The Canadian Dream? Comparing the Densities of Modernist and New Urbanist Suburban Development – A Comparative Case Study of Don Mills, Toronto and Cornell, Markham

By

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Executive Summary

This report compares the developments of Modernist Don Mills, Toronto and New Urbanist Cornell, Markham across various built form indicators, specifically gross and net residential density, housing mix, land use mix, and street design and circulation. This report assesses the similarities and differences between the developments, which were influenced by their respective suburban planning theories.

These built form indicators represent key characteristics which contribute to urban design and morphology. Given that both sites were developed on greenfield, or undeveloped, lands on the urban fringe with a comparable area (835 hectares in Don Mills and 973 hectares in Cornell), the sites are suitable for comparison.

Development in Don Mills began in 1953, following the completion of the master plan in 1952. It followed the concepts of Modernism to separate land uses, support residential areas with recreational spaces, employ the Neighbourhood Unit concept, and provide residents with commercial and employment opportunities located in strategic areas. This report utilized statistics from 1965 which encompassed the original development of Don Mills.

Cornell was first conceived in 1988, with the master plan being completed in 1994 by Duany Plater-Zyberk Co., leading New Urbanist designers. They planned a walkable community based on the New Urbanist principles of mixing housing types, pedestrian scaled streetscapes, and enhancing a sense of community. Geographic Information System (GIS) data was supplied from the City of Markham Planning Department to assist in understanding the current built-out statistics of Cornell.

The Cornell Centre area is the future core area of the project. A secondary plan was released in 2008 which planned for 10,000 residents and 5,000 units in the 240-hectare area. The secondary plan was last revised in 2015 and planned for 18,000 residents in 9,000 new units. These figures were used in addition to the current build-out statistics of Cornell to create three scenarios for the comparison of residential density and housing mix in Cornell and Don Mills.

This report found that Cornell currently has a gross residential density that is 29% greater than 1965 Don Mills, with the 2015 plan supporting a residential density that will be 76% greater than the original Don Mills development. Although net densities were not possible to calculate for the unbuilt Cornell area given the lack of GIS data, the current build-out of Cornell has a net residential density that is 71% greater than that of the original Don Mills (Table I).

Area	Units	Residential Gross Area (hectares)	Gross Residential Density (uph)	Residential Net Area (hectares)	Net Residential Density (uph)
Don Mills 1965	8,121	563	14.4	321	25.3
Cornell 2022	8,016	433	18.5	185	43.3
Cornell 2008 Plan	13,016	673*	19.3	N/A	N/A
Cornell 2015 Plan	17,016	673*	25.3	N/A	N/A

***Table I**: Comparison of density figures. The asterisks beside the residential gross area for Cornell's 2008 and 2015 plans indicate that there is no distinction between land use types in the additional 240-hectare area that is allocated for the Cornell Centre area.*

This report also found that today's Cornell has a comparable supply of single detached units compared to 1965 Don Mills, although Don Mills has a significantly higher proportion of high-density units and Cornell has a greater mix of medium density housing. When considering the planned 9,000 high density residential units in the 2015 plan for the Cornell Centre, Cornell will have a greater supply of apartment units and a higher proportion of townhouses compared to 1965 Don Mills, which gives slightly greater preference to single and semi-detached houses (Table II).

		Single Detached	Semi-Detached	Townhouse	Apartment	Total
1965 Don Mills	Unit Count	2842	778	1282	3219	8121
	% of Total Units	35.0%	9.6%	15.8%	39.6%	100%
Cornell Built (2022)	Unit Count	3171	1042	3323	480	8016
	% of Total Units	39.6%	13.0%	41.5%	6.0%	100%
Cornell 2008 Plan	Unit Count	3171	1042	3323	5480	13016
	% of Total Units	24.4%	8.0%	25.5%	42.1%	100%
Cornell 2015 Plan	Unit Count	3171	1042	3323	9480	17016
	% of Total Units	18.6%	6.1%	19.5%	55.7%	100%

***Table II**: Comparison of housing mix statistics.*

Although the primary land use in both Don Mills and Cornell is residential, 1965 Don Mills had a greater supply and mix of non-residential land uses. Also, both developments utilized a street hierarchy system to reduce the amount of traffic on local roads to improve health, pedestrian safety, and reduce interactions with the neighbourhood interior and heavy traffic.

Ultimately, both developments are successful in creating a sense of community for residents while efficiently planning for the allocation of land uses throughout the neighbourhood, despite Don Mills separating land uses and Cornell mixing compatible land uses. The results of the research are useful because despite the supply of statistical build-out tables, there was no previous analysis of planning statistics relating to the original Don Mills development, and published Cornell statistics were based on plans, as opposed to as-built data.

Table of Contents

List of Tables

List of Figures

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1.0 Introduction

The practice of urban planning should ensure that places are constructed in a physically efficient manner whereby all other social and economic processes can successfully occur within the planned space. This broad generalization of planning has led to the development of planning theories which have attempted to physically organize spaces. Urban planning however does not solely focus on urban settings. Prior to 1931, most Canadians lived in rural settings with a minority living in urban areas. However, with a rise in population, growing economy, and the rise of the automobile as a means of private transportation following the war, housing trends in Canada began to reflect a mix between rural and urban – the suburbs (Gordon & Janzen, 2013). The suburbs offered a sense of privacy and person freedom to own property while being located relatively closely to an urban centre and retaining a sense of community.

The subdivision of land and the creation of suburbs quickly became profitable for developers, while the cost of housing and availability of financing was affordable in the post-war economy. Given the strength of the economy and opportunity for Canadians to own property and a private car, especially for returning veterans, the idealized suburban nuclear quickly became a goal for many Canadians (Harris, 2004). In other words, the Canadian dream. This shift to the suburbs and the trend of owning property within a community has lasted to date. Gordon & Janzen (2013) estimate that two-thirds of Canadians currently live in some form of suburb. Although the influence behind the design and planning of suburbs has shifted through time, this trend of suburban living has remained popular for most Canadians today.

Given the popularity and appeal of suburbs for Canadians over the past seventy years, it can be assumed that their popularity and demand will continue through the foreseeable future. There are many theories for the design of suburbs, with Modernism and New Urbanism being the leading ideas in Canadian suburban planning practice since the Second World War. This paper seeks to compare the residential densities of Don Mills, Toronto and Cornell, Markham given their representation as benchmarks of Modernist and New Urbanist suburban planning models in Canada. Furthermore, this paper seeks to understand how the built form, supply of housing stock, land use mix, and street design compare between the two cases.

1.1 Purpose

Figure 1-1: *Don Mills land uses (Hancock & Lee, 1954: 10).*

The purpose of this report is therefore to better understand the theoretical influences that Modernism and New Urbanism have on suburban planning practices in Canada, with specific regard to the case studies of Don Mills and Cornell. As will be described in greater detail throughout this report, these case studies are widely considered to be the best-in-class examples of each theory. Don Mills has been regarded as an ideal exemplification of Modernism given the built form principles of separating land uses while supplying all other daily and weekly amenities for residents including open spaces and employment opportunities (Moore, 2010; Moritsugu, 1954; Sewell, 1993; Solomon, 2007). Cornell has been considered as a leading example of New Urbanism given its design by Duany & Plater-Zyberk Co., the founders of New Urbanism, and its focus on creating a compact, walkable neighbourhood that blends personal privacy with a sense of community (Duany et al, 2000). This report compares the developments using the built form metrics of residential density, housing mix, land use mix, and street design to understand the similarities and differences between the two areas.

The study of such built form metrics is imperative to understand the utilization of land, the social experiences which result from the community design, and the interactions that occur within place. Residential density allows both planners and researchers to understand the concentration of people in a particular space, while housing and land use mix statistics allude to the location of various densities and where certain uses are located. Assessing street design ensures that the movement of people, goods, and nature within a space occur efficiently, further contributing to the analysis of the daily and weekly interactions within an area.

The cases of Don Mills and Cornell are somewhat comparable given that at the time of initial construction, both sites were greenfield, or undeveloped, on the urban fringe of the municipalities in which they are located in. Both are comparable in size, with Don Mills totalling 835 hectares and Cornell having a total area of 973 hectares. There are differences in the social, economic, and political trends during the forty-year timespan between the developments such as housing markets, cost of living, and governmental support. Thus, the two projects are worth comparing, given the master planning scape of development and the utilization of Modernist and New Urbanist theory on a community-wide scale.

Figure 1-2*: Mixed-use building in Cornell (Source: Author).*

1.2 Report Structure

Following this introductory chapter, this report includes four subsequent chapters and three appendices. Chapter two provides a theoretical assessment of Modernism and New Urbanism, the two predominant urban planning theories related to Canadian suburban planning practices. This chapter also introduces the case studies of Don Mills, Toronto and Cornell, Markham, and provides a brief history of their development and design inspirations. Chapter three identifies the research question, describes the comparative case study approach adopted by this report, provides a brief definition of density, and identifies some limitations to the research methods. Together, these two chapters seek to provide a contextual basis for the quantitative analysis of the case studies.

Chapter four critically assesses the gross and net residential density, housing mix, land use mix, and street design and circulation of both Don Mills and Cornell before comparing the findings against one another. The intent of this is to compare such urban design metrics as a case study of comparing Modernist and New Urbanist suburban planning in Canada. Chapter five concludes the report by providing a summary of comparisons, recommendations for future built form comparison research, and a brief written conclusion.

Regarding the appendices, the Appendix A comprises of figures which support the research and statistical findings of the report that were not included in the chapters. These figures should provide context to the information within the written component of the report. Appendix B consists of tables and supporting analytical documents which contributed to the quantitative findings. Lastly, Appendix C is a list of references used throughout the report.

2.0 Contextualizing Modernism and New Urbanism

This chapter describes and compare the theories of Modernism and New Urbanism before introducing the case study sites of Don Mills and Cornell. This chapter includes two sections. The first section provides a description of the theoretical context behind the suburban planning frameworks of Modernism and New Urbanism. Here, the key concepts and design features are identified and compared to orient the reader on their influence on suburban planning.

The second section introduces the developments of Don Mills and Cornell, contextualizes the geographic areas, provides a brief description of the history and influences behind the developments, and explores how they relate to their respective theory. This description is intended to introduce the histories and contexts related to the development and construction of both Don Mills and Cornell, while demonstrating their theoretical influences.

2.1 Modernism

Modernism emerged in the early twentieth century when a range of professionals sought to recharacterize urban life in a way that is influenced by new art, architecture, and social norms that differed from traditional neoclassical trends (Mumford, 2010). In town planning, Modernism aimed to achieve a physical, economic, and social transformation of cities to create organized and functional entities that were an antithesis to the more common organic forms of urban life (Domhardt, 2012). To achieve this transformative norm, professionals like Le Corbusier, Walter Gropius, and José-Luis Sert established the Congrès International d'Architecture Moderne (CIAM) in Switzerland in 1928 (Mumford, 2000). Essentially, Modernism sought to manage social processes and daily life through creating a functional design of the built environment.

The La Sarraz Declaration was made on June 28, 1928, which affirmed the aims of the CIAM to emphasize the production of efficient spaces and defined town planning as "the organization of the functions of collective life" as centred around the four main functions of dwelling, work, recreation, and transportation (Sert, 1942: 242). These four functions are the framework of the 1933 Athens Charter, which was the planning manifesto of the CIAM (Sert, 1942). Although each of these four functions have specific goals, the most significant function as identified by the CIAM is dwelling and should therefore be the central focus by which all other functions are planned around (Sert, 1942; Mumford, 2019). Therefore, recreation, work, and transportation should be supplied in a way that supports and compliments the dwelling function.

In keeping with the CIAM vision to prioritize dwelling as the most significant function of urban or suburban life, alternative land uses of different functions are to be physically separated from residential areas, supporting the concept of separating land uses. The CIAM argued that residential areas should be situated on the best geographic sites away from contradicting uses such as heavy industry, major roadways, or rail lines to protect residents from noise, dust, and emissions. Additionally, a mix of housing types and the use of apartment buildings is supported by the CIAM to increase residential density and have a more compact urban form (Sert, 1942). Generally, higher density dwelling would be located at the urban core, with densities decreasing as the distance from the core increases (Domhardt, 2012). The concept of prioritizing residential land uses is beneficial in planning to ensure a good quality of physical, social, and healthy life for residents. Recreational functions should support residential uses and be located in close proximity to schools, libraries, and community features in order to occupy the most convenient sites and be accessible to most of the population (Sert, 1942). Finally, the 1933 Athens Charter concluded that "The point of departure for all town planning should be the cell represented by a single dwelling, taken together with similar cells to form a neighbourhood unit of efficacious size" (Sert, 1942: 249). However, the CIAM's idea of neighbourhood units (Le Corbusier's high density *Unité d'habitation*), differed slightly from Clarence Perry's 1929 model, which will be described shortly (Lueder, 2021).

The second most significant function to the CIAM aside from dwelling is work, with the goal of locating employment areas close enough to residential areas where the distance between home and work could be "transversable in a minimum amount of time" but separated enough from dwellings, preferably with the use of a greenbelt, to minimize the negative impacts associated with noise, views, or health (Sert, 1942: 247).

Furthermore, the CIAM argues that the function of transportation should cater to modern means of transportation, specifically the automobile, and a street hierarchy system should be adopted where speed limits and road widths are determined by the function of the street. Additionally, the CIAM advocated that dwellings should be separated from major roadways by greenways to ensure pedestrian safety, quality of life in residential areas, and avoid the health impacts associated with vehicular traffic (Sert, 1942). Adopting the road hierarchy supported the CIAM's goal of functionally organizing urban life by maximizing the efficiency of travel between dwelling and work, while also acting as a physical barrier to separate land uses.

On a city-wide scale, the CIAM sought to implement the functions collectively into a traditionally German concept called *Eine Stunde Städtenbau*, or One Hour City Building, whereby each function was provided, albeit with different types of land uses separated from one another, and connected with an efficient transportation network (Mumford, 2019). The concept of separating land uses therefore became a defining trait of Modernist planning based on the concept of efficient land use and interconnected transit networks.

On a local scale, however, the introduction of the Neighbourhood Unit by Clarence Perry in the 1930s built upon the four urban functions to create a neighbourhood-based form focused on the pedestrian. Perry sought to provide a sense of community and safety to accommodate the rise in automobile use. The Neighbourhood Unit attempts to create a neighbourhood bounded by arterial roads, centred around an elementary school or community centre, have commercial uses located along an arterial road, situate only residential uses on local roads, and have a radius of a quarter mile to support walkability of the 5,000-6,000 residents within the unit (Fig. 2-1) (Perry, 1929). A system of road classifications was also used in this concept where dwellings would only be serviced by local roads, which in turn fed into collectors and ultimately arterial roads (Mehaffy et al., 2015). This concept supports the CIAM objective to efficiently separate dwellings from major roadways and alternative functions, while still maintaining both pedestrian and vehicular access to non-residential land uses. Perry's Neighbourhood Unit however goes beyond function-based planning and instead created a framework for neighbourhood planning on the local scale.

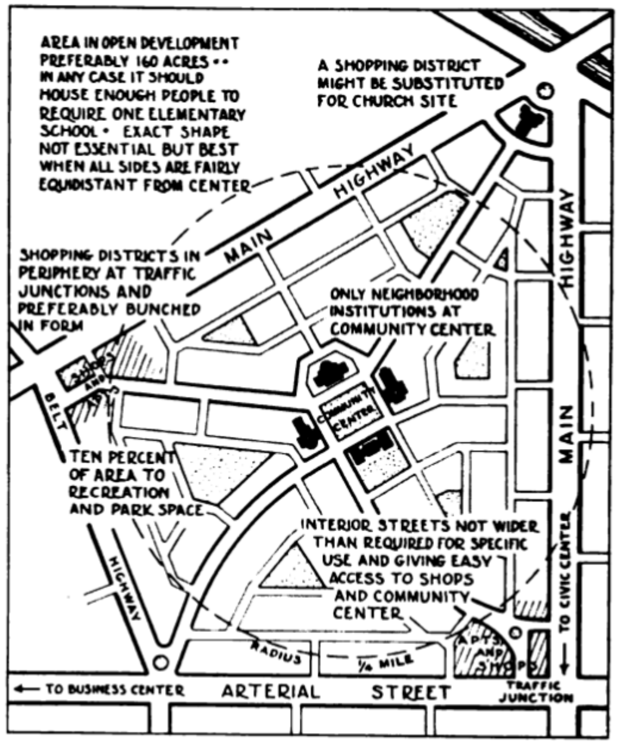


Figure 2-1*: The original sketch of Clarence Perry's Neighbourhood Unit, used to display schools and community facilities as the core features, the network of roads, shopping locations, and the proximity of a feasible walking distances (Perry, 1929: 88).*

2.2 New Urbanism

New Urbanism can be considered as "an urban reform movement that gained prominence in the 1990s, [which] seeks to promote qualities that urban reformers have always sought: vital, beautiful, just, environmentally benign human settlements" (Talen, 2005: 1). The Congress of New Urbanism was established in 1993, with Peter Calthorpe, Andres Duany, and Elizabeth Plater-Zyberk as influential founders (DPZ, 2022). New Urbanism seeks to create sustainable communities which are focused on mixing land uses within neighbourhoods and creating compact, walkable, and socially engaging communities to shift away from the car-oriented nature of Modernist suburbs (DPZ, 2022; Fader, 2000).

This design movement has its own manifesto, the Charter of New Urbanism characterized by the neighbourhood, district, and corridor (Duany Plater-Zyberk & Co., 2002). The neighbourhood supports a range of land uses including residential, commercial, services, schools, and recreation. Generally, the neighbourhood is centred around a core community space or feature and is bounded by main roads or green spaces, with vehicular, transit, and pedestrian connections throughout for connectivity (Fig. 2-2). Like Perry's Neighbourhood Unit, the optimal neighbourhood size and distance to daily amenities should not exceed a quarter mile radius, or the equivalent of a five-minute walk. Neighbourhoods should also consist of short blocks to retain pedestrian safety, slow traffic, and increase social interactions on the street (Duany Plater-Zyberk & Co., 2002).

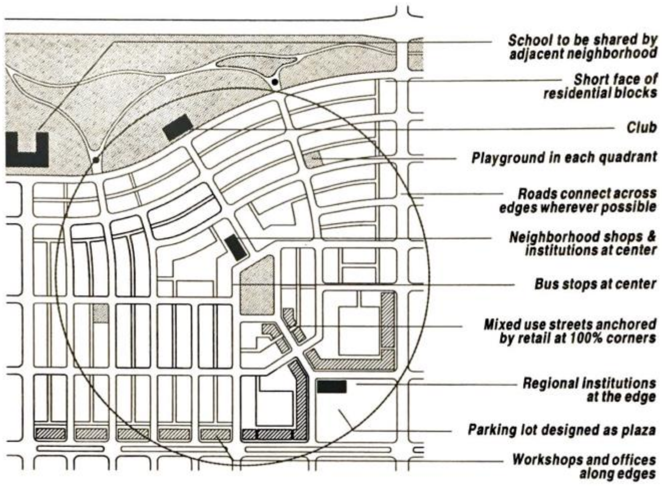


Figure 2-2*: New Urbanist neighbourhood unit adaptation (Duany Plater-Zyberk & Co., 2002: C1).*

Housing within the neighbourhood should support a range of dwelling types and housing cost (Duany Plater-Zyberk & Co., 2002). Within the New Urbanist model, the highest density dwellings should be located around the neighbourhood centre and decrease as the distance away from the centre increases (Duany et al., 2000; Johnson & Talen, 2008). This transition in density also reflects the intent to create an "authentic and gentle transition from culture to nature" between new communities and surrounding open spaces (Duany et al, 2000).

Districts are specific areas that are focused on a single use, such as an employment area or college campus, where uses that cannot be accommodated in the neighbourhood are located. Clear definition of boundaries and connectivity to surrounding neighbourhoods is a central focus of the district, where access to the area is possible from adjacent areas. Alternatively, corridors are transportation or greenway connections that act as physical and environmental connections between neighbourhoods. Green corridors can serve as a connected network of space, such as a park system, whereby transportation corridors primarily focus on the movement of people and goods between areas. Transportation corridors can range from pedestrian lanes to transit-serviced roads, to rail lines, and should be integrated within the community in an appropriate scale that reflects the use and intensity of the corridor (Duany Plater-Zyberk & Co., 2002).

New Urbanism also adopts a road hierarchy system that uses the capacity of vehicles that the road could carry and the use of the street to determine street width, speed limit, and location within the neighbourhood (Fig. A-1). Highways and boulevards would serve as the high-traffic streets, whereby drives and avenues connect the busier roadways with the local roads within the neighbourhood (Duany Plater-Zyberk & Co., 2000). A distinct feature of New Urbanism is the adoption of rear lanes for private vehicle access, which removes the garage from the front yard and ensures that dwellings can be brought closer to the street to further replicate a sense of community and strengthen the relationship between people and the street. Additionally, this leads to narrower streets which are less costly to construct and maintain, but also result in a more compact urban form that is representative of the core New Urbanist concepts (Fader, 2000).

2.3 Comparison of Theories

Modernism is often criticized for separating land uses, prioritizing car-travel, isolating buildings instead of creating a collective urban fabric, and popularizing the privatization of social life by rejecting pedestrian interactions with the street and community (Sorensen & Hess, 2015; Talen, 2005). With regard to the suburbs, the CIAM did not specifically introduce measures for neighbourhood scaled areas and instead focused on city-wide planning in relation to the supply of the four main functions. The theoretical analysis of this chapter proves that there are two fundamental differences between Modernism and New Urbanism.

The first difference is that Modernism seeks to separate land uses regardless of their compatibility, and provides strict guidelines on where commercial, employment, and industrial lands should be located in relation to residential areas. Alternatively, New Urbanism aims to mix compatible land uses within a neighbourhood, only excluding incompatible uses such as industry or institutional uses with the aim of locating them in special districts.

The second difference is that the core philosophy of Modernism, under the ideas of the CIAM, is to organize spaces which are efficient to the physical area and the movement of people and goods. Although the intent behind planning for efficiency was to improve the quality of life and health of residents, it failed to plan on the neighbourhood scale and relied on alternative theories such as the Neighbourhood Unit to account for the small-scale human interactions within space. New Urbanism seeks to improve the sense of community by hosting the street as a communal space for social interaction (Hess, 2008). This is done in by using alleys and reduced front yard setbacks to bring residents closer to the street (Sorensen & Hess, 2015). Therefore, New Urbanism went a step beyond Modernist planning by organizing communities in a way that is shaped by their social value, while still providing the amenities which contribute to a healthy lifestyle such as open spaces and commercial services.

However, despite these fundamental differences, there are some similarities between the two theories. Both prioritize the community as a central feature of the neighbourhood. Under Modernism it is referred to as the function of dwelling whereas New Urbanism considers it as a neighbourhood. They also employ measures of walkability and pedestrian safety by eliminating heavy traffic from residential areas through strict road classification systems. Both also seek to provide non-residential uses that support daily life such as commercial opportunities, open spaces, and employment centres. Thus, although Modernism and New Urbanism differ in a design and organizational lens, they share the ambition of creating a meaningful sense of place that is focused on healthy communities and relationships between people and the environment.

2.4 Case Selection

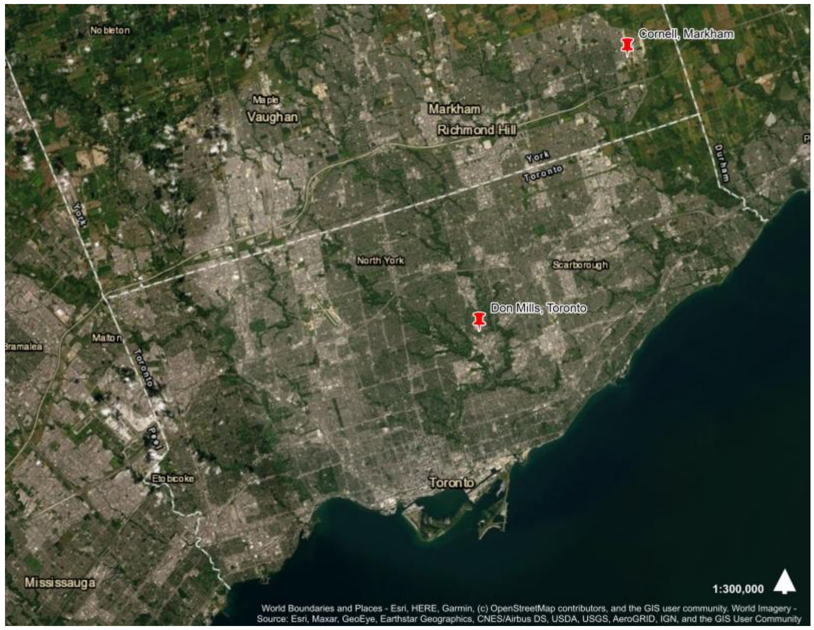


Figure 2-3*: Location of Don Mills and Cornell in the context of the Greater Toronto Area (Source: Author).*

Two sites were chosen for the comparison of Canadian Modernist and New Urbanist suburban planning examples – Don Mills, Toronto and Cornell, Markham. These two areas were chosen given their geographic location in the Greater Toronto Area, having been built on greenfield sites on the urban fringe, and being of comparable size (Fig. 2-3). The total area of Don Mills equates to 835 hectares and Cornell totals 973 hectares, while both supply a range of housing types, land uses, and open spaces. A detailed comparison of such land use metrics will be analyzed in Chapter 4 of this report.

Additionally, both developments are considered to be the best-case examples of Modernist and New Urbanist suburban planning in Canada. Moritsugu (1954) of Canadian Homes and Garden referenced Don Mills as “the suburb that is to become Canada’s most perfect city… based on the needs, hopes and future happiness of the people” (pp. 13, 15). This sentiment has lasted to present day whereby Don Mills is considered by Solomon (2007) to “epitomize the postwar suburban ideal of a planned community” (p. 75), by Moore (2010) as “the default form of suburban development” (p. 104), and by Sewell (1993) to be “the most influential development in Canada during the twentieth century” (p. 80). Cornell is also considered to be an exemplary case of New Urbanism in Canada as it was designed by New Urbanist founders Andrés Duany and Elizabeth Plater-Zyberk, using emerging themes of New Urbanism (Duany et al., 2000; Town of Markham, 1994).

Furthermore, both developments prioritized the concept of the neighbourhood as a central feature of community life. Don Mills separated the development into four neighbourhoods centred around a school site or place of worship, whereas Cornell divided the development into 6 distinct neighbourhoods also centred on an elementary school that is within a five-minute walk of most dwellings (Sewell, 1993; Town of Markham, 1994). As mentioned earlier in this chapter, the neighbourhood-based design focus is a central aspect to both Modernism and New Urbanism and directly influenced the design of both developments.

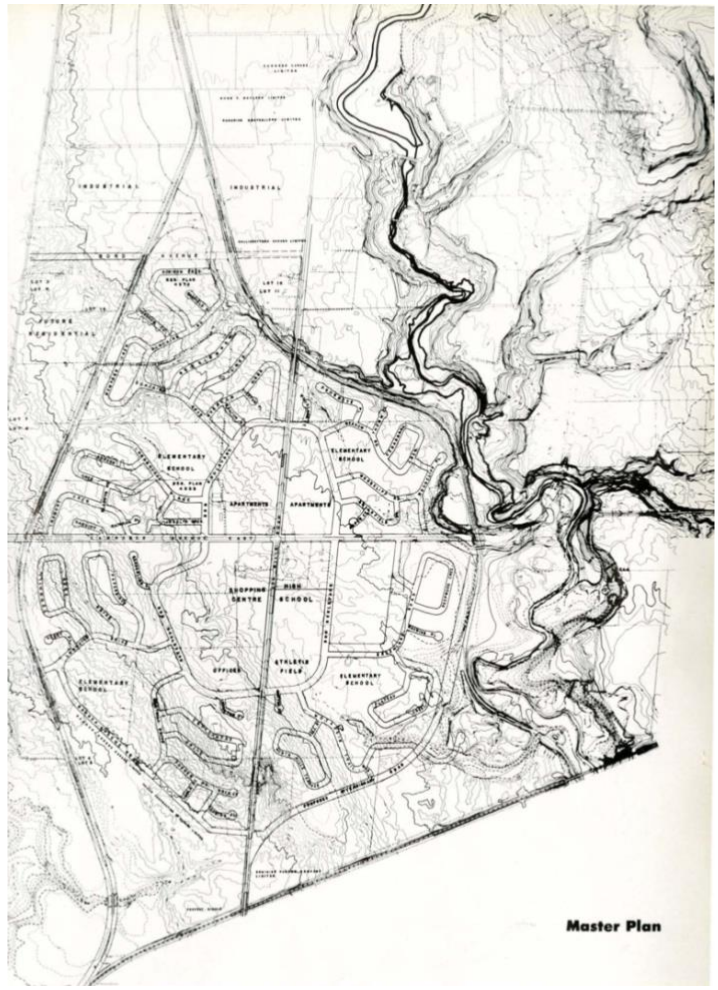


Figure 2-4*: Don Mills Master Plan (Hancock & Lee, 11).*

2.5 Don Mills, Toronto

Don Mills was first conceived as a company town for a proposed on-site brewery, as envisioned by industrialist E.P. Taylor of Canadian Breweries Limited in 1947 (Hart, 1968; Miller, 2009). Taylor began assembling land in North York approximately thirteen kilometres from downtown Toronto in 1947 under O'Keefe Realty Limited, eventually purchasing 2,063 acres (835 hectares) across 31 parcels of land by 1952. Although the official reasoning is unknown, Taylor and his assistant Karl Fraser abandoned the brewery concept and adopted a vision of a self-sufficient community (Sewell, 1976; Sewell, 1993).

Taylor hired Macklin Hancock, a 28-year-old landscape architecture postgraduate student at Harvard University who was the son-in-law of Fraser, to create the master plan for the newly acquired lands (Miller, 2009). Hancock served as a Spitfire pilot in World War Two and developed an appreciation for landscaping from working at his father's nursery in Mississauga, Ontario during the 1930s (Carnerio, Oct. 2003; Sewell, 1976). During his studies at Harvard University Hancock was exposed to the Modernist town planning ideas by the likes of Walter Gropius (Sewell, 1976). Hancock hired Douglas Lee as an assistant planner and completed the first draft of the master plan in September 1952 under the name of Yorktown. The name was eventually changed to Don Mills after Hancock proposed that the community be named after the

Don River and a historic mill upriver from the site (Fig. 2-4) (Hart, 1968; Sewell, 1976). O'Keefe Realty Limited was renamed to Don Mills Development Limited in 1952, and later Canadian Equity & Development Corporation (Hancock, 1959; Sewell, 1976; Sewell, 1993).

Don Mills was planned to be a self-sufficient new town which supplied all the amenities for residents to live, work, and recreate within the community as opposed to across various parts of an entire city, which was the norm in Toronto at the time (Canadian Homes & Garden, 1954; Hancock, 1968). Hancock aimed to create a "balanced integration of industrial, residential, commercial, educational, religious, and civic activities" (Hancock & Lee, 1954). Ultimately, the goal behind the design of Don Mills was to supply all amenities needed for daily life within the neighbourhood so residents did not have to travel elsewhere for school, commerce, or recreation.

Five significant concepts went into the design of Don Mills – the creation of four neighbourhood units, the use of a discontinuous road system, sufficient provision of green space, larger residential parcels favouring 60' by 100' lots, and the strict separation of land uses (Hodge, 1986; Sewell, 1976; Sewell, 1993). Furthermore, a high quality of architectural design was to be employed for all new buildings, including industrial buildings. Notably, the developer retained the right to reject building designs that were not designed by an architect or were not consistent with the modern theme of Don Mills (Carneiro, 2003; Hancock & Lee, 1954).

Each neighbourhood unit has housing centred around an elementary school, which was in walking distance of each house without the need to cross an arterial road. Each neighbourhood was to be bordered by arterial roads to physically define and contain the neighbourhood (Hancock & Lee, 1954). Although elementary schools were located within the neighbourhoods, the high school was located near the centre of the entire site to ensure the most equitable access from each neighbourhood. Additionally, a mix of housing type was a significant aspect of residential design whereby approximately 60% of units would be single-family and 40% would be row housing or apartments with a mix of both rental and ownership properties available to cater to various socio-economic groups (Hancock, 1959). Notably, housing prices ranged from $11,000 - $17,000 with 40 different styles for residents to choose from ($115,000 - $177,000 in 2022 Canadian dollars, adjusted for inflation) (Bank of Canada, 2022; Moritsugu, 1954).

A significant aspect of design to ensure that Don Mills was self-sufficient was to supply industrial areas that could have a workforce consisting of local workers. Non-noxious industries would be located on lands with minimal contact with and increased buffering from residential areas (Fig. 2-5). Industrial sites would also be in areas where both summer and winter winds would blow exhaust fumes away from residential areas to ensure clean air quality in the area. Also, commercial uses would be limited to the town centre to further represent a separation of land uses, with the primary focus being residential areas (Hancock & Lee, 1954). This distinct separation of land uses is consistent with the intent of the CIAM, whereby various uses are organized in a manner to protect the quality of residential uses, the primary function of the neighbourhood (Sert, 1942). Although Hitchcock published early drawings, no statistical summary of the original plans has yet to be found (Hancock & Lee, 1954). The best sources are Hancock's presentation at the 1959 Harvard Urban Design Conference and a summary presented to the Urban Land Institute by Angus McClaskey (Hancock, 1959; McClaskey, 1965).

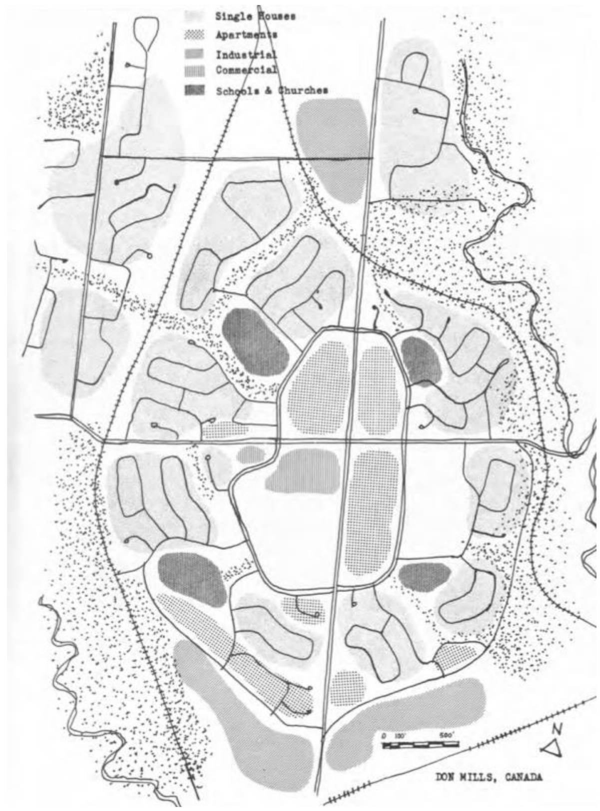


***Figure 2-5**: Map of the land use and housing mix distribution of Don Mills. Note the concentration of higher density housing in the core and the separation of residential uses from industrial uses, which supports the goals of the CIAM to separate the core functions of a city (Hancock, 1959: 19).*

Streets followed a discontinuous system and road hierarchy, whereby traffic flowed efficiently to keep heavy traffic away from residential areas and to separate pedestrians from vehicles (Sewell, 2009). All local roads and minor collectors would empty onto the major collector ring road, which further connects to arterial roads (Hancock & Lee, 1954). Furthermore, "T" shaped intersections are prevalent in Don Mills due to their influence in minimizing the need for four way stops, eliminating through traffic in residential areas, and increasing vehicle and pedestrian safety (Financial Post, 1953; Oldham, 1960). Also, elementary school sites were designed to follow the Neighbourhood Unit Principle and be accessible for children without the need to cross a major roadway or arterial road. A highway was later constructed in the Don Valley to connect Don Mills with the rest of Toronto (Rynnimeri, 1997).

The first phase of development began in May 1953 and the first residents moved into the neighbourhood by November of the same year (Moritsugu, 1954). Development was mostly completed by 1960 with approximately 25,000 residents and seventy industrial lots (McClaskey, 1997). A range of housing was provided in Don Mills which encouraged higher residential densities without sacrificing open space (Hancock, 1994). Don Mills had a direct influence on the construction of other postwar suburbs in the Greater Toronto Area, notably Erin Mills, Mississauga; Bramalea, Brampton; and Mill Woods, Brampton (Hancock & Lee, 1954; Hodge et al, 2021; Sewell, 1976). Therefore, Don Mills served as a model for suburban planning that embodied an efficient separation of land uses, integration of places to live, work, and play in a single community, and ensured a high quality of life. The development also directly reflected the Modernist concepts of separating land uses, prioritizing residential areas while providing other community functions, providing a street hierarchy, and separating pedestrians from traffic.

Don Mills' status as a Modernist suburb was enhanced when Hancock was invited back to Harvard to present his plan to Sert's Third Urban Design Conference (Hancock, 1959). Although the European CIAM members found the design to be low density as compared to Le Corbusier's *Unité d'habitation*, the North American delegates praised its suburban neighbourhood design (Hancock, 1959).

2.6 Cornell, Markham

Cornell was considered as a site for a new community in 1988 when plans for a second Toronto airport were reconsidered and the lands were sold to Law Development Group in 1996 (Moore, 2010; Zehr, 1996). The site has a total area of 2,404 acres (973 hectares) and is bounded by 9th Line, Donald Cousens Parkway, Reesor Road, and Highway 407 on the eastern edge of the City of Markham. Andrés Duany and Elizabeth Plater-Zyberk Architects Inc. were hired to host a series of design charettes and create a master plan for the community based on New Urbanist philosophies (Fig. 2-5) (City of Markham, 2014; Town of Markham, 1994).

These concepts were encouraged by Lorne McCool, Planning Commissioner of the Town of Markham in 1992, who sought to combat urban sprawl with more compact mixed-use neighbourhoods (Duany et al., 2000). Ultimately, the current City of Markham (2014) Official

Plan states that the goal of Cornell is to create "a complete and integrated community based on the principles of new urbanism with a range and mix of employment and housing, varies and high quality open space, and convenient access to public transportation, and public and private services" (p. 9-59).

Following the creation of the master plan, the Town of Markham developed a Secondary Plan in 1994 for Cornell which solidified the New Urbanist plan into the Official Plan (Fig. 2-6). This plan accounted for a total of 27,000 people and 10,000 households to be built by 2011 throughout the entire Cornell site (Town of Markham, 1994: 10). Based on the influences of New Urbanism, this plan is centred the three key concepts of neighbourhoods, districts, and corridors (Town of Markham, 1994).

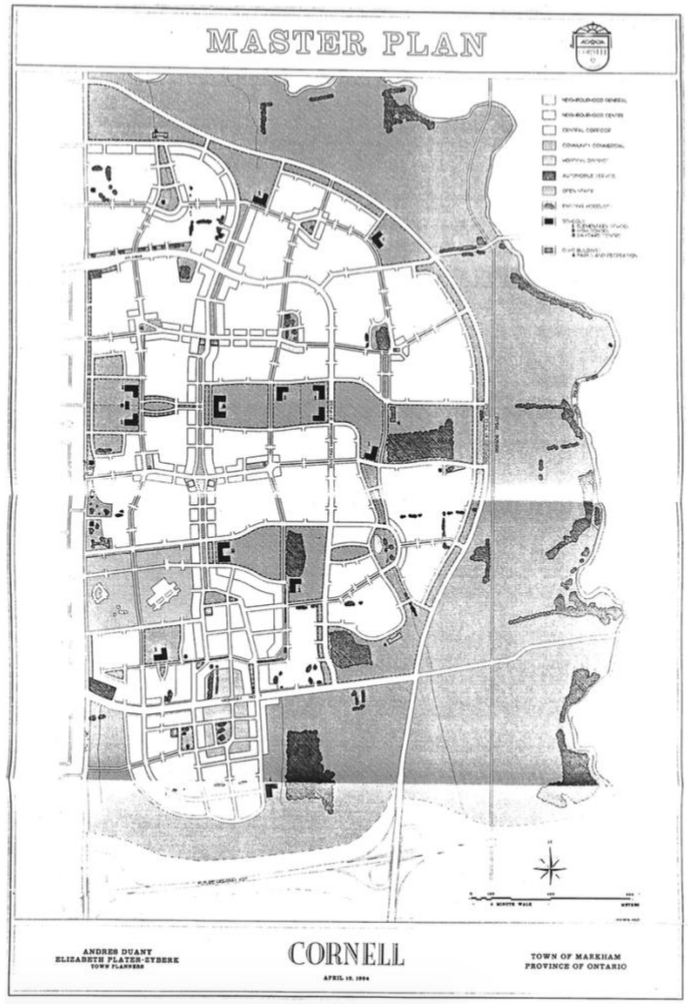


Figure 2-6*: Cornell Master Plan (Town of Markham, 1994: Appendix 4).*

The neighbourhood is the primary focus of the community and consists of a mix of residential and supporting land uses like open spaces, schools, stores, and services. There are six defined neighbourhoods in Cornell and like the Neighbourhood Unit Principle, each is centred around a school or public use that is within a 5-minute walk or 400 metre distance of most residences. Generally, each neighbourhood consists of a mix of residential dwelling types and lot sizes, and is physically defined by a main road, such as an arterial or collector, or a district and change of land uses (Town of Markham, 1994). The establishment of neighbourhoods in Cornell is consistent with the vision of New Urbanism to create compact, walkable neighbourhoods by ensuring that residents can access daily social, recreational, and commercial needs by means of active transportation.

The district refers to a specialized area with a mix of land uses such as the hospital district which sites the Markham-Stouffville Hospital, and the central core district which will host a range of uses such as high density residential, commercial, and office uses. Alternatively, the role of the corridor is to provide linkages and connections between different land uses, neighbourhoods, and districts throughout Cornell. Generally, the types of corridors found in the Secondary Plan are development corridors such as major roadways like Highway 7, and greenlands corridors which link and define open space locations and connections (Town of Markham, 1994).

Regarding transportation, Cornell supplies a range of transit networks for vehicles, transit, and active transit. The road network of Cornell follows a hierarchical model ranging from highways, arterial roads, collector roads, local roads, and alleys (Town of Markham, 1994). The use of alleys for vehicular access to residential units and garages ensures that houses can be built closer to the street with minimal front-yard setbacks, further connecting residents to the community, as is the goal of New Urbanism. This is supported by the presence of front porches, on-street parking for traffic calming measures, landscaped streets, and front lots directly facing open spaces (Berridge et al., 1995). The adoption of a street hierarchy system in Cornell reflects a desire to ensure pedestrian safety and separation of the pedestrian from heavy traffic, in addition to increasing physical permeability into the community. Furthermore, the webbed grid patterned street network and presence of many intersections in residential areas acts as traffic calming measures to ensure pedestrian safety.

A central focus of the design of Cornell is the integration and mix of compatible land uses throughout the development. With this, all lots regardless of land use must have full frontage onto a local road to support access, promote pedestrian interaction, and appeal to the street character (Town of Markham, 1994). To avoid repetition in architectural design, Cornell encourages a mix of housing types and styles in addition to street landscaping that reflects the street type. Cornell also utilizes distinctive architectural designs on corner buildings through massing or unique architectural features to affirm a sense of placemaking and serve as a transition between the public and private realm (Berridge et al., 1995).

Public parks also play a significant role in the design of Cornell, whereby community parks are located at key nodes and adjacent to major collector roads to support convenient access. Alternatively, neighbourhood parks should be the centre of neighbourhoods and consist of distinct features related to the neighbourhood. These parks also support the Neighbourhood Unit concept since it is the intent of the design to locate most dwellings within a 5-minute walk of a park. On a smaller scale, parkettes are also provided for passive relaxation and recreational opportunities (Berridge et al., 1995). The widespread supply of open spaces in Cornell reflects the intent of New Urbanism to create healthy communities for residents to live and experience since it encourages healthy lifestyles and social interactions with other residents.

To complete Cornell as a total community, ten elementary schools and two high schools were planned in 1994, although only one high school and five elementary schools have been built to date (Town of Markham, n.d.). The location of the elementary school coincides with the neighbourhood, where each has its own elementary school. The high school is located at the centre of the development where, like Don Mills, is the most equitable and convenient location for all neighbourhoods. It should be noted that children do not need to cross a major arterial road to access either the elementary schools or central high school.

In 2008, the City of Markham produced a Secondary Plan for the Cornell Centre area, located in the southern portion of the development near the health care campus (Fig A-2). Initially, it called for 10,000 residents and 10,000 jobs for the Cornell Centre area (Urban Strategies, 2012). This plan was later updated in 2015 to focus on increasing residential density through apartment and townhouse units, providing employment opportunities, and expanding the development area east of Donald Cousens Parkway for business park uses. Notably, this 2015 plan differs from the 1994 secondary plan as it anticipates up to 15,000 jobs and 18,000 residents in 9,000 apartment units in just the Cornell Centre area, significantly increasing the residential density of Cornell and supply of employment opportunities (City of Markham, 2015).

3.0 Methods

This chapter describes the rationale behind adopting a comparative case study approach and the variables by which Don Mills and Cornell have been compared by, based on tested research frameworks which are transferrable to this report. This chapter also identifies the sources used to gather data and briefly defines gross and net density.

3.1 Research Question

Considering the suburban planning benchmarks set by the Modernist post-war suburb of Don Mills and the New Urbanist suburb of Cornell, how does the residential densities of these neighbourhoods compare? Subsequently, how does the built form, supply of housing stock, and the land-use mix differ between both cases?

3.2 Methods

Assessing residential density in suburban contexts is essential to understand the allocation of land uses, intensity of certain developments, and the location of growth. These generalizable concepts of land use planning under the umbrella of density ultimately translate to the sense of place that is experienced by the user. Examining density and other characteristics of built form are useful methods in assessing the configuration of an areas land uses.

This report utilized a comparative case study approach to compare the densities and built forms of Don Mills and Cornell. Yin (2014) notes that the case study approach is the most appropriate method when "the main research questions are "how" or "why" questions" relating to real world contemporary phenomenon and when "a researcher has little or no control over behavioural events" (p. 60). Case studies are a versatile research method insofar as they can be used to study a single case or to compare cases by determining variables that result in data collection. This method was the preferred approach to a density study of Don Mills and Cornell since the research question is centralized around contemporary suburban developments with physically distinct built form characteristics that can be compared to one another. Furthermore, the case study approach was chosen since the research does not influence experiences within the built environment and instead focuses on examining two places using comparative metrics.

Since the cases of Don Mills and Cornell differ regarding location in the Greater Toronto Area and temporal influences, it was crucial to establish comparable metrics to assess the theoretical designs outcomes of the differing built forms. Song & Knapp (2004) developed a framework for conducting a comparative case study analysis of urban development patterns based on five key indicators – density, street design and circulation, land-use mix, accessibility, and pedestrian access. Tested with success on comparing suburban neighbourhoods in Portland, Oregon, Song (2005) once again applied this approach to a variety of American cities.

Although these methods were utilized on American cases, the built form indicators are also transferable to Canadian neighbourhoods. Xu (2017) conducted a similar study on ten suburban neighbourhoods in the Greater Toronto Area which drew on a three-step approach to observe design features starting with an analysis of street orientation and size, building types, building heights, and mix of land uses. Here, a Geographic Information System (GIS) based urban form characterization follows, which assesses residential density, diversity of housing type, connectivity of the neighbourhood to external neighbourhoods, and proximity to services. The final step was to then compare the neighbourhoods based on the predetermined variables to ensure an equitable standard.

Tomalty & Haider (2013) also compared Canadian conventional suburban and New Urbanist neighbourhoods in a report for Canada Mortgage and Housing Corporation. This cross-sectional comparison also identified neighbourhood design variables which could be compared across examples, which included the number of housing units for a density calculation, housing mix, non-residential land uses, sidewalks, street design, and more.

This report used a combination of all three methods as it allowed for an equitable basis of comparison and analysis for Don Mills and Cornell. Specifically, this report drew on the built form indicators of gross and net residential density, land use mix, diversity of housing type, and street design as comparative variables. From there, a GIS and textual analysis was conducted to visualize and discuss comparisons. Findings from this report have been displayed through various means such as tables, graphs, and maps with the intention of displaying comparative data between neighbourhoods and providing concise visual representation of findings.

3.3 Data Sources

Density data, specifically parcel area and unit counts, were obtained using a combination of archival and GIS data. For statistics regarding the original Don Mills development, a table obtained from remarks made by Angus McClaskey, President and Director of Canadian Equity & Development Company Limited and its subsidiaries including Don Mills Developments Limited, at the American 1965 Urban Land Institute Convention (McClaskey, 1965; McClaskey, 1997). Therefore, the data presented in 1965 is verifiable given McClaskey's position in the company as president and director. This transcript was found in the local collections of the Toronto Public Library, Don Mills branch. The complete table of all land use related statistics mentioned in this presentation can be found in Appendix B of this report. For Cornell's land use and street related statistics, GIS data was obtained from the City of Markham Planning Department.

Although qualitative sources of information such as interviews and surveys are useful for contextual information related to the neighbourhoods, the COVID-19 pandemic limited research to existing and accessible archival data sources (Yin, 2014). The lack of alternative qualitative sources for context however did not impact the quality of the quantitative assessment. Therefore, relying solely on quantitative information relating to the design of the built environment and demographics ensured that a reasonable research scope was maintained while still utilizing accurate data to assess built form indicators.

There are three significant factors which will influence the density calculation which are unique to this report. Firstly, it should be noted that since Cornell has yet to be completely constructed. Therefore, accurate density calculations have only been conducted for the developed areas, with estimates provided for the complete build out based on the Cornell Centre Secondary Plan. Secondly, since the intentions of this report are to calculate residential density, industrial uses, single-use commercial outside of a residential neighbourhoods, environmentally sensitive areas, utility corridors, and undevelopable areas have been excluded from the calculation of gross area. Thirdly, only data regarding the original development in Don Mills is considered in this report, despite changes to the neighbourhood since construction completed in the 1960s. This intentional focus is to ensure that an accurate comparison between the original developments without modifications over time can be conducted.

3.4 Defining Density

There are two measurements of residential density which have been calculated for Don Mills and Cornell in this report. They are gross and net density per development and relate to the original built form data of each area. Gross density is a ratio of residential units to area, accounting for residential lots, local streets, parks, schools, institutions, and places of worship whereas net density is a ratio of residential units to the area only including residential lots. Both are effective measurements when assessing the allocation of land uses and intensity of residential development and are used at a macro-level to forecast future community goals and servicing needs (Gordon & Vipond, 2005).

The definition of gross density varies between sources, where some only include residential lots, streets, and community features (Hodge et al., 2021; Hitchcock, 1994) and others include all uses in residential areas (Lehman & Associates et al., 1995). Since the data used for Cornell does not differentiate between floor area for mixed-use buildings that are integrated into residential areas and a key feature of Don Mills' design was to separate land uses, this report has included commercial uses located in residential areas for both developments to ensure an equitable means for comparison of gross densities. Although definitions of gross and net density are further described In Chapter 4 of this report, Table 2-1 exemplifies which land uses were included in the calculation of gross and net residential areas.

This report has calculated density using the number of residential units as the numerator and the area of developable land as the denominator, expressed in hectares. As a result, measurements are expressed as units per gross or net hectare.

	Gross Density	**Net Density**
Residential Lots	X	X
Roads	X	O
Parks/Open Spaces	X	O
Schools	X	O
Utility Corridors	O	O
Commercial Lots	X*	O
Places of Worship	X	O
Community Centres	O	O
Other Institutions	X	O
Industrial Lots	O	O

X – Included O – Excluded X* – Included if located in a residential neighbourhood

***Table 3-1**: Land use types included in gross and net density calculations.*

3.5 Limitations of Research Method

Although effective in assessing the differences and similarities between areas, the comparative case study method has two main limitations. Firstly, the method assumes that all variable data is available and accurate. For Cornell, academic data sources regarding unit counts and built form was inaccurate since the development is incomplete. Thus, sources that describe the planned and early development were outdated since new units have since been constructed over larger areas (Moore, 2010; Perrott; 2020; Skaburskis, 2006). To overcome this, data was received from the City of Markham Planning Department and used for analysis.

For Don Mills, some data pertaining to the original development is missing such as population data and key maps given that it was completed approximately 60 years ago by a disbanded corporation and under a former municipality. The primary data utilized for this report has the development broken into 16 sections, but a key map has not been found. Although these limitations do not specifically impact the findings of this report, it limits the visual support and prohibits a population density statistic from being calculated based on the original development.

Secondly, the method does not account for the political and economic influences that would have influenced the design of the two developments. Specifically, there was a greater demand for housing in Toronto following the Second World War compared to the early 1990s that supported the construction of new residential units, as reflected by the 1944 National Housing Act and subsequent amendments (Hodge et al., 2021; Sewell, 2009). In terms of economic influences, E.P. Taylor assumed various development costs such as a $1.25 million sewage treatment plant, trunk sewars, and all local pipes which alleviated the township of such costs and led to further support of the project from council (Sewell, 1993; Sewell, 2009).

Although these factors do not directly relate to the calculation of density and the identification of built form indicators, the political agendas of the time and the financial capabilities of the developer undoubtedly influenced the design of both areas. Also, both areas originated approximately forty years apart within different municipalities and regulatory frameworks, and with differing political and economic influences. To account for this limitation, the report provided a brief historical overview of the influences on the development of both neighbourhoods in Chapter 2 to demonstrate that despite the differences, the two areas are eligible for an useful comparison.

4.0 Analysis

Divided across three sections, this chapter describes and compares various built form components of Don Mills and Cornell. The first section compares the geographical boundaries and developable areas of both developments. Supporting summarization tables for both Don Mills and Cornell are provided to orient the reader with basic spatial statistics. The elements of comparison for this section are total land area, units constructed, and population statistics.

The second section identifies and compares the built form characteristics of both areas based on the methods identified in Chapter 3. Specifically, the five elements of comparison are gross density, net density, residential building types, land use mix, and street design and circulation. This analysis directly reflects the main research question of the report and compares the most significant elements of built form between Don Mills and Cornell.

The third section concludes the chapter with a summary and general analysis of all the comparisons explored in the previous two sections. Throughout the entire chapter, maps and tables are provided to support the findings and provide a visual representation for the reader.

All data that was utilized in these findings was drawn from data received from the City of Markham Planning Department and data from a presentation by Angus McClaskey, President and Director of Canadian Equity & Development Company Limited and its subsidiaries including Don Mills Developments Limited since October 1954, at the Urban Land Institute of the United States Convention in September 1965 (Don Mills News, 1954; McClaskey, 1997).

However, it should be noted that development in Cornell is currently incomplete, with approximately 36% of the area remaining undeveloped, including the Cornell Centre Secondary Plan area. Since the data related to Don Mills in 1965 accounted for the complete original development, a scenario-based model was adopted for Cornell to ensure a suitable comparison between the two with specific regard to residential density and housing mix. The first scenario is the built statistics drawn from City of Markham GIS data. The second scenario accounts for the 2015 Cornell Centre Precinct (Secondary) Plan which aims to supply 9,000 dwelling units in the secondary plan area boundary (City of Markham, 2015). This ratio of two people per dwelling unit was utilized in the formation of the third scenario as it relates to the statistics of the 2008 Cornell Secondary Plan, which only specified a planned population of 10,000 residents within the Cornell Centre area (Urban Strategies, 2012). However, given the unit to population ratio of the revised 2015 plan, it has been assumed that the 2008 plan proposes the supply of 5,000 residential units for the secondary plan area. This assumption will be utilized in this report as it relates to the calculation and analysis of gross and net residential density statistics.

Since approved unit count statistics for development in the secondary plan area are unavailable at the current time, it is assumed in this report that all new units in the secondary plan area will be apartment units, given the intent and direction of the secondary plan (Fig. A-2) (City of Markham, 2015). Due to these assumptions, the findings of this report are subject to change once the development is completely built out. It should also be noted that the Don Mills findings of this report relate to the completion of the original development dating back to 1965 and does not represent the current state of Don Mills or the redevelopment of the central area since the original project was completed.

Ultimately, the comparison between the 1965 Don Mills and Cornell across the three scenarios is meaningful and suitable since they relate to the original development of both neighbourhoods. Thus, since Cornell remains incomplete, this report utilizes data of existing uses in addition to the most relevant sources of estimation for the rest of the development.

4.1 Analysis of Study Areas

As described in Chapter 2, both developments are comparable in size, with Cornell having only 12% more overall land than Don Mills, and Don Mills having only 24% more developable area than Cornell. Table 4-1 below further exemplifies the general statistical comparisons between to two developments. Although only 8,016 units have been completed in Cornell to date, Don Mills had only 3.9% more units when completed. Therefore, although the number of built units in Cornell will increase once the development is completed, the current state of Cornell and the original Don Mills development are comparable in terms of size, built units, and planned population. This identification of comparable baseline figures is significant as it ensures that all subsequent analysis and comparison of land use statistics between both areas is done based on equitable baselines of similar total geographic area and unit counts.

	Don Mills	**Cornell**
Total Area	835 hectares	973 hectares
Total Developable Area	774 hectares	625 hectares
Number of Originally Planned Units	N/A	10,000
Number of Built Units	8,121	8,016
Originally Projected Population	27,000-29,000	27,000

Table 4-1*: General comparisons between Don Mills and Cornell developments. Note that the number of built units for Don Mills includes what was built by 1965 and the number of built units for Cornell includes what is built to date in 2022 (Town of Markham n.d.; Town of Markham, 1994; McClaskey, 1965).*

4.2 Gross and Net Densities

In the analysis of built form characteristics, the assessment of residential densities is a common means to better understand the distribution and compactness of residents within a given area. Density is used to calculate how many people or buildings are in a study area, usually expressed as a ratio of dwelling units or population to land area. Generally, the denser an area is, there is a greater concentration of residential units, supply of services, and a more diverse and compact built form (Lehman & Associates et al., 1995). New Urbanism specifically aims to increase density as a means to promote walkability and minimize urban sprawl (Fader, 2000). Therefore, it is important to study density because it can identify community form, describe how intensely land is utilized, and provide an equitable comparison metric. There are two types of density that will be assessed in this report: gross density and net density (Fig. A-4). This report will describe both gross and net residential densities as a ratio of units per hectare (uph).

Gross density is the measure of residential units divided by the gross land area of the neighbourhood. Gross land area includes all lands that are developable, including all land uses in a residential district and street rights-of-way widths (Lehman & Associates et al., 1995). As noted by Gordon & Vipond (2005), the definition of gross density varies between municipalities making it difficult to compare density statistics provided by a municipality since one assessment may include a land use that is not included in another, skewing the validity of the comparison. In this report, gross land area includes all residential, school, places of worship, institutional, commercial, open space, public utility, emergency service, road, and municipal use lands within a residential area. All lands used for industrial uses, undeveloped land, and undevelopable land have been excluded from the gross residential area calculations.

Alternatively, net density is the measure of residential units divided by the net area of the neighbourhood. Net area is considered the area devoted to a single land use and is not combined with other uses (Lehman & Associates et al., 1995). Therefore, in terms of residential net area, only land parcels that are used for residential purposes are included in net area. School, commercial, open space, places of worship, public utility, emergency service, undeveloped land, undevelopable land, industrial, institutional and health care, and street widths are excluded from the net residential area calculation. Given the mixed-use land use nature of the Cornell development, mixed use parcels that include residential units are incorporated in the net area calculation since most buildings are predominately residential and the GIS data used does not differentiate floor area between land use types.

The identification and use of density is favourable for considering the built form of any given area since it identifies some relations between built form and is a transferable concept that can be applied to multiple areas. However, density should be considered as an approximate figure in determining that characteristics of a place, and emphasis on other features should also be considered to fully assess an area (Hitchcock, 1994). Specifically, given the theoretical differences between Modernism and New Urbanism, density should be used in addition to other features to assess the developments more accurately (Brewer & Grant, 2015). Therefore, this report will consider density and alternative built form characteristics such as housing mix, land use mix, and street design to compare Don Mills and Cornell more thoroughly.

Although perceived density, an individual's perceptions of the denseness of a space, is considerable in terms of how one interacts with and experiences the built environment, this paper will only consider the gross and net residential densities to ensure a quantitative analysis of reasonable scope (Churchman, 1999). Thus, the findings of this report only relate to physical built form and does not account for personal experiences within the space.

It should be noted that all mixed-use parcels containing at least one residential unit in Cornell were included in the residential land use area calculation. Therefore, in keeping with a reasonable research scope, all residential gross and net areas have been calculated based on land parcel area, and the gross floor area per residential unit of mixed-use parcels are not specified.

4.2.1 Don Mills Findings

Given the supply of 8,121 total units and a gross area of 563 hectares, the gross residential density of Don Mills was calculated to be 14.4 uph (5.8 upa). This calculation only considers land uses within residential areas and excludes all areas external to residential areas such as industrial areas (125 hectares), other land uses within industrial areas (81 hectares), undeveloped lands (6 hectares) and lands devoted to the Don Valley Parkway (30 hectares).

Of the 321 hectares of net residential area supporting 8,121 units, the net residential density of Don Mills was calculated to be 25.3 uph (10.2 upa). This figure is higher than initial assumptions due to a greater supply of medium and high-density units compared to what was anticipated to be predominantly low-density housing.

Area	Units	Residential Gross Area (hectares)	Gross Residential Density (uph)	Residential Net Area (hectares)	Net Residential Density (uph)
Don Mills 1965	8,121	563	14.4	321	25.3

Table 4-2*: Don Mills density figures (McClaskey, 1965).*

4.2.2 Cornell Findings

The gross residential density of built Cornell was calculated to be 18.5 uph given a supply of 8,016 units and 433 gross hectares (7.5 upa). This figure reached such high degree of density due to a significant percentage of total land uses being allocated for residential uses, in addition to the mixing of land uses. Gordon & Vipond's (2005) study of five Markham New Urbanist suburbs, including Cornell, discovered an average gross density of 19.6 uph (Fig. A-3). Based on this study, the findings of this report suggest that Cornell is slightly below the mean gross density of the original plans for the New Urbanist suburbs in Markham. However, 18.5 uph is still significantly dense for a suburban area totalling 433-hectares, indicating a compact built form as well as a greater concentration of services and amenities.

Based on a net area of 185 hectares and 8,016 units, the net residential density of Cornell was calculated to be 43.3 uph (17.5 upa). The prominence of medium density residential units throughout the area significantly contributes to the high net residential density figure.

In consideration of the 2008 and 2015 secondary plans for Cornell Centre, an approximate gross density was calculated based on the total area of 240 hectares, with no distinction between residential and non-residential land uses since parcels have yet to be subdivided. Therefore, the 240 hectares was added to the developed area of 433 hectares. Additionally, since roads have yet to be constructed on most of the area, the calculation of net density was avoided for the purpose of this estimation. Evidently, the 2008 Cornell secondary plan accounts for a gross density of 19.3 uph whereas the 2015 secondary plan visualizes a gross density of 25.3 uph (Table 4-3). This density is significantly greater than what is built today due to a large supply of high-density residential units in the revised plan for the Cornell Centre area.

Area	Units	Residential Gross Area (hectares)	Gross Residential Density (uph)	Residential Net Area (hectares)	Net Residential Density (uph)
Cornell 2022	8,016	433	18.5	185	43.3
Cornell 2008	13,016	673*	19.3	N/A	N/A
Cornell 2015	17, 016	673*	25.3	N/A	N/A

Table 4-3*: Cornell density figures, the asterisks indicating that there is no distinction between land use types in the 240-hectare Cornell Centre area (City of Markham, 2022; City of Markham, 2015).*

4.2.3 Comparison

This analysis has found that Cornell in 2022 has a gross density that is 29% greater than that of Don Mills in 1965. Additionally, the current state of Cornell has a net density that is 71% greater than that of Don Mills. When considering the state of Cornell once the Cornell Centre area is completed, based on the 2015 update to the Cornell Centre Secondary Plan and without the distinction of land uses in the 240 hectares of the Cornell Centre area, Cornell is modelled to have a gross density that is 76% greater than that of the original Don Mills development.

This suggests that both the gross and net densities of Cornell under the influence of New Urbanist planning are significantly denser than Don Mills, which utilized a Modernist framework of suburban neighbourhood design. These findings also suggest that Cornell has a more compact built form with a greater concentration of residential units. This is supported by the core principles of New Urbanism which emphasize the construction of compact and community-scaled neighbourhoods (Duany Plater-Zyberk & Co., 2002).

Area	Units	Residential Gross Area (hectares)	Gross Residential Density (uph)	Residential Net Area (hectares)	Net Residential Density (uph)
Don Mills 1965	8,121	563	14.4	321	25.3
Cornell 2022	8,016	433	18.5	185	43.3
Cornell 2008	13,016	673*	19.3	N/A	N/A
Cornell 2015	17, 016	673*	25.3	N/A	N/A

Table 4-4*: Comparison of the density findings from Don Mills and Cornell, including estimates for Cornell Centre. The asterisks indicate that there is no distinction between land use types in the 240-hectare Cornell Centre area (City of Markham, 2022; McClaskey 1965).*

4.3 Residential Building Types and Dwelling Mix

Another significant metric for comparing built form is the analysis of the housing stock classified by housing type. Exploring the housing mix compliments the density analysis by contributing to an understanding the types of dwellings provided in what quantity, in addition to the compactness of built form in each development. This report has identified four dwelling types for both Don Mills and Cornell for comparison: single-detached homes, semi-detached homes, townhouses (including stacked townhouses), and apartments. These four dwelling types were identified in data sets for both sites. It should be noted that mixed-use live-work units with at least one land use designated as residential in Cornell, including the live-work units along Bur Oak Avenue, have been classified as townhouse given the building type, design, and height.

Additionally, any subsequent reference to low density housing refers to single detached and semi-detached dwellings, medium density housing refers to townhouse dwellings, and high density housing refers to apartment dwellings.

4.3.1 Don Mills Findings

Of the 8,121 residential units in the original Don Mills development, only 35% were single detached, 9% were semi-detached, 16% were townhouses, and 40% were apartments (Figure 4-1). Alternatively, 60% of all units were low or medium density dwelling types and 40% of all units were high density dwelling types. These findings suggest a diverse mix of housing types throughout the Don Mills site, contrary to the general perception that this Modernist post-war suburb consists predominately of single-detached housing. The tallest apartments (up to seven stories) were located near the centre of the community along the main arterial roads of Lawrence Avenue East and Don Mills Road, although shorter apartment buildings (up to three stories) were located along arterial and collector roads. Townhouses were generally located along minor arterial and collector roads whereas semi-detached and single detached houses were located on collector and local roads. Medium and low density dwellings were generally separated, but seamlessly integrated within residential areas given similar height requirements, scaled landscaping, and architecture.

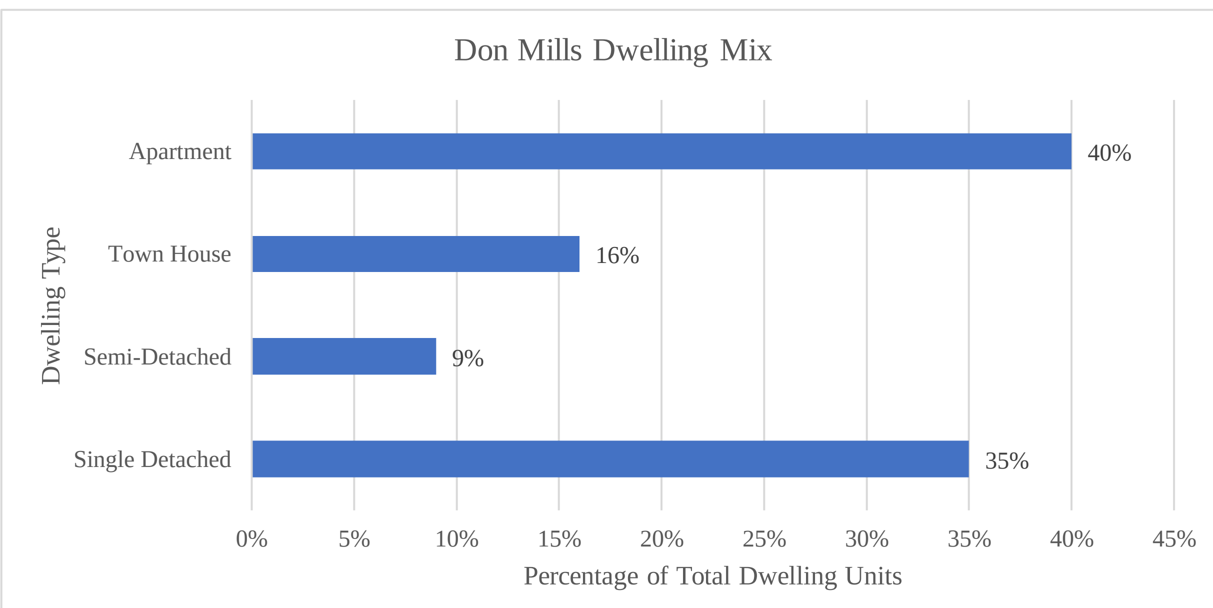


***Figure 4-1**: Dwelling mix of Don Mills (McClaskey, 1965)*

Figure 4-2*: Single detached dwelling in Don Mills (Source: Author).*

Figure 4-3*: Semi-detached dwelling in Don Mills (Source: Author).*

Figure 4-4*: Seven storey apartment dwelling in Don Mills (Source: Author).*

Figure 4-5*: Three storey apartment dwelling in Don Mills (Source: Author).*

Figure 4-6*: Townhouse complex in Don Mills on left half of image (Canadian Housing Design Council, 1959: 20).*

Figure 4-7*: Public art of the original house blueprints in Don Mills (Source: Author).*

4.3.2 Cornell Findings

The supply of housing type differs dramatically across the three scenarios for Cornell. Of the 8,016 residential units built to date in Cornell, 40% are single detached, 13% are semi-detached, 41% are townhouses, and 6% are apartments (Fig. 4-8). When considering the housing mix in terms of dwelling density, 53% of units are low density, 41% are medium density, and only 6% are high density housing. Therefore, the current housing mix in Cornell predominately consists of low and medium density housing. Given the high residential density identified in Cornell in addition to the supply of low density housing types, there is a greater degree of compactness in the residential built form.

When considering the increase in supply of high density housing options in the secondary plan area, the supply of housing type changes dramatically compared to what is currently built. Regarding the 2008 Secondary Plan and assuming that all of the new 5,000 residential units are apartment dwellings, 24% of all units are single detached, 8% are semi-detached, 26% are townhouses, and 42% are apartments. Subsequently, when considering the 2015 Secondary Plan and assuming that all of the new 9,000 units are apartments, 19% of all units are single detached, 6% are semi-detached, 19% are townhouses, and 56% are apartments (Fig. 4-8). Although the planned number of units in the most recent secondary plan will approximately double the total number of units in Cornell compared to what is currently built, these figures indicate that there will be a greater mix of housing types with higher densities.

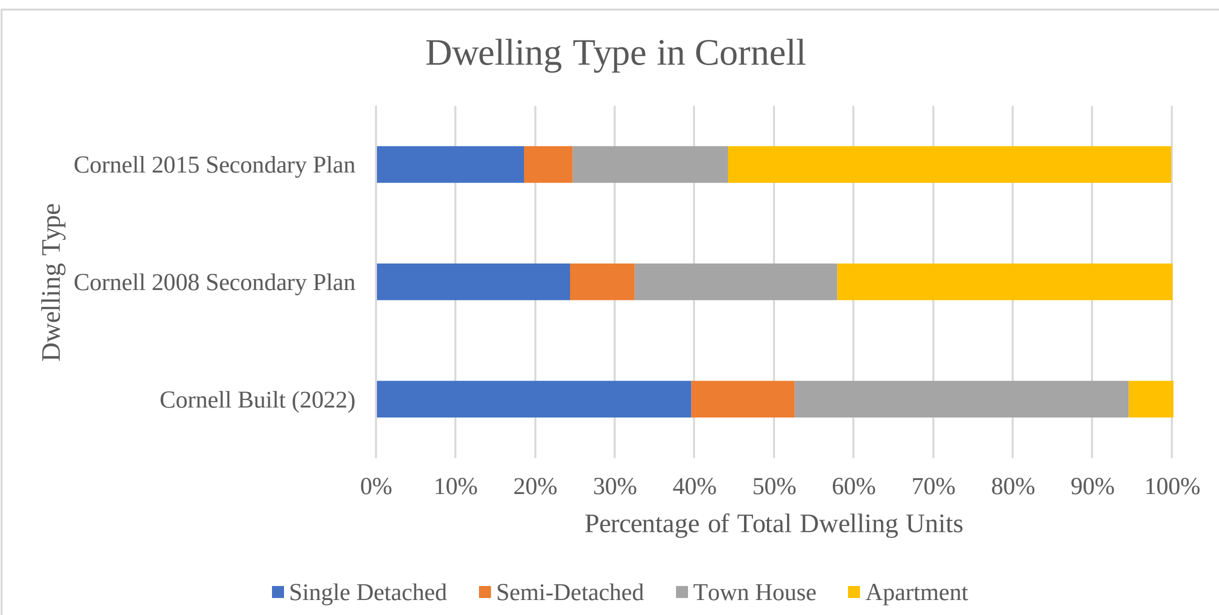


Figure 4-8: *Dwelling mix of Cornell across all development scenarios (City of Markham, 2022).*

Figure 4-9: *Single detached dwelling in Cornell (Source: Author).*

Figure 4-10: *Semi-detached dwelling in Cornell (Source: Author).*

Figure 4-11: *Townhouse dwellings on local road in Cornell (Source: Author).*

Figure 4-12: *Townhouse dwellings on minor collector road in Cornell (Source: Author).*

Figure 4-13: *Townhouse dwellings on Bur Oak Ave. in Cornell (Source: Author).*

Figure 4-14: *Six storey apartment building in Cornell (Source: Author).*

As identified through site visits, the mix of housing types are seamlessly integrated within one another. Aside from major collector roads such as Bur Oak Avenue where the residential dwelling type is devoted to mixed-use buildings and townhouses, single detached and semi-detached houses are generally located along minor collector and local roads. In many instances, a single block of housing can host a range of dwelling types, alternating between singles, semis, and townhouse dwellings on the same street. This high degree of micro-scale housing mix can be implemented because of similar architectural style and continuous urban design. Furthermore, all housing types have reduced front yard setbacks and rear lane vehicular access, bringing the front door of the house directly to the sidewalk which contributes to an increase in pedestrian activity and a sense of community. Ultimately, the location of various housing types in addition to the analysis of housing type supply both reflect the intent of New Urbanism to create a more compact form and strays from the notion of suburbs comprising mainly of low density housing.

4.3.3 Comparison

This analysis suggests that when comparing the 1965 version of Don Mills to what is built in Cornell today, there is a comparable supply of single and semi-detached units. However, there are slightly more single detached homes in Cornell since the high density Cornell Centre area is incomplete (Fig. 4-15). Notably, there is a greater supply of townhouses in Cornell than there was in the original Don Mills, supporting the New Urbanist concepts of supplying a greater mix of housing types. Since most of the high density apartment developments have yet to be built in Cornell, this report analyzed the plans from 2008 and 2015 to get a better understanding of what to expect in Cornell once completely built out.

When considering the 2008 plan for the Cornell Centre, the anticipated mix of low, medium, and high density units is very comparable to that of 1965 Don Mills. Specifically, Don Mills provided 40% of all units to be apartments and built them in earlier phases of the development process, whereas Cornell planned for 45% of all units to be apartments but they have mostly been delayed (Fig. 4-15). Although Don Mills supplied a greater percentage of single detached homes and a lesser percentage of semi-detached and townhouses compared to Cornell, the similarities between the supply of high density and lower density dwellings are relatively similar between the two developments.

Since Cornell is yet to be completed and the City of Markham updated the Cornell Centre Secondary Plan in 2015, the unit count estimates from the update can provide the most accurate means to assess what will be constructed. The addition of 9,000 high density units in Cornell during this phase of development dramatically changes the complexion of the housing mix from what is currently built and how it compares to Don Mills. Compared to what is built in Cornell today, there is a significantly higher percentage of apartment dwellings since most of the 9,000 new units will be of high-density nature. This shift in housing mix sees apartments being the most common housing type comprising of 56% of all units, followed by 29% of units being townhouses, 19% being single detached, and 6% being semi-detached. This shift to a high-density neighbourhood directly challenges the existing trends of low density suburban design.

When compared to the 1965 version of Don Mills, the 2015 plan for Cornell calls for a greater supply of apartment units while providing a greater percentage of townhouse units. Subsequently, Don Mills supplied a slightly greater percentage of single and semi-detached dwellings compared to the 2015 plan for Cornell. Although the final built housing mix of Cornell is unknown, the estimates suggest that there will be a greater supply of high density units and alternative options aside from single detached homes as compared to the original Don Mills.

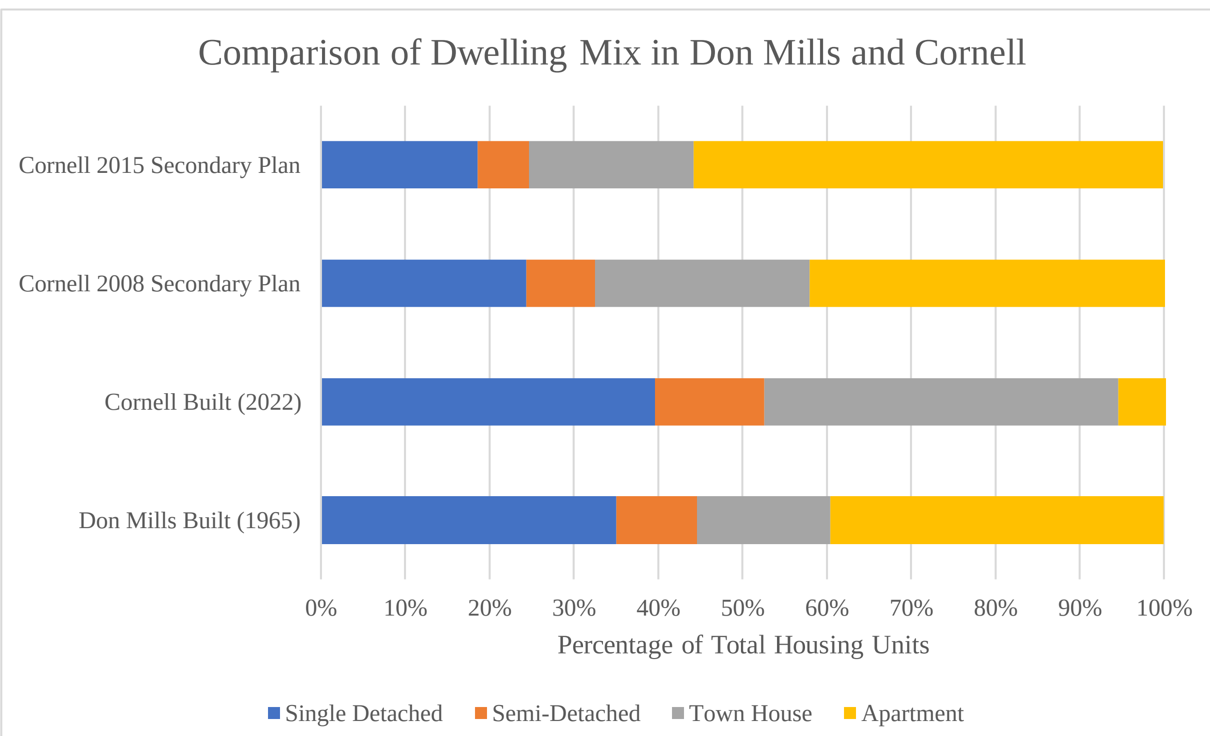


Figure 4-15*: Comparison of the dwelling type mix in Don Mills and Cornell (City of Markham, 2015; City of Markham, 2022; McClaskey 1965, Town of Markham, 1994).*

4.4 Land Use Mix

Although a prominent difference between Modernism and New Urbanism is the allocation of and interaction between different land uses, specifically considering the separation of land uses under and the integration of compatible land uses under New Urbanism, all developments regardless of planning theory influence must incorporate basic land uses. The most notable land uses of a neighbourhood include residential, commercial, open space, and schools.

It should be noted that although Don Mills was not built with mixed-use buildings, Cornell has integrated mixed-use residential buildings with commercial or service uses. Based on the GIS data used, of the 7,311 total parcels in Cornell to date, only 44, or 0.6% consist of mixed-use buildings. These buildings consist of 340 residential units, or about 4% of all residential units to date which is subject to change once the Cornell Centre area is constructed. All subsequent data has classified land use based on land use designation, not building type.

4.4.1 Don Mills Findings

The three most prominent land uses of the original Don Mills development are residential (47%), industrial (18.4%), and public open space (14.9%), although other land uses are supplied throughout the area (Fig. 4-16). Notably, the significant presence of industrial uses in Don Mills was reserved to ensure that Don Mills could act as a complete community where some of the workforce could be locally sourced. Thus, these findings suggest that non-residential uses and employment areas were supplied in Don Mills to establish a live-work-play environment for residents, which is reflective of the ambitions of the CIAM (Sert, 1942).

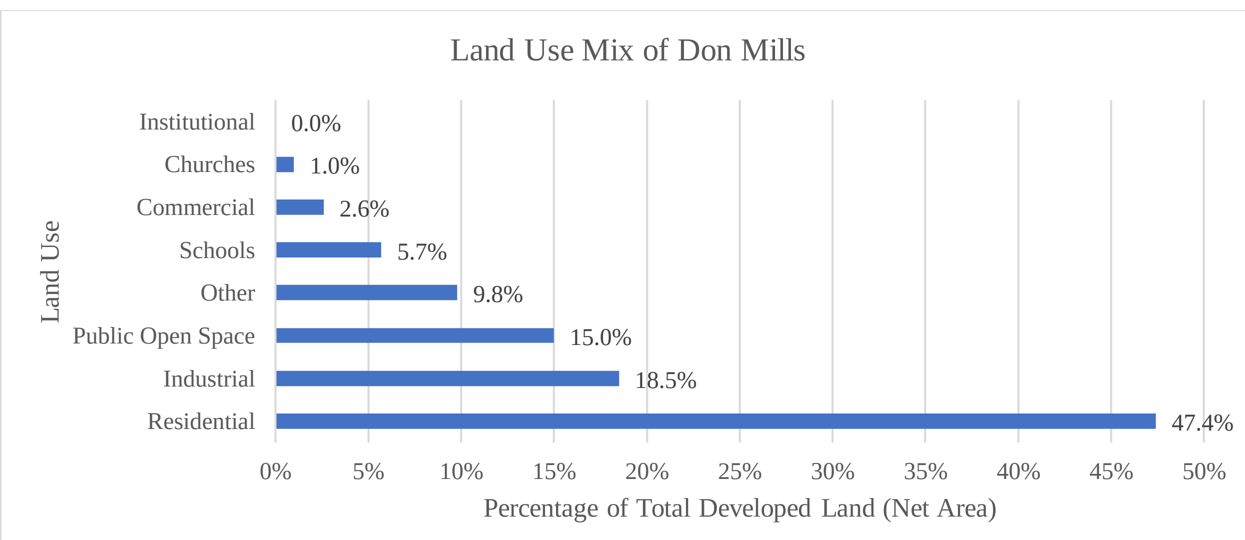


***Figure 4-16**: Land use mix of the original Don Mills development, excluding undeveloped land and roads (McClaskey, 1965).*

4.4.2 Cornell Findings

The three most common land uses in Cornell are residential (56%), public open space (15%), and other land uses (14.5%) which consists of green buffer areas, emergency services, parking lots, and the community centre and library buildings. Notably, the land designated as institutional consists of a health care campus and the Markham-Stouffville Hospital, which makes up 7% of all lands. (Figure 4-17). The low supply of commercial land uses is attributed to the incorporation of most mixed-use buildings being considered as residential land uses.

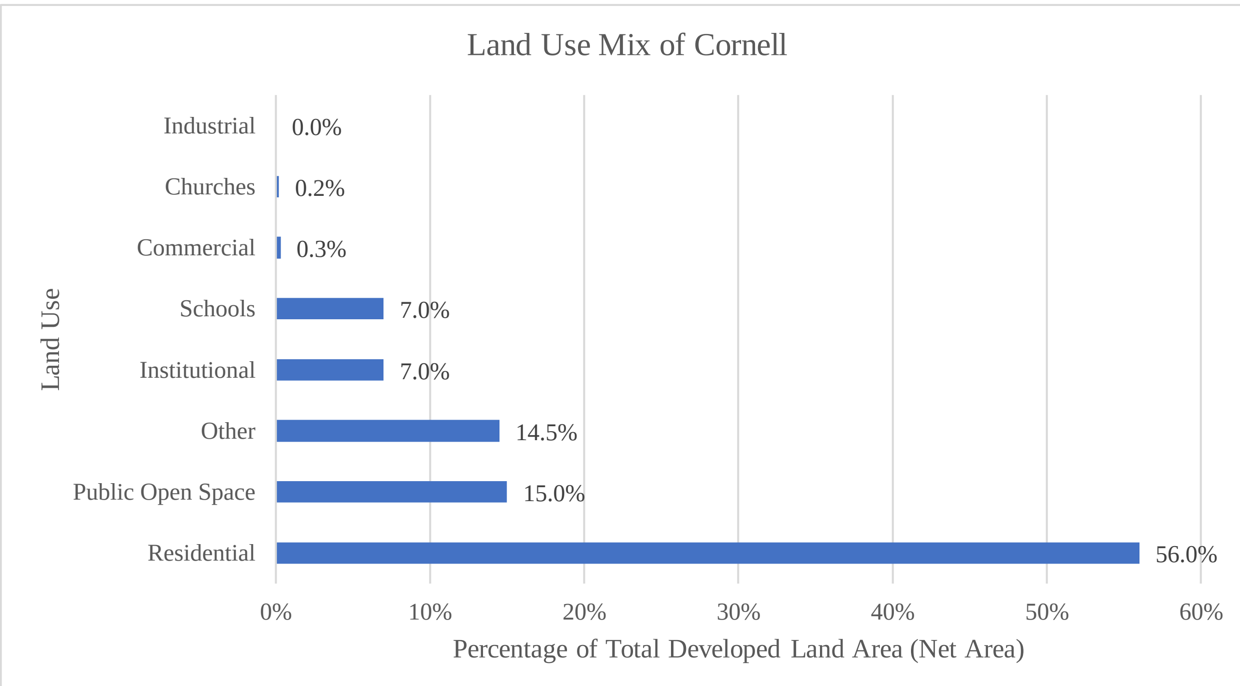


***Figure 4-17**: Land use mix of Cornell, excluding undeveloped land and roads (City of Markham, 2022).*

4.4.3 Comparison

The findings suggest that Don Mills and Cornell have a comparable mix of residential, public open space, other land uses, and schools in relation to the total developed land area (Fig. 4-19). There are some minor differences between the supply of places of worship and single-use commercial land uses between the two developments, whereby Don Mills has a slightly greater land allocated to those uses. However, the supply of these lands is not significantly different and can be attributed to Cornell only having one place of worship and mixed-use commercial buildings compared to the single use nature of Don Mills.

The most significant differences between the two areas are the supply and type of employment lands. In Don Mills, the light industrial uses were located on the peripheries of the site and contribute to 18.5% of all developed lands. To date in Cornell, employment lands are reserved for institutional uses and only consist of 7% of all lands, predominantly located on the southwestern portion of the site (Fig. 4-18). Therefore, Don Mills has a significantly greater supply of on-site employment lands than Cornell.

Furthermore, this analysis suggests that Don Mills has a significantly greater mix of non-residential land uses compared to that of Cornell (Table 4-7). Although both developments significantly favour the supply of residential areas, the percentage of the total developable lands in Don Mills attributed to residential uses is below 50% which allows for a greater diversity of other uses. This diversity was designed intentionally to support the concept of a complete community with a high degree of self-sufficiency. Alternatively, Cornell was designed mainly as a residential suburb with a greater supply of residential uses (over 50% of all developed land uses) which decreases the supply of land for other uses. Therefore, although Cornell has a denser, more compact suburban form, it has a less diverse range of non-residential land uses as compared to Don Mills. This may change, however, once the Cornell Centre area is fully developed given the planned supply of increased employment lands and service uses.

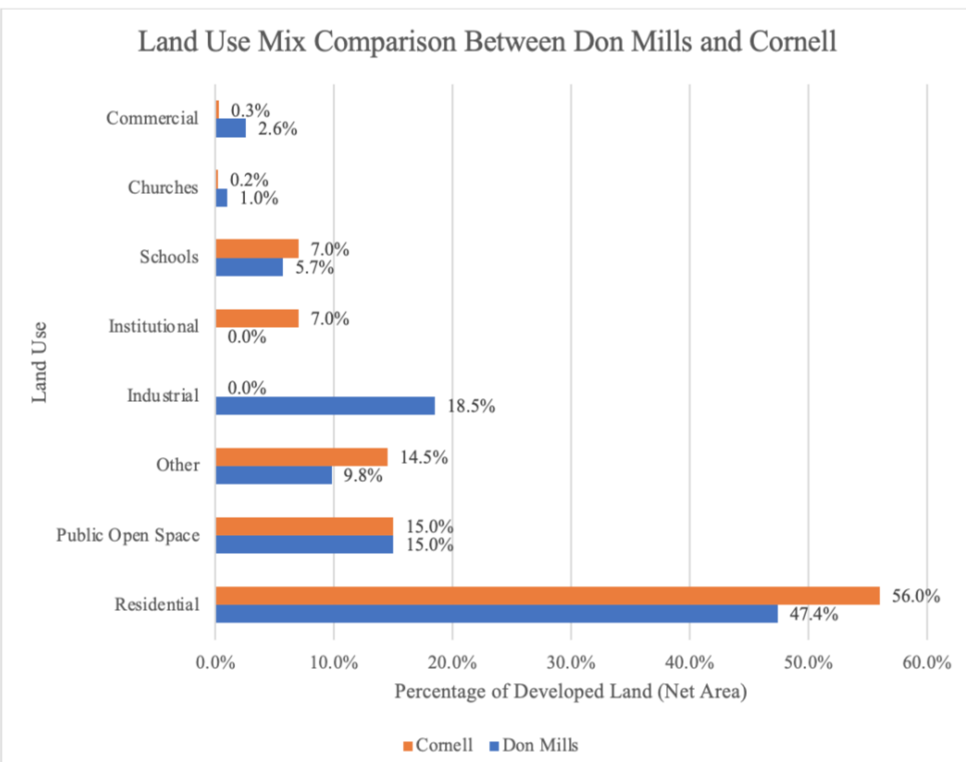


Figure 4-18*: Land use mix comparison between Don Mills and Cornell, excluding undeveloped land and road width area. Note the similarities between residential, public open space, other land uses, and school uses, whereby employment lands differ greatly between the two areas since Don Mills provides expansive industrial areas and Cornell supplies more compact health care campus lands (City of Markham, 2022; McClaskey, 1965).*

4.5 Street Design and Circulation

Analyzing the design of streets, the general pattern that they follow, and the type of street provided is an imperative aspect of a built form analysis since it provides an understanding to how people navigate through an area. As identified in Chapter 3, both Modernism and New Urbanism place an emphasis on a street hierarchy ranging from local roads to arterials. This is done to ensure that traffic is efficiently allocated based on speed and road widths and that traffic is removed from residential areas to ensure pedestrian and child safety (Marshall, 2005).

Based on the cases of Don Mills and Cornell, this report has identified four main types of road classifications that are a significant aspect of the design of both developments. They are local, minor collector, major collector, and arterial roads. Cornell has a fifth type of roadway, which is the rear lane that provides garage access for most residential units. Street classification and right-of way data was retrieved from the City of Markham (2014) Official Plan, GIS data from the City of Markham (2022), Hancock & Lee's (1954) description of the Don Mills plan, former Borough of North York (1972) District 4-5 Plan, and City of Toronto (2022) open data.

4.5.1 Don Mills Findings

The street design of Don Mills follows the hierarchical model emphasised by the CIAM, whereby it mainly consists of local roads that accommodate low density housing and school sites. These discontinuous local streets link to sub-collector roads with slightly higher density housing and faster speed limits. From there, the sub-collectors connect to the collector ring road (The Donway) that has even higher density housing and slightly faster speed limits. From there, the grid-patterned arterials roads can then be accessed (York Mills Road, Don Mills Road, Lawrence Avenue East, and Leslie Street). Ultimately, the arterial roads, the Don Valley, and rail lines geographically bound the development (Hancock & Lee, 1954) (Fig. 4-19).

This model supports the notion that heavy traffic and associated noise is separated from the residential areas of Don Mills and ensures that local traffic passes through various street types ranging in speed limits prior to reaching major roadways.

Although the public right-of-way widths of the original development are unknown, the former Borough of North York released a plan for an area including Don Mills which disclosed the public right-of-way widths for varying road types according to 1972 municipal provisions (Table 4-8). Despite these figures having been published approximately ten years following the completion of Don Mills, they are the earliest records of applicable data found in the City of Toronto Public Library system. Regardless, it is evident that the width of each type of street increases in accordance with the speed limit and traffic capacity.

Road Type	Don Mills
Local	20.0 metres
Collector	20.0 – 26.0 metres
Arterial	26.0 – 46.0 metres

Table 4-5*: Street right-of-way widths (Borough of North York, 1972).*

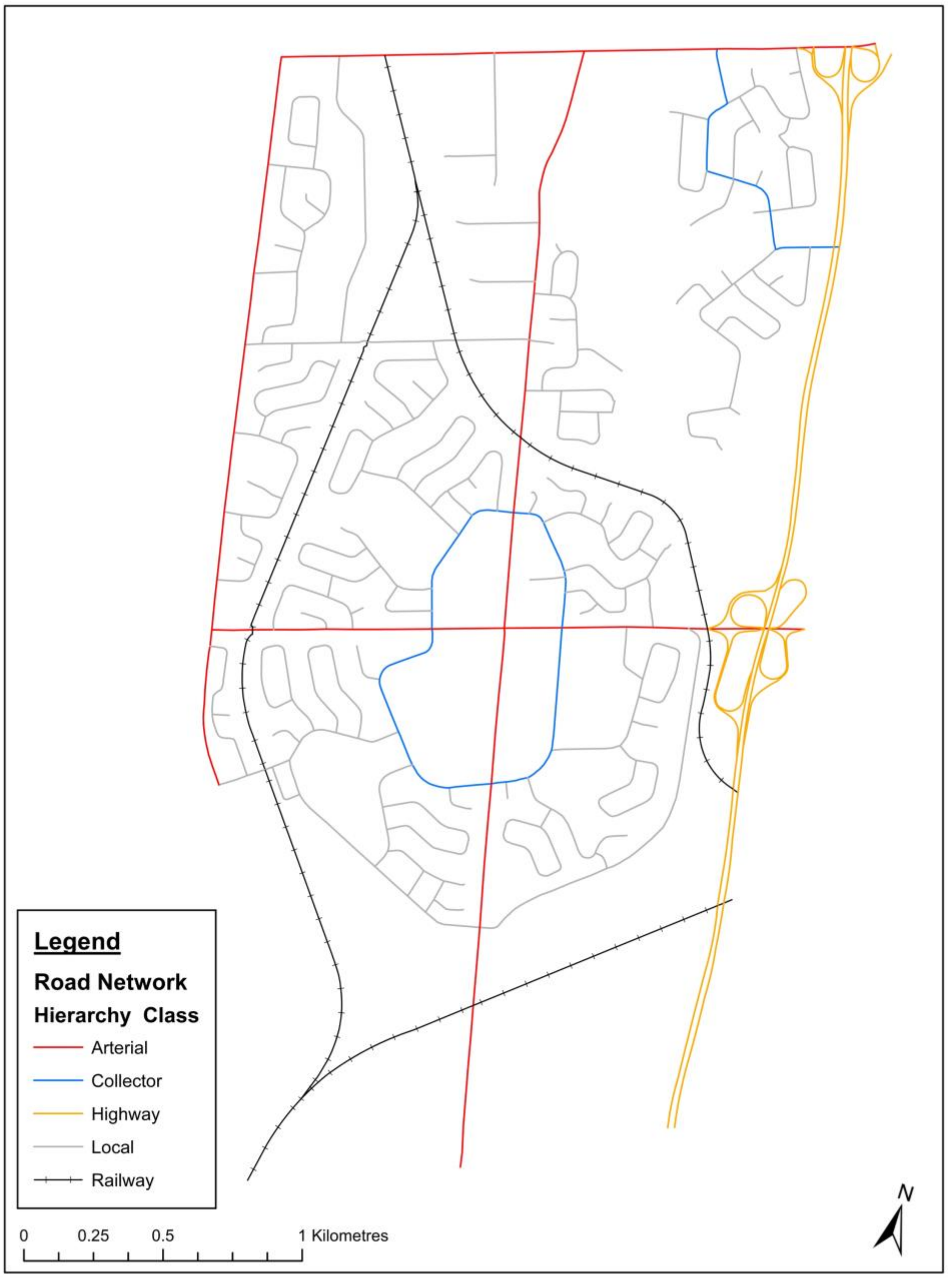


Figure 4-19*: Street classification map based on Don Mills master plan (Hancock & Lee, 1954; Borough of North York 1972). Note that the boundary of the development is shaped by arterial roads, rail lines, or natural features. The Don Valley Parkway was included in the map for reference despite not being included in the master plan (Source: Author).*

4.5.2 Cornell Findings

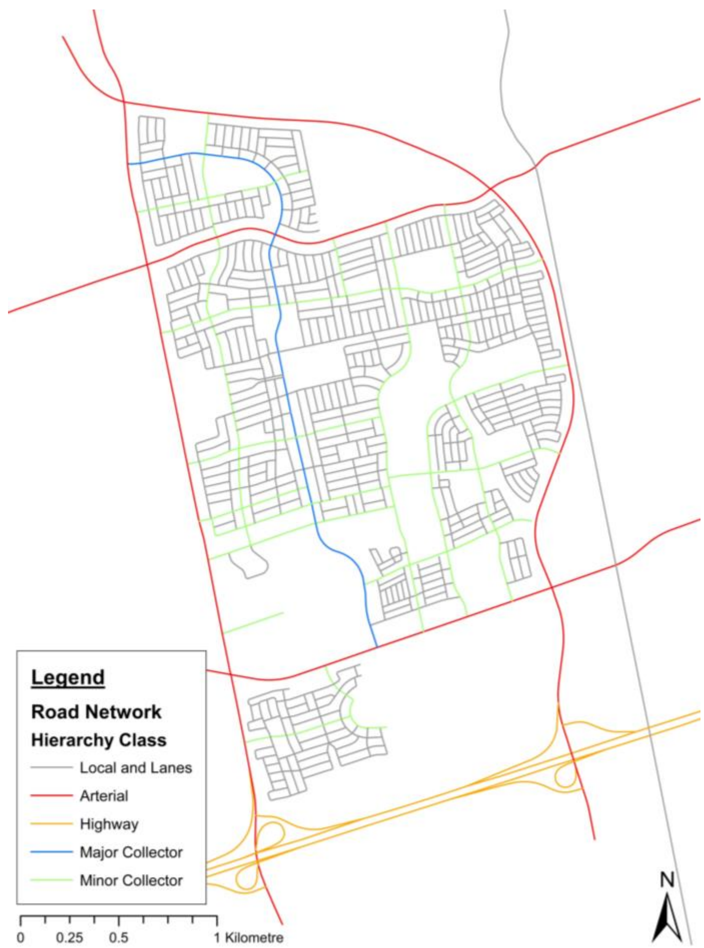
Cornell follows the street classification system as encouraged by the doctrine of New Urbanism and has a continuous modified-grid pattern road network within the neighbourhood. Street design incorporates landscaping and urban design that differs from surrounding neighbourhoods, reinforcing a sense of place within the development. Cornell predominately consists of local roads and alleys which connect to a range of minor collector roads. These roads link to both the major collector road of Bur Oak Avenue and the arterial roads of Donald Cousens Parkway, Highway 7, 16th Avenue, and Ninth Line (Fig. 4-20). Although it is the role of arterial roads to connect various areas of a municipality together, Bur Oak Avenue also serves an essential role in connecting Cornell with the rest of Markham since it crosses Ninth Line and continues west through other residential neighbourhoods, terminating at Kennedy Road.

Street right-of-way widths range from narrow alleys to wide arterial roads (Table 4-9). Notably, the street speed limits increase as the road width increases and the intended traffic type becomes heavier. These principles closely align with those of New Urbanism to direct heavy traffic away from the interior of the neighbourhood to retain a sense of neighbourhood character, pedestrian safety, and physical buffering from heavy traffic.

Road Type	Cornell
Alley/Lane	8.0 – 8.5 metres
Local	10.0 – 15.5 metres
Minor Collector	15.5 – 24.0 metres
Major Collector	29.0 metres
Arterial	37.5 – 47.0 metres

Table 4-6 *(Above): Street right-of-way widths for local, collector, and arterial roads (City of Markham, 2022).*

Figure 4-20 *(Right): Street classification map of Cornell (Source: Author).*



4.5.3 Comparison

This analysis suggests that there are both similarities and differences between the street design and circulation patterns of Don Mills and Cornell. Regarding similarities, both developments embody a hierarchical system of streets ranging from local to arterial. To compliment the range of street types, the land uses and housing type along various street types are similar in both examples and also appropriately reflect the type and use of the street. Although Don Mills has a more discontinuous road network with curved culs-de-sac compared to the linked grid-patterned streets of Cornell, both developments ensure street landscaping to support pedestrian safety through lower local speed limits and physical buffering from the road. Furthermore, this emphasis on street design in both cases creates a notable sense of place for residents which differs from that of surrounding neighbourhoods, making it easier for feelings of inclusion within a novel community to develop in addition to making it difficult for outsiders to navigate and feel included as a member of the local community.

Alternatively, the most significant difference between the street design and circulation of both developments is the street right-of-way widths (Table 4-10). Although the right-of-way widths for minor collectors, major collectors, and arterial roads are comparable, Don Mills has significantly greater right-of-way widths for local roads as compared to Cornell. This difference can be attributed to the fundamental differences of front yard setbacks and neighbourhood character, where Don Mills sought to increase the distance between the front door and street whereby Cornell aimed to bring homes closer to the street and introduced real lanes for vehicular access, which allowed the street widths of local roads to be reduced.

<table>
<tr><th>Road Type</th><th>Don Mills</th><th>Cornell</th></tr>
<tr><td>Alley/Lane</td><td>N/A</td><td>8.0 – 8.5 metres</td></tr>
<tr><td>Local</td><td>20.0 metres</td><td>10.0 – 15.5 metres</td></tr>
<tr><td>Minor Collector</td><td rowspan="2">20.0 – 26.0 metres</td><td>15.5 – 24.0 metres</td></tr>
<tr><td>Major Collector</td><td>29.0 metres</td></tr>
<tr><td>Arterial</td><td>26.0 – 46.0 metres</td><td>37.5 – 47.0 metres</td></tr>
</table>

Table 4-7*: Comparison of street right-of-way widths. Note the ranges of Don Mills represent all roads in North York and is not exclusive to Don Mills (Borough of North York, 1975; City of Markham, 2022).*

4.6 Conclusions

This analysis suggests that under the frameworks of both Modernism and New Urbanism, the cases of Don Mills and Cornell share some similarities and differences. Primarily, Cornell is the significantly denser development with gross and net densities that are currently 29% and 71% respectively greater than that the residential densities of the 1965 Don Mills development. The final state of Cornell is anticipated to be even denser, with a gross density approximated to be 76% greater than that of the original Don Mills. Therefore, although the construction of Cornell is currently incomplete and this statistic is based on the most accurate figures from the City of Markham, the density of Cornell will be subject to change once development is fully complete. The difference in density between Don Mills and Cornell can be attributed to housing mix, mix of non-residential uses, and street design.

Both Don Mills and the current state of Cornell provide a comparable supply of low density housing types. However, Cornell has a significantly greater proportion of medium density housing dispersed within low density areas. Although Don Mills supplied a greater proportion of high density housing, Cornell was able to fit more townhouses throughout the development on smaller lots which resulted in a denser neighbourhood. The plan for Cornell Centre aims to supply more high density housing, which will shift the mix towards a housing stock that predominantly consists of apartment units.

Furthermore, the sentiment of mixing housing types on a single block reflects the core ideas of New Urbanism to integrate uses and create compact neighbourhoods, whereas Don Mills generally separated housing types and land uses under the Modernist framework. Although Don Mills has some instances of different housing types on a single street, the supply of lower density housing on local roads and higher densities along busier roadways is consistent throughout the development.

This analysis also highlights that Don Mills has a greater mix of non-residential land uses, and that Cornell has a slightly greater proportion of total area devoted to residential land uses. Both developments however supply a similar street hierarchy system to ensure pedestrian safety and adequate traffic buffering throughout and within the neighbourhoods. Chapter 5 will explore how both cases reflect their theoretical influences and draw final conclusions of the case study comparison in relation to Modernism and New Urbanism.

5.0 Conclusion

***Research Question**: Considering the suburban planning benchmarks set by the Modernist post-war suburb of Don Mills and the New Urbanist suburb of Cornell, how does the residential densities of these neighbourhoods compare? Subsequently, how does the built form, supply of housing stock, and the land-use mix differ between both cases?*

In conclusion, the analysis of Modernist Don Mills and New Urbanist Cornell has identified key findings relating to the built form of each neighbourhood. Although the current and planned state of Cornell is denser than the original development of Don Mills, this report has reconsidered the preconceived notion of post-war suburbs comprising primarily of low-density residential dwellings. The status of Don Mills in 1965 alludes to a diverse range of housing types and non-residential land uses, in addition to a balanced supply of both owned and rental properties (60% houses, 40% apartments).

Additionally, Don Mills has a greater proportion of non-residential land uses as compared to the current state of Cornell. Therefore, this report has identified that although single detached housing was a significant aspect in both Don Mills and Cornell, the supply of medium and high density units were also prominent sources of dwelling. This finding was a surprise and is a great example for current communities to follow. The apartments in Don Mills are low-medium rise buildings, adding density and unit mix without sacrificing the overall human scale of the suburb.

Don Mills directly followed the Modernist framework of functionally separating land uses according to the primary function of dwelling. Residential areas were split into four Neighbourhood Units surrounding an elementary school to ensure the safety of children and other pedestrians while keeping heavy traffic away from the interior of the neighbourhood. Don Mills also supported the function of work by allocating 19% of the total land to industrial uses (which were buffered from residential uses to ensure the health of residents) and 3% to commercial uses. Open spaces were provided through the development and a road hierarchy system was implemented to ensure traffic remained scaled to the neighbourhood and to minimize the health-related impacts of traffic on the dwelling areas. Thus, the design of Don Mills followed the principles of Modernism under the CIAM and promoted a self-sufficient community which prioritized the experience and lifestyle of the residents, while supplying employment opportunities and a scaled jobs-housing balance.

Cornell also directly aligns with the vision of its respective theory, New Urbanism, as it provided the basis for the neighbourhood, district, and corridor. Cornell planned for six distinct neighbourhoods, like the concept of the Neighbourhood Unit, with an increased focus on mixing housing types and residential density on a single block. Houses were brought closer to the front lot line, often leading directly onto the sidewalk, to encourage pedestrian interactions with the street and a sense of community which rivaled the privatized deep front lots that are common in post-war suburbs. A variety of open spaces are also provided in Cornell which further contribute to a sense of community while providing access to recreational opportunities. Additionally, Cornell accounts for specialized districts, specifically the health care campus and employment lands in the Cornell Centre area, and a range of connections via green corridors and a road hierarchy system. Ultimately, like Don Mills, the design of Cornell draws heavy influence from the guiding theory to provide an opportunity for residents to live a healthy lifestyle while providing the daily and weekly service amenities all within a neighbourhood that encourages a sense of community among residents.

Ultimately, the greater non-residential land use mix in Don Mills and greater residential densities of Cornell is not surprising given that Don Mills was planned as a complete community which sought to integrate residential and employment uses within a single community. Although Cornell supplies some employment areas, it is predominantly a residential community yielding a greater residential density compared to the more multi-use nature of Don Mills.

5.1 Summary of Built Form Comparisons

Evidently, both Don Mills and Cornell directly embody the design traits of their respective theory. This report has analyzed how the designs of both developments compare to one another using the metrics of residential density, dwelling mix, land use mix, and street and circulation.

The current built out of Cornell has a gross residential density that is 29% greater than that of 1965 Don Mills and a net density that is 71% greater than that of 1965 Don Mills. This density figure for Cornell also includes nixed-use buildings and parcels with at least one residential unit. Additionally, when considering the estimations for the build-out of Cornell Centre with high density residential units, the approximate gross density is 76% greater than the density of the original Don Mills development. Net density was not calculated for the Cornell

Centre estimates since the streets have yet to be constructed or even digitized on any mapping software, making it impossible to determine the street width areas that is crucial in differentiating between gross and net area measurements. Ultimately, this report has identified that both the current and planned residential density of New Urbanist Cornell is greater than the residential density of Modernist Don Mills, alluding to a more compact suburban form.

When comparing the housing mix in Cornell and Don Mills, this report broke down the analysis into three scenarios. The first scenario compared the 2008 Secondary Plan to 1965 Don Mills and revealed that both plans had comparable provisions of apartment units (41% in Cornell and 40% in Don Mills), although the plan for Cornell had a greater mix of low and medium density housing while Don Mills supplied a slightly greater percentage of single-detached housing (24% in Cornell and 35% in Don Mills). The second scenario compared the current build-out of Cornell in 2022 to 1965 Don Mills and revealed that Don Mills has a significantly greater percentage of apartment dwellings (40% in Don Mills and 4% in Cornell) and a lesser supply of low and medium density dwellings (40% in Don Mills and 96% in Cornell). These figures are however skewed since the greatest concentration of high density dwellings are yet to be built in Cornell. Therefore, the third scenario compared Don Mills to what is planned to be built in Cornell based on the 2015 Secondary Plan. This revealed that Cornell will have a greater supply of apartment dwellings (55% in Cornell and 40% in Don Mills), a lesser supply of single detached dwellings (19% in Cornell and 35% in Don Mills), and a comparable supply of single-detached and townhouse dwellings (26% in Cornell and 25% in Don Mills). Therefore, this report has identified that Cornell currently has and is planned to have a greater mix of dwelling types in comparison to the original housing stock of Don Mills, with a greater percentage of high density dwellings that support the higher gross and net density also identified in this report.

Additionally, the two developments have a comparable supply of residential, open space, school, and place of worship uses. However, Don Mills has a greater non-residential land use mix compared to what is currently built in Cornell, although employment lands are scheduled to be supplied in the Cornell Centre area upon completion. Therefore, despite Cornell supplying a denser urban form and a more diverse range of dwelling types, it has a less diverse range of non-residential uses compared to the original Don Mills development.

Lastly, the findings of this repot suggest that both Don Mills and Cornell have similar street design and circulation patters given the use of a street hierarchy and limiting heavier traffic away from residential areas. The local and collector streets within both developments are designed to reduce the speed of traffic, ensure pedestrian safety, and improve aesthetic views of the street, although Don Mills has a more discontinuous street network to further a sense of belonging for residents and unfamiliarity for outsiders. Generally, the street width of local roads is narrower in Cornell, given the intent to supply vehicular access via rear lanes to promote pedestrian interactions on the street and a sense of community among residents.

5.2 Build-Out

As described in Chapter 4 of this report, the build-out estimations of Cornell have been based on two figures of residential units and population. The 2015 Cornell Centre Secondary Plan proposed an additional 9,000 residential units for 18,000 residents in the 240-hectare area (City of Markham, 2015). Additionally, the 2008 Cornell Centre Secondary Plan proposed to accommodate 10,000 residents in the 240-hectare area, where this report estimated that this plan supported 5,000 units given the 2:1 ratio of residents to units within the Cornell Centre area as based on the 2015 secondary plan (City of Markham, 2015; Urban Strategies, 2012). These figures were compared with data gained from the City of Markham's Planning Department to depict what is currently built to date in Cornell. When considering the area that is currently developed compared to the total area available for development in Cornell, only approximately 64% of the development has been built out over the last 28 years.

For the purposes of this report, findings related to Don Mills were referenced to 1965 due to the availability of data from Angus McClaskey, whereby construction was 95% complete by 1960 (McClaskey, 1965; McClaskey, 1997). Although Don Mills has undergone significant transformations since the original development, specifically regarding increased intensity within the ring road, the 1965 cut-off date used by this report supports a limited timeframe related to the original development that can be comparable to Cornell. It should be noted that unlike the lengthy development timeframe of Cornell, most of Don Mills was completed within in 10 years due to favourable housing market conditions which incentivized the developer to complete the project quicker, increased municipal support for the project, and favourable economic conditions supported mortgage financing and rental markets (Hancock, 1968; Sewell, 1993). Ultimately, the dates chosen for both Cornell and Don Mills reflect the best available data in addition to being the most comparable in terms of built-out and estimated development phases.

5.3 Limitations

The findings of this report have yielded valuable insight into the original Don Mills development and current state of Cornell. However, there are four limitations to the research of this report which required adaptation. These limitations did not negatively affect the findings of this study but would have been useful to help enhance the research component of the report.

Firstly, given that the original Don Mills development was completed approximately sixty years ago without the assistance of GIS, information related to unit counts, land use statistics, development applications, and other planning documents were difficult or impossible to access. This report relied on municipal reports and archived documents found at the Don Mills Library and Toronto Reference Library of the Toronto Public Library system. Furthermore, gaining access to the Toronto Archives was not possible given the constraints of the COVID-19 pandemic. Therefore, there could be additional data, documents, or photographs related to the Don Mills development located in the archives which was not accessed. Although this report is quantitative in nature and was able to proceed with the transcript of Angus McClaskey's 1965 presentation, access to archival sources could have contributed to a further analysis of land use related statistics and could have corroborated the data used. Despite these limitations, the data that was found and utilized in the report is reputable and was able to provide an understanding into the density, land use mix, and housing mix of Don Mills.

Secondly, given the transition to remote work for the City of Markham Planning Department in accordance with public health measures related to the COVID-19 pandemic, the Cornell GIS data obtained from the City was only received in February 2022 despite research for this report beginning in early 2021. Initially, census data from the Statistics Canada 2016 Census was utilized to approximate unit counts. However, staff at the City of Markham's Planning Department assisted in providing accurate GIS data by which unit counts, land use mix, land area, and streets were based on. If given more time with the data, further analysis could have been conducted on mixed-use areas and the specific definition of unit types classified beyond single-detached, semi-detached, townhouse, and apartments. Thus, although this report thoroughly utilized the available data, there is the opportunity for further analysis to be conducted when construction is fully completed for maximum analytical potential.

Thirdly, this report is limited in the sense that construction in Cornell is incomplete, specifically in the Cornell Centre area which is planned to site dense residential populations and a high concentration of mixed-use buildings. Therefore, the findings of this report related to planned unit counts are only approximate, and the actual total unit counts will undoubtedly change with time. The slow development of apartments in the area over the past 20 years is a concern when most units remaining are apartments. The data used for this report however is the most accurate information available at the current time, and the number of built units are accurate as per the data obtained by the City of Markham's Planning Department. Additionally, the residential density and land use mix will change once the development gets completed. Therefore, further analysis and updates to these findings will be required once Cornell is complete to ensure accurate, up to date data.

Fourthly, the findings of this report did not consider employment or population data from either Don Mills or Cornell. The reason behind this is twofold. Primarily, assessing employment data to determine such statistics would increase the scope of research to a point beyond capable means of a report during a pandemic. If population and employment data was pursued, the quality of analysis of built form metrics would have suffered. Secondarily, given that Cornell is incomplete and the plans for Cornell Centre include a significantly denser residential population and new employment lands, the current data of Cornell would be skewed and incomparable to the complete employment and population data of Don Mills, making for an unfair comparison. Thus, with extra time and a greater research scope in addition to the completion of Cornell, such population and employment analysis could have been completed.

Ultimately, although there were some limitations regarding the research process, temporal constraints, and setbacks in not obtaining documents or data to further develop findings, the overall research of this report adapted to these limitations and utilized the best possible sources to produce comparable findings. Although the final land use statistics of Cornell will differ from what is currently built and planned once development is completed, the figures used for this report consist of the most recent data publicly released by the City of Markham.

5.4 Recommendations and Conclusions

The findings of the report hold valid to the 1965 development of Don Mills, the existing state of Cornell in 2022, and the general state of the planned Cornell Centre area. This report and the process of research related to it has yielded four main recommendations that can contribute to future research on built form indicators and the developments of Don Mills and Cornell. The first recommendation is for municipalities within Canada to standardize the definitions of gross and net density to ensure an equitable basis of comparison for areas across various municipal borders and policies. Leaving the inclusion and exclusion of various land uses in the area calculations related to density results in the findings of various studies differing greatly from one another, based on what land uses were included in the calculation. Undoubtedly, density studies rely on the assumptions made by the researcher. However, with standardized definitions of density, planners and researchers can have a more systematic approach to including various land uses in area calculations that result in more consistent statistics for comparison.

The second recommendation is that given the incompletion of Cornell, further research related to the built form indicators be conducted once development is fully completed in the Cornell Centre area to better understand the outcomes of New Urbanism in Cornell. The planned increase in residential and land use density resulting from the Cornell Centre will change the relationship between people and space. Residential density would increase given the planned number of new units, employment opportunities would also rise, and alternative travel modes to the car will also be incorporated into the community given the operational VIVA transit terminal and growth of Markham's public transit. Therefore, it is advisable that the residential density, housing mix, and land use mix be revisited in future research once Cornell is fully constructed.

The third recommendation extends to researchers and suggests that once the Cornell Centre area is built out, additional comparisons between 1965 Don Mills and modern-day Don Mills be reassessed to further understand the differences between the two developments. This also allows researchers to understand the adaptation and transformation of Don Mills from the post-war suburb to a contemporary suburb.

The fourth recommendation is for researchers and municipalities to adopt a more diverse classification of assessing mix-use buildings in New Urbanist suburbs for comparisons between older suburbs to be more accessible. This report generalized mixed-use buildings in Cornell as residential uses, despite the ground floor being occupied by commercial or services uses. Thus, further differentiation between the mix of land uses on a single parcel would ensure a more accurate and practical means of comparison.

Ultimately, the built form analysis of this report highlights the significance of density, housing mix, and land use mix in relation to the character of a neighbourhood. These features directly relate to one's relationship with space and the social interactions that occur within the built environment. As seen with the theories of Modernism and New Urbanism, the practical design of these features is significant to ensure a high quality of life and the functional arrangement of daily life. It should not be the goal of suburban planners to simply plan for the densest possible neighbourhoods, but instead support a reasonable density that is complimented by the supply and arrangement of other features that are critical to daily life. Both Don Mills and Cornell exemplify positive models of supplying density at a human scale, in addition to supporting community features such as recreation, commerce, services, and employment.

Appendix A

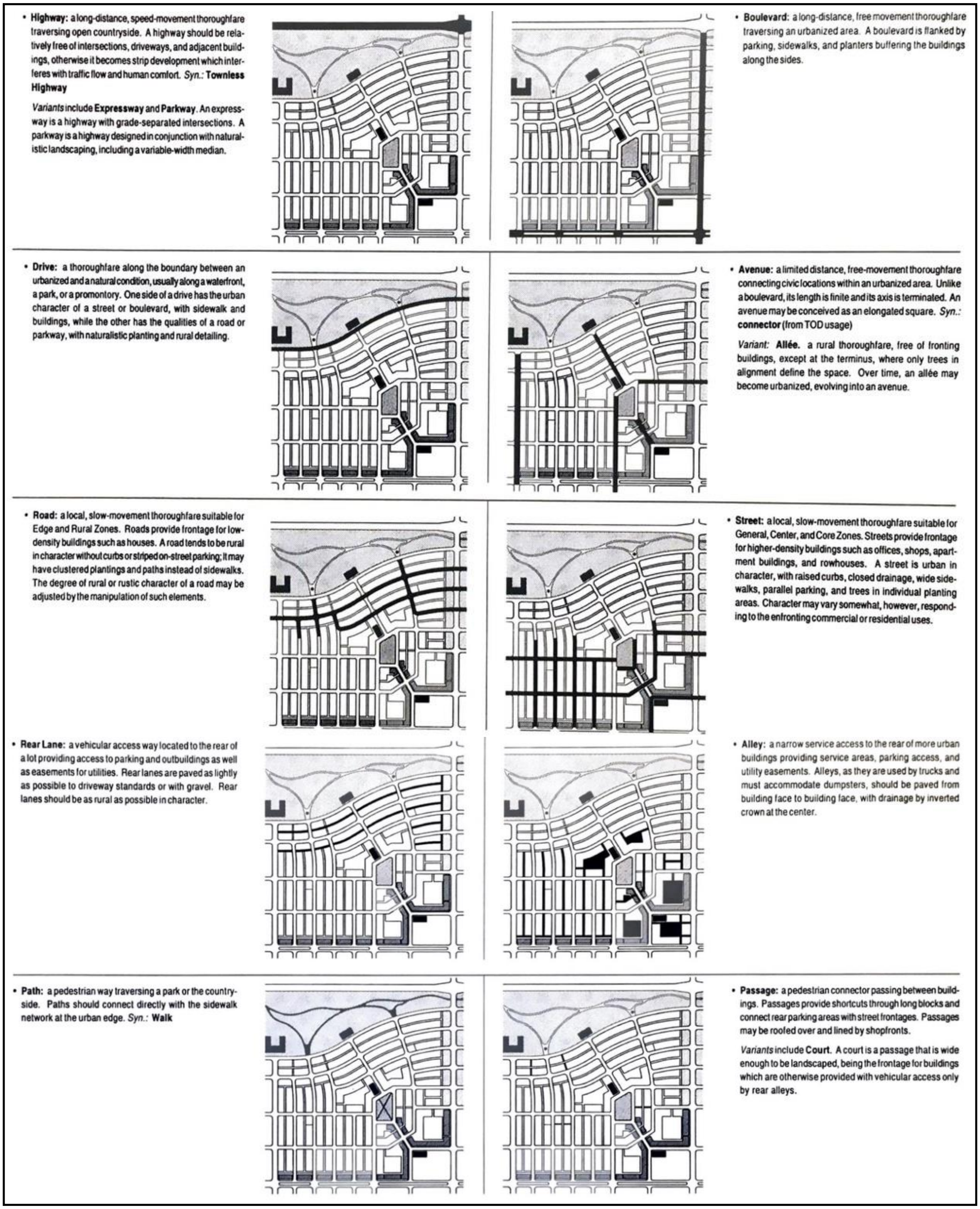


Figure A-1*: Road classification system under New Urbanism ranging in terms of vehicular travel and traffic density (Duany Plater-Zyberk & Co., 2002: 1.1-1.2).*

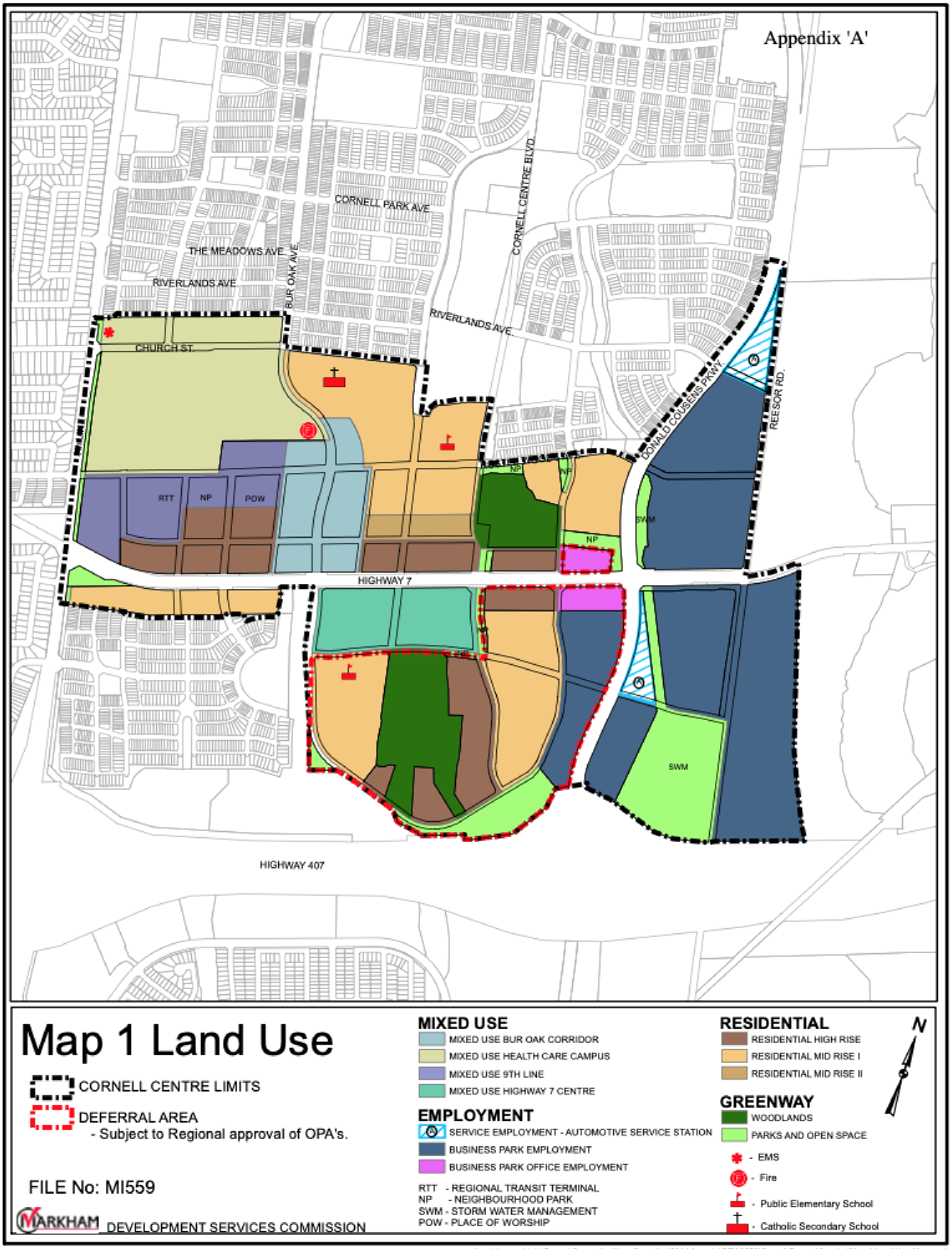


***Figure A-2**: Land use and area map of the Cornell Centre area (City of Markham, 2015: Appendix A).*

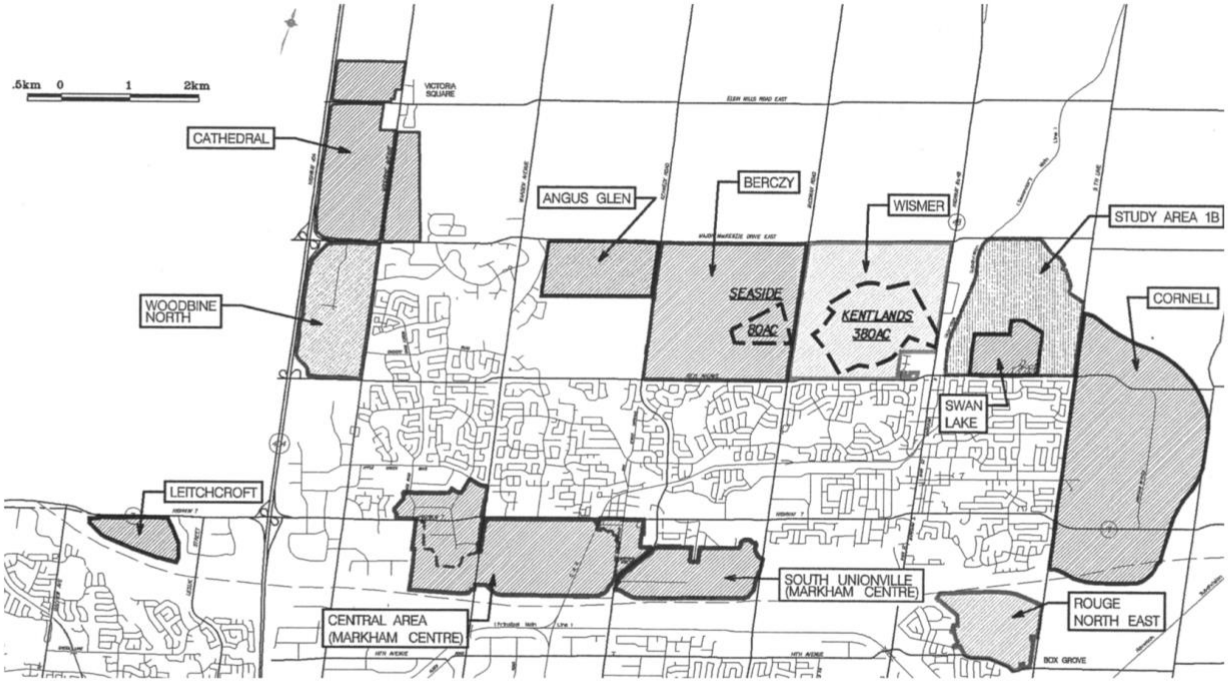


Figure A-3*: New secondary plan areas in Markham as of 1999, related to the location of other New Urbanist and conventional suburban neighbourhoods in Markham (Gordon & Vipond, 2005: 42).*

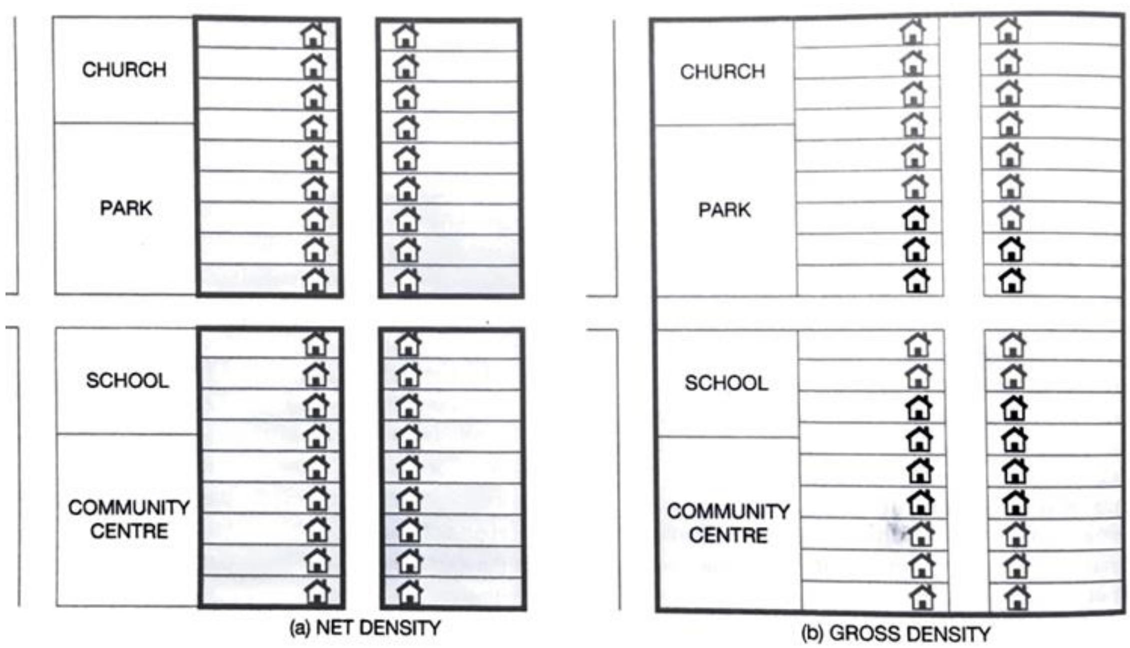


Figure A-4*: Visualization of net and gross density, whereby the land uses within the bolded border are those to be included in the applicable density calculation. Note the inclusion and exclusion of non-residential uses between the two density models, as followed by Hitchcock's (1994) density report (Hodge et al., 2020: 228).*

Appendix B

	Total Residential Units															
	Home Ownership						Multiple Rental								Total	
	Single Family		Semi-Detached		Cumulative Total		Apartments		Garden Homes		Horizontal		Cumulative Total			
	No. of Units	Density	No. of Units	Density	No. of Units	Density	No. of Units	Density	No. of Units	Density	No. of Units	Density	No. of Units	Density	No. of Units	Density
Section 1	471	6.1	50	10.2	521	6.3	570	24.7			16	17.2	586	24.4	**1107**	**10.4**
Section 2	183	5.6	24	7.1	207	5.7	505	33.5			6	12.0	511	32.8	**718**	**13.9**
Section 3	239	6.7	50	4.5	289	6.2	1075	43.2			192	24.0	1267	38.5	**1556**	**19.6**
Section 4	234	3.8	154	9.1	388	5.0	200	34.9	190	10.5			390	16.4	**778**	**7.7**
Section 5	68	4.9			68	4.9									**68**	**4.9**
Section 6	218	5.2			218	5.2									**218**	**5.2**
Section 7	175	5.0			175	5.0									**175**	**5.0**
Section 8	440	4.9			440	4.9									**440**	**4.9**
Section 9	132	4.8			132	4.8									**132**	**4.8**
Section 10	346	4.3	90	8.2	436	4.7					60	18.6	60	18.6	**496**	**5.2**
Section 11	130	5.4	410	9.8	540	8.2	869	50.7					869	50.7	**1409**	**17.0**
Section 12	206	5.6			206	5.6					818	23.7	818	23.7	**1024**	**14.7**
All Sections	**2842**	**5.1**	**778**	**8.8**	**3620**	**5.6**	**3219**	**37.5**	**190**	**10.5**	**1092**	**23.2**	**4501**	**29.8**	**8121**	**10.2**

*Density given in terms of units per acre

***Table B-1**: Unit counts and gross density (residential units per acre) of the original Don Mills development, as presented by Angus McClaskey in 1965. Note the ratio of 55% owned units and 45% rental units (McClaskey, 1965).*

Total Land Use																		
	Sections																**Total Area (acres)**	**% of Total Lands**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Elementary School	9.48	4.34	7.16	8.23				7.28		4.91	5.16						**46.56**	**2.3**
High School			19.46								14.57						**34.03**	**1.7**
Private School										14.79							**14.79**	**0.7**
Churches	2.44	0.55	2.36	2.46				2.6	3.39	1.53	1.54						**16.87**	**0.8**
Parks	15.53	5.73	36.62	2.38	1.61	5.06	3.00	8.88	0.06	16.91	14.53	41.89	3.85		82.57		**238.62**	**11.5**
Golf Course										41.65						96.40	**138.05**	**6.7**
Residential	105.84	51.60	79.41	100.92	13.81	41.46	34.39	89.63	27.39	95.1	82.66	71.29					**793.50**	**38.4**
Commercial Recreation			5.31	8.18													**13.49**	**0.6**
Commercial				34.9			2.33				6.38						**43.61**	**2.1**
Service Stations			0.75				0.79			0.47	0.64				1.31		**3.96**	**0.3**
Municipal Use	1.26			2.27													**3.53**	**0.2**
Industrial													151.45	115.44	43.07		**309.96**	**15.0**
Public Utility			0.46	0.12		0.64					0.01	0.69	0.63			16.37	**18.92**	**0.9**
Undeveloped Land			13.59														**13.59**	**0.6**
Don Valley Parkway			45.99							11.50		17.45					**74.94**	**3.6**
Roads and Widenings	32.95	15.79	28.01	33.82	4.89	13.42	11.00	30.46	8.88	31.38	37.27	20.94	13.04	0.47	16.87		**299.19**	**14.6**
TOTAL	**167.50**	**78.01**	**239.12**	**193.28**	**20.31**	**60.58**	**51.51**	**138.85**	**39.72**	**218.24**	**162.76**	**152.26**	**168.97**	**115.91**	**143.82**	**112.77**	**2063.61**	**100%**

***Table B-2**: Allocation of various land uses in the original Don Mills development, as presented by Angus McClaskey in 1965 (McClaskey, 1965).*

		Single Detached	Semi-Detached	Townhouse	Apartment	Total
1965 Don Mills	Unit Count	2842	778	1282	3219	8121
	% of Total Units	35.0%	9.6%	15.8%	39.6%	100%
Cornell Built (2022)	Unit Count	3171	1042	3323	480	8016
	% of Total Units	39.6%	13.0%	41.5%	6.0%	100%
Cornell 2008 Plan	Unit Count	3171	1042	3323	5480	13016
	% of Total Units	24.4%	8.0%	25.5%	42.1%	100%
Cornell 2015 Plan	Unit Count	3171	1042	3323	9480	17016
	% of Total Units	18.6%	6.1%	19.5%	55.7%	100%

***Table B-3**: Housing mix assessment of the original Don Mills development, current build-out of Cornell in 2022, and the projected scenario estimates of Cornell given the 1994 and 2015 secondary plans (City of Markham, 2015; City of Markham, 2022; McClaskey, 1965; Town of Markham, 1994).*

Date	Unit Type	Yearly No. of Units	Accumulative Sub-total	Accumulative Totals	Population
Dec. 1953	Housing	144	144	144	504
	Apartments	0	0		
Dec. 1954	Housing	658	802	1089	3811
	Apartments	287	287		
Dec. 1955	Housing	732	1534	2227	7794
	Apartments	406	693		
Dec. 1956	Housing	470	2004	3027	10594
	Apartments	330	1023		
Dec. 1957	Housing	376	2380	3462	12117
	Apartments	59	1082		
Dec. 1958	Housing	620	3000	4645	16257
	Apartments	563	1645		
Apr. 1959	Housing	60	3060	4905	17166
	Apartments	200	1845		
Jun. 1960	Housing	374	3434	5607	19625
	Apartments	328	2173		
Jun. 1961	Housing	186	3620	6434	22519
	Apartments	641	2814		
Jul. 1962	Housing	0	3620	7303	25561
	Apartments	869	3683		
Ultimate	Housing	0	3620	8121	28426
	Apartments	818	4501		

***Table B-4**: Residential unit and population count of Don Mills per year of development between December 1953 and final completion in 1963 (Sewell, 1977: 26).*

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