

# Evaluation of Public Recreational Greenspace in Halifax for Physical Activity Promotion

Caroline McNamee

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Supervisor: Daniel Rainham, Ph.D., Environmental Science

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## Abstract

This research investigates features of public recreational greenspace on Halifax Peninsula that promote physical activity. Physical inactivity and its associated poor health outcomes are a major health concern. Past research has determined specific features and characteristics of greenspace that influence physical activity. However, objective measurements of these characteristics have rarely been performed in Canada and never in Halifax. The Quality of Public Open Space Tool (POST), originally developed in Australia, was modified for the Canadian context. The tool was used to audit greenspaces in the study area using direct observation to collect information on the characteristics of greenspace known to influence physical activity. Greenspace quality scores were compared to neighbourhood-level scores of socio-economic deprivation to assess whether parks that promote physical activity are distributed evenly across socioeconomic strata. It was predicted that on average the greenspaces in Halifax Peninsula would have medium quality scores and that these would correlate negatively with neighbourhood deprivation. Most greenspaces scored in the middle of the POST scale calculated from aggregate of activity, environmental quality, amenity, and safety scores. Environmental quality scores were statistically significantly associated with neighbourhood-level socioeconomic deprivation. The results from this project can inform urban planning strategies in Halifax by providing decision makers with current information necessary to identify strengths and weaknesses of public recreational greenspace in support of promoting physical activity.



## Chapter 1: Introduction

### **1.1 Project Motivation**

Increasing trends in physical inactivity represent a major obstacle in establishing healthy, sustainable communities. Improved knowledge about the ability of greenspaces to promote physical activity can aid municipalities, like Halifax, in using greenspace as a strategic planning tool to improve the health of its citizens. Several studies have shown a link between greenspace and health, as well as a relationship between greenspace and physical activity (McCormack et al., 2010). To assess the potential for physical activity to occur on various greenspaces throughout a municipality, a full audit of the greenspaces must be completed. Tools, such as the Quality of Public Open Space Tool (POST), have been created to audit open spaces with an emphasis on the characteristics that can influence physical activity (Broomhall et al., 2004). The application of this audit to the greenspaces in the Halifax Peninsula can provide decision makers with valuable information on the current state of greenspaces as well as suggestions on how to improve greenspace throughout the city so as to encourage more physical activity.

### **1.3 Greenspace and Quality**

Greenspaces can be defined as areas of vegetated land in urban environments (Environmental Protection Agency, 2012). These spaces can be publicly or privately owned, as well as vary in size and intended purpose. For example, some greenspaces, such as playgrounds and parks are designed for recreational purposes, whereas urban gardens serve agricultural or aesthetic purposes. When examining the likelihood that physical activity will occur in a

greenspace, most studies have only examined greenspaces that are greater than a minimum size deemed suitable for physical activity. Thus, the examination of small areas of greenspace, which may contribute negligibly to the promotion of physical activity, can be negated. Size of greenspace and its accessibility (or location) have been shown to be factors influencing use of greenspace for physical activity (Kaczynski et al., 2008). However, research has also found that the characteristics or overall quality of the greenspace has a stronger correlation with physical activity than the size of the park (Kaczynski et al., 2008).

Quality of greenspace is partially determined by its ability to promote physical activity. Characteristics of greenspace that have been identified as important in promoting physical activity are safety, the presence of amenities, aesthetics, and environmental quality (Broomhall et al., 2004). Features, such as the type and placement of lighting and nearby roads can affect the real and perceived safety of greenspace (Broomhall et al., 2004). Similarly, benches, fountains, picnic tables, and water features can both relate to aesthetics and represent the amenities that are available in the park; the presence of wildlife and trees relate to the environmental quality of the space. Past research has shown that the characteristics of greenspace that relate to safety, amenities, and environmental quality play an important role in determining whether it will promote physical activity (Broomhall et al., 2004).

#### **1.4 Greenspace & Physical Activity in the Literature**

Many studies have shown that greenspaces can serve as important areas that promote physical activity. Although the size and accessibility of the greenspace

plays an important role in the strength of this connection, one of the most important determining factors in whether or not people will use greenspace for physical activity refers to the characteristics or overall quality of the space (Kaczynski et al., 2008). Features relating to the aesthetics, safety, amenities, and environmental quality of the space affect the likelihood of the space promoting physical activity (Broomhall et al., 2004). The presence of play equipment and fields designated for sports have been determined to be an important factor that promotes physical activity among children and youth at greenspace (Lachowycz et al., 2012). In contrast, walking tends to be the physical activity of choice for most adults at greenspace; thus, the placement and maintenance of walking trails may help encourage and facilitate walking and adults' usage of a park (Temple et al., 2011).

Canadian research on the link between greenspace and physical activity has focused on the importance of greenspace characteristics relating to safety, amenities, aesthetics, and environmental quality (Nichol et al., 2010). Similarly, studies with Canadian children have also revealed that play equipment and sports fields are important for physical activity (Nichol et al., 2010). Seasonal use is a specific aspect of greenspace design that must be considered in a Canadian context. Some Canadian cities include the presence of an outdoor skating rink on greenspace as part of the municipal strategy to encourage physical activity because it is an important feature that aids in facilitating the use of the greenspace for physical activity during winter months (City of Vaughan, 2008). Another consideration is the maintenance of the space throughout the year, such as the ploughing of snow from walking trails, and

whether the greenspace is open to the public all year in order to encourage physical activity through each season.

At present there is little data on the overall quality of greenspace in terms of its ability to promote physical activity in Halifax Regional Municipality. The analysis of specific greenspace characteristics is valuable in understanding how to promote physical activity at greenspaces; however, a complete analysis of the many characteristics is helpful in understanding the greenspace as an interaction and composition of its many components. For example, focusing only on the presence of sports facilities in a greenspace does not provide an accurate sense of its potential to promote physical activity since other important factors, such as the safety, aesthetics, and available amenities, have not been considered. Several Canadian cities audit and analyze public greenspace by examining a limited number of characteristics, such as the hectares of greenspace per capita provided. However, by focusing only on the amount of greenspace, cities are ignoring important characteristics of the space that determine whether or not it will actually be used. Structured audits of greenspace that analyze the features that influence physical activity are extremely valuable in providing information on the quality of specific characteristics, such as the safety or aesthetics of the area, as well as the greenspace's overall ability to promote physical activity. These audit tools are also extremely useful for comparisons of different greenspaces across the various categories that influence physical activity and as a whole. This type of audit to my knowledge has never been performed in Canada.



## 1.5 Project Introduction

This research project aimed to answer two questions: “What is the quality of public recreational greenspace in terms of its ability to promote physical activity in the Halifax Peninsula according to the POST audit tool?” and “Does greenspace quality in Halifax Peninsula differ according to neighbourhood-level deprivation?” It was hypothesized that the Halifax Peninsula will have few greenspaces of high quality in terms of their ability to promote physical activity, and that most of the greenspaces will result in a medium quality score. It was also predicted that greenspace quality scores of POS, environmental quality, activities, amenities, and safety would all correlate negatively with census-tract deprivation levels. The project had time limits of 7 months of research and analysis. The research was also limited geographically as only Halifax Peninsula was analyzed due to time constraints. Also, greenspace that was analyzed only included those that were open to the public, intended for recreational purposes, and had at least 0.4 hectares of vegetation. The size limitation was applied due to time constraints and to exclude greenspaces that are too small to promote multiple forms of physical activity for multiple users according to expert opinion (Sunarja et al., 2008).

The research questions were addressed using the Quality of Public Open Space (POST) audit tool modified for a Canadian context and applied using direct observation in the Halifax Peninsula. The POST audit tool was developed in Australia with the purpose of auditing public open spaces with an emphasis on the characteristics that promote physical activity (Broomhall et al., 2004). The tool has proven to be reliable and is validated in that parks with higher POS scores are used

more frequently for physical activity (Giles-Corti et al., 2005); it also has been used internationally. However, to better represent a Canadian context this research project will involve an extensive literature review of Canadian research involving the features of greenspace that influence physical activity and will be modified accordingly. Using direct observation of each greenspace in the Halifax Peninsula, the audit tool will then result in information regarding the characteristics of each space, as well as an overall composite score in addition to sub-category scores of activities, environmental quality, amenities, and safety.

The results from this project can inform Halifax urban planning, in particular in terms of changes that should be made to new and existing greenspaces. Halifax Regional Municipality has recognized the local and national trend of physical inactivity and has identified the creation of public greenspaces that promote physical activity as a strategy to combat these trends. The results from this project will directly relate to the information required by decision makers to implement plans to promote physical activity on greenspace. Because the data will be related to neighbourhood-level deprivation, it will also assist decision makers in understanding whether there is equitable access to high quality greenspace throughout Halifax Peninsula and which neighbourhoods could benefit the most from improvements to local parks. This research will also provide other Canadian cities with a model to audit the greenspaces in their municipalities so that the spaces' ability to promote physical activity can be determined.

## Chapter 2: Literature Review

### **2.1 Formal Strategy**

A comprehensive literature review on the connections between greenspace and physical activity was completed to provide a solid background and foundation for this project. The majority of the information discussed in this literature review was gathered using a formal strategy that can be replicated. Peer reviewed articles written in English were selected from the following databases: Academic Search Premier, PubMed, ScienceDirect, and SportDiscus. The search was further limited using the keywords (greenspace\* OR parks\* OR open space\*) AND (physical activity\* OR exercise\* OR recreation\*). The search was then repeated using the previous keywords in addition to (features\* OR characteristics\* or quality\*). The search was then again repeated in the same databases using a keyword search of (greenspace\* OR parks\* OR open space\*) AND (physical activity\* OR exercise\* OR recreation\*) AND (Canada\*). There were no limitations on the year of publication; however, a majority of the research on the subject matter, especially in Canada, has been published in the last 15 years. Relevant studies that were cited in articles found using the formal search were included in this literature review along with related articles suggested by the databases.

### **2.2 Greenspace & Physical Activity**

Research on the role that the built environment plays in limiting or encouraging physical activity is relatively recent, but has been increasing. In particular, public greenspace, which includes areas of vegetation in urban

environments like parks, playgrounds, or fields, have been the spaces that are mainly studied for their influence on physical activity participation (Lee & Maheswaran, 2010). Understanding the potential for greenspaces to encourage physical exercise is particularly important because it can guide urban planning measures in a way that promotes physical activity amongst multiple users.

Much of the initial research regarding the built environment and physical activity has focused on the size and accessibility of public greenspace as the environmental correlates of physical activity (Epstein et al., 2006). These studies largely employed quantitative methods, such as recording the number of times participants exercised in a public greenspace, to analyze this relationship (Epstein et al., 2006). One review of the literature found that proximity to parks was generally associated with increased physical activity, but that access to different park types had a mixed association (Kaczynski & Henderson, 2007). Although some studies have shown a positive correlation between the size and/or proximity of greenspace and its usage for physical activity (Kaczynski & Mowen, 2011; Kaczynski et al., 2009), the results have not been consistent across all studies (Kaczynski, Potwarka, & Saelens, 2008; Prince et al., 2011; Potwarka, Kaczynski, & Flack, 2008; Sugiyama et al., 2010). A plausible explanation for this is that size and proximity are not representative or at least not solely representative of the factors that influence people's use of greenspace for physical activity.

### **2.3 Environmental Correlates of Physical Activity in Greenspace**

Features of the built environment, such as aesthetics, access to facilities, and safety, have been found to have a fairly consistent positive correlation with physical

activity (McCormack et al., 2004). This finding has been supported by both direct observation and qualitative research methods, such as focus groups and interviews (Kaczynski, Potwarka, & Saelens, 2008; McCormack et al., 2010; Veitch, Crawford, & Giles-Corti 2011). Recent studies that involved both youth and adults found that parks with more features were associated with greater physical activity, while park size and proximity were not a significant predictor (Kaczynski, Potwarka, & Saelens, 2008; Potwarka, Kaczynski, & Flack, 2008). Such features include the presence of paths, wooded areas, trails, water areas, sports fields, trash bins, benches, rule signs, drinking fountains, and playgrounds (Kaczynski, Potwarka, & Saelens, 2008).

Understanding which greenspace features are supportive of physical activity is a current focus in children's health research. A study in England that used accelerometers and global positioning systems technology to measure the amount of children's physical activity that occurred in various locations found that greenspace was an important area for moderate to vigorous physical activity, especially on weekday evenings and weekends (Lachowycz et al., 2012). Parents' perceived safety of an area has been shown to have a strong association with the likelihood of children's play or physical activity occurring there (Bringolf-Isler et al., 2010). Teachers, parents, and administrators associated with 59 schools across Canada identified safety, shade, the opportunity to learn more about and interact with nature, play equipment, and moveable parts (e.g. sand, dirt, stones, stick, etc.) as characteristics of the schoolyard greenspace that had observable positive effects on the children's physical activity (Dyment & Bell, 2007). The presence and availability of playgrounds or play spaces have been commonly identified as a

feature of greenspace that has a strong connection with children's physical activity (Potwarka, Kaczynski, & Flack, 2008; Stratton & Mullan, 2005).

#### **2.4 Audit Tools for Measuring Greenspace Quality**

Increased research and understanding of the relationship between physical activity and greenspace has led to the development of survey tools that are designed to gather information about the environmental correlates that influence use of public greenspace for physical activity (Saelens et al., 2006; Broomhall, Giles-Corti, & Lange, 2004; Bedimo-Rung et al., 2006). Each tool differs in its length, applicability for particular situations, and the specific topics that are covered. For example, the Physical Activity Resource Assessment (PARA) tool has been developed to assess the ability of many different environments to promote physical activity, such as parks, churches, sports facilities, and fitness centres (Lee et al., 2005). Because the tool is designed to audit both indoor and outdoor environments equally, the results may lack specificity in comparison to other available audit tools that are more specialized for outdoor environments.

The Quality of Public Open Space Tool (POST) is an audit tool developed in Australia that gathers information regarding environmental characteristics of open spaces, such as parks, playgrounds and other forms of recreational greenspace, with a specific emphasis on the characteristics that are related to physical activity (Broomhall, Giles-Corti, & Lange, 2004). The tool involves direct observation and includes 49 questions in five general categories: activities, environmental quality, aesthetics, amenities, and safety. The tool was developed using information from focus groups and literature reviews and was assessed by a panel of experts (two

government experts on planning, one government expert on sport and recreation, one public health academic, and two community architect and planners) for content validity (Giles-Corti et al., 2005). The creators of the tool also consulted expert opinion to develop a weighting system that is applied to some of the audit questions, and results in a composite score of overall quality or likelihood to promote physical activity (Giles-Corti et al., 2005). The POST audit tool has been tested for inter-rater reliability and was validated in a study that determined that park users were significantly more likely to partake in physical activity in parks that were scored high according to the POST tool (Giles-Corti et al., 2005). Versions of this tool have also been used in other studies conducting research into the connection between greenspace and physical activity (Taylor et al., 2011; Crawford et al., 2008; Badland et al., 2010) and to evaluate the quality of public greenspace in communities and municipalities so that needed improvements can be identified (Montachusett Opportunity Council, 2010).

## **2.5 Greenspace Quality and Deprivation**

There is evidence that exposure to greenspace can aid in reducing socioeconomic health inequalities (Mitchell & Popham, 2008). In addition, researchers have noted that people who are socio-economically deprived are less physically active in comparison to people from a higher-income bracket (Gidlow et al., 2006). One possible explanation for this is that people who are socio-economically deprived may have less access to resources that promote physical activity, such as high-quality greenspace. The accessibility and amount of greenspace has not been found to vary significantly between areas of high or low

socio-economic deprivation (Timperio et al., 2007). However, as emphasized previously, it is important to also consider the features of greenspace along the socioeconomic strata because they are a strong predictor of the likelihood that the space will actually be used for physical activity (McCormack et al., 2004).

There is evidence that greenspace in high socioeconomic areas have more characteristics that promote physical activity (Crawford et al., 2008). Both adults and youth from a deprived neighbourhood in North Staffordshire, U.K. expressed a lack of facilities as a barrier to their usage of a local greenspace for recreation (Gidlow & Ellis, 2011). People living in more deprived areas have also indicated a negative perception of the safety of their local greenspace (Jones et al., 2009). Crawford et al. (2008) also found that in comparison to areas of high socioeconomic status greenspaces in highly deprived areas had fewer features that may be important in the promotion of children's physical activity, such as walking/cycling paths, shady trees, picnic tables, and drinking fountains.

## **2.6 Greenspace and Physical Activity in Canada**

Greenspace audits should also consider the influence of weather on the availability of features that promote physical activity. Research done in Canada (McCormack et al., 2009) and in England (Chan, Ryan, & Tudor-Locke, 2006) have similarly found that inclement weather can have a moderate effect on decreasing the likelihood of people to participate in outdoor physical activity. For example, dog-owners are more likely to participate in outdoor recreation than non-dog owners during winter months (Lail, McCormack, & Rock, 2011). Opportunities to partake in outdoor winter activities, such as skating, influence the likelihood of



outdoor physical activity occurring (Public Health Agency of Canada, 2009). Thus, access to well maintained public greenspace during the winter season, as well as the availability of features that promote cold-season recreation may influence usage of greenspace for physical activity in Canada during the winter.

There are very few Canadian studies that have examined the link between the features of greenspace and physical activity. The available research is relatively recent. Some researchers omitted many of the features of greenspace that have been identified as an influence on physical activity, such as the presence of sports facilities or aesthetic qualities, when designing their study and instead only focused on the size or proximity, which has resulted in perplexing results (Prince et al., 2011). Of the studies conducted in Canada to evaluate the links between greenspace characteristics and physical activity, most found that safety, access to facilities, amenities, and aesthetics are important greenspace features in promoting physical activity (Dyment & Bell, 2007; Kaczynski, Potwarka, & Saelens, 2008).

## **2.7 Gaps in Knowledge**

An audit tool that is specific to Canada and gathers information about the objectively measured environmental correlates of greenspace and physical activity has not yet been developed. Similarly, very few studies in Canada have been conducted that involve the application of knowledge about the characteristics of greenspace that influence physical activity. This application refers to the ability to determine the quality and capacity of individual public greenspaces to promote physical activity amongst multiple users, such as through the use of audit tools. One of the strengths of audit tools is their ability to standardize information, so that

individual greenspaces can be compared and particular areas that need improvement can be identified easily. In addition, few studies in both Canadian and international literature have investigated how greenspace quality varies with socioeconomic status on a neighbourhood level. The available Canadian research indicates that the factors that influence Canadians' usage of greenspace for physical activity are similar to the factors that have been discussed in this literature review and are represented in available audit tools, especially the POST tool (Dyment & Bell, 2007; Kaczynski, Potwarka, & Saelens, 2008). Although studies have identified features of greenspace that influence physical activity, research that involves objectively measuring the characteristics of greenspace in Canada to determine its ability promote physical activity is scant. This type of research has never been performed in Halifax to my knowledge. Thus, modification of the POST tool for a Canadian context and the direct application of this tool provides a great opportunity for understanding of the current quality of greenspace in Halifax in terms of its ability to promote physical activity amongst multiple users.

## Chapter 3: Methods

### **3.1 Overview of Methods**

The methods used in this research involve the modification of the Quality of Public Open Space Tool for the Canadian context, as well as the application of the audit tool in the field using direct observation. Basic statistics and calculations congruent with the audit measurement will be performed to analyze the data and answer the research questions. Socioeconomic deprivation data for the census tracts of the study area will be assessed for a statistical correlation with all greenspace quality scores. Data will also be represented spatially using GIS mapping and shared with Halifax Regional Municipality.

### **3.2 Scope of Research**

The study area chosen for the research is Halifax Peninsula using Joseph Howe Drive as the boundary between the peninsula and the mainland (Figure 1). A larger study area would have significant feasibility issues in terms of time and access constraints. Due to time constraints, the research was performed from the months of September 2012 to April 2012 (Figure 2). Direct observation and auditing of the parks occurred primarily during the month of November (Figure 2).



Figure 1: Map of the study area (Halifax Peninsula). Joseph Howe Drive is highlighted in Red and will be used as the cut-off point from the mainland

Tasks	2012					2013		
	S	O	N	D	J	F	M	
1 Audit Greenspace in Halifax Peninsula Using POST audit tool								
1a Review literature and modify POST for Canadian context	█	█	█					
1b Determine sizes and locations of all spaces to be audited		█	█	█				
1c Apply modified POST tool on chosen sites using direct observation			█	█	█			
2 Compile visual representations of greenspace quality in Halifax Peninsula								
2a Score and rank audits of greenspace				█	█	█		
2b Create GIS database of greenspace quality in Halifax Peninsula					█	█	█	
2c Analyze trends and statistical analysis						█	█	
3 Communication of Work								
3a Write and submit final thesis					█	█	█	
3b Honours Qualifying Exam							█	

Figure 2: Gantt chart displaying planned project schedule and objectives

### 3.3 Project Design

As greenspaces can have a variety of purposes, the greenspaces for this study were limited to those that were public and recreational (intended for some form of physical activity). This allows for a greater likelihood that recommendations from the research will be directly applicable for decision makers, as the municipality already identifies the areas in their land-use strategies as places that should promote physical activity (Halifax Regional Municipality Community Development, 2009). Halifax Regional Municipality geographic data, specifically the ArcGIS layer HRM Parks, from 2012 was accessed to supply the sample of public recreational greenspaces in the study area. HRM parks include a wide variety of greenspace in the municipality that are all public and recreational. The data were added into GIS and the parks in the study area were selected, resulting in 78 greenspaces.

Because of time constraints, it would not be feasible to sample all 78 public recreational greenspaces in the study area. Although Halifax Regional Municipality considers 0.1 hectares to be the minimum size of an urban park (Halifax Regional Municipality Community Development, 2009), expert opinion suggests that this size is not ideal for creating multiple physical activity opportunities for multiple users (Sunarja, Wood, & Giles-Corti, 2008). Thus, the greenspaces to be audited were further limited by maintaining that they must be greater than or equal to 0.4 hectares in area, which is more congruent with expert suggestion for minimum park size and the minimum park sizes used by other Canadian cities (City of Hamilton, 2004). The application of the 0.4 hectare size criteria resulted in a selection of 45 parks in the study area.

Recent satellite imagery from Google Maps was added as a basemap to the GIS database and the transparency of the HRM Parks layer was changed to 70% so that imagery of each park could be visible. Using the satellite imagery and the measure tool in GIS, the amount of vegetation in each park was determined and 0.4 hectares of actual vegetation was used as another inclusion criteria. Parks that did not meet this criteria include: Grafton Street Park, St. Catherine's Elementary School Park, Historic Properties, Bloomfield Centre Park, Grand Parade, Ecole Beaufort Park, Oxford School Park, Highland Park Junior High School Park, St. Joseph's Alexander McKay Elementary School Park, St. Mary's Elementary School Park, and Joseph Howe Elementary School Park. Following the exclusion of the parks that did not meet the requirements, 34 greenspaces in the study area remained to be audited.

### **3.4 Modification of Audit Tool for a Canadian Context**

The Quality of Public Open Space Tool (POST) was modified for a Canadian context based on a review of Canadian literature in the field as well as from personal knowledge of Canadian winters. The modified POST tool (POSTcan) is available in Appendix 1 and primarily differs from the original POST in that the effects of winter weather are considered.

### **3.5 Auditing of Greenspaces**

POSTcan contains 47 questions that collect data in 4 general categories: activities, environmental quality, amenities, and safety. The same auditor audited each space primarily during the month of November 2012 using direct observation. Because the POST tool has high inter-rater reliability (Broomhall et al., 2004), it is assumed that having one person conduct the audits will have little impact on the

results in comparison to multiple people auditing the same parks. In addition, photographs were taken during the auditing process. The majority of the questions on the audit do not relate specifically to weather-influenced characteristics and can be accurately audited in the fall season (Appendix 1). However, due to time constraints, questions that pertain to the effects of winter weather, such as snow removal from paths were not answered using direct observation as it would require all of the greenspaces to be audited again once there is snow on the ground. Instead, a list of all greenspaces used in the research were sent to the Halifax Regional Municipality Recreation Department and communication with them was used to answer the questions on maintenance of the park during the winter.

### **3.6 Data Analysis of Greenspace Scores and Deprivation**

The data collected for each greenspace was compiled in Excel and the established weighting system for the POST Tool was applied to calculate the overall Public Open Space (POS) score of each greenspace. Additionally, sub-component scores for safety, environmental quality, activities, and amenities were calculated for each greenspace using a researcher-derived basic point system that provides equal weight to the presence of certain features particular to each sub-component (Appendix 2). Descriptive statistics, including the mean, median, and standard deviation, were calculated to describe the Halifax Peninsula park scores. A deprivation index that represents both social and material deprivation on the census tract level of the study area was obtained from previous research (Jones, Terashima, & Rainham, 2009) and mapped. The census-tract level deprivation scores were grouped in quintiles so that a greenspace would receive a deprivation

value of between 1 and 5 from less to more deprived based on the census tract in which it was located. This manner of linking greenspaces to deprivation levels was most suitable for the time constraints of this project; however, greenspaces could also be linked to deprivation levels using more complex methods that associate deprivation with greenspace based on a radius surrounding each park. One-way ANOVA was applied to the data in order to determine if parks scores across five categories of deprivation were significantly different. The Tukey-Kramer multiple comparison method was used to correct for the unequal sample sizes and to determine specifically which groups differed. POST scores and deprivation values were mapped to explore spatial variation in scores in the study area.

### **3.7 Limitations & Assumptions**

The research of this project is also operating under certain assumptions. Because the HRM Park list from the Halifax Regional Municipality database provided the population of public recreational greenspace for sampling, any errors in the database, such as parks that were mistakenly excluded, will likely be present in this research. Thus, the research is operating under the assumption that the HRM Park list is accurate and representative of the public recreational greenspace in Halifax. Additionally, the research is operating under the assumption based on expert opinion that the greenspace being audited are able to promote multiple forms of physical activity for multiple users due to it being of a size greater than 0.4 hectares.

### **3.8 Result Sharing**

The information gathered from this research will be compiled into an honours thesis and the results will be shared at the Honours Qualifying Exam at



Dalhousie University. The results from the research can also be available to be shared with those interested in conducting further research into the connection between greenspace and physical activity in Halifax. Results will also be shared with Halifax Regional Municipality to aid in the general knowledge of the state of the public recreational greenspace, as well as to assist in making improvements.

## Chapter 4: Results

### 4.1 Park Scores

The park with the highest POS score was Westmount Elementary School Park, while the park with the lowest POS score was St. Andrew's Park (Table 1). Chisholm Avenue Park had some of the lowest scores in POS, environmental quality, and amenities (Table 1). Westmount Elementary School Park scored high in POS, safety, and activities (Table 1). Fort Needham Park also scored high in all categories, except for safety (Table 1). Some parks scored very high in one category, but poorly in another. Point Pleasant Park had one of the highest environmental quality scores, but also one of the poorest safety scores (Table 1). Similarly, Halifax Public Gardens had one of the highest environmental quality scores, but scored very poorly in terms of activities (Table 1). The only park to score 0 in any of the categories was Memorial Drive Trail, which had no positive features that related to amenities (Table 1).

Table 1: Individual Park Scores and Corresponding Deprivation Ranking. Score of 1= least deprived, 5= most deprived; the highest possible score that can be achieved for the remaining categories is as follows: POS = 100, Activities = 18, Environmental Quality = 12, Amenities = 12, Safety = 6. Parks are listed in descending order based on their POS score,

Park Name	POS	Activities	Environmental Quality	Amenities	Safety	Deprivation
St. Andrew's Park	17.6	1	6	4	2	5
Chisholm Avenue Park	18.6	1	1	1	4	5
BI-HI Park	23.2	1	3	3	2	4

Park Name	POS	Activities	Environmental Quality	Amenities	Safety	Deprivation
Murray Warrington Park	23.4	1	4	5	4	5
Chebucto Road School Park	27.1	2	4	4	5	3
St. Catherine's Elementary School Park	33.9	3	3	4	4	5
Isleville Park	35	2	5	4	6	5
Seaview Lookoff Park	36.2	1	6	2	1	3
Gorsebrook Park	40.1	5	4	5	4	4
Larry OConnell Park	40.1	4	6	4	5	1
LeMarchant St. Thomas Elementary School	40.1	2	5	5	3	2
St. Stephen's Elementary School Park	40.1	4	5	5	5	3
Memorial Drive Trail	43	1	8	0	3	3
Saunders Park	44.9	1	8	4	5	3
Westwood Park	48	2	6	3	6	5
Horseshoe Island Park	50.7	1	7	4	2	1
Cornwallis Park	51.7	2	8	5	5	3
Victoria Park	52	1	7	4	5	1
Halifax North Commons	52.5	3	6	5	5	1

Park Name	POS	Activities	Environmental Quality	Amenities	Safety	Deprivation
St. Agnes Junior High School Park	53.8	2	6	3	4	3
Public Gardens	55.2	1	10	5	4	1
George Dixon Centre Park	57.6	4	6	6	5	5
Conrose Park	63.5	3	6	7	5	2
Halifax Central Commons	63.5	6	5	6	4	1
Africville	65.5	2	9	7	1	3
Point Pleasant Park	67.3	3	11	9	2	1
Upper Flinn Park	69.1	3	9	5	2	1
Merv Sullivan Park	70.3	6	6	6	5	3
Ardmore Park	75.9	3	9	4	5	3
Fort Needham Memorial Park	75.9	5	10	7	3	5
St. Mary's Boat Club Park	81.4	3	7	5	4	2
Westmount Elementary School Park	83	5	8	5	5	3

## 4.2 Descriptive Statistics

Table 2: Descriptive Statistics of Park Scores (N=32)

	Mean	Median	Standard Deviation	Maximum	Minimum
POS Score	50.0	51.2	18.3	83.0	17.6
Activities Score	2.6	2.0	1.6	6.0	1.0
Environmental Quality Score	6.4	6.0	2.3	11.0	1.0
Amenities Score	4.6	5.0	1.8	9.0	0.0
Safety Score	3.9	3.0	1.4	6.0	1.0

## 4.3 Statistical Analysis of Relationship Between Park Scores and Deprivation

A statistical analysis of park scores between deprivation levels using one-way analysis of variance revealed that the overall POS scores did not differ significantly between deprivation levels (See Table 3). This same trend, of no significant difference between deprivation levels, was noted for activities, amenities, and safety scores (See Table 3). However, a p-value of 0.045 indicates environmental quality scores are statically significantly associated with deprivation levels (See Table 3). Thus, environmental quality is the only greenspace quality score that differs significantly between the neighbourhood-level deprivation rankings.

Table 3: Results from One-Way Analysis of Variance (ANOVA) Comparing Park Score Means Between Deprivation Rankings. Values of statistical significance (<0.05) are indicated in bold

	Sum of Squares	df	Mean Square	F	Significance
POS Score	2568.365	4	642.091	2.230	0.092
Activities Score	0.913	4	0.228	0.083	0.987
Environmental Quality Score	46.250	4	11.563	2.806	<b>0.045</b>
Amenities Score	11.299	4	2.825	0.902	0.477
Safety Score	3.344	4	0.836	0.393	0.812

The Tukey-Kramer multiple comparison method did not determine significant differences between the mean environmental quality scores of different deprivation levels as a significance level of 0.05 was not achieved (See Table 4).

Table 4: Multiple Comparisons Analysis of Environmental Quality Scores Between Deprivation Levels Using the Tukey-HSD with Kramer correction. There are no significant values ( $p < 0.05$ ).

#### Multiple Comparisons

Tukey HSD							
Dependent Variable	(I) Deprivation Ranking	(J) Deprivation Ranking	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
						Environmental Quality Score	1.00
3.00	.62500	.94320	.963	-2.1298	3.3798		
4.00	4.12500	1.60475	.105	-.5620	8.8120		
5.00	2.50000	1.01493	.129	-.4643	5.4643		
2.00	1.00	-1.62500	1.37423	.761	-5.6387		2.3887
	3.00	-1.00000	1.32213	.941	-4.8615		2.8615
	4.00	2.50000	1.85301	.664	-2.9121		7.9121
	5.00	.87500	1.37423	.968	-3.1387		4.8887
3.00	1.00	-.62500	.94320	.963	-3.3798		2.1298
	2.00	1.00000	1.32213	.941	-2.8615		4.8615
	4.00	3.50000	1.56037	.195	-1.0574		8.0574

### Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Deprivation Ranking.	(J) Deprivation Ranking	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
	4.00	5.00	1.87500	.94320	.299	-.8798	4.6298
		1.00	-4.12500	1.60475	.105	-8.8120	.5620
		2.00	-2.50000	1.85301	.664	-7.9121	2.9121
		3.00	-3.50000	1.56037	.195	-8.0574	1.0574
		5.00	-1.62500	1.60475	.847	-6.3120	3.0620
	5.00	1.00	-2.50000	1.01493	.129	-5.4643	.4643
		2.00	-.87500	1.37423	.968	-4.8887	3.1387
		3.00	-1.87500	.94320	.299	-4.6298	.8798
		4.00	1.62500	1.60475	.847	-3.0620	6.3120

#### 4.4 GIS Maps of Study Area

The spatial representations of the study area depict the relationship between greenspace quality scores and census-tract level deprivation. Four census tracts did not contain any public recreational greenspace with at least 0.4 hectares of vegetation; thus they were not included in the deprivation analysis and appear only as satellite imagery (See Figures 3, 4, 5, 6, 7). Each of the maps depicts a general trend in which the census tracts in the southern part of the study area are less deprived than those in the north (See Figures 3, 4, 5, 6, 7). The most visible trend shows that environmental quality scores tend to be highest in the least deprived census-tracts (Figure 5). Similarly, with the exception of one high-scoring park, the most deprived census-tracts mostly contain greenspaces with poor environmental quality scores (Figure 5).

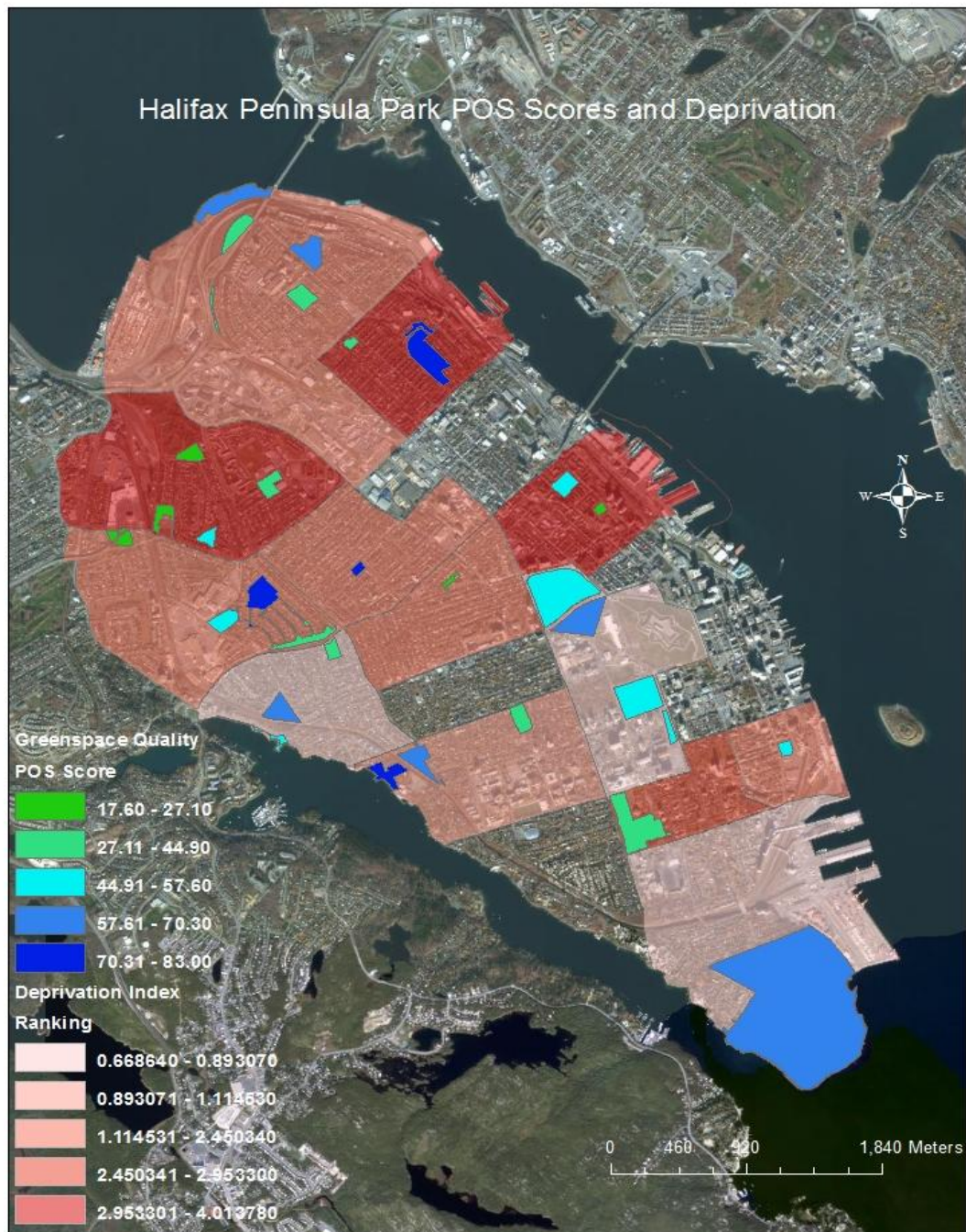


Figure 3: Halifax Peninsula Park POS Scores and Corresponding Deprivation Rankings. Census tracts that are a darker shade of red are more socio-economically deprived. Park POS scores range from shades of green (low scores) to blue (high scores)



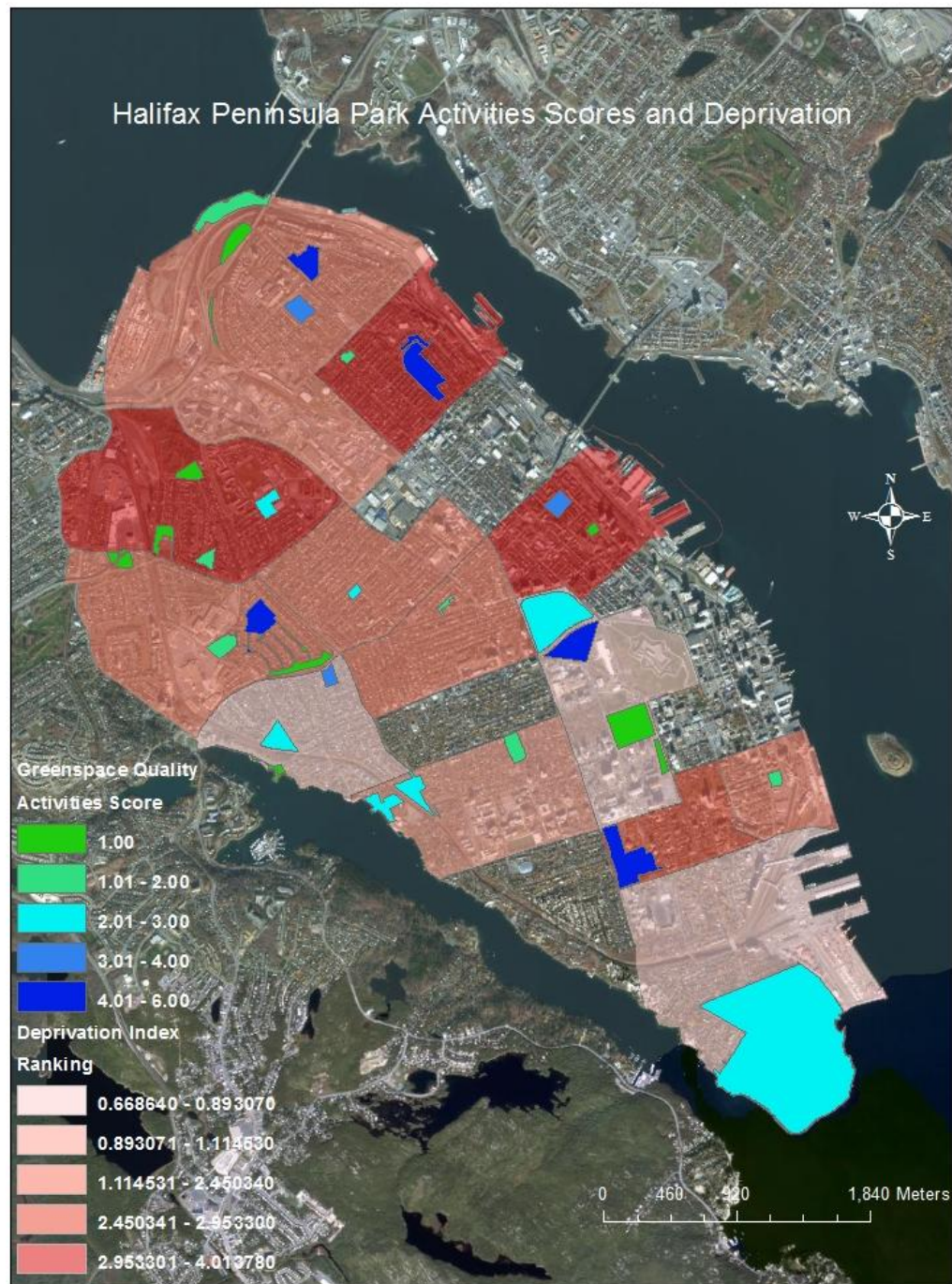


Figure 4: Halifax Peninsula Park Activities Scores and Corresponding Deprivation Ranking. Census tracts that are a darker shade of orange are more socio-economically deprived. Park activities scores range from shades of green (low scores) to shades of blue (high scores).



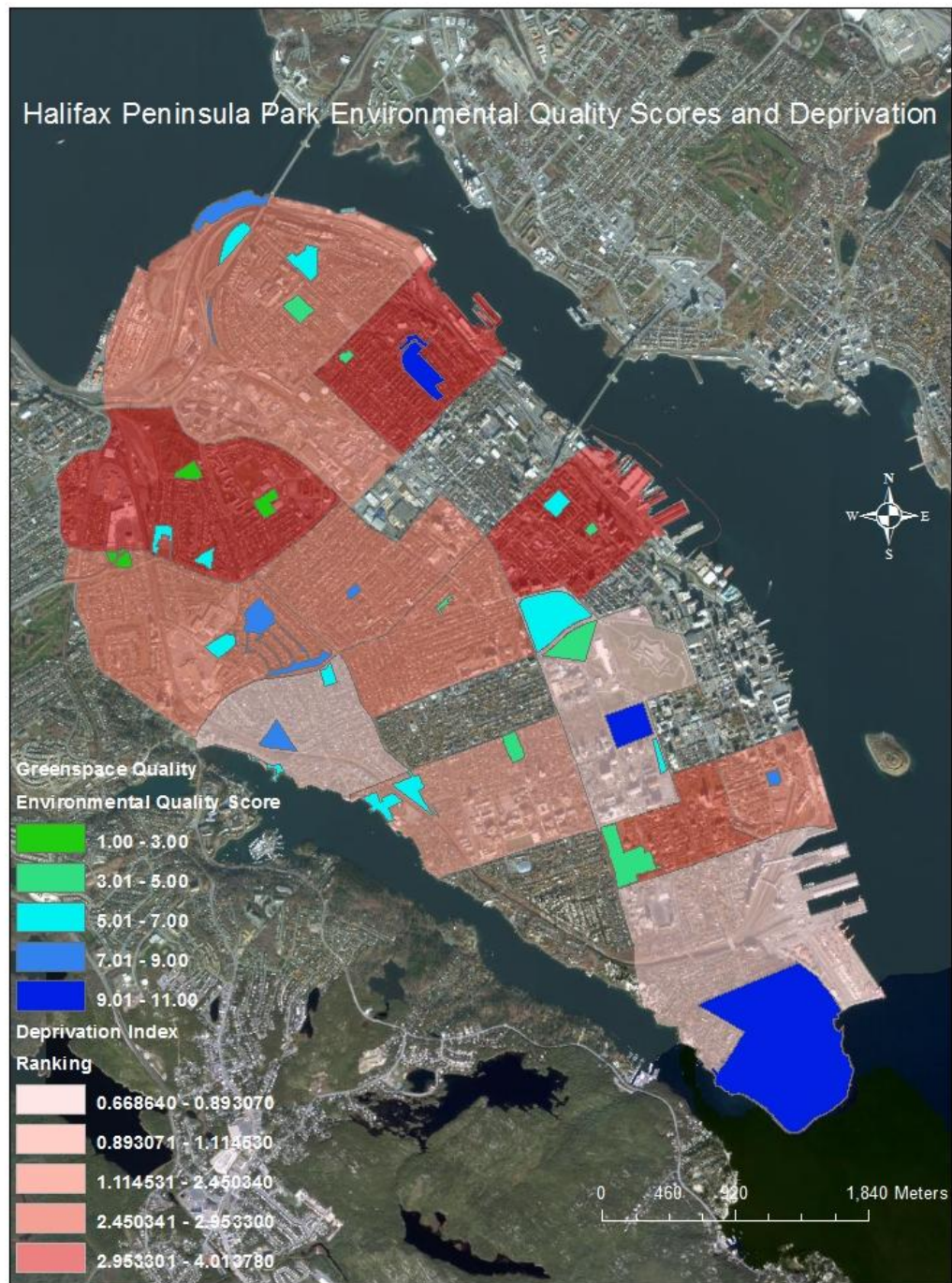


Figure 5: Halifax Peninsula Park Environmental Quality Scores and Corresponding Deprivation Ranking. Census tracts of a darker shade of orange are more socio-economically deprived. Park environmental quality score range from shades of green (low scores) to shades of blue (high scores)



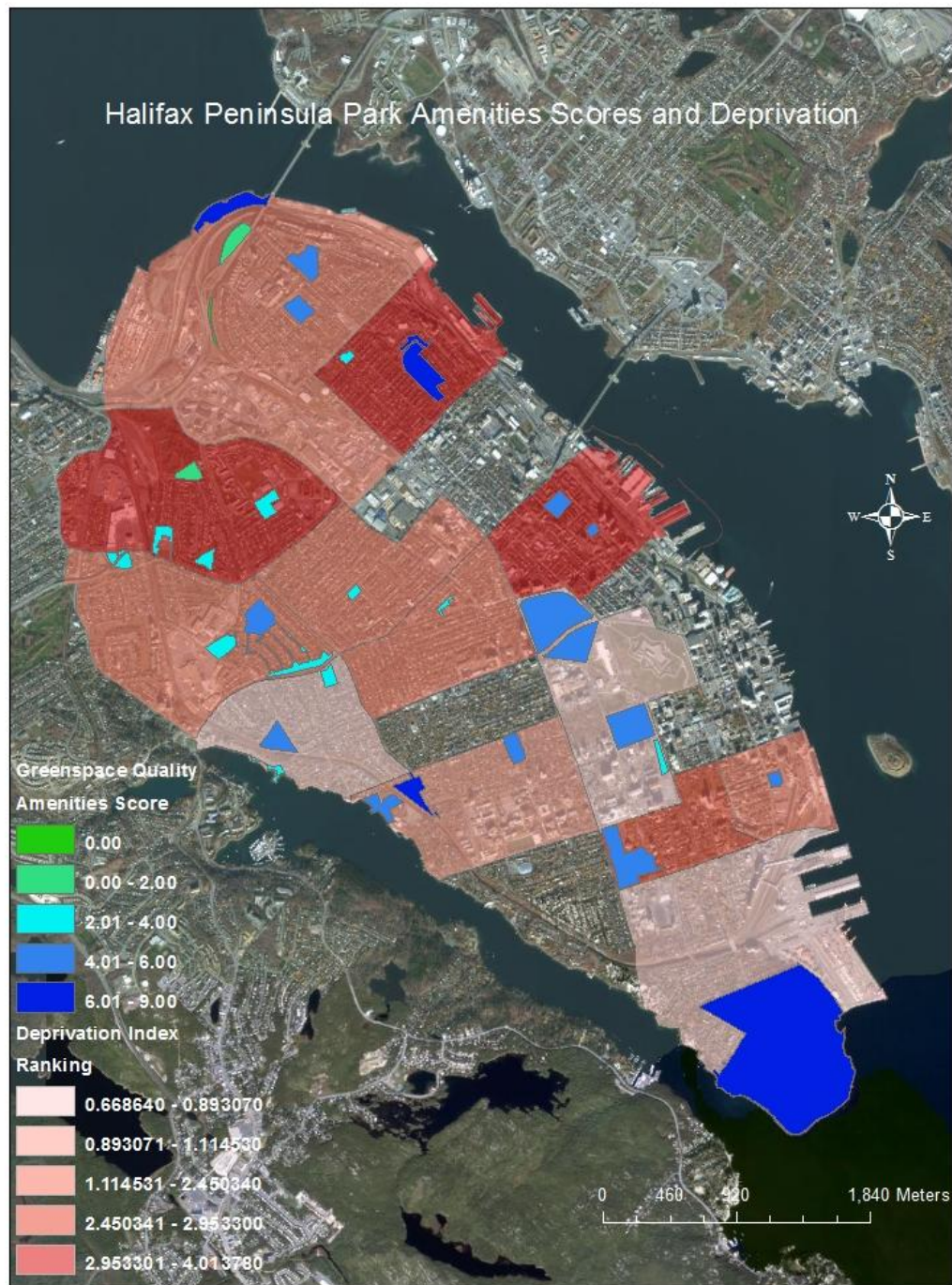


Figure 6: Halifax Peninsula Park Amenities Scores and Corresponding Deprivation Ranking. Census tracts of a darker shade of orange are more socio-economically deprived. Park amenities scores range from shades of green (low scores) to shades of blue (high scores).

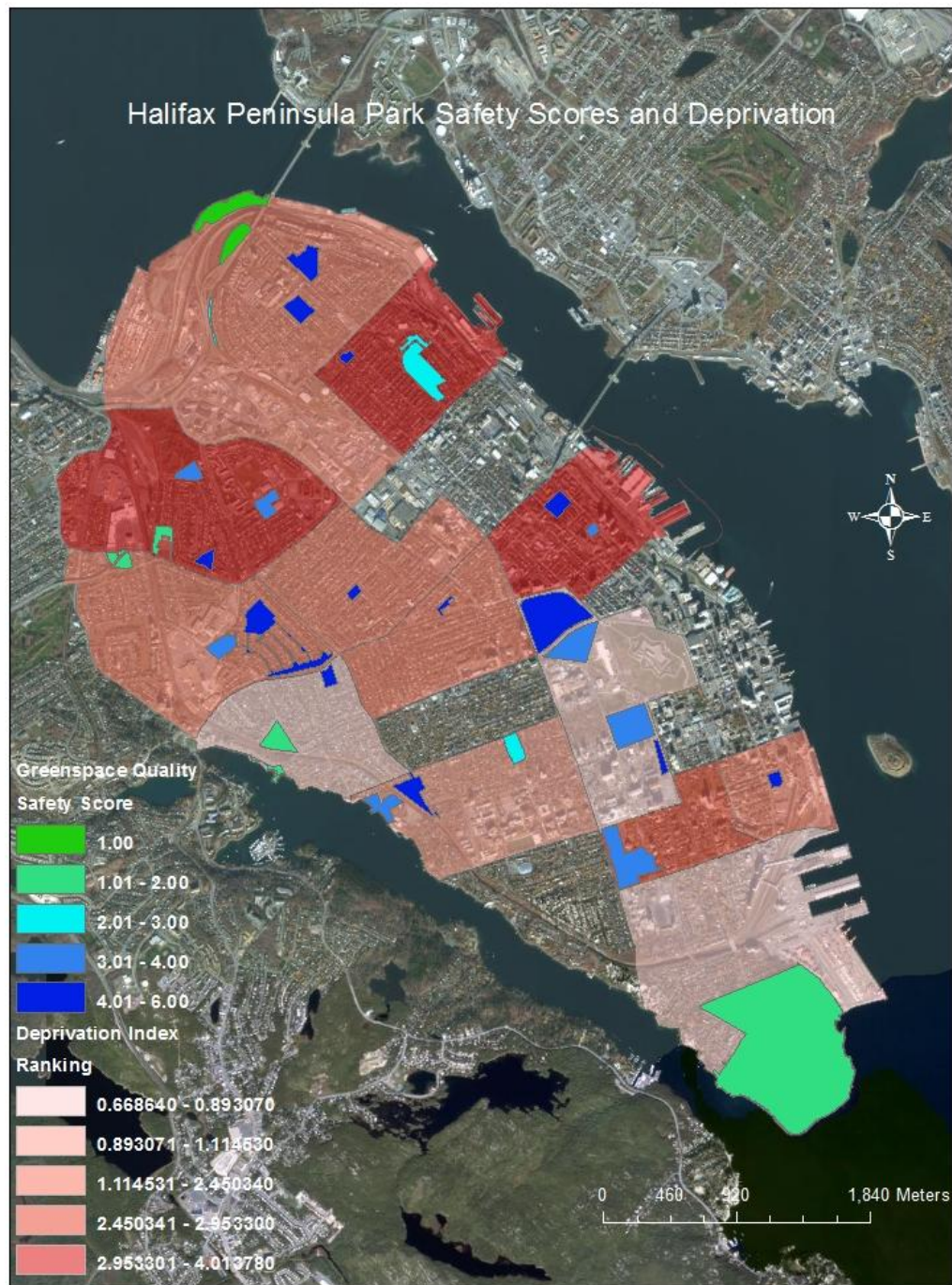


Figure 7: Halifax Peninsula Park Safety Scores and Corresponding Deprivation Ranking. Census tracts of a darker shade of orange are more socio-economically deprived. Park safety scores range from shades of green (low scores) to shades of blue (high scores).



## Chapter 5: Discussion

### **5.1 Interpretation of Park Scores**

On average, the public recreational greenspaces in Halifax Peninsula that were studied in this thesis scored medium POS scores, environmental quality scores, amenity scores, and safety scores (See Table 2). The mean park score in each of these dimensions was nearly 50% of the highest possible score that could have been achieved. However, the average activity score is much lower than the maximum possible score, which indicates that most of the parks in the study area are designed for the purpose of a few specific activities and not for multiple differing forms of physical activity. This may be due to the fact that designing and maintaining greenspaces that can support multiple forms of physical activity can be expensive and thus potentially less appealing for Halifax Regional Municipality. For example, the implementation of swimming pools and sports fields may be viewed as a superfluous expenditure to public recreational greenspace. Alternatively, public recreational greenspace in HRM may be designed with a purposeful emphasis on more passive forms of physical activity, such as walking, since the majority of audited parks had walking paths. The mean POS score of Halifax Peninsula parks is similar to the mean score observed in studies performed in Australia (Giles-Corti, 2005).

The range of each greenspace quality score reveals that public recreational greenspace in Halifax Peninsula can vary considerably from poor to high quality between individual parks in each of the studied dimensions; however, most parks achieved medium level scores. In general, parks that scored high POS scores also

scored relatively high scores for environmental quality, activities, amenities, and safety (Table 1). An example of the reverse trend is Chisholm Avenue Park, which achieved the second lowest POS score and scored poorly on all other dimensions except for safety (Table 1). As the calculated POS score is a representation of the ability of the greenspace to promote physical activity, the results from this study indicate that individual public recreational greenspaces in HRM may differ greatly in this ability. The scores for environmental quality, activities, amenities, and safety also reveal that the audited parks in Halifax Peninsula can differ greatly in terms of quality relating to those factors. This could be due to park design that heavily emphasizes particular characteristics. For example, Halifax Public Gardens scored extremely high in terms of environmental quality (aesthetics), but very poorly in terms of activities (Table 1). This is likely due to the fact that the greenspace is designed with an emphasis on its aesthetic features, such as gazebos and flowers, and is restrictive of any forms of physical activity other than walking so as to protect these aesthetics features. Another example of this is Point Pleasant Park, which scored poorly in terms of safety partially due to the fact that neither roads nor houses can be seen from the centre of the park; however, this quality is inherent to a large urban forest.

## **5.2 Environmental Quality and Deprivation**

Statistical analysis using one-way ANOVA revealed environmental quality scores were significantly associated with neighbourhood-level socioeconomic deprivation (Table 3,  $p < 0.05$ ). However, the Tukey-Kramer multiple comparison method did not determine a significant difference between mean environmental

quality scores of different deprivation levels (Table 4). This statistical contradiction may be due to the fact that the Tukey-Kramer multiple comparison test addresses the fact that the sample sizes are unequal. Although this correction is appropriate since the sample sizes from each deprivation level were unequal, it can make it more difficult to determine a significant difference. Hence, the sample size used in this study may be too small and lacking in statistical power for a significant difference to be determined. Another possibility is that the trend noted in the one-way ANOVA is too complex to be determined using a post hoc test. For example, the one-way ANOVA can detect differences between various combinations of means, but post-hoc tests generally only test for differences between pairs of means. The results from this study indicate a general trend that parks in the study area with higher environmental quality scores were more likely to be found in the least deprived areas (Table 1 and Figure 3).

The observed general trend that parks with low environmental quality scores, or less aesthetically pleasing features, are found in areas of high socio-economic deprivation generally echoes the findings of past research that have determined that socio-economically deprived areas may lack access to greenspace with more features that promote physical activity (Crawford et al., 2008). More aesthetically pleasing greenspace may be located in less deprived areas of Halifax Peninsula due to a multitude of factors. People who are less deprived are more likely to have additional income to donate towards the aesthetics of their local greenspaces. Also, people who are not socio-economically deprived may have more political, social, and economic power in determining how the municipalities' funds

are allocated for greenspace maintenance and aesthetics, which could result in the favourable environmental quality scores for parks in the least deprived areas.

Similarly, people who live in socio-economically deprived neighbourhoods may lack high expectations for the aesthetics of local greenspace if they feel that they have little agency in terms of municipal planning. In addition, the aesthetics of local greenspace may not be a priority for people who are socially or economically deprived; thus, if they were to advocate for changes within the municipality the environmental quality of local greenspace may not be an issue that they address or vocalize.

However, the general trend that the environmental quality of greenspace is lower in more deprived areas is particularly concerning as past research has found that socio-economically deprived groups participate in less physical activity than their high-income counterparts (Boone-Heinonen et al., 2010). This lack of participation in physical activity may be due in part to lack of access to high quality public parks that promote physical activity. Environmental quality, or aesthetics, has been determined to have an important influence on the likelihood that greenspace will be used for physical activity purposes (Giles-Corti, 2005). Thus, there is a potential that the general trend noted in this thesis may in turn have an effect on the levels of physical activity usage in public recreational greenspace on Halifax Peninsula. In particular, less physical activity may occur in socio-economically deprived areas because the public greenspace are less aesthetically pleasing.

### **5.3 Significance and Implications of Results**



The results from this thesis could have a significant impact on Halifax Regional Municipality urban planning, particularly in terms of public recreational greenspace. Firstly, the results from this research provide detailed and current information on the characteristics of many public recreational greenspaces. This information provides decision makers with the foundation needed to make changes to urban greenspace, as knowledge of the current state of public parks is a necessary prerequisite to determining unique improvements required for individual greenspaces. Secondly, the calculation of POS scores using the Quality of Public Open Space Tool allows for the physical activity promotion potential of each park to be identified, which can aid in the success of current and upcoming municipal planning initiatives to increase public physical activity levels. Park scores relating to environmental quality, activities, amenities, and safety can assist decision makers by providing a more broad description of the characteristics of public greenspace, especially those that influence physical activity. Thus, areas of improvement can be targeted and specific strategies can be devised based on the unique needs of particular areas. For example, Memorial Drive Trail had no features that relate to amenities, so the addition of benches, picnic tables, or trash bins could aid in increasing physical activity in that area. Similarly, Chisholm Avenue scored very poorly in terms of environmental quality; thus, the addition of more aesthetic features and maintenance of the park to remove litter and graffiti could aid in promoting more physical activity. The examination of greenspace in relation to deprivation levels also informs decision makers of a general trend in which more aesthetically pleasing public greenspace are located in less deprived areas.

Knowledge of this trend can result in policies or strategies that aim to improve the environmental quality of public greenspace in socio-economically deprived neighbourhoods in Halifax Peninsula, such as increased park maintenance to reduce litter and graffiti as well as the addition of gardens.

## Chapter 6: Conclusion

### **6.1 Research Focus**

Specific characteristics of urban greenspace have been shown to influence the likelihood that physical activity will occur there. It is important to understand the connection between greenspace and physical activity because physical activity has many known health benefits, but the majority of Canadian adults and children are not achieving the recommended daily levels of physical activity. This trend has also been observed in Halifax Regional Municipality and the municipality has indicated an interest in using greenspace to increase and promote physical activity. In addition, past research has observed that quality greenspace may be distributed unequally between deprived and privileged areas. The development of tools, such as the Quality of Public Open Space Tool, allow for an objective measurement of the characteristics of greenspace that influence physical activity. The purpose of this research was to answer the following questions:

- How do public recreational greenspaces in Halifax Peninsula score according to the Quality of Public Open Space audit tool in terms of their ability to promote physical activity?
- Is there a relationship between the quality of public recreational greenspace in Halifax Peninsula and the socio-economic deprivation of the area where it is located?

## **6.2 Main Findings**

The results from this thesis indicate that on average the 32 studied parks, with a median score of 51.2, achieved a medium POS score according to the Quality of Public Open Space Tool (Table 2). On average, the studied parks also achieved medium scores for environmental quality, amenities, and safety (Table 2). However, the standard deviation and range of each score indicates that there is significant variation and amongst individual studied parks in terms of overall ability to promote physical activity (POS), environmental quality, activities, amenities, and safety (See Table 2). The results also indicate that the parks' POS, activities, amenities, and safety scores are not correlated with census tract deprivation levels. However, the results indicate a general trend that greenspace with poor environmental quality is more likely to be located in census tracts that are more deprived (Table and Figure 5).

## **6.3 Limitations and Future Research**

There are important limitations to this research that must be considered in order to accurately understand any of the observed results. Due to time and access restraints, the study area and sample size for this research were limited. The small sample size may have contributed to the contradictory statistical results observed using the Tukey-Kramer multiple comparison method (Table 4). Thus, the research in this thesis can be expanded upon in the future by increasing both the size of the study area and sample. Another important limitation in terms of data analysis refers to the allocation of greenspaces to deprivation rankings based on the deprivation of the census tract in which they are located. Some parks are located

near multiple census tracts with differing deprivation levels, which means that the park could easily be accessible to people from different deprivation rankings. Thus, the assignment of the parks to a deprivation ranking based only on the census tracts in which they are located may not accurately reflect the deprivation of the people who are accessing the park. Future research could develop a more comprehensive method to link greenspace to deprivation levels, such as calculating deprivation levels within a certain radius of the greenspace.

Another important consideration is that this research made use of a deprivation index that included both social and material factors. There is a potential that different results may be observed if either social and material deprivation were analyzed independently of one another and this should also be considered for future research. Due to time constraints, the Quality of Public Open Space Tool was modified for a Canadian context using only a review of Canadian literature on the factors that influence the likelihood of physical activity occurring in the greenspace; however, further studies can make use of focus groups and questionnaires regarding characteristics of greenspace that encourage or discourage physical activity to develop an audit tool that is even more specific for the regional or municipal level. Although this study did not determine significant associations between overall greenspace quality and deprivation, it could be possible that there are significant associations between the overall availability of all forms of activity space, such as indoor sports arenas and shopping areas. Further research could investigate the availability of these areas in Halifax Peninsula and a possible association with deprivation.

#### **6.4 Research Contribution and Broader Implications**

As the analysis of objective measurements in order to determine the ability of greenspace to promote physical activity is limited in Canadian literature, this thesis provides a novel addition to the current knowledge base on the connection between greenspace and physical activity. The application of an audit tool, such as the Quality of Public Open Space Tool, to determine the physical activity promotion potential of public recreational greenspace has never been performed in Halifax Regional Municipality; thus, the results from this thesis provide valuable information regarding the quality of public recreational greenspace on the peninsula in terms of its ability to encourage physical activity. This thesis can have significant implications because of its potential to be directly applied to Halifax Regional Municipality urban planning strategies. The data and analysis provided in this thesis documents the current state of Halifax Peninsula's public recreational greenspace in terms of physical activity promotion potential and identifies an important trend in terms of the environmental quality of greenspace and census-tract level deprivation.

Use of this research can aid in the development of successful urban planning strategies that improve greenspace quality and promote physical activity. Not only can the results from this research benefit Haligonians, but also the structure and nature of the research can serve as a model for other Canadian cities to encourage the simultaneous promotion of healthy environments and healthy people.

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## Appendix 1

### POSTcan

Prepared by: Caroline McNamee

\*Questions 1-5 will remain from previous post, which asks for basic information about space like the address, area (hectares), etc.

#### **Activities**

6) Type of usage of site? (Tick all relevant)

\*Active-formal

\*Active-informal

\*Passive only

7) For what type of activities is the space designed? (Tick all relevant)

\*Tennis

\*Soccer

\*Football

\*Baseball

\*Walking (only if paths)

\*Cycling

\*Basketball

\*Hockey/skating

\*Track & Field

\*Rugby

\*Swimming

\*Children's playground

\*Other

#### **Environmental Quality**

8) Is the POS on the beach/river foreshore?

9) Are there water features within the POS?

10) Type of water feature (tick all relevant)

\*Lake

\*Pond

\*Water Fountain

\*Stream

\*Other

11) Estimate the percentage of the POS occupied by the water feature(s)? (tick one)

- \*Up to 25%
- \*26%-50%
- \*51%-75%
- \*More than 75%

12a) Are there other aesthetic features in the POS?

12b) Which of the following features are present? (tick all relevant)

- \*Statues
- \*Gazebos
- \*Sculptures
- \*Ducks/swans
- \*Bridge
- \*Rocks
- \*Other

13) Are there trees in this POS?

14) Estimate the approximate number of trees present (tick one)

- \*1-50 trees
- \*50-100 trees
- \*More than 100 trees

15) Where are the trees placed? (tick all relevant)

- \*Perimeter all sides
- \*Perimeter some sides
- \*Along walking paths
- \*Random placement throughout
- \*Other

16) Are there gardens in this POS?

17a) Are there walking paths or bike paths within or around the POS? (tick all relevant)

- \*Walking paths
- \*Designated dual-use paths
- \*None

17b) Shade along paths (tick one)

- \*Very good (canopies of many trees touch)
- \*Good (canopies of some trees touch)
- \*Medium (canopies don't touch but trees close together)
- \*Poor (canopies of trees don't touch and trees spread apart)
- \*Very poor (little or no shade)

17c) Is there evidence that snow is cleared from the paths in the winter?

18) Describe the placement of paths within the POS (tick all relevant)

- \*Perimeter, all sides
- \*Perimeter, some sides
- \*Diagonal
- \*Radial
- \*Path around water/visual feature
- \*Other

19) Is there evidence that the grass is watered?

20) Are dogs allowed? (tick all relevant)

- \*Yes, on leash at all times
- \*Yes, on leash at certain times
- \*Yes, no leash specified
- \*Not allowed
- \*Not specified

21) Is access for dogs: (tick one)

- \*Restricted from some areas
- \*Allowed all areas
- \*Not specified

22) Is graffiti present?

23) Is vandalism evident?

24) Is there litter throughout the POS?

### **Amenities**

25) Is children's play equipment present?

26) What items of play equipment are present? (please tick all relevant)

- \*Swing/s
- \*Slide/s
- \*Climbing equipment
- \*Hanging bars/rings
- \*Seesaws
- \*Bridges/Tunnels
- \*Activity Panels
- \*Cubby house/s
- \*Other

27) What is the playground surface? (tick all relevant)

- \*Sand
- \*Grass
- \*Rubber
- \*Gravel or pebbles
- \*Woodchips
- \*Other

28) Is playground shaded? (tick one only)

- \*Partial cover/shade
- \*Total cover/shade
- \*No cover/shade

29) Are picnic tables present?

30a) Are there parking facilities serving the POS?

30b) Estimate the number of parking spots? (tick one only)

- \*0-20
- \*21-50
- \*More than 50

31) Are there public access toilets?

32) Is there a kiosk/café present? (tick one only)

- \*7 days per week
- \*Weekdays only
- \*Weekends only
- \*No

33) Is there access to public transport within one block of POS?

34) Is there seating present?

35) Are trash bins present?

36) Are dog litterbags provided?

37) In how many locations in POS are dog litter bags present?

38) Are there taps or other water sources accessible for dogs?

39) Are drinking fountains present?

40) Is the POS accessible during the winter?



## Safety

41) Is there lighting within the POS (i.e. not just street lighting)?

42) Where is the lighting located? (tick all relevant)

- \*Around courts, buildings, and equipment
- \*Along paths
- \*Perimeter all sides
- \*Perimeter some sides
- \*Random throughout POS

43) From the centre of the POS, how visible are surrounding roads? (tick one)

- \*Road/s clearly visible from the centre of the POS
- \*Road/s is partly visible from the centre of the POS
- \*Road/s cannot be seen from the centre of the POS

44a) From the centre of the POS, how visible are the surrounding houses? (tick one)

- \*House/s clearly visible from the centre of the POS
- \*House/s partly visible from the centre of the POS
- \*House/s cannot be seen from the centre of the POS

44b) How many of these houses overlook the park? (tick one)

- \*More than 10
- \*Between 5 and 10
- \*Between 1 and 5

44c) Is there any area of the POS where you are unable to clearly see surrounding houses?

45) Are all roads surrounding the POS minor roads or cul-de-sacs?

46a) Does the major road/s have a zebra crossing to assist access to the POS?

46b) Does the major road/s have a pedestrian crossing with signals to assist access to the POS?

47) Is there signage in the POS?

48) To what extent do you agree with each of the following statements regarding this POS? (Circle one number for each item)

1=Strongly agree, 2= Agree, 3= Neither Agree nor Disagree, 4= Disagree, 5= Strongly disagree

- \*POS is suitable for walking
- \*POS is suitable for casual ball sports
- \*POS is suitable for cycling

## Appendix 2

Table 1: Park Score Criteria. One point was given if the features associated with activities, environmental quality, amenities, or safety were present. This results in a maximum possible score of 18 for activities, 12 for environmental quality, 12 for amenities, and 6 for safety.

<b>Activities Score</b>	<b>Environmental Quality Score</b>	<b>Amenities Score</b>	<b>Safety Score</b>
Tennis court	Located on beach/river foreshore	Play equipment	Lighting
Soccer field	Water features	Picnic tables	Surrounding roads visible from centre of park
Football field	Other aesthetic features (e.g. statues, gazebos)	Parking facilities	Surrounding houses visible from centre of park
Baseball diamond	Trees	Public access toilets	Surrounding houses visible from all areas of park
Walking paths	Gardens	Kiosk/café	Park is surrounded by minor roads/pedestrian crossing light
Cycling paths	Walking paths	Access to public transport within one block	Signage present in park
Basketball courts	Shady trees	Seating	
Hockey/skating rink	Watered grass	Trash bins	
Track & field area	Dogs are allowed in park	Dog litterbags provided	
Rugby field	No graffiti	Water sources for dogs	
Swimming pool	No litter	Drinking fountains	
Children's playground	No vandalism	Walking paths ploughed in winter	
Skate park			
Floor hockey			
Lawn bowling			
Batting cages			
Children's water park			

