City of Toronto

Keele Finch Plus

Downsview Airport Operational Needs Assessment.

November 2, 2016

ARUP

Contents

1 Introduction

1.1 Background

The TTC is currently constructing a subway station at the Keele Street and Finch Avenue West intersection, and Metrolinx is investing in the Finch West Light Rail Transit line (LRT). Both of these lines will result in improvements to public transit service to and from the Keele and Finch area. The subway and LRT lines will significantly improve mobility and transportation options while also bringing a number of city building opportunities.

In provincial planning policy documents, the Finch Avenue West corridor is identified as an "intensification corridor", and the area around Keele and Finch is identified as a "major transit station area" and a "Mobility Hub". This means that it should be planned to achieve "increased residential and employment densities that support and ensure the viability of existing and planned transit service levels", among other things. That aside, it is an established best-practice in planning to encourage transit-oriented development around new transit stations in order to achieve a number of city-building objectives. There is currently both residential and office development interest in the immediate vicinity of Keele and Finch.

The Keele Finch Plus Study is about planning for the future of the area, and how to best leverage investment in rapid transit for the benefit of the community and city.

Building heights in the area are limited by the flight path of the Downsview Airport, with greater heights permissible with greater distance from the airport. Current municipal zoning includes Schedule D of North York Zoning By-Law 7625 "Airport Hazard Map", (see Figure 1) which is used to help determine height limits in the Keele Finch Plus Study area.

Site specific applications have been approved for heights that (in at least one case) are more than twice what the height limit set out in Schedule D identify as a maximum height. Examples such as this suggest a disconnect between the zoning height permissions and the flight path/surface requirements for Downsview Airport operations and the need for a full review of the relationship between aerodrome and land use regulatory frameworks within the study area was identified.

The objective of this study is to identify opportunities for potential increases in zoning height permissions that are compatible with Downsview Airport operations.

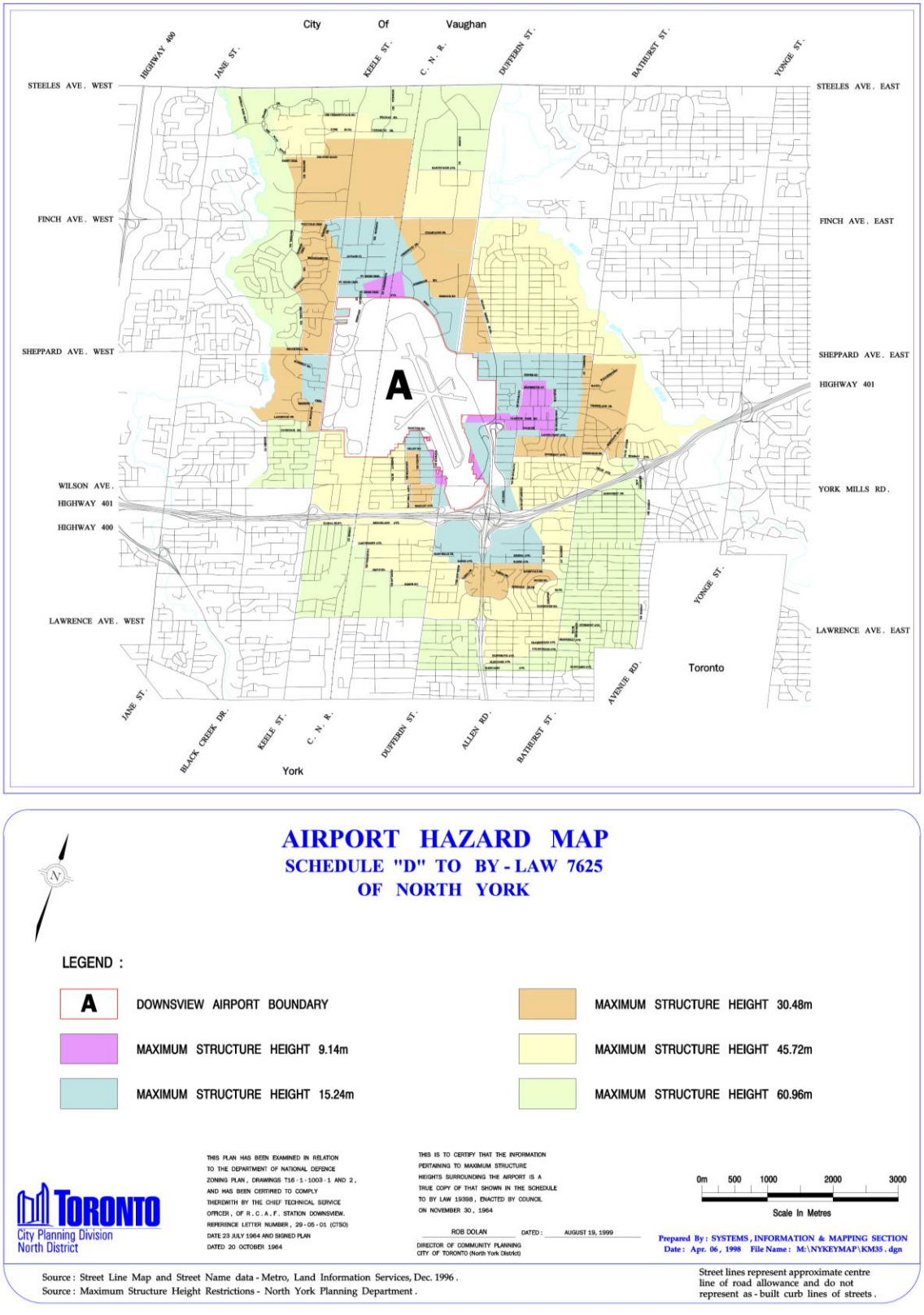

Figure 1 Airport Hazard Map, Schedule “D” to By-Law 7625 of North York

1.2 Airport Operations

An airport's two most important elements of infrastructure are its runways and the clear airspace needed for aircraft to utilize the runways. Without these two, the airport ceases to be an airport. Adequate clearance to obstacles must be enforced both on airport property, and off airport property.

The primary mechanism for protecting airspace is to develop comprehensive mapping of aeronautical surfaces aligned with the runways and surrounding the aerodrome, known as obstacle limitation surfaces (OLS), and ensure that these surfaces are not penetrated by new obstacles. The Obstacle Limitation Surfaces are permanent and should form the basis for municipal zoning by-law controls.

Obstacle Limitation surfaces are defined by Transport Canada in *TP312 Aerodrome Standards and Recommended Practices*. These standards are periodically updated. TP312 is currently in its 5th edition, which superseded the 4th edition on September 15th, 2015.

An airport operator must conform to the standards applicable to the airport at the time of initial certification. If any part of the airport is replaced or improved, then the airport operator must adhere to the latest standards.

Downsview Airport was certified under TP312 4th edition as such this study reviews and compares the Obstacle Limitation Surfaces as defined in both the 4th and 5th edition of TP312.

2 Downsview Airport Classification

Downsview Airport (CYZD) is classified as a 3C Non-Precision Airport with a 7,003 ft runway capable of accommodating Bombardier's regular DASH 8 – Q400 aircraft.

Figure 2 Bombardier DASH 8 – Q400

Bombardier has certified the airport based on the performance of their larger jet aircraft (Global Express - BD700) manufactured at the Bombardier Downsview facilities. This aircraft can occasionally be seen flying to and from the airport in its green primer paint scheme.

Figure 3 Bombardier Global Express – BD700

2.1 Aerodrome Reference Code (ARC)

The Aerodrome reference code is used for planning purposes to ensure that an airport provides adequate facilities for the aircraft to be accommodated at that aerodrome. The alpha-numeric Aerodrome reference code is a factor of Code Elements 1 and 2 (Table 1-1, TP312, 4th Ed.) . Code Element 1 is determined by the available field length required for the design aircraft. In other words, it is the length of runway required for the design aircraft to take-off. Downsview has used the Global Express – BD700 as the design aircraft requiring less than 1,800 m (5,900 ft) of runway to take off. Therefore, based on Table 1-1 in TP312, this is equivalent to a Code 3 runway.

Code Element 2 is determined by either the maximum wingspan or maximum outer gear main wheel span, whichever provides the most demanding code letter. Bombardier's aircraft both fall within the Code letter C classification making for a combined Aerodrome Reference Code of **3C**.

2.2 TP312 5th Edition ARC Equivalent

The equivalent to the Aerodrome Reference Code in TP312 5th edition is called the Aircraft Group Number (AGN). The AGN is determined through the application of several characteristics of the aircraft intended to use the airport.

These characteristics include:

1. Wing span
2. Outer main gear span, or
3. Tail height,
4. The approach speed can also be taken into consideration.

The AGN classification for Downsview is **AGN IIIB**.

Downsview is governed by Transport Canada's TP312 – Aerodrome Practices and Recommended Procedures (4th Edition). This document "serves as the authoritative document for airport specifications, including physical characteristics, obstacle limitation surfaces, lighting, markers, marking and signs" (TP312, 4th ed, Forward, xi).

TP312 (4th ed.) provides Downsview with the guidelines necessary to maintain their Aerodrome Certification as outlined within Downsview's Airport Operations Manual (AOM). The AOM provided this study with key information that was used to develop the Obstacle Limitation Surfaces (OLS).

KEY AIRPORT SPECIFICATIONS	
Compliance Document	TP312, 4th Ed.
Aerodrome Reference Point Elevation	652 ft (198.7 m)
Runway 15-33 Length	7003 ft x 200 ft
Airport Reference Code	3C Non-Precision
Threshold Elevation (RWY 15)	649 ft (197.8 m)

3 Obstacle Limitation Surfaces TP312, 4th Edition

The Obstacle Limitation Surface (Take-off/Approach, Transitional, and Outer Surface), as defined in TP308, defines the volume of airspace that should ideally be kept free from obstacles to minimize the dangers presented by obstacles to an aircraft, either during an entirely visual approach or during the visual segment of an instrument approach. The Obstacle Limitation Surfaces are permanent. Values are fixed in relation to the proposed airport use, forming the basis for municipal zoning by-law controls.

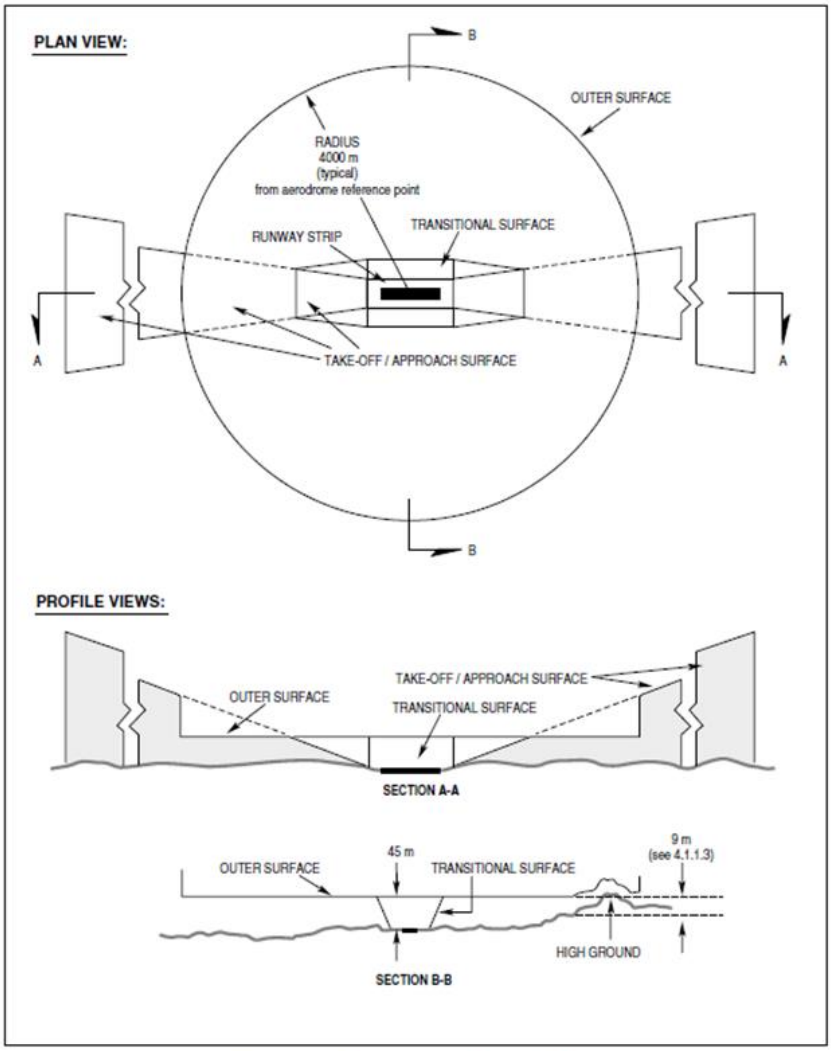

Figure 4-1. Obstacle Limitation Surfaces

Figure 4 OLS Page From TP312E

3.1 Components of the Downsview Airport OLS

As noted earlier, Downsview's runways are classified as 3C Non-Precision. This is important when determining the values associated with the development of the OLS. A non-precision runway requires an Outer Surface, a Take-off/Approach Surface and Transitional Surfaces.

These Surfaces originate from the Threshold of Runway 15 and directly affect land use planning within the Keele Finch Plus study area.

3.1.1 Outer Surface

The Outer Surface comprises of a common plane established at 45 m above the Aerodrome Reference Point (ARP) and extends out from the ARP at a 4,000 m radius. The Outer Surface at Downsview is established at 800 ft (243.8 m) Above Sea Level (ASL). Objects cannot penetrate this surface.

Figure 5 TP312 4th Edition – Outer Surface Plan, Runway 15, Downsview

3.1.2 Take-off/Approach Surface

The Take-off/Approach Surface originates at 60 m north of Runway 15 threshold (649 ft/197.8 m ASL). It continues north at a slope of 2.5% along the extended runway centerline for a horizontal distance of 3,000 m. Objects cannot penetrate this surface.

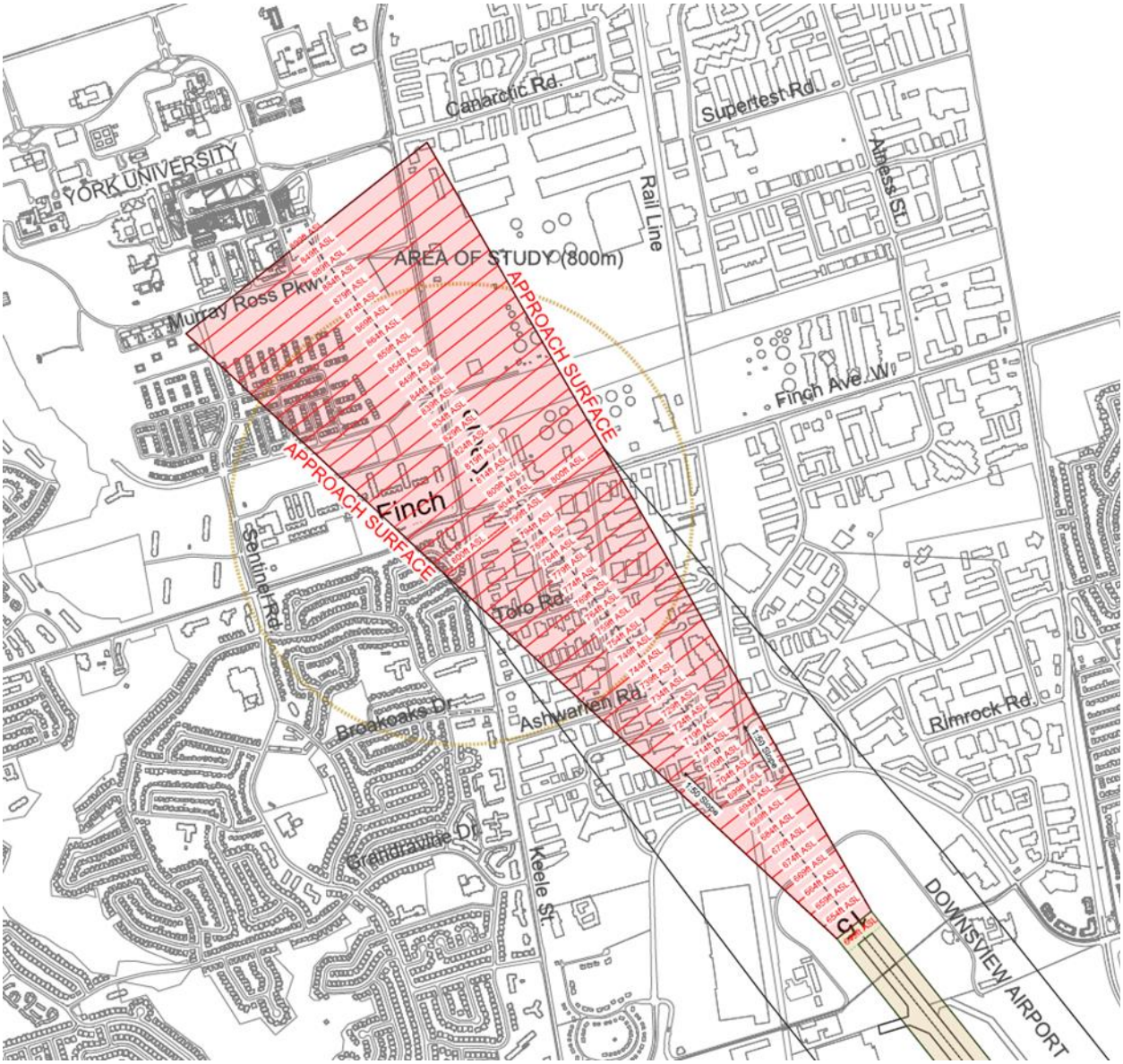

Figure 6 TP312 4th Edition – Take-off/Approach Surface Plan, Runway 15, Downsview

3.1.3 Transitional Surface

The Transitional Surface begins along the sides of the Approach Surface and extends up and outwards at a 14.3% slope until it reaches the Outer Surface. Objects cannot penetrate this surface.

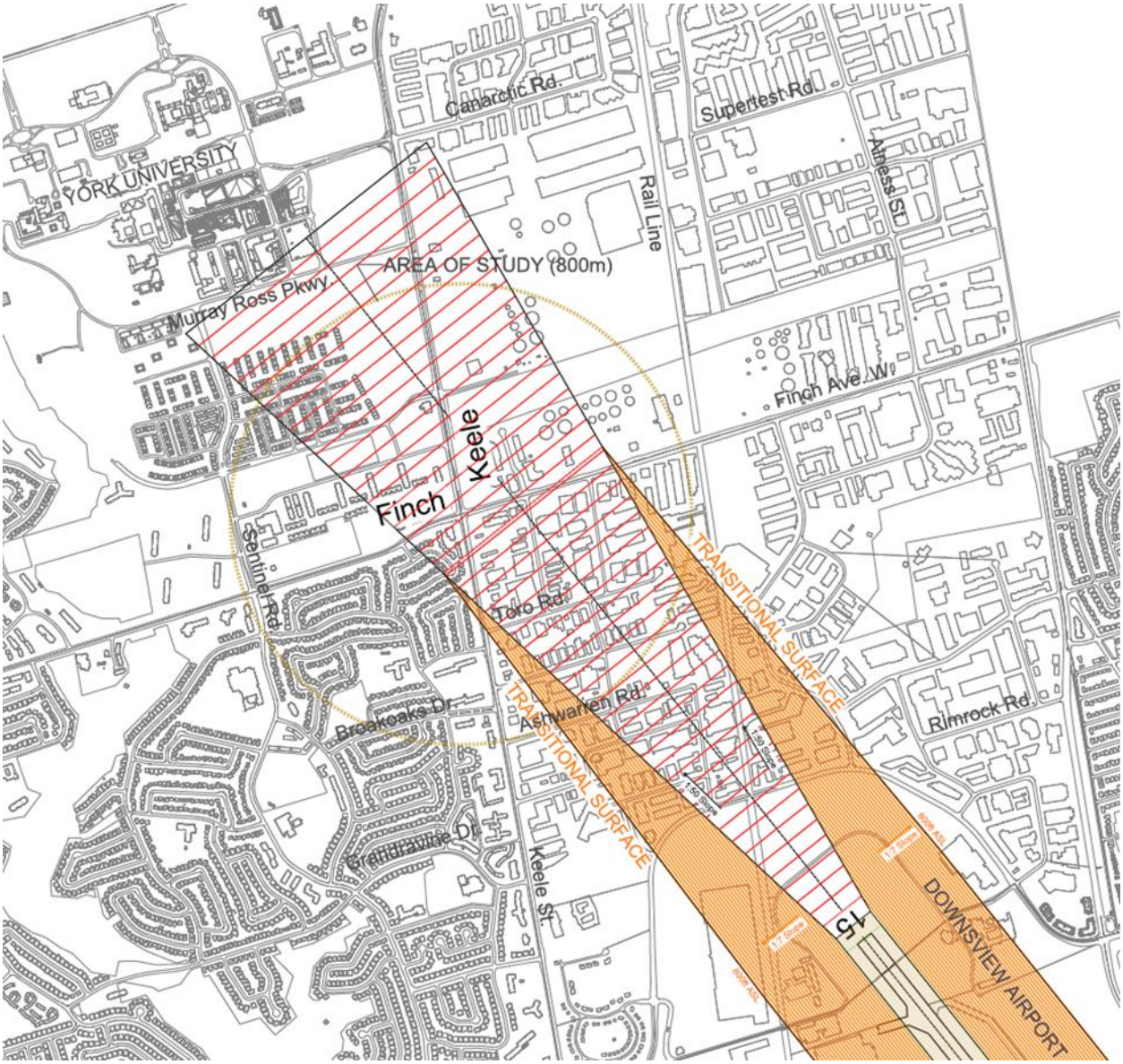

Figure 7 TP312 4th Edition – Transitional Surface Plan, Runway 15, Downsview

Buildings and other obstacles must not penetrate any of these surfaces. Where surfaces overlap the lower surface will govern the maximum building heights.

Figure 8 TP312 4th Edition – Elevated Perspective of composite OLS surfaces, Runway 15, Downsview

It is important to note that the obstacle limitation surfaces are applicable to all objects including installations commonly found on roof tops (such as air handling equipment, satellite dishes, antenna and obstacle lights) as well as temporary installations including construction cranes.

4 Obstacle Limitation Surfaces TP312, 5th Edition

TP312 Aerodrome Standards and Recommended Practices, 5th Edition superseded the 4th edition on September 15th, 2015. However, this does not imply that all airport operators must make the necessary changes to conform to the 5th edition. As noted in Transport Canada's Advisory Circular regarding the introduction of TP312, 5th ed.:

> "The change in the AOM and aeronautical publications resulting from the introduction of TP312, 5th edition does not oblige airport operators to comply with the standards in TP312, 5th edition or to undertake any physical changes to the infrastructure of the airport. Compliance to TP312, 5th edition would only be required in accordance with the requirement of CAR 302.07" (*See AC 302-018 Grandfathering at Airports pursuant to CAR 302.07*).

This document, effectively, states that an airport operator must conform to the standards applicable to the airport at the time of initial certification. If any part of the airport is replaced or improved, then the airport operator must adhere to the latest standards. If Downsview decides to make any changes to the airport, then these changes must conform to the TP312, 5th ed. standards. Otherwise, Downsview continues its operations in conformity with all applicable standards within TP312, 4th edition.

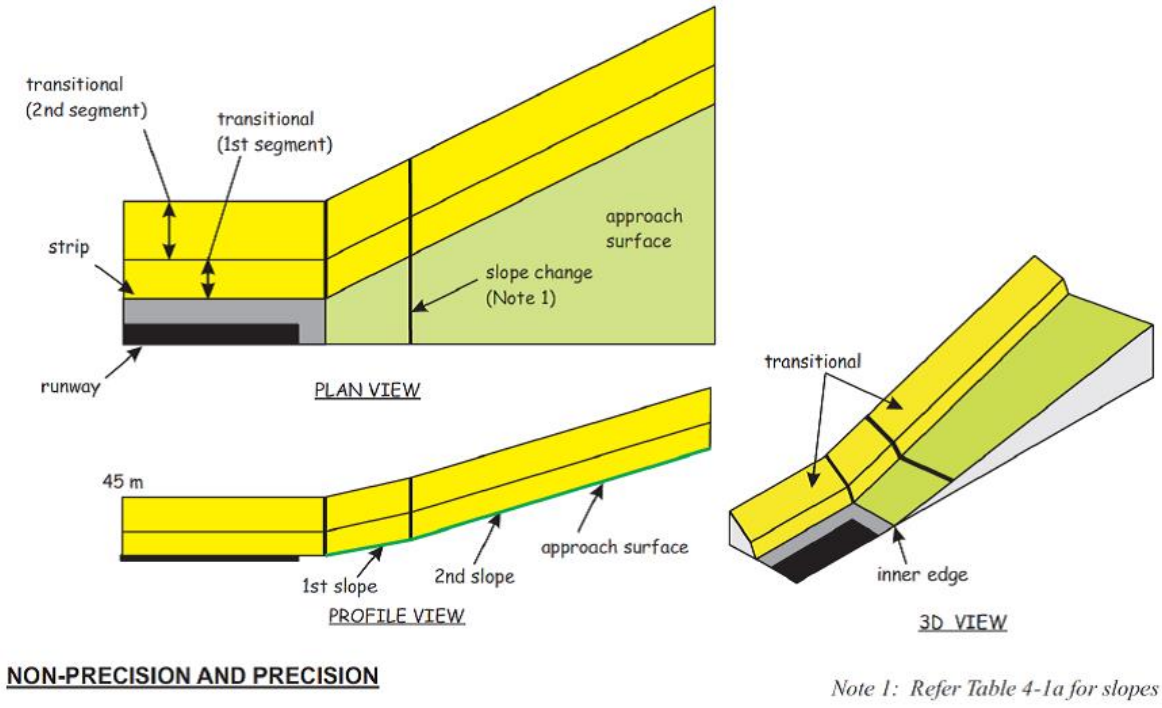

Figure 9 Diagram of TP312 5th Edition OLS Surfaces

The Obstacle Limitation Surface requirements within TP312, 5th edition result in clearances under the applicable surfaces of the Downsview OLS which are greater than or equal to the TP312 4th Edition. These changes would only be applicable if Downsview initiated a TP312, 5th certification process with Transport Canada.

Some notable changes that would affect development surrounding Downsview include:

1. TP312 5th includes two slope sections within the Approach Surface. The first section has the same slope as the 4th edition (2.5%), but it only extends out by 720 m compared to the 4th edition length of 3,000 m. The second Approach Surface sloping section within the 5th edition increases to 2.9% for 4,280 m. Overall, this would increase the maximum heights for development under the approach, when compared to TP312, 4th edition.
2. The Transitional Surface also has two slope sections with the first section (25%) being considerably steeper than the 4th edition slope of 14.3%. The second section of the Transitional Surface in the 5th edition has the same 14.3% slope as the 4th edition but, it begins at a higher elevation because of the steep first section.
3. TP312 5th has removed the Outer Surface as part of the Obstacle Limitation Surfaces. It has, instead, replaced the Outer Surface with a similar surface called the Outer ID Surface which is part of the Obstacle Identification Surfaces (OIS). The OIS do not carry the same regulatory powers as the OLS. The OIS are there to provide identification of obstacles that would require further assessment to determine if approach procedures require an increase in obstacle clearance altitudes/heights.

4.1 Components of the Downsview Airport OLS/OIS

As noted earlier, Downsview's runways are classified as 3C Non-Precision per TP312 4th edition. The 5th edition equivalent is IIIB Non-Precision. This is important when determining the values associated with the development of the OLS and OIS. A non-precision runway requires an OLS consisting of an Approach Surface and a Transitional Surface. The Outer ID Surface is an equivalent to the 4th edition Outer Surface but it is not part of the OLS. There is also an Approach ID surface as part of the OIS. This surface is identical in shape to the Approach Surface, however it maintains a 2.5% slope all the way out to 5,000 m.

These Surfaces originate from the Threshold of Runway 15 and directly affect the development within the Keele Finch Plus Study area.

4.1.1 Approach Surface

The Approach Surface originates at 61m north of Runway 15 threshold (649 ft/197.8 m ASL). The first section (720 m) continues north at a slope of 2.5% along extended runway centerline and then transitions to a second section (4,280 m) at a slope of 2.9% for a total horizontal distance of 5,000 m. Objects cannot penetrate this surface.

Figure 10 TP312 5th Edition – Approach Surface Plan, Runway 15, Downsview

4.1.2 Transitional Surface

The Transitional Surface is comprised of two segments. The lower segment begins along the edge of the approach surface and slopes up at 25% to an elevation that is 23m above the elevation point on the approach surface. The upper segment begins at the upper point of the lower segment and slopes up at 14.3% to and elevation that is 45m above the elevation point on the approach surface. Objects cannot penetrate this surface.

Figure 11 TP312 5th Edition – Transitonal Surface Plan, Runway 15, Downsview

4.1.3 Outer Obstacle Identification Surface (OIS)

The Outer Obstacle Identification Surface comprises of a common plane established at 45 m above the Aerodrome Reference Point (ARP) and extends out from the ARP at a 4,000 m radius. The Outer Obstacle Identification Surface at Downsview is established at 800 ft (243.8 m) Above Sea Level (ASL). Objects penetrating this surface require further assessment and may require changes to Flight Procedures.

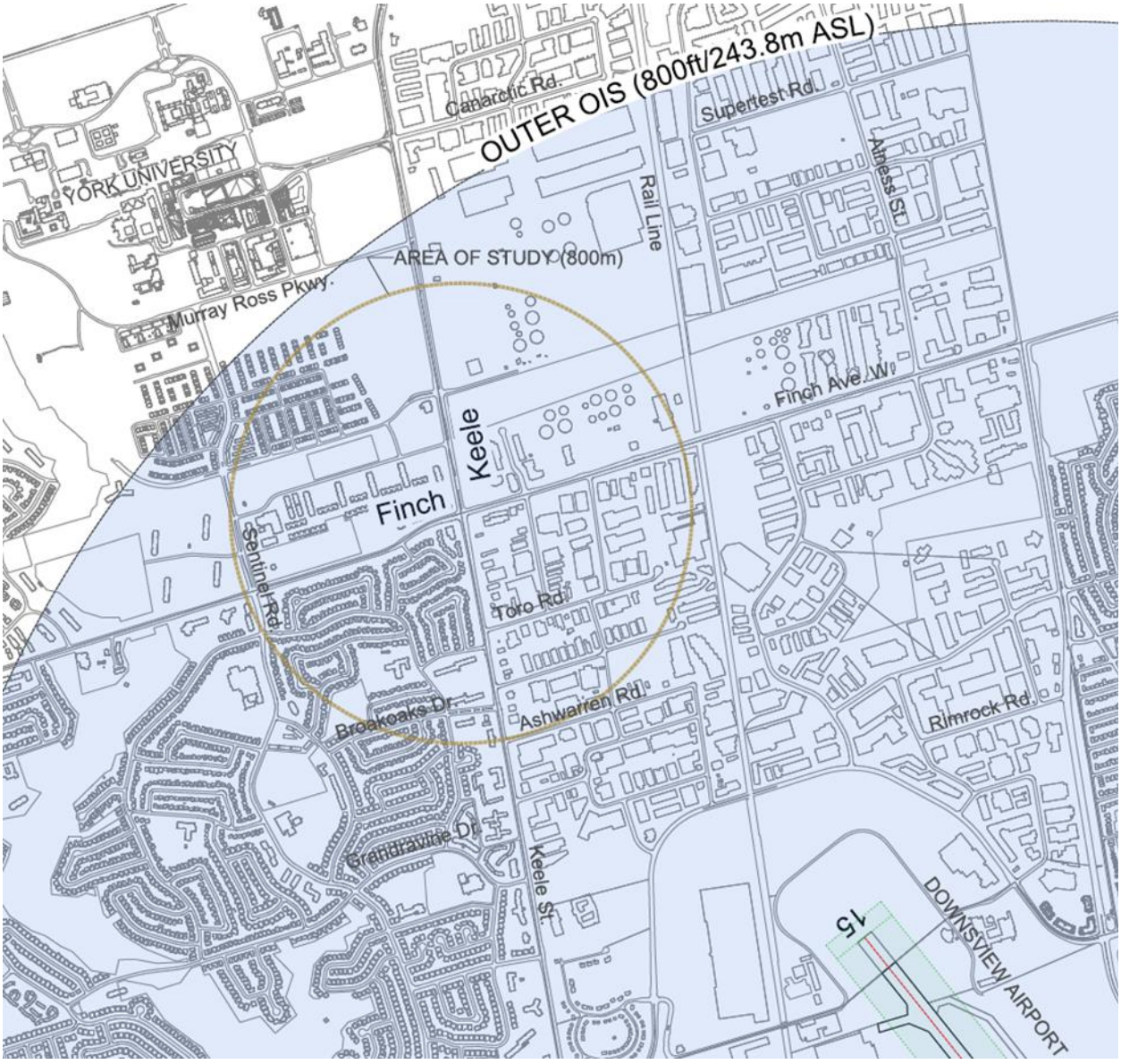

Figure 12 TP312 5th Edition – Outer Obstacle Identification Surface Plan, Runway 15, Downsview

4.1.4 Approach Obstacle Identification Surface (OIS)

The Approach Obstacle Identification Surface is established for non-precision runways serving AGN IIIB operations. The dimensions of this surface are identical to the approach surface dimensions with the exception of the value of the slope along the entire surface. The Approach OIS continues at a 2.5% slope all the way to its end at 5,000 m. Objects penetrating this surface require further assessment and may require changes to Flight Procedures.

Figure 13 TP312 5th Edition – Approach Obstacle Identification Surface Plan, Runway 15, Downsview

5 Implications on Zoning Height Permissions

The objective of this study is to identify opportunities for potential increases in zoning height permissions that are compatible with Downsview Airport operations.

5.1 Governing Standard – TP312 4th Edition

The Obstacle Limitation Surfaces defined by TP312 4th Edition should form the basis for municipal zoning by-law controls for the following reasons:

- Downsview Airport was certified under TP312 4th Edition as such this will be the governing standard until such time as changes to airport facilities trigger the need to adhere to latest standards.
- The Obstacle Limitation Surface requirements within TP312, 4th Edition result in clearances which are less than TP312 5th edition and as such represent the more restrictive standard.

5.2 Comparison to Current Zoning

Permissible building heights in the Keele Finch Plus Study area permitted under TP312 4th Edition were compared against the current municipal zoning per Schedule D of North York Zoning By-Law 7625 "Airport Hazard Map", (see Figure 1).

In general permissible building heights under TP312 4th Edition are greater than the current municipal zoning. In the Keele Finch Plus Study area permissible building heights with respect to airport operations only (i.e. the OLS) are between 1.3 to 4.1 times greater depending on location.

There is an important distinction in how the permissible building heights are defined currently and under TP312.

- In the Schedule D of North York Zoning By-Law 7625 permissible are defined by a maximum structure height in metres. This implies a risk in penetrating OLS surfaces as it does not take into consideration variations in topography.
- TP312 4th Edition defines permissible heights relative to an elevation above sea level. It is important to note that the obstacle limitation surfaces are applicable to all objects including installations commonly found on roof tops (such as air handling equipment, satellite dishes, antenna and obstacle lights) as well as temporary installations including construction cranes.

5.3 Indicative Building Heights

TP312 4th Edition defines permissible heights relative to an elevation above sea level. The height of obstacles is ultimately governed by their maximum elevation above sea level, however in order to visualize the potential development heights in and around the study area an analysis of indicative building heights was assessed by city block.

The indicative building heights in Figure 14 reflects the minimum distance between current topography provided by the City of Toronto and the obstacle limitation surface in each area. In areas of lower topography, greater building heights may be achievable. Where building heights in excess of those noted below are proposed, detailed assessment based on permissible height above sea level will be required.

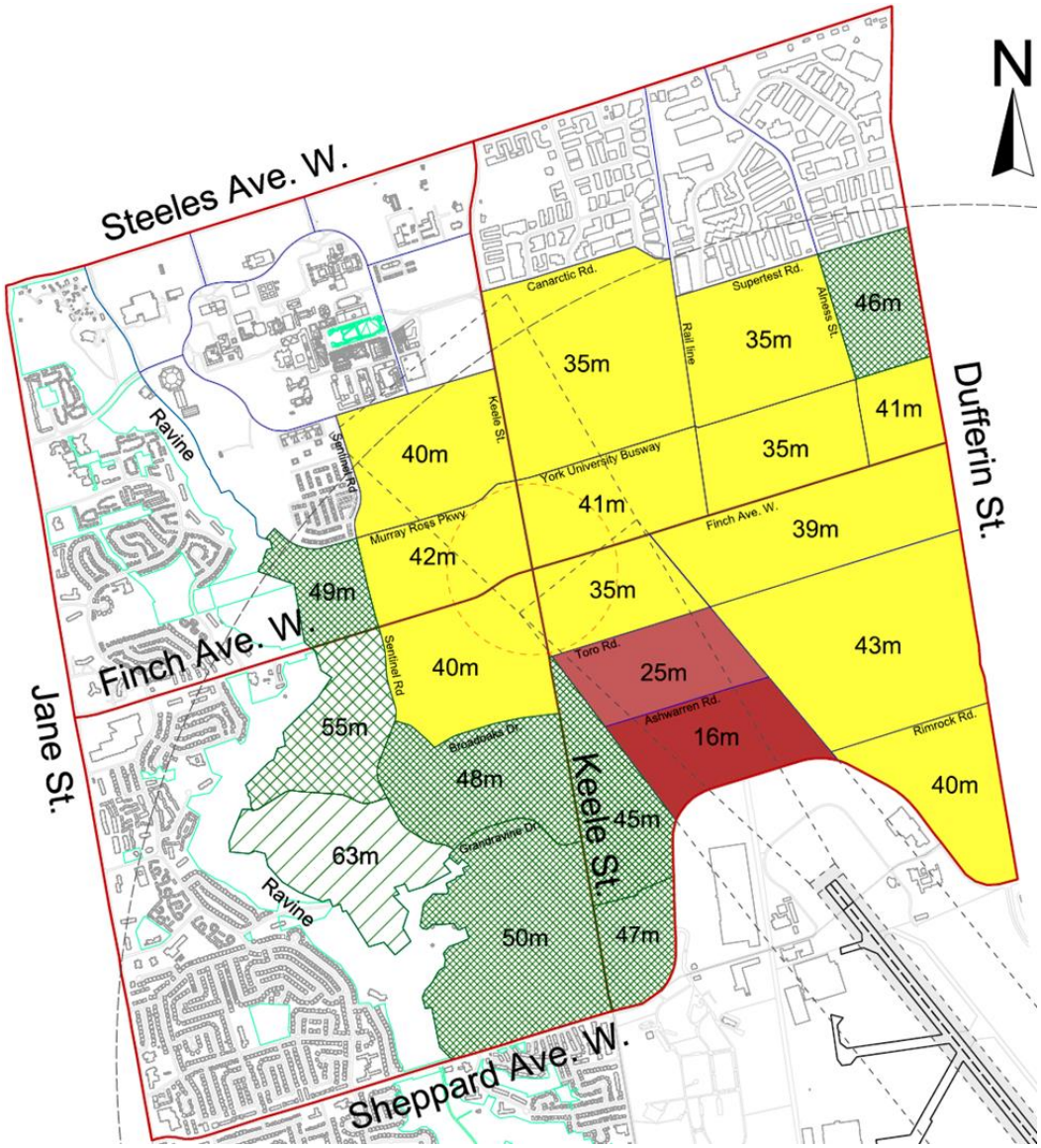

Figure 14 Diagram Maximum Buildable Height (in meters), By Block

As this study focused more specifically on the development area around the intersection of Keele and Finch, the following visualization was prepared to illustrate maximum potential building heights, using 1315 Finch Avenue West as an example.

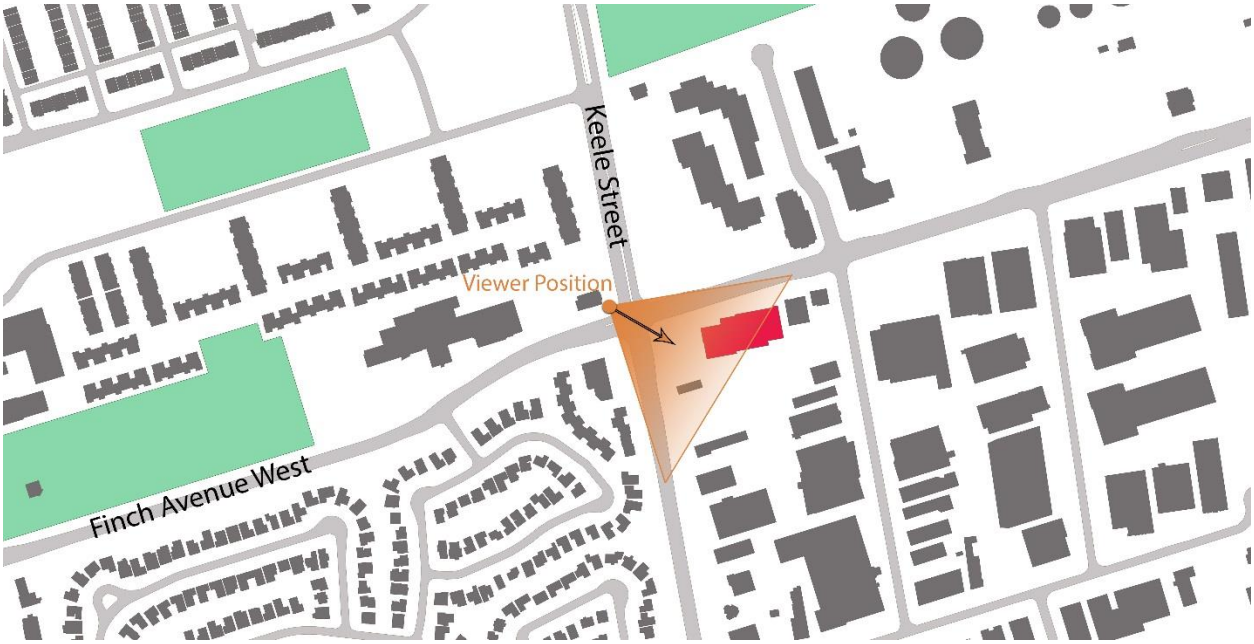

Figure 15 Keele Finch Plus Study Area Key Plan – 1315 Finch Avenue West

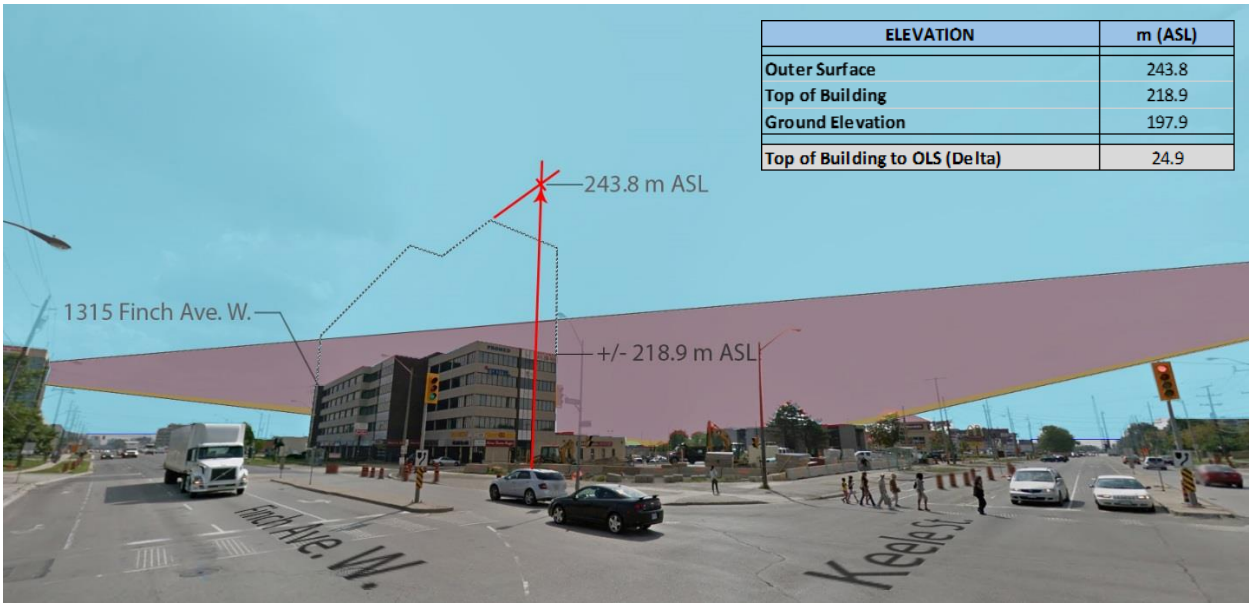

Figure 16 Keele Finch Plus Study Area Visualization – Maximum Buildable height, 1315 Finch Avenue West (Southeast Corner of Keele & Finch)

Figure 17 Keele Finch Plus Study Area Section (along Keele St.) indicating OLS Surfaces.

The visualization is not intended to reflect proposed design or planning recommendations but rather to represent an example of the potential development heights in the area.

5.4 Conclusions

The Obstacle Limitation Surfaces defined by TP312 4th Edition should form the basis for municipal zoning by-law controls.

The majority of Keele Finch Plus area falls beneath the horizontal plane of the Outer Surface, with an Above Sea Level (ASL) height restriction of 243.8 m / 800 ft. The block in the southeast quadrant of the intersection falls beneath the sloped Approach and Transitional Surfaces, and therefore has a slightly more restrictive buildable heights ranging from 759 – 800 ft ASL.

Permissible building heights under TP312 4th Edition in the Keele Finch Plus Study area are significantly greater than the current municipal zoning, supporting the objective to increase residential and employment densities, subject to other municipal planning considerations.

Appendix

Full scale drawings of the Obstacle Limitation Surfaces (OLS) are attached to this report.

- sk001 - 2 - Downsview - OLS – TP312 Fourth Ed-Plot A
- sk001 - 3 - Downsview - OLS – TP312 Fourth Ed-Plot B
- sk002 - 2 - Downsview - OLS – TP312 Fifth Ed-Plot A
- sk002 - 3 - Downsview - OLS – TP312 Fifth Ed-Plot B