypothesis I. The perception of the internal connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of the degree of the internal connectivity of their neighborhoods, the one-way ANOVA test revealed that there was significant difference between the means among the three groups. Tukey's post-hoc test results verified the differences in means, especially between CHV and SL neighborhoods. Respondents who live in CHV neighborhood identified the internal connectivity of their neighborhood as the highest compared to the other two neighborhoods. On the other hand, the perception of the internal connectivity perception was lowest amongst respondents who live in SL neighborhood.

According to the statistical analyses applied on this type of neighborhood connectivity, CHV respondents indicated that the provision of well-connected sidewalks in their neighborhood significantly contributed to their perception of internal connectivity. MR respondents identified two other aspects besides the provision of well-connected sidewalks that significantly contributed to their perception of internal connectivity, such as street networks with short blocks, and connected bike lanes.

In terms of the neighborhood scorecard, the three neighborhoods earned the same number of points under the internal connectivity category. CHV and MR neighborhoods provided also the same aspects from the recommended list of designs in the neighborhood scorecard. On the other hand, SL provided some different aspects but yet earned the same total number of points as the other two neighborhoods. Only SL neighborhood provided physical connection to on-site historic buildings/areas, at the meantime it failed to provide a connected network of sidewalks to

strengthen its internal connectivity. CHV neighborhood provided some aspects that could have contributed to the high perception of its internal connectivity among its residents. The design aspects that were provided include: hierarchy of streets, connected streets, connected sidewalks, connected bike lanes, appropriate intersections density, and finally appropriate number of cul-de-sacs.

Thus, neighborhood layouts should include the following design aspects to enhance its perception of internal connectivity amongst its residents: short blocks, hierarchy of streets, connected streets, connected sidewalks, connected bike lanes, appropriate intersections density, appropriate number of cul-de-sacs, and physical connection to on-site distinguishable buildings/areas.

16) Hypothesis II. The perception of the external connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of the degree of the external connectivity of their neighborhoods with the surrounding physical mesh, the one-way ANOVA test revealed that there was significant difference between the means among the three groups. Tukey's post-hoc test results verified the differences in means, especially between the LEED-ND certified neighborhood and the other two neighborhoods. Respondents who live in SL neighborhood identified the external connectivity of their neighborhood with the surrounding physical mesh as the highest compared to the other two neighborhoods. On the other hand, the perception of the external connectivity was lowest among respondents who live in CHV neighborhood.

According to the statistical analyses applied on this type of neighborhood connectivity, SL respondents indicated that the provision of well-connected street network and their proximity

to public facilities significantly contributed to their perception of external connectivity. On the other hand, CHV respondents did not identify any aspect that significantly contributed to their perception of external connectivity.

According to the neighborhood scorecard, SL neighborhood earned the highest point in terms of external connectivity, which could be attributed to the high perception of external connectivity among its residents. SL provided the following aspects listed in the scorecard: hierarchy of streets, well-connected streets, well-connected bike lanes, adequate number and locations of public transit stops, proximity to public schools, proximity to recreational areas, and proximity to public facilities, such libraries. Thus, neighborhoods should consider adding the following aspects as well when considering enhancing their connectivity with the surrounding public and private services, connected sidewalks, proximity to commercial areas and cultural services.

#### 5. Place-making and Sense of Belonging criterion

17) Hypothesis I. The perception of sense of belonging is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

The one-way ANOVA test applied earlier on the respondents' perceptions of the level of sense of belonging in their neighborhoods revealed that there was significant difference between the means among the three groups. Tukey's post-hoc test results verified the differences in means, especially between MR neighborhood and the other two neighborhoods. Respondents who live in SL neighborhood had the highest mean in terms of their perception of sense of belonging. On the other hand, respondents who live in MR neighborhood had the lowest mean in terms of their perception of sense of belonging.



Residents in MR neighborhood indicated that the Victorian architecture of the neighborhood significantly contributed to their perception of sense of belonging as well as respondents living in CHV neighborhood. Also, respondents who live in CHV neighborhood indicated some other aspects that significantly contributed to their sense of belonging, such as: the traditional design of the neighborhood's design with a clear center and a clear edge, socially active residential streets due to the semi-public attachments, equally accessible public spaces, and the design restrictions imposed by HOA to ensure streetscape coherency.

According to the neighborhood scorecard, SL neighborhood earned the highest number of points in terms of providing most of the recommended design elements that boost sense of belonging in neighborhoods. On the other hand, MR earned the lowest number of points and that could be attributed to the low perception of sense of belonging among residents in MR neighborhood. MR neighborhood failed to provide the following: mixed-uses, adequate number of public spaces with all age-integrated outdoors activities, recreational venues, clear neighborhood edges, historically preserved land/building, visual and physical connections to historically preserved lands/buildings, community garden or access to healthy food and farmers market, and finally affordable housing.

Thus, in order to create residential neighborhoods with a unique sense of place and with communal bonding to enhance their residents sense of belonging the following design aspects should be considered: mixed-uses, residential streets that respect human scale, adequate number and adequate access to public spaces, diverse public spaces with all age-integrated outdoors activities, recreational venues, clear neighborhood center and edges, historically preserved land/building, visual and physical connections to historically preserved lands/buildings,

community garden or access to healthy food and farmers market, unique architectural designs, and finally affordable housing.

#### 6. Aesthetic criterion

18) Hypothesis I. The perception of aesthetic quality of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.

According to the statistical analyses applied on the respondents' perceptions of pedestrian comfort in their neighborhoods, the one-way ANOVA test revealed that there was significant difference between the means among the three neighborhoods. Tukey's post hoc test results verified the differences in means, especially between CHV neighborhood and the other two neighborhoods. The perception of the aesthetic quality of the neighborhood was the highest among respondents who live in CHV neighborhood. On the other hand, the perception of aesthetic quality of the neighborhood was the least among respondents who live in MR neighborhood.

According to the statistical analyses applied on this type of neighborhood quality, CHV respondents indicated that Victorian architecture of the buildings in their neighborhood and the design regulations to create coherent streetscape significantly contributed to their perception of the aesthetic quality in their neighborhood. On the other hand, respondents living in SL neighborhood identified that alleys, in addition to the Victorian architecture, significantly contributed to their perception of the visual appeal of their neighborhood.

According to the neighborhood scorecard, CHV neighborhood earned the number of points under the aesthetic quality category. On the other hand, MR neighborhood earned the lowest number of points under the same category, which could be attributed to the low perception of visual appeal among its residents. MR failed to provide the following: diverse lots

size, diverse building types, diverse housing ages, landmarks, hierarchy of public places, diverse land use, buffers block undesirable abandoned areas, coherent signage system, and unique features at night. Accordingly, in order to enhance the visual appeal of neighborhoods, such mentions aspects should be provided in addition to some other aspects, including diverse building materials, architectural details, unique street vistas, aesthetic treatment for parking areas, coherent building additions, well-maintained streetscape and neighborhood.

Table 5.51 illustrates the hypotheses of this research study. According to quantitative analyses, all of the hypotheses of this research study were rejected since there was differences in the residents' perceptions regarding the five dimensions of QoL.

**Table 5.51: Hypotheses Testing Summary**

| <b>Hypothesis</b> | <b>Content</b>                                                                                                                                                                            | <b>Supported or not supported</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| H1                | Residents who live in both New Urbanist and LEED-ND certified neighborhoods are highly satisfied by their QoL in their neighborhoods.                                                     | Not supported                     |
| H2                | Residents who live in New Urbanist neighborhoods feel as safe as residents who live in LEED-ND certified neighborhood in terms of crime.                                                  | Not supported                     |
| H3                | Residents who live in New Urbanist neighborhoods feel as safe as residents who the LEED-ND certified neighborhood in terms of traffic safety.                                             | Not supported                     |
| H4                | Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods during the day. | Not supported                     |
| H5                | Residents who live in New Urbanist neighborhoods feel as safe as residents who live in the LEED-ND certified neighborhood when they walk alone around their neighborhoods at night.       | Not supported                     |
| H6                | The perception of safety when visiting public spaces in the morning is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.                      | Not supported                     |
| H7                | The perception of safety when visiting public spaces at night is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.                            | Not supported                     |
| H8                | The perception of safety when using public transit services is the same is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.                  | Not supported                     |
| H9                | The perception of biking safety is the same among the residents living in both New Urbanist and LEED-ND certified neighborhoods.                                                          | Not supported                     |
| H10               | New Urbanist and LEED-ND certified neighborhoods are comfortable neighborhoods for their residents.                                                                                       | Not supported                     |
| H11               | The perception of pedestrian comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                                    | Not supported                     |
| H12               | The perception of comfort level when visiting public places is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                   | Not supported                     |
| H13               | The perception of comfort level when using public transit services is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                            | Not supported                     |
| H14               | The perception of biking comfort level is the same among the residents living in New Urbanist and LEED-ND certified neighborhoods.                                                        | Not supported                     |
| H15               | The perception of the internal connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.                                   | Not supported                     |
| H16               | The perception of the external connectivity of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods.                                   | Not supported                     |
| H17               | The perception of sense of belonging is the same among residents                                                                                                                          | Not supported                     |

**Table 5.51 (cont'd)**

|     |                                                                                                                                                 |               |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|     | living in New Urbanist and LEED-ND certified neighborhoods.                                                                                     |               |
| H18 | The perception of aesthetic quality of the neighborhood is the same among residents living in New Urbanist and LEED-ND certified neighborhoods. | Not supported |

#### 5.4 Suggestions for Neighborhood Design

The following are some suggested design guidelines and policy considerations to support and enhance the safety considerations for NU neighborhoods:

1) New Urbanism (NU) has to include design guidelines and principles that emphasize the recommended designs for neighborhood entryways. For example, the principles could include estimations for the recommended number of entryways in proportion to the size of residential developments. They also could include design guidelines that support natural surveillance along entryways.

2) Pedestrian safety should be a priority in NU housing projects. Speed bumps, pedestrian safety signage, and brightly painted crosswalks have to be included as essential traffic calming techniques on main thoroughfares in NU neighborhoods.

3) Installing proper lighting systems in NU neighborhoods, especially in public spaces, have to be stressed upon in NU and CNU design principles (see Figure 5.17). Also, a proper study has to be executed to identify the proper designs for street and pedestrian light poles to adequately light the different types of public spaces. Such study should also include the proper length and number of light poles in proportion to the public spaces that need to be lit, especially green areas and streets.



**Figure 5.17: Proper Lighting system in Public Spaces**  
(Image credit to author)

4) CNU principles have to shape and provide explicit design guidelines that support the safety of residents in NU neighborhoods that share the same circulation corridors with abandoned areas and/or brownfields. For example, NU principles can recommend locating the center and/or the mixed-uses in NU neighborhoods in close proximity to the abandoned areas and/or brownfields to improve pedestrian's safety at night. Also, CNU principles have to include minimum design guidelines for installing adequate lighting system along the edges of the abandoned areas and/or the brownfields.

5) New Urbanism Best Practices Guide and CNU principles have to include comprehensive design approaches that involve design recommendations to assist in developing brownfields into safe residential developments. These recommendations have to include a variety of design guidelines that can be applied to brownfields with different locations, sizes, shapes, and

development stages. It is also recommended to include design guidelines that support safety of residents through recommending different design scenarios that can be implemented in a timely manner in the case of developing the brownfields in phases into residential developments. In addition, NU is recommended to provide comprehensive design guidelines for each development phase of the redeveloping process of brownfields. Such design guidelines have to be based on maximizing the safety of residents.

6) Public spaces have to be surrounded by active uses, and/or active streets. The location of public spaces has to be studied in the early design stages to ensure the safety of its users. For example, public spaces are not recommended to be adjacent to under-developed and/or brownfields.

7) The safety of public transit users has to be emphasized in NU neighborhoods. CNU has to shape and include principles dedicated mainly for enhancing the safety of public transit users. NU has to include design guidelines that ensure the provision of safe routes to public transit stops and the provision of safe locations for public transit stops as well. Also, dry and safe shelters have to be provided in NU neighborhoods.

The following are some suggested design guidelines and policy considerations to support and enhance the safety considerations for LEED-ND Certification System:

1) Design guidelines that support the overall safety of the neighborhood have to be included as required criteria in LEED-ND neighborhood certification system. For example, residential infills have to be designed in a manner that ensures the safety of neighborhoods through selecting safe locations for potential residential developments that are located adjacent to exiting activities and away from brownfields, and/or under-developed areas.

2) Reducing the capacity of under-used parking spaces has to be recommended and awarded by the certification system to improve the overall safety of the neighborhood and to reduce non-paved surfaces. Reducing the parking footprint sub-category has to include required criterion that encourages the re-use of under-used parking areas. Also, the design guidelines in this sub-category could include several design options for re-using and designing under-used parking areas in order to equip the developers with a variety of design options that are geared towards enhancing the neighborhood's safety.

3) Smart Location and Linkage (SLL) category has to include required criteria that support minimizing risks from surrounding and/or on-site underused areas on residential developments. For example, sites that are surrounded with under-developed areas must meet certain design guidelines that ensure the safety of residents, such as requiring a minimum number of light poles along the peripheries of the under-developed areas in proportion to their total area.

4) The weighting system needs to put a greater emphasis on pedestrian safety. The provision of pedestrians' safety measures should be required in the Neighborhood Pattern and Design (NPD) category in order to gain LEED-ND certification. NPD category in the LEED-ND certification system has to put more emphasis on pedestrians' safety and not only emphasizing internal and external street connectivity, proportions of blank walls along streets, and accessibility to public transit hubs. For example, the provision of connected sidewalk network on both sides of the circulation networks of LEED-ND certified neighborhoods have to be included as a required design criterion under Walkable Streets sub-category and not an optional design intervention (see Figure 5.18). Another safety design guideline that must be required and not awarded by the certification system is the provision of crosswalks at intervals no greater than



800 feet (245 meters) along multi-way boulevards. Another optional criterion under the sub-category.



**Figure 5.18: Connected Network of Sidewalks**  
(Image credit to author)

5) Controlling speed limits along shared streets to protect bicyclists has to be mandated in the walkable street sub-category. This safety criterion has to change from an optional safety measure to a required criterion. Also, the certification has to require other biking safety measures to gain certification. For example, bike lanes/trails have to be located on safe terrains and away from dangerous slopes. Also, bike lanes/trails have to be connected and well maintained. In addition, shared streets have to provide biking safety signage that clearly indicates the start and the end of bike lanes.

6) Major thoroughfares that are part of the street network in LEED-ND certified neighborhoods have to include decent number of pedestrian safety measures, such as speed limit

signs, speed pumps, and brightly painted crossings. Also, these thoroughfares have to be located at intervals crosswalks that are in proportion to the length of the thoroughfares.

7) Developments of brownfield sites have to be emphasized and generously awarded by the LEED-ND certification system. For example, Brownfield Remediation sub-category in Smart Location and Linkage (SLL) category has to include additional number of points, at least 3 points.

8) Additional points have to be incorporated in the Neighborhood Pattern and Design (NPD) category in LEED-ND certification system to encourage brownfield developments.

9) Requiring an adequate number of street and pedestrian light poles along public spaces, including streets, and open green spaces should be required in Neighborhood Pattern and Design (NPD) category to enhance the safety of residents. Also, the provision of lighting systems along the edges of under-developed and/or brownfields that are adjacent to the housing units in neighborhoods seeking LEED-ND certification has to be required. The safety of the future residents in neighborhood seeking LEED-ND certification has to be a priority in the certification system, especially in neighborhoods that are in close proximity to abandoned areas and/or brownfields. NPD category have to require minimum number of street and/or pedestrian light poles along the peripheries of abandoned areas and brownfields that share the circulation corridors with the residential development that is seeking LEED-ND certification.

The following are some suggested design guidelines and policy considerations to support and enhance the comfort considerations for NU neighborhoods:

1) CNU has to include design guidelines that encourage the selection of residential developments locations within walking distance to daily needs and surrounding public services

2) CNU has to accentuate the importance of including mixed-uses in neighborhoods and also it has to provide design guidelines for optimizing the locations of such mixed-uses in neighborhoods. For example, complementing the principle of pedestrian shed with design scenarios that illustrate a range of different layout designs to help in maximizing accessibility to the center of the neighborhood.

3) Neighborhood design chapter in NU *Best Practices Guide* have to include a section that displays an array of noise treatments along residential streets in residential developments.

4) The inclusion of adequate block sizes to encourage walkability has to be emphasized upon in NU neighborhoods.

5) Installation of trash receptacles and recycling bins in public spaces has to be included in the design requirement of NU movement (see Figure 5.19).

6) Creating active green spaces in NU neighborhoods that provide diverse outdoors activities has to be emphasized upon. The provision of a variety of passive and active green spaces is recommended to ensure the comfort of residents (see Figure 5.20-21).



**Figure 5.19: Trash Respectable in Public Spaces**  
(Image credit to author)



**Figure 5.20: Playscape and Seating Area in Public Space**  
(Image credit to author)



**Figure 5.21: Gazebo in Public Space**  
(Image credit to author)

The following are some suggested design guidelines and policy considerations to support and enhance the comfort considerations for LEED-ND Certification System:

1) The LEED-ND certification system has to place great emphasize on the comfort of residents in terms of proximity to daily needs on foot. Smart Location and Linkage (SLL) category could include some prerequisites to ensure proximity to daily needs and thus improve QoL. For example, SLL category could include design guidelines that require infill developments to be within 10 minutes' walk from daily needs.

2) Neighborhood Pattern and Design (NPD) category could include a sub-category dedicated for noise reduction to ensure the comfort of residents. Such a sub-category could include options that unfold diverse noise treatments. The treatments could include different types of noise buffers according to the noise sources, such as nearby railroads, heavy traffic on

residential thoroughfares, etc. Such design guidelines could be either required or awarded with more than 1 point to encourage developers to adopt such treatments.

3) Neighborhood Pattern and Design (NPD) category has to include design guidelines that accentuate the comfort of the residents when walking around their neighborhood. For example, both Walkable Streets and Compact Development sub-category could include required design guidelines that support having short blocks in neighborhoods.

4) LEED-ND neighborhoods should include design guidelines that improve the legibility of residential developments. For example, developers could be awarded extra points for creating clear neighborhood center and edge. Also, installation of way-finding signage could be awarded by the certification system.

5) Universal design requirements for sidewalks should be included in the certification system. Access to civic and public space sub-category should include design guidelines that require developers to create accessible public spaces and sidewalks to comfortably accommodate different physical abilities and needs.

6) Walkable Streets sub-category should include required design guidelines that mandates developers to include comfortable sidewalks along under-developed areas or to reduce speed limits and adopt more pedestrian safety measures along shared streets.

7) The certification system is recommended to include an additional category that involves required and optional design guidelines that ensures and improves the comfort of pedestrians. For example, installing closely spaced tree linings along sidewalks is recommended to be required under walkable streets sub-category or at least to be rewarded by the certification system (see Figure 5.22).



8) Installing trash receptacles in public spaces has to be awarded in the certification system. Neighborhood Pattern and Design (NPD) category could include a sub-category that highlights some recommended design guidelines that ensure the overall cleanliness of the neighborhood.

9) It is important to include design guidelines that ensure a comfort of seniors in neighborhoods, such as, installing proper way-finding systems to help them navigate easily in their neighborhoods. Ensure the presence of comfortable street furniture, such as benches and tree canopies to provide a comfortable walking experience for them.



**Figure 5.22: Tree Linings along Sidewalks**  
(Image credit to author)

The following are some suggested design guidelines and policy considerations to support and enhance connectivity considerations for NU neighborhoods:

1) It is recommended to adopt regularly shaped layouts to enhance the residents' connectivity and accessibility to various on-site destinations. Irregular shaped layouts might result in weakening the connection between some residential units and the rest of the neighborhood.

2) Developers who intend to adopt NU principles are recommended to select sites for residential developments within a walking distance from services that offer daily needs. Incentives and tax exemptions could be offered to developers to encourage developing sites that are in close proximity to adjacent mixed-uses.

3) Mixed uses included in neighborhoods have to be located in the center of the neighborhood and within a ¼-mile from all residential units to allow for equal and easy access for all residents.

4) Incentives and tax exemptions can be offered to developers when they select sites within ¼ of mile from a public school.

5) Proximity to public transit has to be encouraged in NU neighborhoods. Also, NU neighborhoods have to provide adequate number of dry shelters and locations in proportion to the neighborhood's population density and in accordance to the residents' socio-economic background.

6) Shaping design guidelines for encouraging shorter trips and more travel by transit, and ridesharing is important to include in the CNU documents.

The following are some suggested design guidelines and policy considerations to support and enhance connectivity considerations for LEED-ND Certification System:



1) Smart Location and Linkage (SLL) category in LEED-ND certification has to include required guidelines that accentuate the importance of selecting sites that are in close proximity to public and private services that offer everyday needs.

2) Each of the site selection options included in the Smart Location sub-category has to require residential projects to be within a ¼-mile from services that offer everyday needs. Also, daily and weekly needs have to be identified, categorized and prioritized according to the importance of these services to the different population types with different socio-economic status.

3) Additional points and credits could be incorporated in LEED-ND certification system, especially in Smart Location and Linkage (SLL) category, to encourage developers to select locations adjacent to adjacent mixed-uses.

4) Smart Location and Linkage (SLL) category should be revised to achieve a balance between environmental sustainability and the residents' needs in terms of services.

5) Additional points can be incorporated in the Bicycle Facilities sub-category under Smart Location and Linkage (SLL) category, to encourage developers to select locations near to existing or future bicycle network.

The following are some suggested design guidelines and policy considerations to support and enhance place-making and sense of belonging considerations for NU neighborhoods:

1) NU best practices guide can include a section that unfolds all of the appropriate and needed outdoors activities for residential developments. Also, the activities proposed in public spaces have to reflect the needs of residents based on their age and their socio-economic status.

2) The inclusion of community gardens or any sort of community agriculture has to be accentuated upon in the residential neighborhoods because they serve as stages that improve socialization and improve sense of place.

3) The provision of diverse housing types has to be included in NU neighborhoods.

4) Visual and physical connections to nearby historically significant places and/or buildings have to be highlighted in NU principles. For example, the residential section in NU *Best Practices Guide* can include a section that specifically tackles the issue of historic preservation and suggest design techniques.

5) CNU is recommended to encourage developers to provide affordable housing units in NU neighborhoods.

6) The center of NU neighborhood has to be clear and accessible. Also, the center of the neighborhood has to function as the main stage for social gatherings in the neighborhood and it also has to reflect the local character.

7) Design interventions other than the Transect is recommended to accentuate the design of the edge of NU neighborhoods. The transition from the urban public realm in the center of the neighborhood to the suburban edge was not successful enough to create clear neighborhood edge.

8) The functional and psychological needs of the future residents, especially minorities, have to be addressed.

The following are some suggested design guidelines and policy considerations to support and enhance place-making and sense of belonging considerations for LEED-ND Certification System:

- 1) Increasing the points allocated to the affordable housing credit in Housing Types and Affordability sub-category could encourage the provision of affordable housing.
- 2) Additional points could be awarded for affordable rental units to provide a community with greater income diversity.
- 3) The certification costs could be reduced or subsidized for projects that provide a significant number of affordable housing units.
- 4) The inclusion of community gardens or any sort of community agriculture has to be accentuated upon in the residential neighborhoods because they serve as stages that improve socialization and improve sense of place.
- 5) Universal design features for accessing public spaces have to be required design aspects in the certification system and not optional.
- 6) More points have to be rewarded to residential projects that include residential units with either outdoors and/or indoors universal design features. The options included in Visitability and Universal Design sub-category have to be reviewed to put an emphasis on creating communities where their residents can age gracefully. (see Figure 5.23)

The following are some suggested design guidelines and policy considerations to support and enhance aesthetics considerations for NU neighborhood:

- 1) It is recommended to include entrances to alleyways that do not exceed 12 feet in width to ensure the continuity of the residential street vistas and tree linings (see Figure 5.24).

2) It is also recommended to apply the needed visual treatments to alleyways to enhance the visual appeal of alleys.

3) CNU principles can include design principles that support visual appeal through recommending different types of visual treatments to block the visually undesirable areas/buildings. The design guidelines can include several types of places and buildings and the appropriate techniques to deal with such problem. For example, NU can shape a list of techniques that can be used as visual buffers for huge under-used parking spaces. They also can develop a list of recommended design techniques to visually treat abandoned buildings.

4) It is recommended to include design guidelines dedicated for developing brownfields into visually appealing residential neighborhoods. Such design guidelines can display different types of visual buffers to treat the brownfields. Also, the design recommendations can include different design scenarios that can be implemented in a timely manner in the case of developing the brownfields in phases into residential developments.

The following are some suggested design guidelines and policy considerations to support and enhance aesthetics considerations for LEED-ND Certification System:

1) Alleyways are recommended to not exceed 12 feet in width.

2) Visual appeal should be added as a sub-category in the certification system. Neighborhood Pattern and Design (NPD) category can include optional criteria that support the aesthetic quality of the neighborhood. For example, the certification system can award developers who provide adequate visual and physical buffers to block undesirable elements and/or areas/buildings.

3) Adopting a coherent design for street furniture and signage system is another design aspect that can be awarded by the system under Neighborhood Pattern and Design (NPD) category.

4) Neighborhood Pattern and Design (NPD) category can include design guidelines that emphasize the visual quality of the new residential developments on brownfields. It is recommended to include designated design guidelines that can be applied throughout the different developing phases of brownfields into residential developments to ensure the aesthetic quality of the new residential development.



**Figure 5.23: Condos with ADA Access**  
(Image credit to author)



**Figure 5.24: Narrow Entrance to Alleyway**  
(Image credit to author)

## CHAPTER 6

### CONCLUSIONS AND SUGGESTIONS

#### 6.1 Conclusions

As mentioned before, Quality of Life (QoL) mirrors social sustainability and thus fulfilling the needs for better QoL improves social sustainability. Based on the findings of this research study, New Urbanist (NU) and LEED-ND certified neighborhoods design guidelines need to be critically reconsidered to ensure that they fulfill the needs of the social dimension of sustainability.

Based on the analysis, NU neighborhood provided better QoL for its residents more than the LEED-ND certified neighborhood. NU neighborhoods succeeded in creating walkable, comfortable and visually neighborhoods. The major findings from the neighborhood scorecard were that NU greenfield neighborhood provided safer than the NU brownfield residential development and the LEED-ND certified neighborhood. Also, NU greenfield neighborhood earned more points than the other two neighborhoods in terms of the internal and external connectivity degree of the neighborhood. At the meantime, both NU neighborhoods provided more comfortable environments for their residents to live in more than the LEED-ND certified neighborhood. In terms of fulfilling the recommended design guidelines for place-making and aesthetic quality, again NU greenfield neighborhood had earned higher points than the other two neighborhoods.

The major findings from the survey were: Survey participants living in both NU neighborhoods were more satisfied with their QoL more than the participants living in the LEED-ND certified neighborhood. Also, respondents living in both NU neighborhoods perceived their neighborhoods as safer places to live in more than participants living in the

LEED-ND certified neighborhood. On the other hand, respondents living in NU brownfield development perceived their neighborhood as the least comfortable neighborhood among the three neighborhoods. In terms of the internal connectivity of the neighborhood, respondents living in NU greenfield neighborhood identified the internal connectivity of their neighborhood as the highest compared to the other two neighborhoods.

The perception of the internal connectivity perception was the lowest amongst respondents living in the LEED-ND certified neighborhood. Respondents living in the LEED-ND certified neighborhood had the highest mean in terms of their perceptions of sense of belonging, while respondents living in NU brownfield neighborhood had the lowest mean under the same category. The perception of the aesthetic quality of the neighborhood was the highest among respondents living in NU greenfield neighborhood. On the other hand, the perception of aesthetic quality of the neighborhood was the least among respondents living in NU brownfield neighborhood

**Neighborhood safety** is a crucial aspect to improve QoL. According to the qualitative analysis, the two NU neighborhoods, Cherry Hill Village (CHV) and Mason Run (MR), earned more points than the LEED-ND certified neighborhood. Based on the quantitative analysis, both NU neighborhoods were also identified by the survey participants as safer neighborhoods more than the LEED-ND certified neighborhood, Saint Luke (SL). The few neighborhood entries and fewer grey areas could be attributed to the safety features found in both NU neighborhoods. Accordingly, the lack of neighborhood safety in the LEED-ND neighborhood could be attributed to the inclusion of multiple entryways, and also to the huge grey areas that surround Saint Luke's Hospital. The design guidelines under reducing parking footprint sub-category in the certification system are all voluntary guidelines and are not required by the system. These guidelines focus on



reducing parking footprints for new residential and non-residential buildings and does not imply any design requirements or recommendations to reduce the area of the existing under-used parking spaces. In addition, the close of proximity of the abandoned buildings and under-developed lands to the residential units in the LEED-ND certified neighborhood could be also an additional reason that affected the overall perception of the safety of the neighborhood.

Despite the fact that both NU neighborhoods were perceived safer by the residents than the LEED-ND certified neighborhood, the NU brownfield neighborhood did not provide all the of the safety measures that are recommended for improving a neighborhood's safety from crime. As mentioned before in this study, the NU brownfield neighborhood was surrounded by brownfields and under-developed areas that were not appropriately lit and they also shared the same circulation corridors with the new residential units in NU brownfield neighborhood. Such hazardous and under-used areas could attract unwanted visitors and could also affect the QoL of the residents. Accordingly, NU has to shape design guidelines that ensure the safety of the neighborhood.

In terms of **pedestrian safety from traffic**, the NU brownfield neighborhood, MR neighborhood, was also identified as the least safe neighborhood among the three neighborhoods. Also, the quantitative analysis revealed that all of the survey participants living in MR neighborhood reported the need for more pedestrians' safety measures in their neighborhoods to improve their QoL. According to the qualitative analysis, the three neighborhoods lacked the provision of speed pumps, and brightly painted crosswalks especially on main thoroughfares that were four lanes wide. The NU brownfield neighborhood and the LEED-ND certified neighborhood lacked the provision of a decent number of speed limit signs along the residential streets. In order to encourage walkability, pedestrians' safety has to be a design priority

complemented with some other design techniques to encourage walking and safety of pedestrians.

Based on the analyses of this study, it is not enough to depend primarily on the speed limit signs, two-way narrow streets, on-street parking, and shallow front yards to control the speed of vehicular movements on main thoroughfares. In addition, pedestrians' safety measures have to be considered not only along the residential streets within the limits of a neighborhoods, but they also have to be applied on the streets surrounding the neighborhoods to enhance the safety of its residents when crossing the streets to reach nearby destinations and public services. According to the qualitative analysis, the three neighborhoods did not offer safe crossings to their residents on major thoroughfares that surround their neighborhoods. Enhancing pedestrians' safety along the immediate adjacent streets will not only result in improving walkability but will also enhance connectivity with the surrounding public services.

In terms of **pedestrian safety at night**, the LEED-ND certified neighborhood earned the least number of points in the neighborhood scorecard in comparison to the NU neighborhoods. This lack of safety at night could be attributed to the lack of required criteria and design guidelines in LEED-ND certification, especially in Neighborhood Pattern and Design (NPD) category to enhance the safety of residents at night. For example, NPD category includes prerequisites that place great emphasis on the density of street intersections, internal and external connectivity of streets, building density, functional entries to buildings and public spaces, building to street ratios, and minimizing blank walls along residential streets, and do not place emphasize on pedestrian safety at night. Simultaneously, other crucial design guidelines that are included in the NPD category for encouraging walkability and ensuring pedestrians' safety are optional and not required to gain the certification. For example, on-street parking, continuous

sidewalks on both of sides of the entire circulation network within the neighborhood, and slow speed limits within the neighborhood are all optional credits under NPD category.

Respondents living in the NU greenfield neighborhood, Cherry Hill Village (CHV), identified the provision of adequate lighting system as an essential service to improve their QoL. According to the qualitative analysis, the residential streets in CHV neighborhood mostly depended on the mandatory lighting along porches and balconies for night lighting. Accordingly, it is important to enhance the safety of pedestrians and public space users at night through installing an adequate lighting system throughout the neighborhood. The inadequate lighting system along the under-developed areas and the brownfields in NU brownfield neighborhood had also resulted in reducing the safety perception among its residents at night.

Respondents living in LEED-ND certified neighborhood also reported that they did not feel safe when walking around their neighborhood at night due to the lack of adequate lighting along the on-site under-developed areas and because of the on-premise abandoned buildings as well. The LEED-ND certification system does not include any design criterion that involves the safety of pedestrians at night. Accordingly, LEED-ND certification system is recommended to include required design guidelines regarding the lighting system along the public spaces in LEED-ND certified neighborhoods to improve safety at night and thus encourage walking.

**The safety of public spaces** is also considered important crucial aspect to improve the QoL in neighborhoods. Based on the analysis of this study, respondents living in NU brownfield neighborhood, Mason Run (MR) indicated that they did not feel safe when visiting public spaces during the day. Also, based on the neighborhood scorecard, MR neighborhood earned the least number of points in comparison to the other two neighborhoods in terms of safety of public spaces during the day. MR did not provide diversity of outdoors activities in the open green

spaces and the green spaces in MR neighborhood were mainly passive greens with playgrounds. Also, according to the neighborhood scorecard, most of the public spaces in MR neighborhood were surrounded by brownfields and under-developed areas, which could have affected the safety perceptions of such public spaces.

Simultaneously, respondents living in both NU neighborhoods indicated that they did not feel safe visiting the open public spaces in their neighborhoods at night. According to the qualitative analysis NU greenfield neighborhood, Cherry Hill Village (CHV) neighborhood provided adequate number of diverse outdoors activities in its public spaces and also adopted some design techniques to enhance natural surveillance in all of its open spaces. CHV failed to provide adequate lighting in its public spaces. On the other hand, MR neighborhood provided adequate lighting in the open green spaces but failed to provide natural surveillance along in its public spaces and failed to provide adequate number of outdoors activities. Accordingly, providing adequate lighting, diverse outdoors activities, and design techniques to encourage natural surveillance are crucial to improve the safety of residents in public spaces.

In terms of the **public transit safety**, both NU neighborhoods scored the least number of points in the neighborhood scorecard, while the LEED-ND certified neighborhood had scored the highest number of points under the same safety category. According to the neighborhood scorecard, both NU neighborhoods lacked the provision of safe routes to public transit stations, and also lacked the provision of safe public transit shelters. Thus, NU neighborhoods have to include design guidelines that ensure the safety of public transit users. Based on the respondent's perceptions of safety when using public transit services, respondents living in NU greenfield neighborhood, Cherry Hill Village (CHV), felt the safest when using public transit stops, while

respondents living in NU brownfield neighborhood, Mason Run (MR), felt the least safe when using public transit services.

In terms of **biking safety**, the LEED-ND certified neighborhood was the least safe in terms of biking safety according to the neighborhood scorecard. Meanwhile, respondents living in the LEED-ND certified neighborhood reported that their neighborhood included decent amount of biking safety measures. Both NU neighborhoods earned higher points than the LEED-ND certified neighborhood in terms of biking safety, simultaneously, both NU neighborhoods did not provide all of the recommended safety measures for biking, such as biking safety signage. The LEED-ND certified neighborhood also did not provide all the recommended safety measures for biking. this neighborhood did not provide connected and well-maintained bike lanes, at the meantime, it provided biking safety signage along major thoroughfares.

Neighborhood Pattern and design (NPD) category in LEED-ND certification includes a handful of optional design criteria to protect cyclists from vehicular movement, and it is mostly about controlling speed limits along residential streets. The certification rating systems lacks immensely the provision of required guidelines to protect cyclists from moving traffic.

**Neighborhood comfort** was also assessed in this research study. According to the neighborhood scorecard, NU brownfield development, Mason Run (MR) was identified as the least comfortable neighborhood, while NU greenfield development, Cherry Hill Village (CHV) was identified as the most comfortable neighborhood. MR neighborhood failed to provide most of the recommended design guidelines for creating comfortable neighborhoods. MR neighborhood failed to provide adequate noise buffer from the nearby railroad, and it also failed to provide a legible layout. MR neighborhood did not have adequate way finding signage, clear edge, small blocks, and most importantly it did not provide adequate access to nearby public

services or daily needs. As for CHV neighborhood, it also did not provide adequate access to nearby public services or daily needs. In addition, the size of the residential blocks in CHV neighborhood surpassed the recommended size for comfortable walking experience.

New Urbanists call for encouraging walkable neighborhoods through locating within a 10 minutes walking distance from daily needs, but based on the qualitative and quantitative analyses, residents living in both NU neighborhoods relied mostly on cars to get their daily needs. As mentioned before in Chapter IV, CHV neighborhood included a mixed-use building, the Village Center, but the location of this mixed-used building on the edge of the neighborhood made the Village Center less accessible to residents on foot. According to the survey results, all respondents living in CHV indicated that they used their cars to get to their daily needs. They also reported that proximity to services that offer everyday needs is an essential aspect to improve their QoL. Although CHV neighborhood included mixed uses, the irregular shape of the layout design of NU and the location of the Village Center on the periphery of the neighborhood and not in the center might have affected accessibility to the Village Centre on foot. On the other hand, MR neighborhood did not provide any type of mixed uses and the neighborhood was not located within the recommended ¼-mile distance from services that offered daily needs.

The LEED-ND certified neighborhood failed to provide clear neighborhood edge, buffers to reduce traffic noise, and also it did not provide adequate access to daily needs. NU movement did not place enough emphasize on the need for noise buffers, simultaneously; LEED-ND certification system did not include any design guideline that support such need. On the other hand, the NU and LEED-ND certification system provided an adequate emphasize on the recommended design guidelines for comfortable building and population densities in residential neighborhoods.

In terms of **pedestrian comfort**, the LEED-ND certified neighborhood had earned the least number of points for this category according to the neighborhood scorecard. On the other hand, both NU greenfield and brownfield neighborhoods provided most of the recommended design guidelines for creating comfortable walking experiences for their residents. This finding was also verified by the resident's input, since residents living in both NU neighborhoods indicated that their pedestrian comfort level was higher than those living in the LEED-ND certified neighborhood. The two NU neighborhoods provided most of the recommended guidelines for creating comfortable walking experience except for the provision of short blocks.

The LEED-ND certified neighborhood lacked the provision of continuous and shaded sidewalks, short blocks, and also the sidewalks were not adequately designed to accommodate different physical abilities. LEED-ND certification system does not mandate developers to include universally design residential units. The certification system awards developers with only one point when they include universal design features throughout the home. Also, the certification system does not imply any requirements for ensuring designing sidewalks and public spaces that are accessible by different physical abilities.

In terms of **comfortable public spaces**, based on the scores in the neighborhood scorecard, the NU brownfield neighborhood, Mason Run (MR), scored the least number of points in terms of comfortable public spaces. MR provided mostly passive green spaces that did not include adequate street furniture or diverse outdoors activities. At the meantime, both MR and the LEED-ND certified neighborhood failed to provide adequate number of trash receptacles in public spaces to ensure the cleanings of the public spaces. On the other hand, the NU greenfield neighborhood, Cherry Hill Village (CHV), succeeded in providing comfortable public spaces.

In terms of **comfort of public transit**, the LEED-ND neighborhood had earned the highest number of points under this category in comparison to the other two NU neighborhoods. Based on the neighborhood scorecard, both NU neighborhoods did not offer adequate number of public transit shelters or stops, whilst they both offered comfortable routes to public transit stops. In terms of the survey responses, participants living in NU brownfield neighborhood perceived the use of public transit in their neighborhood as the least comfortable in comparison to the other two neighborhoods.

In terms of **comfort of biking comfort**, both NU neighborhoods, Cherry Hill Village (CHV) and Mason Run (MR), had earned higher number of points under this category in comparison to the LEED-ND certified neighborhood. Based on the neighborhood scorecard, LEED-ND certified neighborhood did not offer adequate network of bike lanes or well-maintained bike lanes. In terms of the survey responses, participants living in the LEED-ND neighborhood perceived their biking experience as the most comfortable in comparison to the NU neighborhoods.

In terms of **internal and external connectivity**, the LEED-ND neighborhood earned the least number of points in terms of internal connectivity, simultaneously it earned the highest number of points in terms of external connectivity. Both NU neighborhoods earned the same number of points in terms of internal and external connectivity. Despite the fact that both NU and LEED-ND certification system encourage walkability, the majority of respondents use their cars to get to their daily needs. Based on the survey responses, respondents living in both NU and the LEED-ND certified neighborhoods reported that they use their cars to reach five of the most visited services during the week, which were: grocery store, pharmacy, restaurants, bank, and medical clinics. Accordingly, NU movement and LEED-ND certification system



neighborhoods have to include design guidelines that support the proximity of neighborhoods to such services to improve their residents' QoL.

In terms of accessibility to public schools, based on the qualitative and quantitative analyses, both NU neighborhoods were not located within the recommended 10 minutes' walk from public schools. In contrast, the LEED-ND certified neighborhood was located within the recommended walking distance to public schools. Also, most the respondents living in both NU neighborhoods indicated that their children go to school by the school bus or by car, and none of the respondents indicated that their children walked to their schools.

In terms of **place-making and sense of belonging**, the Victorian Architecture succeeded in creating a unique sense of place and belonging among their residents in all of the three neighborhoods. The historically preserved building in the LEED-ND certified neighborhood had also helped in creating a unique sense of place among its residents. The affordable housing units in the LEED-ND certified neighborhood also played a role in creating an equitable neighborhood that included diverse population with different socio-economic backgrounds. On the other hand, the NU greenfield neighborhood, Cherry Hill Village (CHV) failed to provide any visual or physical connection to the adjacent significant historical buildings. Furthermore, both NU neighborhoods failed to provide affordable housing units. The NU brownfield neighborhood, Mason Run (MR) failed to provide active outdoors venues to encourage socialization and thus enhancing the sense of community. Whilst, the NU greenfield and the LEED-ND certified neighborhoods succeeded in providing adequate public spaces for attracting residents of different ages and physical abilities.

In terms of **aesthetic quality**, according to the quantitative analysis, the perception of the aesthetic quality was the highest among respondents living in the NU greenfield neighborhood, Cherry Hill Village (CHV) neighborhood. On the other hand, the perception of aesthetic quality of the neighborhood was the least among respondents living in the NU brownfield neighborhood, Mason Run (MR). The results in the neighborhood scorecard also verified this finding, since MR had earned the least number of points in terms of aesthetic quality. This could be attributed to a lot of reasons. Based on the neighborhood scorecard, MR neighborhood lacked the provision of adequate visual buffers to the on-site brownfields, coherent signage and street furniture, hierarchy of public spaces, diverse housing types and ages, and diverse land uses.

CHV neighborhood succeeded in providing most of the recommended design guidelines in the neighborhood scorecard, such as the provision of coherent streetscape and signage system, diverse lots sizes and building types, landmarks, mixed-uses, and adequate visual buffers. CHV neighborhood failed to provide adequate aesthetic treatment for the parking space around the Village Center, and also failed to provide various housing ages.

The abandoned buildings and the under-developed areas in the LEED-ND certified neighborhood, Saint Luke (SL), negatively affected the visual appeal of the neighborhood. Also, the huge area of the under-used parking that surround the historical building of Saint Luke's hospital affected the visual interest of the neighborhood. The LEED-ND certification system does not require developers to visually treat on-site abandoned areas and/or buildings. Also, the certification system lacks design guidelines that support visual interest.

**In summary**, NU principles and design guidelines put more emphasize on esthetic quality and internal connectivity and less emphasize on external connectivity, site selection and affordability. In addition, despite the fact that NU encourages walkability, the two selected NU

neighborhoods in this research study showed that public green spaces were the only accessible public spaces on foot, and the other daily services were not within the recommended walking distance. All participants living in both NU neighborhoods used their cars to go to most of their needed services. In addition, all of the participants living in the NU neighborhoods indicated that they do not use public transit since their neighborhoods did not offer on-site public transit facilities. In terms of the provision of affordable housing, the selected NU neighborhoods did not include affordable units.

LEED-ND certification emphasized and mandated many design guidelines that ensure the internal and external connectivity of LEED-ND certified neighborhoods. LEED-ND certification lacks emphasis on other design guidelines that support better QoL. For example, USGBC's Neighborhood Pattern and Design (NPD) category in the certification system did not provide enough required design guidelines that ensure the safety of pedestrians or bicyclists. Also, requirements for night safety in public spaces in LEED-ND certified neighborhoods were not included under the same category.

In terms of connectivity, LEED-ND certification system succeeded in fulfilling this criterion. The certification system included an appropriate number of recommended design guidelines to enhance the internal and external connectivity of neighborhoods, such as requiring certain numbers of intersection densities per square mile, and also, requiring proximity to existing and/or future public transit hubs. Finally, the neighborhood's visual appeal has to be supported in LEED-ND certification system. The certification system does not include enough design guidelines that improve place identity or the aesthetic quality of neighborhoods.

## 6.2 Suggestions for Future Studies

The findings of this research study clearly reveal the need for further investigating the physical dimensions of QoL in neighborhoods. This study provided a base for identifying the essential physical characteristics of an urban form to improve QoL in neighborhoods. Thus, it is recommended to further investigate the five dimensions of QoL suggested in this study, namely safety, comfort, connectivity, place making, and aesthetic quality from the lens of interior design as well. It is recommended to have a future study that analyzes the impact of both the urban form of NU and LEED-ND certified neighborhoods and the interior designs of their residential units to adequately understand and identify the needs of the residents to improve their QoL.

This research study implemented the neighborhood scorecard as a suggested qualitative tool to assess the QoL in neighborhoods and it is recommended to further investigate other qualitative tools to complement the neighborhood scorecard to adequately assess QoL in neighborhoods. Also, further study is needed to categorize and prioritize each design guideline that is included in the neighborhood scorecard to appropriately weight each design guideline. This research study assumed that all the design guidelines in the neighborhood scorecard are equal in importance. Accordingly, an in-depth study is needed to weight the design guidelines included in the neighborhood scorecard according to their importance and need.

To enhance the qualitative approach when assessing QoL in neighborhoods, it is recommended to include interviews with the developers of the selected neighborhoods in the research study. To improve the quantitative approach, it is recommended to include more than three case studies, to recruit a high number of participants. Also, it is recommended to examine case studies with similar socio-economic background to appropriately assess their physical needs and preferences. As mentioned earlier, this research study focused primarily on studying QoL in

neighborhoods in the Midwest area in the USA, thus studying NU and LEED-ND certified neighborhoods in other areas in the USA can possibly add more insights regarding improving QoL in neighborhoods and also can possibly further polish the principles and design guidelines in NU movement and LEED-ND certification system.

### 6.3 Limitations of the Study

This research study has a few limitations that should be considered. Studies have revealed that there are significant variations in life satisfaction among different countries and among different regions of the same country (Diener et al., 1995; Muse et al., 2006). This research focused on assessing the QoL in the United States and focused primarily on studying QoL in neighborhoods in the Midwest area. The research specifically focused on studying neighborhoods in the East North Central Region, which is defined by the Census Bureau as these 5 states: Illinois, Indiana, Michigan, Ohio, and Wisconsin. The East North Central States typically share the same geographical features, weather characteristics, and socio-economic characteristics. Accordingly, the recommendations included in this research study were shaped to improve the designs of the residential developments located in the Midwest region and might not be applicable to other neighborhoods that do not share the same geographical, climatic, economical, and cultural characteristics of the neighborhoods in the Midwest region.

Also, due to the heterogeneous distribution of LEED-ND certified projects across the United States and due to the scarcity of LEED-ND certified projects in the Midwest, SL neighborhood in OH was the selected as a convenient case study for this particular research study. Also, this research study included CHV and MR neighborhoods due to the scarcity of New Urbanism neighborhood projects in the Midwest.

In addition, this research study focused only on assessing QoL in neighborhoods through the urban form lens. This study focused primarily on the physical characterizes of the streetscapes and the configurations of the blocks, and street networks. This study did not include in depth architectural studies and did not include any analysis regarding the impact of the designs of the interiors of the first floors of the residential units and QoL. Accordingly, the quantitate analysis and the recommendations included in this study should be carefully considered.

## APPENDICES

## APPENDIX A:

### Neighborhood Design Principles and Statistical Analysis



**Table A.1: CNU Principles for the Different Development Scales of a Given Metropolis**

| <b>The Metropolis, City, and Town Scale</b>           |                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Principle #                                           |                                                                                                                                                                                                                                                                                                                                                                        |
| 1.                                                    | Metropolitan regions are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks, and river basins. The metropolis is made of multiple centers that are cities, towns, and villages, each with its own identifiable center and edges.                                                                      |
| 2.                                                    | The metropolitan region is a fundamental economic unit of the contemporary world. Governmental cooperation, public policy, physical planning, and economic strategies must reflect this new reality.                                                                                                                                                                   |
| 3.                                                    | The metropolis has a necessary and fragile relationship to its agrarian hinterland and natural landscapes. The relationship is environmental, economic, and cultural. Farmland and nature are as important to the metropolis as the garden is to the house.                                                                                                            |
| 4.                                                    | Development patterns should not blur or eradicate the edges of the metropolis. Infill development within existing urban areas conserves environmental resources, economic investment, and social fabric, while reclaiming marginal and abandoned areas. Metropolitan regions should develop strategies to encourage such infill development over peripheral expansion. |
| 5.                                                    | Where appropriate, new development contiguous to urban boundaries should be organized as neighborhoods and districts, and be integrated with the existing urban pattern. Non-contiguous development should be organized as towns and villages with their own urban edges, and planned for a jobs/housing balance, not as bedroom suburbs.                              |
| 6.                                                    | The development and redevelopment of towns and cities should respect historical patterns, precedents, and boundaries.                                                                                                                                                                                                                                                  |
| 7.                                                    | Cities and towns should bring into proximity a broad spectrum of public and private uses to support a regional economy that benefits people of all incomes. Affordable housing should be distributed throughout the region to match job opportunities and to avoid concentrations of poverty.                                                                          |
| 8.                                                    | A framework of transportation alternatives should support the physical organization of the region. Transit, pedestrian, and bicycle systems should maximize access and mobility throughout the region while reducing dependence upon the automobile.                                                                                                                   |
| 9.                                                    | Revenues and resources can be shared more cooperatively among the municipalities and centers within regions to avoid destructive competition for tax base and to promote rational coordination of transportation, recreation, public services, housing, and community institutions.                                                                                    |
| <b>The Neighborhood, District, and Corridor Scale</b> |                                                                                                                                                                                                                                                                                                                                                                        |
| Principle #                                           |                                                                                                                                                                                                                                                                                                                                                                        |
| 10.                                                   | The neighborhood, the district, and the corridor are the essential elements of development and redevelopment in the metropolis. They form identifiable areas that encourage citizens to take responsibility for their maintenance and evolution                                                                                                                        |
| 11.                                                   | Neighborhoods should be compact, pedestrian friendly, and mixed-use. Districts generally emphasize a special single-use, and should follow the principles of the neighborhood, the district, and the corridor are the essential elements of development and redevelopment in the metropolis.                                                                           |

**Table A.1 (cont'd)**

|                                              |                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12.                                          | Neighborhoods should be compact, pedestrian friendly, and mixed-use. Districts generally emphasize a special single-use, and should follow the principles of neighborhood design when possible. Corridors are regional connectors of neighborhoods and districts; they range from boulevards and rail lines to rivers and parkways. |
| 13.                                          | Many activities of daily living should occur within walking distance, allowing independence to those who do not drive, especially the elderly and the young. Interconnected networks of streets should be designed to encourage walking, reduce the number and length of automobile trips, and conserve energy.                     |
| 14.                                          | Within neighborhoods, a broad range of housing types and price levels can bring people of diverse ages, races, and incomes into daily interaction, strengthening the personal and civic bonds essential to an authentic community.                                                                                                  |
| 15.                                          | Transit corridors, when properly planned and coordinated, can help organize metropolitan structure and revitalize urban centers. In contrast, highway corridors should not displace investment from existing centers.                                                                                                               |
| 16.                                          | Appropriate building densities and land uses should be within walking distance of transit stops, permitting public transit to become a viable alternative to the automobile.                                                                                                                                                        |
| 17.                                          | Concentrations of civic, institutional, and commercial activity should be embedded in neighborhoods and districts, not isolated in remote, single-use complexes.                                                                                                                                                                    |
| 18.                                          | The economic health and harmonious evolution of neighborhoods, districts, and corridors can be improved through graphic urban design codes that serve as predictable guides for change.                                                                                                                                             |
| 19.                                          | A range of parks, from tot-lots and village greens to ball fields and community gardens, should be distributed within neighborhoods. Conservation areas and open lands should be used.                                                                                                                                              |
| 20.                                          | A primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use.                                                                                                                                                                                      |
| <b>The Block, Street, and Building Scale</b> |                                                                                                                                                                                                                                                                                                                                     |
| <b>Principle #</b>                           |                                                                                                                                                                                                                                                                                                                                     |
| 21.                                          | Individual architectural projects should be seamlessly linked to their surroundings. This issue transcends style.                                                                                                                                                                                                                   |
| 22.                                          | The revitalization of urban places depends on safety and security. The design of streets and buildings should reinforce safe environments, but not at the expense of accessibility and openness.                                                                                                                                    |
| 23.                                          | In the contemporary metropolis, development must adequately accommodate automobiles. It should do so in ways that respect the pedestrian and the form of public space.                                                                                                                                                              |
| 24.                                          | Streets and squares should be safe, comfortable, and interesting to the pedestrian.                                                                                                                                                                                                                                                 |
| 25.                                          | Architecture and landscape design should grow from local climate, topography, history, and building practice.                                                                                                                                                                                                                       |
| 26.                                          | Civic buildings and public gathering places require important sites to reinforce community identity and the culture of democracy. They deserve distinctive form, because their role is different from that of other buildings and places that constitute the fabric of the city.                                                    |

**Table A.1 (cont'd)**

|     |                                                                                                                                                                                                 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 27. | All buildings should provide their inhabitants with a clear sense of location, weather and time. Natural methods of heating and cooling can be more resource-efficient than mechanical systems. |
| 28. | Preservation and renewal of historic buildings, districts, and landscapes affirm the continuity and evolution of urban society.                                                                 |

(Adapted from CNU Database)

**Table A.2:LEED for Neighborhood Development (v4) Project Check List**

| <b>Smart Location &amp; Linkage</b>         |                                                                           | <b>Possible Points: 28</b> |
|---------------------------------------------|---------------------------------------------------------------------------|----------------------------|
| Prereq                                      | Smart Location                                                            | Required                   |
| Prereq                                      | Imperiled Species and Ecological Communities                              | Required                   |
| Prereq                                      | Wetland and Water Body Conservation                                       | Required                   |
| Prereq                                      | Agricultural Land Conservation                                            | Required                   |
| Prereq                                      | Floodplain Avoidance                                                      | Required                   |
| Credit                                      | Preferred Locations                                                       | 10                         |
| Credit                                      | Brownfield Remediation                                                    | 2                          |
| Credit                                      | Access to Quality Transit                                                 | 7                          |
| Credit                                      | Bicycle Facilities                                                        | 2                          |
| Credit                                      | Housing and Jobs Proximity                                                | 3                          |
| Credit                                      | Steep Slope Protection                                                    | 1                          |
| Credit                                      | Site Design for Habitat or Wetland and Water Body Conservation            | 1                          |
| Credit                                      | Restoration of Habitat or Wetlands and Water Bodies                       | 1                          |
| Credit                                      | Long-Term Conservation Management of Habitat or Wetlands and Water Bodies | 1                          |
| <b>Neighborhood Pattern &amp; Design</b>    |                                                                           | <b>Possible Points: 41</b> |
| Prereq                                      | Walkable Streets                                                          | Required                   |
| Prereq                                      | Compact Development                                                       | Required                   |
| Prereq                                      | Connected and Open Community                                              | Required                   |
| Credit                                      | Walkable Streets                                                          | 9                          |
| Credit                                      | Compact Development                                                       | 6                          |
| Credit                                      | Mixed-Use Neighborhoods                                                   | 4                          |
| Credit                                      | Housing Types and Affordability                                           | 7                          |
| Credit                                      | Reduced Parking Footprint                                                 | 1                          |
| Credit                                      | Connected and Open Community                                              | 2                          |
| Credit                                      | Transit Facilities                                                        | 1                          |
| Credit                                      | Transportation Demand Management                                          | 2                          |
| Credit                                      | Access to Civic & Public Space                                            | 1                          |
| Credit                                      | Access to Recreation Facilities                                           | 1                          |
| Credit                                      | Visitability and Universal Design                                         | 1                          |
| Credit                                      | Community Outreach and Involvement                                        | 2                          |
| Credit                                      | Local Food Production                                                     | 1                          |
| Credit                                      | Tree-Lined and Shaded Streetscapes                                        | 2                          |
| Credit                                      | Neighborhood Schools                                                      | 1                          |
| <b>Green Infrastructure &amp; Buildings</b> |                                                                           | <b>Possible Points: 31</b> |
| Prereq                                      | Certified Green Building                                                  | Required                   |
| Prereq                                      | Minimum Building Energy Performance                                       | Required                   |
| Prereq                                      | Indoor Water Use Reduction                                                | Required                   |
| Prereq                                      | Construction Activity Pollution Prevention                                | Required                   |
| Credit                                      | Certified Green Buildings                                                 | 5                          |
| Credit                                      | Optimize Building Energy Performance                                      | 2                          |

**Table A.2 (cont'd)**

|                                        |                                                          |                           |
|----------------------------------------|----------------------------------------------------------|---------------------------|
| Credit                                 | <b>Indoor Water Use Reduction</b>                        | <b>1</b>                  |
| Credit                                 | Outdoor Water Use Reduction                              | 2                         |
| Credit                                 | Building Reuse                                           | 1                         |
| Credit                                 | <b>Historic Resource Preservation and Adaptive Reuse</b> | <b>2</b>                  |
| Credit                                 | Minimized Site Disturbance                               | 1                         |
| Credit                                 | Rainwater Management                                     | 4                         |
| Credit                                 | Heat Island Reduction                                    | 1                         |
| Credit                                 | Solar Orientation                                        | 1                         |
| Credit                                 | Renewable Energy Production                              | 3                         |
| Credit                                 | District Heating and Cooling                             | 2                         |
| Credit                                 | Infrastructure Energy Efficiency                         | 1                         |
| Credit                                 | Wastewater Management                                    | 2                         |
| Credit                                 | Recycled and Reused Infrastructure                       | 1                         |
| Credit                                 | Solid Waste Management                                   | 1                         |
| Credit                                 | Light Pollution Reduction                                | 1                         |
| <b>Innovation &amp; Process Design</b> |                                                          | <b>Possible Points: 6</b> |
| Credit                                 | Innovation                                               | 5                         |
| Credit                                 | LEED Accredited Professional                             | 1                         |
| <b>Regional Priority</b>               |                                                          | <b>Possible Points: 4</b> |
| Credit                                 | Regional Priority                                        | 1                         |
| Credit                                 | Regional Priority                                        | 1                         |
| Credit                                 | Regional Priority                                        | 1                         |
| Credit                                 | Regional Priority                                        | 1                         |

(Adapted from LEED-ND Project Database)

**Table A.3: Multiple Regression Models for Explaining Residents' Perceptions of Safety in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Perception of neighborhood safety from crime                    |              |       |          |           |
|-----------------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.590        | 0.781 |          | 0.502     |
| Few entryways                                                   | 0.213        | 0.118 | 0.075    |           |
| Active nodes                                                    | 0.109        | 0.117 | 0.356    |           |
| Active street fronts                                            | 0.228        | 0.169 | 0.183    |           |
| Minimum grey areas                                              | 0.371        | 0.184 | 0.048 *  |           |
| Adequate lighting                                               | -0.031       | 0.078 | 0.693    |           |
| Perception of pedestrians' safety measures from traffic         |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.405        | 0.161 |          | 0.874     |
| On-street parallel parking                                      | 0.209        | 0.131 | 0.117    |           |
| Traffic calming techniques                                      | 0.128        | 0.081 | 0.121    |           |
| Narrow streets                                                  | 0.108        | 0.109 | 0.325    |           |
| Sidewalks buffers                                               | 0.453        | 0.134 | 0.001 ** |           |
| Perception of safety walking in the morning                     |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.857        | 0.636 |          | 0.426     |
| Minimum blank wall length                                       | 0.031        | 0.128 | 0.804    |           |
| Shallow fronts                                                  | -0.055       | 0.150 | 0.714    |           |
| Natural surveillance                                            | 0.617        | 0.131 | 0.000*** |           |
| Active nodes                                                    | 0.267        | 0.132 | 0.049 *  |           |
| Perception of safety walking at night                           |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 1.759        | 0.460 |          | 0.410     |
| Minimum blank wall length                                       | -0.067       | 0.134 | 0.615    |           |
| Shallow fronts                                                  | 0.528        | 0.250 | 0.039 *  |           |
| Natural surveillance                                            | 0.383        | 0.292 | 0.194    |           |
| Active nodes                                                    | -0.064       | 0.226 | 0.775    |           |
| Mandatory lights                                                | -0.284       | 0.178 | 0.115    |           |
| Perception of individuals' safety in open spaces in the morning |              |       |          |           |

**Table A.3 (cont'd)**

| Variables                                                 | Coefficients | SE     | p-value   | R-squared |
|-----------------------------------------------------------|--------------|--------|-----------|-----------|
| Intercept                                                 | 2.853        | 0.499  |           | 0.640     |
| Natural surveillance through semi-public attachments      | 0.297        | 0.178  | 0.100     |           |
| Minimum blank wall length                                 | 0.078        | 0.153  | 0.610     |           |
| Natural surveillance through shallow street fronts        | 0.005        | 0.1407 | 0.967     |           |
| Perception of individuals' safety in open spaces at night |              |        |           |           |
| Variables                                                 | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                 | 0.801        | 0.301  |           | 0.728     |
| Natural surveillance through semi-public attachments      | 0.500        | 0.071  | 0.000 *** |           |
| Minimum blank wall length                                 | 0.285        | 0.073  | 0.000 *** |           |
| Natural surveillance through shallow street fronts        | 0.064        | 0.076  | 0.405     |           |
| Lighting in public spaces                                 | -0.072       | 0.058  | 0.215     |           |
| Perception of safety when using transit stops             |              |        |           |           |
| Variables                                                 | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                 | -0.021       | 0.144  |           | 0.892     |
| Safe routes to public transit stops                       | 0.990        | 0.097  | 0.000 *** |           |
| Safe locations of public transit stops                    | 0.036        | 0.106  | 0.730     |           |
| Safe shelters                                             | 0.030        | 0.060  | 0.617     |           |
| Perception of biking safety                               |              |        |           |           |
| Variables                                                 | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                 | -0.357       | 0.211  |           | 0.820     |
| Well-connected bike lanes                                 | 0.128        | 0.072  | 0.083     |           |
| Well-maintained bike lanes                                | 0.233        | 0.087  | 0.010 *   |           |
| Away from dangerous terrain                               | 0.620        | 0.062  | 0.000 *** |           |

**Table A.4: Multiple Regression Models for Explaining Residents' Perceptions of Safety in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Overall neighborhood safety perception from crime               |              |                |                  |           |           |
|-----------------------------------------------------------------|--------------|----------------|------------------|-----------|-----------|
| Variables                                                       | Coefficients | SE             | p-value          | R-squared |           |
| Intercept                                                       | -0.007       | 0.663          |                  | 0.500     |           |
| Few entry ways                                                  | 0.378        | 0.140          | 0.009 **         |           |           |
| Active nodes                                                    | 0.195        | 0.136          | 0.160            |           |           |
| Active street fronts                                            | 0.376        | 0.198          | 0.063            |           |           |
| Minimum grey areas                                              | 0.094        | 0.106          | 0.378            |           |           |
| Adequate light                                                  | 0.019        | 0.200          | 0.924            |           |           |
| Perception of pedestrians' safety measures from traffic         |              |                |                  |           |           |
| Variables                                                       | Coefficients | SE             | p-value          | R-squared |           |
| Intercept                                                       | 0.049        | 0.520          |                  | 0.963     |           |
| On-street parallel parking                                      | 0.675        | 0.087          | 0.000***         |           |           |
| Traffic calming techniques                                      | 0.043        | 0.064          | 0.509            |           |           |
| Narrow streets                                                  | 0.219        | 0.060          | 0.000***         |           |           |
| Sidewalks buffers                                               | 0.041        | 0.070          | 0.561            |           |           |
| Perception of safety walking in the morning                     |              |                |                  |           |           |
| Variables                                                       | Coefficients | SE             | p-value          | R-squared |           |
| Intercept                                                       | 1.526        | 0.563          |                  | 0.520     |           |
| Minimum blank wall length                                       | 0.179        | 0.141          | 0.210            |           |           |
| Shallow fronts                                                  | 0.179        | 0.177          | 0.317            |           |           |
| Natural surveillance                                            | 0.078        | 0.171          | 0.649            |           |           |
| Active nodes                                                    | 0.227        | 0.151          | 0.139            |           |           |
| Perception of safety walking at night                           |              |                |                  |           |           |
| Variables                                                       | Coefficients | SE             | p-value          | R-squared |           |
| Intercept                                                       | 0.256        | 0.406          |                  | 0.700     |           |
| Minimum blank wall length                                       | 0.495        | 0.111<br>0.194 | 0.908<br>0.014 * |           |           |
| Shallow fronts                                                  | 0.012        | 0.111          | 0.908            |           |           |
| Natural surveillance                                            | 0.148        | 0.183          | 0.420            |           |           |
| Active nodes                                                    | 0.114        | 0.189          | 0.066            |           |           |
| Mandatory lights                                                | 0.236        | 0.125          | 0.549            |           |           |
| Perception of individuals' safety in open spaces in the morning |              |                |                  |           |           |
| Variables                                                       | Coefficients | SE             | p-value          |           | R-squared |
| Intercept                                                       | 0.897        | 0.225          |                  | 0.700     |           |
| Natural surveillance through semi-public attachments            | 0.664        | 0.104          | 0.000***         |           |           |
| Minimum blank wall length                                       | 0.078        | 0.103          | 0.449            |           |           |
| Natural surveillance through shallow street fronts              | 0.033        | 0.099          | 0.740            |           |           |



**Table A.4 (cont'd)**

| Perception of individuals’ safety in open spaces at night |              |       |          |           |
|-----------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.889        | 0.247 |          | 0.646     |
| Natural surveillance through semi-public attachments      | 0.159        | 0.091 | 0.088    |           |
| Minimum blank wall length                                 | 0.214        | 0.095 | 0.029 *  |           |
| Natural surveillance through shallow street fronts        | 0.050        | 0.076 | 0.509    |           |
| Lighting in public spaces                                 | 0.364        | 0.083 | 0.000*** |           |
| Perception of safety when using transit stops             |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.499        | 0.185 |          | 0.724     |
| Safe routes to public transit stops                       | 0.438        | 0.148 | 0.004 ** |           |
| Safe locations of public transit stops                    | 0.304        | 0.147 | 0.043*   |           |
| Safe shelters                                             | 0.089        | 0.103 | 0.392    |           |
| Perception of biking safety                               |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.149        | 0.201 |          | 0.835     |
| Well-connected bike lanes                                 | 0.181        | 0.110 | 0.105    |           |
| Well-maintained bike lanes                                | 0.318        | 0.122 | 0.012 *  |           |
| Away from dangerous terrain                               | 0.482        | 0.070 | 0.000*** |           |

**Table A.5: Multiple Regression Models for Explaining Residents' Perceptions of Safety in Saint Luke (SL) LEED-ND Neighborhood**

| Overall neighborhood safety perception from crime               |              |       |           |           |
|-----------------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | -0.033       | 0.395 |           | 0.727     |
| Few entryways                                                   | 0.462        | 0.114 | 0.000***  |           |
| Active nodes                                                    | 0.032        | 0.172 | 0.851     |           |
| Active street fronts                                            | 0.411        | 0.119 | 0.0015 ** |           |
| Minimum grey areas                                              | 0.060        | 0.098 | 0.545     |           |
| Adequate light                                                  | 0.047        | 0.127 | 0.708     |           |
| Perception of pedestrians' safety measures from traffic         |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 1.020        | 0.211 |           | 0.788     |
| On-street parallel parking                                      | 0.277        | 0.133 | 0.044 *   |           |
| Traffic calming techniques                                      | 0.109        | 0.083 | 0.197     |           |
| Narrow streets                                                  | 0.149        | 0.098 | 0.139     |           |
| Sidewalks buffers                                               | 0.185        | 0.096 | 0.062     |           |
| Perception of safety walking in the morning                     |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.365        | 0.321 |           | 0.818     |
| Minimum blank wall length                                       | 0.263        | 0.199 | 0.194     |           |
| Shallow fronts                                                  | -0.130       | 0.204 | 0.527     |           |
| Natural surveillance                                            | 0.202        | 0.202 | 0.323     |           |
| Active nodes                                                    | 0.626        | 0.175 | 0.001**   |           |
| Perception of safety walking at night                           |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.299        | 0.277 |           | 0.802     |
| Minimum blank wall length                                       | 0.427        | 0.147 | 0.006**   |           |
| Shallow fronts                                                  | 0.212        | 0.112 | 0.067     |           |
| Natural surveillance                                            | 0.235        | 0.121 | 0.201     |           |
| Active nodes                                                    | -0.029       | 0.061 | 0.637     |           |
| Mandatory lights                                                | 0.319        | 0.112 | 0.007 **  |           |
| Perception of individuals' safety in open spaces in the morning |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 2.001        | 0.654 |           | 0.424     |
| Natural surveillance through semi-public attachments            | 0.112        | 0.168 | 0.510     |           |
| Minimum blank wall length                                       | 0.259        | 0.230 | 0.268     |           |
| Natural surveillance through shallow street fronts              | 0.132        | 0.163 | 0.423     |           |

**Table A.5 (cont'd)**

| Perception of individuals' safety in open spaces at night |              |       |          |           |
|-----------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.635        | 0.676 |          | 0.664     |
| Natural surveillance through semi-public attachments      | -0.023       | 0.165 | 0.890    |           |
| Minimum blank wall length                                 | -0.095       | 0.229 | 0.680    |           |
| Natural surveillance through shallow street fronts        | -0.018       | 0.160 | 0.911    |           |
| Lighting in public spaces                                 | 0.905        | 0.108 | 0.000*** |           |
| Perception of safety when using transit stops             |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.585        | 0.102 | 0.000*** | 0.751     |
| Safe routes to public transit stops                       | 0.284        | 0.109 | 0.013 *  |           |
| Safe locations of public transit stops                    | 0.009        | 0.113 | 0.934    |           |
| Safe shelters                                             | 0.585        | 0.102 | 0.000*** |           |

**Table A.6: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Safety in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Overall neighborhood safety perception from crime               |              |       |           |           |
|-----------------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.6788       | 0.762 |           | 0.504     |
| Few entryways                                                   | 0.232        | 0.111 | 0.042 *   |           |
| Active street fronts                                            | 0.256        | 0.164 | 0.183     |           |
| Minimum grey areas                                              | 0.379        | 0.181 | 0.040 *   |           |
| Perception of pedestrians' safety from traffic                  |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.408        | 0.161 |           | 0.872     |
| On-street parallel parking                                      | 0.266        | 0.118 | 0.028*    |           |
| Traffic calming techniques                                      | 0.173        | 0.068 | 0.013 *   |           |
| Sidewalks buffers                                               | 0.460        | 0.134 | 0.001 **  |           |
| Perception of safety walking in the morning                     |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.888        | 0.552 |           | 0.425     |
| Natural surveillance                                            | 0.607        | 0.123 | 0.000***  |           |
| Active nodes                                                    | 0.244        | 0.112 | 0.033 *   |           |
| Perception of safety walking at night                           |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 1.759        | 0.460 |           | 0.410     |
| Minimum blank wall length                                       | -0.067       | 0.134 | 0.615     |           |
| Shallow fronts                                                  | 0.528        | 0.250 | 0.039 *   |           |
| Natural surveillance                                            | 0.383        | 0.292 | 0.194     |           |
| Active nodes                                                    | -0.064       | 0.226 | 0.775     |           |
| Mandatory lights                                                | -0.284       | 0.178 | 0.115     |           |
|                                                                 |              |       |           |           |
| Perception of individuals' safety in open spaces in the morning |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 2.947        | 0.461 |           | 0.639     |
| Natural surveillance through semi-public attachments            | 0.352        | 0.118 | 0.004 **  |           |
| Perception of individuals' safety in open spaces at night       |              |       |           |           |
| Variables                                                       | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                       | 0.686        | 0.301 |           | 0.729     |
| Natural surveillance through semi-public attachments            | 0.514        | 0.070 | 0.000 *** |           |
| Minimum blank wall length                                       | 0.308        | 0.065 | 0.000 *** |           |

**Table A.6 (cont'd)**

| Perception of safety when using transit stops |              |       |           |           |
|-----------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                     | Coefficients | SE    | p-value   | R-squared |
| Intercept                                     | -0.021       | 0.144 |           | 0.892     |
| Safe routes to public transit stops           | 0.990        | 0.097 | 0.000 *** |           |
| Safe locations of public transit stops        | -0.036       | 0.106 | 0.730     |           |
| Safe shelters                                 | 0.030        | 0.060 | 0.617     |           |
| Perception of biking safety                   |              |       |           |           |
| Variables                                     | Coefficients | SE    | p-value   | R-squared |
| Intercept                                     | -0.357       | 0.211 |           | 0.820     |
| Well-connected bike lanes                     | 0.128        | 0.072 | 0.083     |           |
| Well-maintained bike lanes                    | 0.233        | 0.087 | 0.010 *   |           |
| Away from dangerous terrain                   | 0.620        | 0.062 | 0.000 *** |           |

**Table A.7: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Safety in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Overall neighborhood safety perception from crime               |              |       |          |           |
|-----------------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.176        | 0.593 |          | 0.499     |
| Few entryways                                                   | 0.388        | 0.137 | 0.006 ** |           |
| Semi-pubic attachment                                           | 0.385        | 0.137 | 0.007 ** |           |
| Perception of pedestrians' safety from traffic                  |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.050        | 0.094 |          | 0.962     |
| On-street parallel parking                                      | 0.734        | 0.056 | 0.000*** |           |
| Narrow streets                                                  | 0.242        | 0.051 | 0.000*** |           |
| Perception of safety walking at night                           |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 1.786        | 0.520 |          | 0.712     |
| Minimum blank wall length                                       | 0.273        | 0.117 | 0.023 *  |           |
| Natural surveillance                                            | 0.343        | 0.124 | 0.007**  |           |
| Perception of individuals' safety in open spaces in the morning |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.897        | 0.225 |          | 0.700     |

**Table A.7 (cont'd)**

| Perception of safety walking at night                     |              |       |          |           |
|-----------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                 | Coefficients | SE    | p-value  |           |
| Intercept                                                 | 0.199        | 0.362 |          | 0.690     |
| Shallow fronts                                            | 0.522        | 0.187 | 0.007**  |           |
| Mandatory lights                                          | 0.280        | 0.101 | 0.008 ** |           |
| Perception of individuals' safety in open spaces at night |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.932        | 0.237 |          | 0.643     |
| Minimum blank wall length                                 | 0.243        | 0.084 | 0.005 ** |           |
| Lighting in public spaces                                 | 0.367        | 0.083 | 0.000*** |           |
| Perception of safety when using transit stops             |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.520        | 0.182 |          | 0.720     |
| Safe routes to public transit stops                       | 0.474        | 0.143 | 0.001 ** |           |
| Safe locations of public transit stops                    | 0.337        | 0.142 | 0.021 *  |           |
| Perception of biking safety                               |              |       |          |           |
| Variables                                                 | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                 | 0.149        | 0.201 |          | 0.835     |
| Well-maintained bike lanes                                | 0.318        | 0.122 | 0.012 *  |           |
| Away from dangerous terrain                               | 0.482        | 0.070 | 0.000*** |           |

**Table A.8: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Safety in Saint Luke (SL) LEED-ND Neighborhood**

| Overall neighborhood safety perception from crime               |              |       |          |           |
|-----------------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.183        | 0.305 |          | 0.720     |
| Few entryways                                                   | 0.518        | 0.095 | 0.000*** |           |
| Active street fronts                                            | 0.422        | 0.102 | 0.000*** |           |
| Perception of pedestrians' safety measures from traffic         |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 1.059        | 0.211 |          | 0.777     |
| On-street parallel parking                                      | 0.323        | 0.129 | 0.017*   |           |
| Sidewalks buffers                                               | 0.218        | 0.094 | 0.026 *  |           |
| Perception of safety walking in the morning                     |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.554        | 0.243 |          | 0.813     |
| Active nodes                                                    | 0.607        | 0.158 | 0.000*** |           |
| Perception of safety walking at night                           |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.243        | 0.248 |          | 0.800     |
| Minimum blank wall length                                       | 0.428        | 0.146 | 0.005**  |           |
| Shallow fronts                                                  | 0.193        | 0.104 | 0.071 .  |           |
| Mandatory lights                                                | 0.323        | 0.110 | 0.006**  |           |
| Perception of individuals' safety in open spaces in the morning |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 2.115        | 0.640 |          | 0.410     |
| Shallow fronts                                                  | 0.461        | 0.173 | 0.011 *  |           |
| Perception of individuals' safety in open spaces at night       |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.194        | 0.357 |          | 0.660     |
| Lighting in public spaces                                       | 0.889        | 0.104 | 0.000*** |           |
| Perception of safety when using transit stops                   |              |       |          |           |
| Variables                                                       | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                       | 0.459        | 0.307 |          | 0.750     |
| Safe routes to public transit stops                             | 0.585        | 0.102 | 0.000*** |           |
| Safe locations of public transit stops                          | 0.284        | 0.109 | 0.0137 * |           |

**Table A.9: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Comfortable neighborhood                                          |              |         |          |           |
|-------------------------------------------------------------------|--------------|---------|----------|-----------|
| Variables                                                         | Coefficients | SE      | p-value  | R-squared |
| Intercept                                                         | -0.124       | 0.604   |          | 0.675     |
| Well maintained neighborhood                                      | 0.269        | 0.100   | 0.010 ** |           |
| Clean                                                             | 0.317        | 0.083   | 0.000*** |           |
| Buffers to limit noise                                            | 0.064        | 0.076   | 0.406    |           |
| Low traffic residential streets                                   | -0.027       | 0.087   | 0.751    |           |
| Convenient access to services                                     | 0.068        | 0.062   | 0.276    |           |
| Legible layout                                                    | 0.079        | 0.071   | 0.270    |           |
| Clear center and edge                                             | 0.171        | 0.089   | 0.061    |           |
| Way finding system                                                | -0.031       | 0.075   | 0.673    |           |
| Comfortable building density                                      | 0.077        | 0.068   | 0.243    |           |
| Comfortable population density                                    | 0.100        | 0.084   | 0.259    |           |
| Pedestrian Comfort                                                |              |         |          |           |
| Variables                                                         | Coefficients | SE      | p-value  | R-squared |
| Intercept                                                         | 0.10532      | 0.24692 |          | 0.888     |
| Tree-linings along sidewalks                                      | 0.313        | 0.104   | 0.003 ** |           |
| Human scale                                                       | 0.368        | 0.098   | 0.000*** |           |
| Wide sidewalks                                                    | 0.049        | 0.037   | 0.192    |           |
| Connected sidewalks                                               | 0.062        | 0.106   | 0.558    |           |
| Well-maintained sidewalks                                         | 0.049        | 0.104   | 0.637    |           |
| Accessible sidewalks by all ages and different physical abilities | 0.144        | 0.103   | 0.169    |           |
| Comfortable public spaces                                         |              |         |          |           |
| Variables                                                         | Coefficients | SE      | p-value  | R-squared |
| Intercept                                                         | -0.310       | 0.282   |          | 0.834     |
| Adequate number of public spaces                                  | 0.411        | 0.115   | 0.000*** |           |
| Adequate street furniture                                         | 0.057        | 0.087   | 0.509    |           |
| Clean public spaces                                               | 0.509        | 0.109   | 0.000*** |           |
| Accessible by all ages and different physical abilities           | 0.129        | 0.128   | 0.321    |           |



**Table A.9 (cont'd)**

| Comfortable public spaces                               |              |       |          |           |
|---------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                               | Coefficients | SE    | p-value  | R-squared |
| Intercept                                               | -0.310       | 0.282 |          | 0.834     |
| Adequate number of public spaces                        | 0.411        | 0.115 | 0.000*** |           |
| Adequate street furniture                               | 0.057        | 0.087 | 0.509    |           |
| Clean public spaces                                     | 0.509        | 0.109 | 0.000*** |           |
| Accessible by all ages and different physical abilities | 0.129        | 0.128 | 0.321    |           |
| Comfortable public transit facilities                   |              |       |          |           |
| Variables                                               | Coefficients | SE    | p-value  | R-squared |
| Intercept                                               | 0.120        | 0.188 |          | 0.736     |
| Dry shelters                                            | 0.224        | 0.100 | 0.0289 * |           |
| Comfortable routes to public transit stops              | 0.603        | 0.093 | 0.000*** |           |
| Biking Comfort                                          |              |       |          |           |
| Variables                                               | Coefficients | SE    | p-value  | R-squared |
| Intercept                                               | 0.3295       | 0.177 |          | 0.740     |
| Connected bike lanes                                    | 1.198        | 0.269 | 0.001**  |           |
| Well-maintained bike trails/lanes                       | -0.387       | 0.280 | 0.173    |           |
| Adequate number of bike racks and other bike facilities | 0.115        | 0.120 | 0.345    |           |

**Table A.10: Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Comfortable neighborhood                                          |              |       |          |           |
|-------------------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                                         | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                         | -1.615       | 0.445 |          | 0.800     |
| Well maintained neighborhood                                      | 0.070        | 0.254 | 0.781    |           |
| Clean                                                             | 0.194        | 0.101 | 0.061    |           |
| Buffers to limit noise                                            | 0.043        | 0.090 | 0.630    |           |
| Low traffic residential streets                                   | 0.339        | 0.261 | 0.201    |           |
| Convenient access to services                                     | 0.010        | 0.109 | 0.923    |           |
| Legible layout                                                    | 0.350        | 0.125 | 0.007 ** |           |
| Clear center and edge                                             | 0.203        | 0.118 | 0.091    |           |
| Way finding system                                                | 0.071        | 0.120 | 0.555    |           |
| Comfortable building density                                      | 0.157        | 0.116 | 0.183    |           |
| Comfortable population density                                    | 0.149        | 0.124 | 0.234    |           |
| Pedestrian Comfort                                                |              |       |          |           |
| Variables                                                         | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                         | 0.373        | 0.482 |          | 0.740     |
| Tree-linings along sidewalks                                      | 0.041        | 0.075 | 0.589    |           |
| Human scale                                                       | 0.151        | 0.095 | 0.121    |           |
| Wide sidewalks                                                    | 0.142        | 0.074 | 0.061    |           |
| Connected sidewalks                                               | 0.081        | 0.060 | 0.185    |           |
| Well-maintained sidewalks                                         | -0.120       | 0.102 | 0.244    |           |
| Accessible sidewalks by all ages and different physical abilities | 0.597        | 0.097 | 0.000*** |           |
| Comfortable public spaces                                         |              |       |          |           |
| Variables                                                         | Coefficients | SE    | p-value  | R-squared |
| Intercept                                                         | 0.067        | 0.275 |          | 0.743     |
| Adequate number of public spaces                                  | 0.154        | 0.085 | 0.079    |           |
| Adequate street furniture                                         | 0.127        | 0.085 | 0.143    |           |
| Clean public spaces                                               | 0.566        | 0.132 | 0.000*** |           |
| Accessible by all ages and different physical abilities           | 0.131        | 0.116 | 0.262    |           |

**Table A.10 (cont'd)**

| Comfortable public transit facilities                   |              |       |          |           |
|---------------------------------------------------------|--------------|-------|----------|-----------|
| Variables                                               | Coefficients | SE    | p-value  | R-squared |
| Intercept                                               | 0.101        | 0.070 |          | 0.970     |
| Dry shelters                                            | -0.011       | 0.136 | 0.933    |           |
| Comfortable routes to public transit stops              | 0.988        | 0.136 | 0.000*** |           |
| Biking Comfort                                          |              |       |          |           |
| Variables                                               | Coefficients | SE    | p-value  | R-squared |
| Intercept                                               | -0.027       | 0.080 |          | 0.973     |
| Connected bike trails/lanes                             | 0.390        | 0.112 | 0.001**  |           |
| Well-maintained bike lanes                              | 0.611        | 0.111 | 0.000*** |           |
| Adequate number of bike racks and other bike facilities | 0.031        | 0.029 | 0.287    |           |

**Table A.11: Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Saint Luke (SL) LEED-ND Neighborhood**

| Comfortable neighborhood                                          |              |       |           |           |
|-------------------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                                         | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                         | -1.849       | 0.828 |           | 0.930     |
| Well-maintained neighborhood                                      | 0.648        | 0.148 | 0.000 *** |           |
| Clean                                                             | 0.004        | 0.096 | 0.966     |           |
| Buffers to limit noise                                            | 0.327        | 0.136 | 0.022 *   |           |
| Low traffic residential streets                                   | 0.248        | 0.196 | 0.217     |           |
| Convenient access to services                                     | -0.196       | 0.162 | 0.234     |           |
| Legible layout                                                    | 0.234        | 0.102 | 0.029*    |           |
| Clear center and edge                                             | 0.093        | 0.152 | 0.544     |           |
| Way finding system                                                | 0.160        | 0.067 | 0.023 *   |           |
| Comfortable building density                                      | 0.112        | 0.134 | 0.411     |           |
| Comfortable population density                                    | -0.079       | 0.164 | 0.633     |           |
| Pedestrian Comfort                                                |              |       |           |           |
| Variables                                                         | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                         | 0.693        | 0.509 |           | 0.500     |
| Tree-linings along sidewalks                                      | 0.509        | 0.189 | 0.983     |           |
| Human scale                                                       | 0.583        | 0.205 | 0.007 **  |           |
| Wide sidewalks                                                    | 0.027        | 0.175 | 0.875     |           |
| Connected-sidewalks                                               | 0.276        | 0.181 | 0.138     |           |
| Well-maintained sidewalks                                         | 0.089        | 0.144 | 0.538     |           |
| Accessible sidewalks by all ages and different physical abilities | -0.127       | 0.237 | 0.594     |           |
| Comfortable public spaces                                         |              |       |           |           |
| Variables                                                         | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                         | 0.126        | 0.322 |           | 0.750     |
| Adequate number of public spaces                                  | 0.092        | 0.083 | 0.279     |           |
| Adequate street furniture                                         | 0.000        | 0.095 | 0.995     |           |
| Clean public spaces                                               | 0.478        | 0.104 | 0.000***  |           |
| Accessible by all ages and different physical abilities           | 0.423        | 0.090 | 0.000***  |           |

**Table A.11 (cont'd)**

| <b>Comfortable public transit facilities</b> |              |       |          |           |
|----------------------------------------------|--------------|-------|----------|-----------|
| Variables                                    | Coefficients | SE    | p-value  | R-squared |
| Intercept                                    | 0.061        | 0.114 |          | 0.956     |
| Dry shelters                                 | 0.442        | 0.115 | 0.000*** |           |
| Comfortable routes to public transit stops   | 0.566        | 0.118 | 0.000*** |           |

**Table A.12: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Comfortable neighborhood                                |              |         |          |           |
|---------------------------------------------------------|--------------|---------|----------|-----------|
| Variables                                               | Coefficients | SE      | p-value  | R-squared |
| Intercept                                               | 0.13704      | 0.45741 |          | 0.653     |
| Well-maintained neighborhood                            | 0.307        | 0.093   | 0.001 ** |           |
| Clean                                                   | 0.317        | 0.080   | 0.000*** |           |
| Clear center and edge                                   | 0.185        | 0.080   | 0.025*   |           |
| Pedestrian Comfort                                      |              |         |          |           |
| Variables                                               | Coefficients | SE      | p-value  | R-squared |
| Intercept                                               | 0.05621      | 0.233   |          | 0.881     |
| Tree-linings along sidewalks                            | 0.408        | 0.075   | 0.000*** |           |
| Human scale                                             | 0.400        | 0.095   | 0.000*** |           |
| Accessible by all ages and different physical abilities | 0.187        | 0.098   | 0.062    |           |
| Comfortable public spaces                               |              |         |          |           |
| Variables                                               | Coefficients | SE      | p-value  | R-squared |
| Intercept                                               | -0.186       | 0.267   |          | 0.828     |
| Adequate number of public spaces                        | 0.515        | 0.086   | 0.000*** |           |
| Clean public spaces                                     | 0.606        | 0.106   | 0.000*** |           |
| Comfortable public transit facilities                   |              |         |          |           |
| Variables                                               | Coefficients | SE      | p-value  | R-squared |
| Intercept                                               | 0.120        | 0.188   |          | 0.735     |
| Dry shelters                                            | 0.224        | 0.100   | 0.0289 * |           |
| Comfortable routes to public transit stops              | 0.603        | 0.093   | 0.000*** |           |
| Biking Comfort                                          |              |         |          |           |
| Variables                                               | Coefficients | SE      | p-value  | R-squared |
| Intercept                                               | 0.36955      | 0.216   |          | 0.802     |
| Connected bike lanes                                    | 0.892        | 0.0582  | 0.000*** |           |

**Table A.13: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Comfortable neighborhood                                |              |       |           |           |
|---------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | -1.566       | 0.424 |           | 0.793     |
| Clean                                                   | 0.218        | 0.093 | 0.024 *   |           |
| Low traffic residential streets                         | 0.427        | 0.109 | 0.000 *** |           |
| Legible layout                                          | 0.399        | 0.109 | 0.000 *** |           |
| Clear center and edge                                   | 0.225        | 0.110 | 0.046 *   |           |
| Comfortable population density                          | 0.276        | 0.082 | 0.001 **  |           |
| Pedestrian Comfort                                      |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.373        | 0.482 |           | 0.740     |
| Tree-linings along sidewalks                            | 0.041        | 0.075 | 0.589     |           |
| Human scale                                             | 0.151        | 0.095 | 0.121     |           |
| Wide sidewalks                                          | 0.142        | 0.074 | 0.061     |           |
| Connected-sidewalks                                     | 0.081        | 0.060 | 0.185     |           |
| Well-maintained sidewalks                               | -0.120       | 0.102 | 0.244     |           |
| Accessible by all ages and different physical abilities | 0.597        | 0.097 | 0.000***  |           |
| Comfortable public spaces                               |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.198        | 0.275 |           | 0.736     |
| Adequate street furniture                               | 0.163        | 0.079 | 0.045*    |           |
| Clean public spaces                                     | 0.626        | 0.122 | 0.000***  |           |
| Comfortable public transit facilities                   |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.101        | 0.070 |           | 0.97      |
| Dry shelters                                            | -0.011       | 0.136 | 0.933     |           |
| Comfortable routes to public transit stops              | 0.988        | 0.136 | 0.000***  |           |
| Biking Comfort                                          |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | -0.027       | 0.080 |           | 0.97      |
| Connected bike lanes                                    | 0.390        | 0.112 | 0.001**   |           |
| Well-maintained bike lanes                              | 0.611        | 0.111 | 0.000***  |           |
| Adequate number of bike racks and other bike facilities | 0.031        | 0.029 | 0.287     |           |

**Table A.14: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Comfort in Saint Luke (SL) LEED-ND Neighborhood**

| Comfortable neighborhood                                |              |       |           |           |
|---------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | -1.363       | 0.350 |           | 0.926     |
| Well maintained neighborhood                            | 0.675        | 0.138 | 0.000 *** |           |
| Buffers to limit noise                                  | 0.321        | 0.111 | 0.006**   |           |
| Legible layout                                          | 0.226        | 0.093 | 0.020*    |           |
| Way finding system                                      | 0.146        | 0.061 | 0.024*    |           |
| Pedestrian Comfort                                      |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.704        | 0.465 |           | 0.478     |
| Human scale                                             | 0.597        | 0.133 | 0.000 *** |           |
| Comfortable public spaces                               |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.126        | 0.322 |           | 0.748     |
| Clean public spaces                                     | 0.478        | 0.098 | 0.000***  |           |
| Accessible by all ages and different physical abilities | 0.424        | 0.089 | 0.000***  |           |
| Comfortable public transit facilities                   |              |       |           |           |
| Variables                                               | Coefficients | SE    | p-value   | R-squared |
| Intercept                                               | 0.061        | 0.114 |           | 0.956     |
| Dry shelters                                            | 0.442        | 0.115 | 0.000***  |           |
| Comfortable routes to public transit stops              | 0.566        | 0.118 | 0.000***  |           |



**Table A.15: Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Internal connectivity                                                               |              |       |           |           |
|-------------------------------------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                                                           | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                                           | 1.120        | 0.273 |           | 0.680     |
| Street network with short residential blocks and high ratios of 4-way intersections | 0.158        | 0.077 | 0.051     |           |
| Connected sidewalks                                                                 | 0.619        | 0.08  | 0.000 *** |           |
| Connected bike trails/lanes                                                         | 0.014        | 0.038 | 0.697     |           |
| External connectivity                                                               |              |       |           |           |
| Variables                                                                           | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                                           | 0.207        | 0.317 |           | 0.700     |
| Connected street network with the surroundings                                      | 0.336        | 0.190 | 0.083     |           |
| Connected sidewalk network with the surroundings                                    | -0.218       | 0.180 | 0.233     |           |
| Connected bike trails/lanes                                                         | 0.215        | 0.110 | 0.056     |           |
| Close to grocery stores                                                             | 0.142        | 0.109 | 0.199     |           |
| Close to public facilities, such as libraries                                       | 0.162        | 0.122 | 0.188     |           |
| Close to public facilities, such as public transit stops                            | 0.124        | 0.135 | 0.364     |           |

**Table A.16: Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Internal connectivity                                                               |              |        |           |           |
|-------------------------------------------------------------------------------------|--------------|--------|-----------|-----------|
| Variables                                                                           | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                                           | 0.065        | 0.094  | 0.492     | 0.968     |
| Street network with short residential blocks and high ratios of 4-way intersections | 0.078        | 0.034  | 0.027 *   |           |
| Connected sidewalks                                                                 | 0.946        | 0.034  | 0.000 *** |           |
| Connected bike trails/lanes                                                         | -0.048       | 0.019  | 0.015 *   |           |
| External connectivity                                                               |              |        |           |           |
| Variables                                                                           | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                                           | 0.429        | 0.246  |           | 0.670     |
| Connected street network with the surroundings                                      | 0.611        | 0.2062 | 0.004**   |           |
| Connected sidewalk network with the surroundings                                    | -0.179       | 0.213  | 0.405     |           |
| Connected bike trails/lanes                                                         | 0.0239       | 0.095  | 0.483     |           |
| Close to grocery stores                                                             | 0.229        | 0.096  | 0.021*    |           |
| Close to public facilities, such as libraries                                       | 0.023        | 0.095  | 0.802     |           |
| Close to public facilities, such as public transit stops                            | 0.125        | 0.082  | 0.136     |           |

**Table A.17: Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Saint Luke (SL) LEED-ND Neighborhood**

| Internal connectivity                                                               |              |       |           |           |
|-------------------------------------------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                                                           | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                                           | 0.397        | 0.187 |           | 0.887     |
| Street network with short residential blocks and high ratios of 4 way intersections | 0.528        | 0.088 | 0.000 *** |           |
| Connected sidewalks                                                                 | 0.381        | 0.087 | 0.000 *** |           |
| Connected bike trails/lanes                                                         | 0.020        | 0.029 | 0.477     |           |
| External connectivity                                                               |              |       |           |           |
| Variables                                                                           | Coefficients | SE    | p-value   | R-squared |
| Intercept                                                                           | 0.487        | 0.197 |           | 0.890     |
| Connected street network with the surroundings                                      | 0.693        | 0.086 | 0.000 *** |           |
| Connected sidewalk network with the surroundings                                    | -0.000       | 0.050 | 0.985     |           |
| Connected bike trails/lanes                                                         | -0.047       | 0.067 | 0.484     |           |
| Close to grocery stores                                                             | -0.058       | 0.043 | 0.349     |           |
| Close to public facilities, such as libraries                                       | 0.181        | 0.080 | 0.031 *   |           |
| Close to public facilities, such as public transit stops                            | 0.147        | 0.075 | 0.059     |           |

**Table A.18: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| Internal connectivity            |              |       |           |           |
|----------------------------------|--------------|-------|-----------|-----------|
| Variables                        | Coefficients | SE    | p-value   | R-squared |
| Intercept                        | 1.120        | 0.273 |           | 0.675     |
| Street network with short blocks | 0.619        | 0.077 | 0.000 *** |           |
| Connected sidewalks              | 0.158        | 0.078 | 0.043 *   |           |
| External connectivity            |              |       |           |           |
| Variables                        | Coefficients | SE    | p-value   | R-squared |
| Intercept                        | 0.628        | 0.406 |           | 0.548     |
| Good street network              | 0.303        | 0.104 | 0.005**   |           |
| Good sidewalk network            | 0.402        | 0.078 | 0.000***  |           |
| Connected bike lanes             | 0.217        | 0.097 | 0.028 *   |           |

**Table A.19: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| Internal connectivity            |              |       |           |           |
|----------------------------------|--------------|-------|-----------|-----------|
| Variables                        | Coefficients | SE    | p-value   | R-squared |
| Intercept                        | 0.065        | 0.094 |           | 0.968     |
| Street network with short blocks | 0.078        | 0.034 | 0.027 *   |           |
| Connected sidewalks              | 0.946        | 0.034 | 0.000 *** |           |
| Connected bike trails            | -0.048       | 0.019 | 0.015 *   |           |
| External connectivity            |              |       |           |           |
| Variables                        | Coefficients | SE    | p-value   | R-squared |
| Intercept                        | 0.408        | 0.299 |           | 0.670     |
| Good street network              | 0.499        | 0.089 | 0.000 *** |           |
| Good sidewalk network            | 0.229        | 0.096 | 0.000 *** |           |

**Table A.20: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Connectivity in Saint Luke (SL) LEED-ND Neighborhood**

| Internal connectivity                                    |              |        |           |           |
|----------------------------------------------------------|--------------|--------|-----------|-----------|
| Variables                                                | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                | 0.426        | 00.181 |           | 0.885     |
| Street network with short blocks                         | 0.537        | 0.086  | 0.000 *** |           |
| Connected sidewalks                                      | 0.371        | 0.085  | 0.000 *** |           |
| External connectivity                                    |              |        |           |           |
| Variables                                                | Coefficients | SE     | p-value   | R-squared |
| Intercept                                                | 0.0418       | 0.253  |           | 0.894     |
| Good street network                                      | 0.642        | 0.070  | 0.000 *** |           |
| Good sidewalk network                                    | 0.204        | 0.075  | 0.009**   |           |
| Close to public facilities, such as public transit stops | 0.159        | 0.071  | 0.032*    |           |

**Table A.21: Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b>   |              |       |           |           |
|------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                      | Coefficients | SE    | p-value   | R-squared |
| Intercept                                      | 0.257        | 0.131 |           | 0.94      |
| Traditional architecture                       | 0.503        | 0.087 | 0.000 *** |           |
| Traditional layout design                      | -0.156       | 0.067 | 0.023 *   |           |
| Active streets through minimizing blank walls  | 0.026        | 0.062 | 0.668     |           |
| Active streets through semi-public attachments | 0.289        | 0.078 | 0.000 *** |           |
| Architectural review board                     | 0.161        | 0.071 | 0.026 *   |           |
| Accessible outdoors facilities                 | 0.131        | 0.054 | 0.019*    |           |

**Table A.22: Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b>   |              |        |           |           |
|------------------------------------------------|--------------|--------|-----------|-----------|
| Variables                                      | Coefficients | SE     | p-value   | R-squared |
| Intercept                                      | 0.007        | 0.081  |           | 0.974     |
| Traditional architecture                       | 0.932        | 0.050  | 0.000 *** |           |
| Traditional layout design                      | -0.104       | 0.051  | 0.047 *   |           |
| Active streets through minimizing blank walls  | -0.034       | 0.0494 | 0.487     |           |
| Active streets through semi-public attachments | 0.067        | 0.054  | 0.222     |           |
| Architectural review board                     | 0.206        | 0.0446 | 0.000 *** |           |
| Accessible outdoors facilities                 | -0.053       | 0.0469 | 0.257     |           |

**Table A.23: Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Saint Luke (SL) LEED-ND Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b>   |              |       |           |           |
|------------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                      | Coefficients | SE    | p-value   | R-squared |
| Intercept                                      | 0.278        | 0.204 |           | 0.926     |
| Traditional architecture                       | 0.821        | 0.066 | 0.000 *** |           |
| Traditional layout design                      | 0.056        | 0.054 | 0.309     |           |
| Active streets through minimizing blank walls  | 0.043        | 0.077 | 0.581     |           |
| Active streets through semi-public attachments | 0.055        | 0.056 | 0.334     |           |
| Architectural review board                     | -0.038       | 0.077 | 0.627     |           |
| Accessible outdoors facilities                 | 0.020        | 0.062 | 0.747     |           |

**Table A.24: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b> |              |       |           |           |
|----------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                    | Coefficients | SE    | p-value   | R-squared |
| Intercept                                    | 0.257        | 0.131 |           | 0.94      |
| Traditional architecture                     | 0.503        | 0.087 | 0.000 *** |           |
| Traditional layout design                    | -0.156       | 0.067 | 0.023 *   |           |
| Semi-public attachments                      | 0.289        | 0.078 | 0.000 *** |           |
| Architectural review board                   | 0.161        | 0.071 | 0.026 *   |           |
| Accessible outdoors facilities               | 0.131        | 0.054 | 0.019*    |           |

**Table A.25: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b> |              |       |           |           |
|----------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                    | Coefficients | SE    | p-value   | R-squared |
| Intercept                                    | 0.026        | 0.080 |           | 0.973     |
| Traditional architecture                     | 0.929        | 0.037 | 0.000 *** |           |
| Traditional layout design                    | -0.103       | 0.045 | 0.027 *   |           |
| Architectural review board                   | 0.184        | 0.040 | 0.000 *** |           |

**Table A.26: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Sense of Belonging in Saint Luke (SL) New Urbanist Brownfield Neighborhood**

| <b>Place-making &amp; Sense of Belonging</b> |              |       |           |           |
|----------------------------------------------|--------------|-------|-----------|-----------|
| Variables                                    | Coefficients | SE    | p-value   | R-squared |
| Intercept                                    | 0.313        | 0.181 |           | 0.921     |
| Traditional architecture                     | 0.872        | 0.054 | 0.000 *** |           |

**Table A.27: Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Aesthetic Quality</b>   |              |       |         |           |
|----------------------------|--------------|-------|---------|-----------|
| Variables                  | Coefficients | SE    | p-value | R-squared |
| Intercept                  | 1.697        | 0.496 |         | 0.510     |
| Traditional architecture   | 0.255        | 0.109 | 0.023 * |           |
| Alleyways                  | 0.115        | 0.084 | 0.177   |           |
| Visual buffers             | 0.080        | 0.122 | 0.510   |           |
| Architectural review board | 0.249        | 0.107 | 0.024 * |           |

**Table A.28: Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Aesthetic Quality</b>   |              |       |           |           |
|----------------------------|--------------|-------|-----------|-----------|
| Variables                  | Coefficients | SE    | p-value   | R-squared |
| Intercept                  | 0.036        | 0.087 |           | 0.960     |
| Traditional architecture   | 0.850        | 0.101 | 0.000 *** |           |
| Alleyways                  | 0.064        | 0.080 | 0.428     |           |
| Visual buffers             | -0.291       | 0.104 | 0.007**   |           |
| Architectural review board | 0.384        | 0.083 | 0.000 *** |           |

**Table A.29: Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Saint Luke (SL) LEED-ND Neighborhood**

| <b>Aesthetic Quality</b>   |              |       |          |           |
|----------------------------|--------------|-------|----------|-----------|
| Variables                  | Coefficients | SE    | p-value  | R-squared |
| Intercept                  | -0.485       | 0.481 |          | 0.70      |
| Traditional architecture   | 0.733        | 0.175 | 0.000*** |           |
| Alleyways                  | 0.237        | 0.082 | 0.006 ** |           |
| Visual buffers             | 0.244        | 0.161 | 0.137    |           |
| Architectural review board | -0.086       | 0.116 | 0.461    |           |

**Table A.30: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Cherry Hill Village (CHV) New Urbanist Greenfield Neighborhood**

| <b>Aesthetic Quality</b>   |              |       |          |           |
|----------------------------|--------------|-------|----------|-----------|
| Variables                  | Coefficients | SE    | p-value  | R-squared |
| Intercept                  | 1.910        | 0.376 |          | 0.502     |
| Traditional architecture   | 0.254        | 0.108 | 0.023 *  |           |
| Architectural review board | 0.275        | 0.099 | 0.007 ** |           |

**Table A.31: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Mason Run (MR) New Urbanist Brownfield Neighborhood**

| <b>Aesthetic Quality</b>   |              |       |           |           |
|----------------------------|--------------|-------|-----------|-----------|
| Variables                  | Coefficients | SE    | p-value   | R-squared |
| Intercept                  | 0.0513       | 0.084 |           | 0.965     |
| Traditional architecture   | 0.896        | 0.083 | 0.000 *** |           |
| Alleyways                  | -0.317       | 0.098 | 0.002 **  |           |
| Architectural review board | 0.424        | 0.424 | 0.000 *** |           |

**Table A.32: Stepwise Multiple Regression Models for Explaining Residents' Perceptions of Aesthetic Quality in Saint Luke (SL) LEED-ND Neighborhood**

| <b>Aesthetic Quality</b> |              |       |          |           |
|--------------------------|--------------|-------|----------|-----------|
| Variables                | Coefficients | SE    | p-value  | R-squared |
| Intercept                | -0.420       | 0.470 |          | 0.672     |
| Traditional architecture | 0.677        | 0.156 | 0.000*** |           |
| Alleyways                | 0.205        | 0.069 | 0.005 ** |           |



## APPENDIX B:

### Residents' Survey

## Consent

You are invited to participate in a survey that is part of a dissertation research titled “Quality of life in Contemporary Neighborhood Design Initiatives. ” This survey is administered by Michigan State University (MSU) and will take you approximately 15 to 20 minutes to complete. The survey includes questions that ask you about the design features of your neighborhood, and your level of satisfaction regarding some social and physical characteristics in your neighborhood. The primary goal of this research is to evaluate and improve residents’ quality of life in their residential neighborhoods. Also, this research will assist urban designers and planners to better understand the social and physical needs of residents to improve their quality of life.

There will be only minimal risk associated with participation in this study. Your response is scholarly valuable for this research because the analysis and the results of this research will be based on your responses, and your responses are important to improve neighborhoods’ design and are important to improve the individuals’ quality of life as well.

All the information that you provide will be kept confidential and will only be used to help this research to move forward. The data collected will be anonymously and, secretly stored in locked file cabinets for at least next three years after the project closes. Your responses will be immediately shredded upon the completion of the study. Any published results from this study will not mention any names of participants and all associated information will be treated confidentially to the extent allowed by law. The records of this study will be kept private and no identifiers will be included that links you to the study in any sort. Research records will be stored securely and only Amal Shaaban, the researcher, will have access to the data.

Your participation in this study is voluntary. You may choose not to participate at all, or you may refuse to answer certain questions or discontinue your participation at any time without consequence. You may change your mind at any time and withdraw.

Agreement to participate implies that you complete and return the questionnaire. Please acknowledge that you can stop responding to any of the survey questions if you don’t feel comfortable at anytime. If you don’t feel comfortable for pursuing participation in this research at any time, you are free to withdraw without any penalty.

If you have any questions regarding your rights, or any other concerns please feel free to contact Amal Shaaban at 734-730-9600, or via e-mail at [shaabana@msu.edu](mailto:shaabana@msu.edu). Or contact Dr. Suk-Kyung Kim at [kimsk@msu.edu](mailto:kimsk@msu.edu). If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University’s Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail [irb@msu.edu](mailto:irb@msu.edu) or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

By participating in this written survey you are consenting to participate in this research.  
Thank you so much for your time

Section I includes questions about your current house and household:

1. Do you rent or own your current place of residence? (Please check one box)

- ☐ Own ☐ Other (please specify) \_\_\_\_\_  
☐ Rent

2. Which option from the list below best describes your current household status? (Please check one box)

- ☐ I live alone ☐ I live with Spouse/partner and with children  
☐ I live with my parents ☐ I live with my friends/roommates  
☐ I live with children without spouse/partner ☐ Other (please specify) \_\_\_\_\_  
☐ I live with spouse/partner, and no children

3. What is the total number of your household including yourself? \_\_\_\_\_ Persons

4. If you have children who are currently living with you, please indicate their ages, in years:

Child 1 \_\_\_\_\_, Child 2 \_\_\_\_\_,  
Child 3 \_\_\_\_\_, Child 4 \_\_\_\_\_,  
Child 5 \_\_\_\_\_, More than 5 children \_\_\_\_\_  
Not Applicable \_\_\_\_\_

5. What is the approximate size of your current place of residence in square footage? (Please check one box)

- ☐ Less than 750 sq ft ☐ Between 2000-2750 sq ft  
☐ Between 750-1250 sq ft ☐ Between 2750-3500 sq ft  
☐ Between 1250-2000 sq ft ☐ Greater than 3500 sq ft

6. How many bedrooms and bathrooms do you have in place of residence?

\_\_\_\_\_ bedroom(s), and \_\_\_\_\_ bathroom(s)

7. When did you move to your place of residence?

\_\_\_\_ / \_\_\_\_ (Month/year)

8. How long do you plan to live in your place of residence? (Please check one box)

- ☐ Less than 2 years ☐ More than 15 years  
☐ Between 2 and 5 years ☐ Other  
☐ Between 5 and 10 years ☐ (please specify) \_\_\_\_\_  
☐ Between 10 and 15 years

9. Please place a check p on each line of boxes to rank the importance of the following factors when you considered selecting your current neighborhood

|                                                   | Not at all<br>Important  | Not<br>important         | Neutral                  | Important                | Very<br>important        |
|---------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| For example: Close to schools                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Age of housing                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Housing price                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to work                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to family members                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to highways/freeways                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to public transit services                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to commercial areas                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to entertainment choices                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to healthcare facilities                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Close to good public schools                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Maintenance of streets and<br>sidewalks           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Aesthetics of the neighborhood                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Outdoors activities & facilities                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Neighborhood that support eco-<br>friendly living | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Local food production and/or<br>community garden  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Historically preserved<br>buildings/landscapes    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low crime rate level                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Well maintained bicycle<br>lanes/trails           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pedestrian friendly community                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Community with diverse<br>incomes                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Community with diverse<br>ethnicities and races   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Community with diverse<br>housing types           |                          |                          |                          |                          |                          |
| Other (please<br>specify) _____                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

10. If you plan to leave your current in less than 5 years, please check all the reasons that apply if you plan to leave your current neighborhood. (Please check all that apply)

- |                                                        |                                                    |
|--------------------------------------------------------|----------------------------------------------------|
| <input type="checkbox"/> To be close to family members | <input type="checkbox"/> To have a bigger house    |
| <input type="checkbox"/> To be close to public transit | <input type="checkbox"/> To have a smaller house   |
| <input type="checkbox"/> To be close to leisure places | <input type="checkbox"/> To have a bigger lot size |
| <input type="checkbox"/> To be close to work           | <input type="checkbox"/> To pay less mortgage      |
| <input type="checkbox"/> To walk to shops, restaurants | <input type="checkbox"/> To play less rent         |

☐ Other (please specify)\_\_\_\_\_

11. How far do you currently live from your workplace? (Please check one box)

- |                                            |                                                                   |
|--------------------------------------------|-------------------------------------------------------------------|
| <input type="checkbox"/> I work from home  | <input type="checkbox"/> Within 5-10 miles                        |
| <input type="checkbox"/> I am not employed | <input type="checkbox"/> Within 10-15 miles                       |
| <input type="checkbox"/> Less than 1 mile  | <input type="checkbox"/> Within 15-20 miles                       |
| <input type="checkbox"/> Within 1-2 miles  | <input type="checkbox"/> More than 20 miles (please specify)_____ |
| <input type="checkbox"/> Within 2-5 miles  |                                                                   |

12. How do you usually commute to workplace? (Please check only the most common mode)

- |                                                |                                                      |
|------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Walk to work          | <input type="checkbox"/> Carpool                     |
| <input type="checkbox"/> Drive my own car      | <input type="checkbox"/> Other (please specify)_____ |
| <input type="checkbox"/> Bike to work          | <input type="checkbox"/> Not applicable              |
| <input type="checkbox"/> Public transportation |                                                      |

13. How long does it take you to travel one-way from your place of residence to your workplace using the most common mode of transportation you selected from the previous question?

\_\_\_\_\_ hours \_\_\_\_\_ minutes , Not Applicable \_\_\_\_\_

14. What is the average number of automobile trips you usually make per day from your place of residence to any other destination?

\_\_\_\_\_ Trips (Please include a number)

\_\_\_\_\_ Not applicable

15. Please rank the following services according to your frequent visits during the week? 1 means most visited and 10 means least visited?

- |                                    |                        |
|------------------------------------|------------------------|
| ____ Grocery store                 | ____ Beauty shop/salon |
| ____ Bank                          | ____ Post office       |
| ____ Doctor                        | ____ Library           |
| ____ Pharmacy                      | ____ Restaurants       |
| ____ Church/religious destinations | ____ Athletic club     |

16. How do you often go to the listed services below? (Please select one transportation mode)

|                        | Wal<br>k                 | Bike                     | Bus                      | Car                      | Other (please<br>specify) |
|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| Grocery store          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Bank                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Doctor                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Pharmacy               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Religious destinations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Beauty shop            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Post office            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Library                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |
| Restaurants            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____                     |

|               |                          |                          |                          |                          |  |
|---------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| Athletic club | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |
|---------------|--------------------------|--------------------------|--------------------------|--------------------------|--|

Section II is about the environment you live in and your satisfaction degree with your neighborhood:

Please place a check on each line of boxes to indicate how much you agree or disagree with following statements

17. My quality of life has been improved since I moved to this neighborhood

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

18. My neighborhood is safe and free from crime

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

19. My neighborhood is safe because it has few entryways that helps in limiting the access of unwelcomed intruders

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

20. My neighborhood is safe because it has active/frequently used open spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

21. My neighborhood is safe because it has buildings with front porches, balconies, and stoops along residential streets

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

22. My neighborhood is safe because it does not have any abandoned areas/buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

23. My neighborhood is safe because it has adequate number of street light poles

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

24. My neighborhood provides good pedestrian safety measures from traffic

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

25. My neighborhood provides adequate traffic calming techniques, such as speed bumps, brightly painted crosswalks, etc. that enhances my safety from traffic

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

26. The narrow streets in my neighborhood and the on-street parking improved my safety from traffic when I walk around the neighborhood

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

27. The tree-linings along sidewalks improved my safety from traffic when I walk around the

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

28. neighborhood because they protect me from moving traffic on streets

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

29. I feel safe walking around in my neighborhood in the morning

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

30. I feel safe walking around in my neighborhood at night

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

31. I feel safe walking alone in the neighborhood in the morning because of the placement of porches, balconies and stoops along residential buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

32. I feel safe walking alone in the neighborhood at night because of the placement of porches, balconies and stoops on the front facades of the buildings along residential buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

33. I feel safe walking alone in the neighborhood in the morning because buildings with front

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

34. porches, balconies, stoops, and bay windows are placed close to the sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

35. I feel safe walking alone in the neighborhood at night because buildings with front porches, balconies, stoops, and bay windows are placed close to the sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

36. New Urbanism neighborhoods are also known for placing car garages at the back of the buildings, away from street fronts, to decrease the amount of blank wall along streets. Do you think that placing car garages at the rear of building improved your safety when you walk alone in the neighborhood in the morning?

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

37. Do you think that placing car garages at the back of the buildings, away from street fronts, improved your safety when you walk alone in the neighborhood at night?

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

38. I feel safe walking around my neighborhood in the morning because my neighborhood has active and busy public areas

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



39. I feel safe walking around my neighborhood at night because my neighborhood has active and busy public areas

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

40. I feel safe walking around my neighborhood at night because of the mandatory night lights in porches and balconies

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

41. I feel safe when I visit the open green spaces in my neighborhood in the morning

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

42. I feel safe when I visit the open green spaces in my neighborhood at night

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

43. I feel safe when I visit the open green spaces in my neighborhood in the morning because of the minimal amount blank walls around open green spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

44. I feel safe when I visit the open green spaces in my neighborhood at night because of the minimal amount blank walls around open green spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

45. I feel safe when I visit the open green spaces in my neighborhood in the morning because of the front porches, balconies, and stoops that are attached to the fronts of the surrounding buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

46. I feel safe when I visit the open green spaces in my neighborhood at night because of the front porches, balconies, and stoops that are attached to the fronts of the surrounding buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

47. I feel safe when I visit the open green spaces in my neighborhood in the morning because buildings with shallow front, front porches, balconies, stoops, and bay windows are placed close to the sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

48. I feel safe when I visit the open green spaces in my neighborhood at night because buildings with shallow fronts, front porches, balconies, stoops, and bay windows are placed close to the sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

49. I feel safe when visiting the open green spaces in my neighborhood at night because of they have adequate light at night

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

50. My neighborhood provides safe public transit services

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

51. My neighborhood provides safe public transit stops/stations locations

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

52. My neighborhood provides safe routes to public transit stops/stations

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

53. I feel safe biking around my neighborhood

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

54. My neighborhood has a well-connected network of bike lanes/trails

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

55. My neighborhood has a well-maintained network of bike lanes/trails

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

56. My neighborhood has bike lanes/trails that are safe and away from dangerous terrains

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

57. My neighborhood provides comfortable environment to live in

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

58. My neighborhood is well-maintained

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

59. My neighborhood is clean

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

60. My neighborhood is comfortable because it provides adequate noise buffers, such as trees to buffer traffic noise from main streets

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

61. My neighborhood is comfortable because it has low traffic streets

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

62. My neighborhood is comfortable because it provides easy access to services that I regularly visit, such as grocery stores, shopping, restaurants, etc.

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

63. My neighborhood is comfortable because it has an easy and clear layout design

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

64. My neighborhood is comfortable because has a clear central area and a clear edge

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

65. My neighborhood is comfortable because it has adequate way finding signage system

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

66. My neighborhood is comfortable because it has an adequate population density and is not crowded by people

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

67. My neighborhood is comfortable because it has an adequate building density and is not crowded by buildings

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

68. The sidewalks in my neighborhood are comfortable

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

69. The sidewalks in my neighborhood are comfortable because they have tree linings that protect me from the sun

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

70. My walking experience in my neighborhood is comfortable because the ration between the width of the streets and the height of buildings is comfortable and respects human scale

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

71. The sidewalks in my neighborhood are comfortable because they are wide enough to accommodate several activities, such as walking, jogging, standing, biking, etc.

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

72. The sidewalks in my neighborhood are comfortable because they are well-connected

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

73. The sidewalks in my neighborhood are comfortable because they are well-maintained

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

74. The sidewalks in my neighborhood are comfortable for all different physical abilities and different ages

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

75. My neighborhood provides comfortable open green spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

76. My neighborhood has a decent number public open green spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

77. My neighborhood has open green spaces that have convenient street furniture for sitting, gathering, socializing, etc.

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

78. My neighborhood has clean open green spaces

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

79. My neighborhood has open green spaces that are equally accessible by people with different ethnicities, incomes, physical abilities, and ages

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

80. My neighborhood provides comfortable biking experience

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

81. My neighborhood provides comfortable biking experience because it has well-connected bike lanes

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

82. My neighborhood provides comfortable biking experience because it has well-maintained bike lanes

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

83. My neighborhood provides comfortable biking experience because it provides adequate number of bike racks and bike storage facilities

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

84. My neighborhood provides comfortable public transit services

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

85. My neighborhood provides dry public transit shelters

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

86. My neighborhood provides comfortable routes to public transit routes

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

87. My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

88. My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach on foot because it has short blocks and an adequate number of street intersections

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

89. My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach on foot because it has well-connected sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

90. My neighborhood has public spaces, green areas, and other places/destinations that are easy to reach by bike because it provides well-connected bike lanes

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

91. I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

92. I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood by car because the streets in my neighborhood are well-connected to the other surrounding streets

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

93. I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood on foot because the sidewalks in my neighborhood are well-connected to the other surrounding sidewalks

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

94. I can easily reach public services, and other daily needs, such as grocery stores, located outside my neighborhood by bike because the bike lanes in my neighborhood are well-connected to the other surrounding bike lanes

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

95. I live within approximately 10 minutes walk from a grocery store and other convenience stores

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

96. I live within approximately 10 minutes walk from public services, such as library

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

97. I live within approximately 10 minutes walk from a public transit stop/station

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

98. My sense of belonging has been enhanced since I moved to this neighborhood

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

99. My sense of belonging has been improved because it has unique Victorian architectural style

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

100. My sense of belonging has been improved because it resembles old traditional neighborhoods by providing narrow streets, a central gathering space, alleyways, etc.

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



101. My sense of belonging has been improved because my neighborhood provides a decent number of open green spaces that gives me the opportunity to be more socially engaged with neighbors

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

102. My sense of belonging has been improved because the streets in my neighborhood has front porches, balconies, and stoops that gives me the opportunity to be more socially engaged with neighbors

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

103. My sense of belonging has been improved because the streets in my neighborhood are active with minimal amount of blank walls

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

104. My sense of belonging has been improved because Home Owners Association imposes strict regulations regarding the exterior improvements of any house

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

105. My sense of belonging has been improved because my neighborhood provides open green spaces that are accessible by all different physical abilities, different ages, and diverse ethnicities

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

106. My neighborhood is visually attractive

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

107. NU is known for designing alleyways to house undesirable elements; such as utility boxes, trashcans, etc. Do you think that alleyways have improved the visual appeal of your neighborhoods?

| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

108. The visual appeal of my neighborhood is improved because of the Victorian architectural style of the buildings

|                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

109. The visual appeal of my neighborhood is improved because Home Owners Association imposes strict regulations regarding the exterior improvements of any house.

|                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

110. The visual appeal of my neighborhood is improved because it provides adequate buffers that blocks the views to any undesirable buildings/areas in my neighborhood

|                          |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree        | Disagree                 | Neutral                  | Agree                    | Strongly agree           | I don't know             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

111. Please place a check ☐ on each line of boxes if any of the following are considered a problem in your neighborhood

|                        | A problem                | Not a problem            |
|------------------------|--------------------------|--------------------------|
| Graffiti               | <input type="checkbox"/> | <input type="checkbox"/> |
| Noise                  | <input type="checkbox"/> | <input type="checkbox"/> |
| Trash/litter           | <input type="checkbox"/> | <input type="checkbox"/> |
| Abandoned buildings    | <input type="checkbox"/> | <input type="checkbox"/> |
| Abandoned areas/lots   | <input type="checkbox"/> | <input type="checkbox"/> |
| Brownfield             | <input type="checkbox"/> | <input type="checkbox"/> |
| Poor air quality       | <input type="checkbox"/> | <input type="checkbox"/> |
| Soliciting             | <input type="checkbox"/> | <input type="checkbox"/> |
| Other (Please specify) | <input type="checkbox"/> | <input type="checkbox"/> |

112. In your opinion, which of the following criteria is not found in your neighborhood and is needed to improve the quality of life in your neighborhood? (Please check all that apply)

- |                                                                  |                                                                        |
|------------------------------------------------------------------|------------------------------------------------------------------------|
| <input type="checkbox"/> Services that support walking           | <input type="checkbox"/> Architectural quality                         |
| <input type="checkbox"/> Services that support children wellness | <input type="checkbox"/> Lighting system                               |
| <input type="checkbox"/> Dog park                                | <input type="checkbox"/> Local food production                         |
| <input type="checkbox"/> Social events                           | <input type="checkbox"/> Bike lanes and shared streets                 |
| <input type="checkbox"/> Shared swimming pool                    | <input type="checkbox"/> Nearby everyday needs, such as grocery stores |
| <input type="checkbox"/> Meditation spaces                       | <input type="checkbox"/> Nothing to improve                            |
| <input type="checkbox"/> Pedestrian safety measures              | <input type="checkbox"/> Other. (Please specify)                       |
| <input type="checkbox"/> Security measures                       | _____                                                                  |
| <input type="checkbox"/> Different Housing type                  |                                                                        |
| <input type="checkbox"/> Aesthetic quality of the neighborhood   |                                                                        |

Section III is about demographics and socioeconomic information

113. What is your gender? (Please check one box)

- ☐ Male  
☐ Female  
☐ Decline

114. What is your age? (Please check one box)

- ☐ 18-20 ☐ 40-49  
☐ 21-29 ☐ 50-59  
☐ 30-39 ☐ 60 or older

115. Which ethnic or cultural group best describes you? (Please check all that apply)

- ☐ Caucasian/White ☐ Asian /Pacific Islander/Oriental  
☐ Black/African American ☐ Other (please specify) \_\_\_\_\_  
☐ Hispanic/Latino ☐ Prefer not to answer  
☐ Native American/American Indian

116. What is the highest degree or level of school you have completed? (Please check one box)

- ☐ Elementary school ☐ Bachelor's Degree  
☐ Middle school ☐ Graduate degree or higher  
☐ High school ☐ Other (please specify) \_\_\_\_\_

117. What is your current employment status? (Please check one box)

- ☐ Full-time ☐ A student  
☐ Part-time ☐ Military  
☐ Self-employed ☐ Retired  
☐ A homemaker ☐ Unemployed  
☐ A working student ☐ Other \_\_\_\_\_

118. What is your household income? (Please check one box)

- ☐ Below or equal \$10K ☐ More than \$150K-\$200K  
☐ More than \$10K-\$50K ☐ More than \$200k-\$250K  
☐ More than \$50K-\$100K ☐ Over \$250K  
☐ More than \$100K-\$150K ☐ Decline

119. Would you recommend this neighborhood to your family members, friends, colleagues, and/or others to live in? (Please check one box)

| Never<br>recommend       | Don't<br>recommend       | Neutral                  | Recommend                | Highly<br>recommend      | I don't<br>know          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

120. Do you have any further comments that you would like to share in order to improve the quality of life in your neighborhood?

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THANK YOU FOR YOUR TIME

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## BIBLIOGRAPHY

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