To: **Chair and Members of Rothesay Planning Advisory Committee**

From: **Brian L. White, MCIP, RPP**
Director of Planning and Development Services

Date: **Tuesday, November 30, 2021**

Subject: **Rezoning - 41 Unit Apartment Building – (Highland Avenue & Hillcrest Drive)**

Applicant/owner:	Sean Hall	**Applicant/owner:**	Luke Moffett
Mailing Address:	41 Brigadoon Terrace Saint John, NB E2K 5P5	**Mailing Address:**	James Avery Grace Corp. 76 Highland Avenue Rothesay NB E2E 5N3
Property Location:	Highland Avenue & Hillcrest Drive	**PID:**	00444885, 00444877, 30346308, 30187629
Plan Designation:	High Density	**Zone:**	Single Family R1A
Application For:	41 Unit Apartment Building + 2 Single Family Dwellings		
Input from Other Sources:			

ORIGIN:
An application from Luke Moffett and Sean Hall to rezone 6751.79m² (1.67 acres) of land (see Map 1) off Highland Avenue and Hillcrest Drive from Single Family Residential – Large Serviced Zone [R1a] to the Multi-Unit Residential Zone [R4]) subject to a development agreement, in order to develop a 41 unit apartment building while retaining the two existing single family dwellings 2 & 4 Hillcrest Drive (PIDs 00444885, 00444877, 30346308, 30187629).

Figure 1 - Architectural Rendering of Proposed 41 Unit Apartment Building

BACKGROUND:

The subject parcels of land are designated for High Density residential uses (see Map 2) and the land has been assembled[1] by the developers for the purpose of developing a multi-unit apartment building. The property location is collectively parcels on Hillcrest and Highland with access to Hampton Road. The area can be classified as a transitional area in that the property backs onto single-family residential homes, is adjacent to the "Central Park" condominium development on Hillcrest and is across from the Veterans Memorial Park. The property also fronts on what was known as NB Provincial Highway No.9 the "old Hampton Highway". Hampton Road is a provincially designated highway and is generally considered as Rothesay's "main street".

Figure 2 - Property Location (Hillcrest & Highland on Hampton Road)

In general, Staff support the redevelopment of the property for higher density residential and note the added population to the area will support the existing churches, schools and businesses in area. Also interesting to note that as our population ages and household sizes shrink this form of higher density becomes increasingly the preferred housing option, in that respect the proposed location is well suited to this form of housing.

[1] A land assembly or assemblage is the process of purchasing various smaller, contiguous parcels of property to merge them into one large land parcel or property.

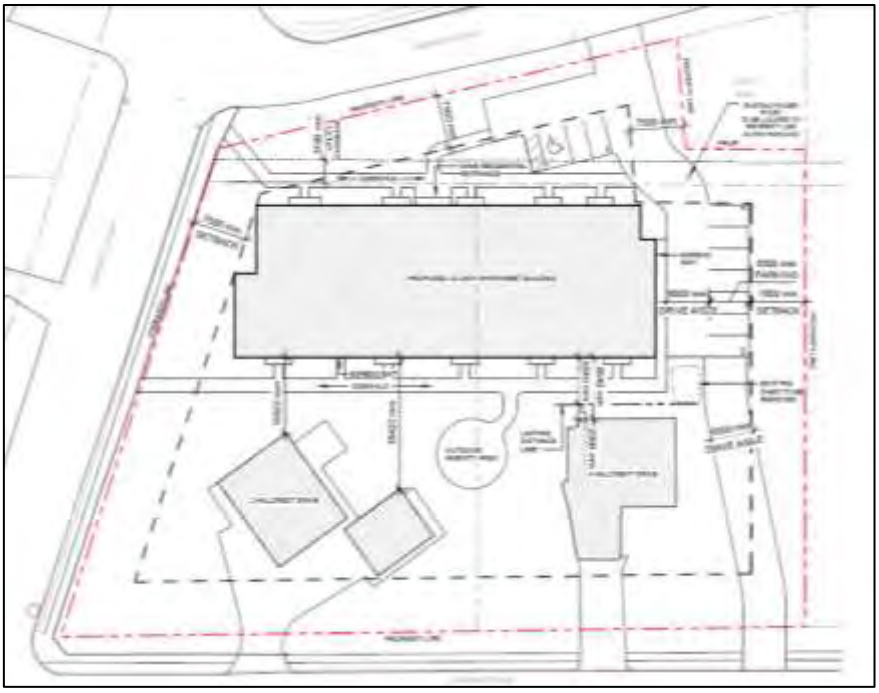


Figure 3 - Proposed Site Plan (41 unit apartment building and 2 single-family dwellings)

Best practices in town planning suggest that when considering residential infill of higher density that it is important to provide a transition in scale to adjacent smaller houses. Sites with higher-density zoning are often located along major streets where new development is intended to be concentrated. Good design would also transition the density to medium density at the rear, which would then abut lower-density zoning and houses. It is a fundamental design principle that in such residential infill situations, larger building volumes should be concentrated along the major street, with smaller buildings toward the rear.

The applicant's proposal is not a good example of how infill high density residential can be positioned next to single-family homes. Furthermore, the proposal conflicts with Municipal Plan Policy HDR-2 which describes the types of housing envisioned within High-Density areas. Policy HDR-2 allows within the High-density Residential designation, a mix of housing of types where the dominant form is an apartment or condominium dwelling. Other compatible uses may be permitted in the High-density designation without amendment to the Municipal Plan, including but not limited to parks, municipal facilities, public utilities, clustered residential housing, and attached dwellings. The policy does not contemplate low-density single-family dwellings as a compatible land use. Conversely, the "Central Park" condominium development (52-54 Hampton Road) is a good example of the correct interpretation and implementation of policy HDR-2, in that the high-density buildings are located next to Hampton Road and the medium density garden home duplexes transition to the single-family homes on Hillcrest.

Figure 4 - Example of Density Transition (Hampton Road and Hillcrest)

DENSITY

The property with 1.67 acres of land has a potential maximum residential density of 33 units calculated at one unit for every 200m^2. The proposal for 43 units (41 unit apartment building and retention of two existing single-family dwellings) is 30% higher than the maximum allowable density. The Municipal Plan By-law 1-20 does permit consideration of density bonusing (affordable housing & age friendly accessible housing). However, to limit the densification and the scale and intensity of a development, Policy IM-7 restricts the density bonusing provisions and in "no circumstance shall the density bonus exceed 20% of the maximum allowable density" permitted by the Zoning By-law.

Therefore, whereas the Plan policy restricts the maximum density bonusing to 20% the total number of units permitted should not exceed 39 (33 units + 20%). In order to consider the proposal for 43 units Council would need to amend the Municipal Plan. Policy IM-8 states that Council can consider amendments to the Municipal Plan when it can be demonstrated that the Plan's effectiveness and policies should be examined based on one or more of the following:

a) changing community demographics, climactic or environmental conditions, technological advances, or unforeseen community economic circumstances;
b) additional technical information or scientific studies which identify the need for change; and
c) changes to Provincial or Federal regulations, laws or policies.

Staff have no information that would indicate that an Amendment to the Municipal Plan is warranted. The existing Municipal Plan is not yet 1 year old and the demographics, climactic or environmental conditions, technological advances, or unforeseen community economic circumstances have not changed in Rothesay since the plan was enacted. Furthermore, there is no additional technical information or scientific studies, which identify the need for, change; nor are there any changes to Provincial or Federal regulations, laws or policies, which would warrant such a change.

Notwithstanding an amendment to the Municipal Plan, the project has a proposed density of 43 units, which is a major increase in density when compared to the adjacent condominium development project at 52-54 Hampton Road. In comparison, the density of the proposed project of 43 units on 1.67 acres has a density of 25.75 units per acre whereas the existing condominium development at 52-54 Hampton Road has a density of 58 units on 3.85 acres or 15.06 units per acre. The increase from 15.06 units per acre to 25.75 units represents a 71% increase in neighbouring density and Staff are concerned that such a major increase could have a negative impact on neighborhood character.

ARCHITECTURE

Architectural style is a very important factor when considering proposals that would change the existing land use, neighbourhood scale, density, and character. Staff support the value of encouraging residential infill development along Hampton Road in those designated high-density residential areas; however, the proposed development when viewed in contrast to its neighbours appears to be uncharacteristic of the area. The homes and larger buildings in this area reflect a more traditional building style and Staff believe that it is important that new buildings have an architectural style that is deferential to the neighbourhood. For example, in order to protect the established character of the area Council did, in the consideration of the 52-54 Hampton Road condominium project, require specific architectural requirements (peaked roof, cedar shingles, etc.).

Staff are concerned that the proposed development is not contextually appropriate. In fact, the building design closely reflects a design proposed by the same developer in a commercial designated area of Rothesay off Chapel Road. Earlier this year, on September 13, 2021, Council approved a 48-unit apartment building for the same developers on Chapel Road. The proposed Chapel Road building, albeit larger and with a few minor variations, has nearly the identical architectural character and building form. That building in a commercial area of Rothesay is appropriate; however, the developer's proposed building design in this location is not appropriate.

Figure 5 - The proposed 41 unit building (left) with the approved Chapel Road 48 unit building (right).

Staff promote and celebrate architectural innovation, and encourage context sensitive design that will advance the architectural excellence for infill development in Rothesay. Staff believe that well designed infill projects can augment, rather than detract from Rothesay's mature neighbourhoods. Regrettably, Staff do not believe the proposed four-story flat roof "modern aesthetic" building relates well to this specific neighbourhood. Staff's hope is that the developer and their architects can present a building that will strengthen the local character of this neighbourhood. Staff observe the one of the major architectural features found in this local neighbourhood context is that of large gabled roofs with pediments[2]. (See figure 6)

[2] A Pediment is triangular gable forming the end of the roof slope over the entrance of a building or a similar form used decoratively over a window or block of windows.

Figure 6 - Rothesay Town Hall and 52 Hampton Road

SUMMARY

Staff are supportive of the rezoning of the property for a higher density residential use. However, Staff do not believe the project as presented is a good fit for this location. Staff's view of the proposed development is that it does not comply with Municipal Plan Policy HDR-2, which does not permit single-family dwellings on the property. The proposed development would also conflict with Policy IM-7, which restricts the density bonusing to 20% and not the 30% as proposed. Furthermore, the project's overall density at 43 units represents a 71% increase over the neighbouring density at 52-54 Hampton Road which combined with the modern style flat roof architecture would create a negative impact on the existing adjacent residential properties and represents an overdevelopment of the site.

Staff also note that where Council refuses a rezoning application, no further application may be considered by Council for one year. For that reason, Staff are not recommending refusal but a rather tabling motion that would permit the developer to improve their proposal.

RECOMMENDATION:

Staff recommend THAT the Planning Advisory Committee consider the following Motion:

A. PAC Hereby TABLES the application to rezone land off Highland Avenue and Hillcrest Drive from the R1a zone to the R4 Multi-Unit Residential Zone pending a revision of the proposed development to reduce the density of the project, revision of the architectural style of the project to reinforce the general character of the area and to remove the existing low-density dwellings in accordance with the Municipal Plan designation of the property for high-density uses.

Map 1	Property Location Map
Map 2	Future Land Use Designation (Municipal Plan)
Attachment A	Proposed Development Submission from Applicant

Report Prepared by: Brian L. White, MCIP, RPP
Date: Tuesday, November 30, 2021

Map 1

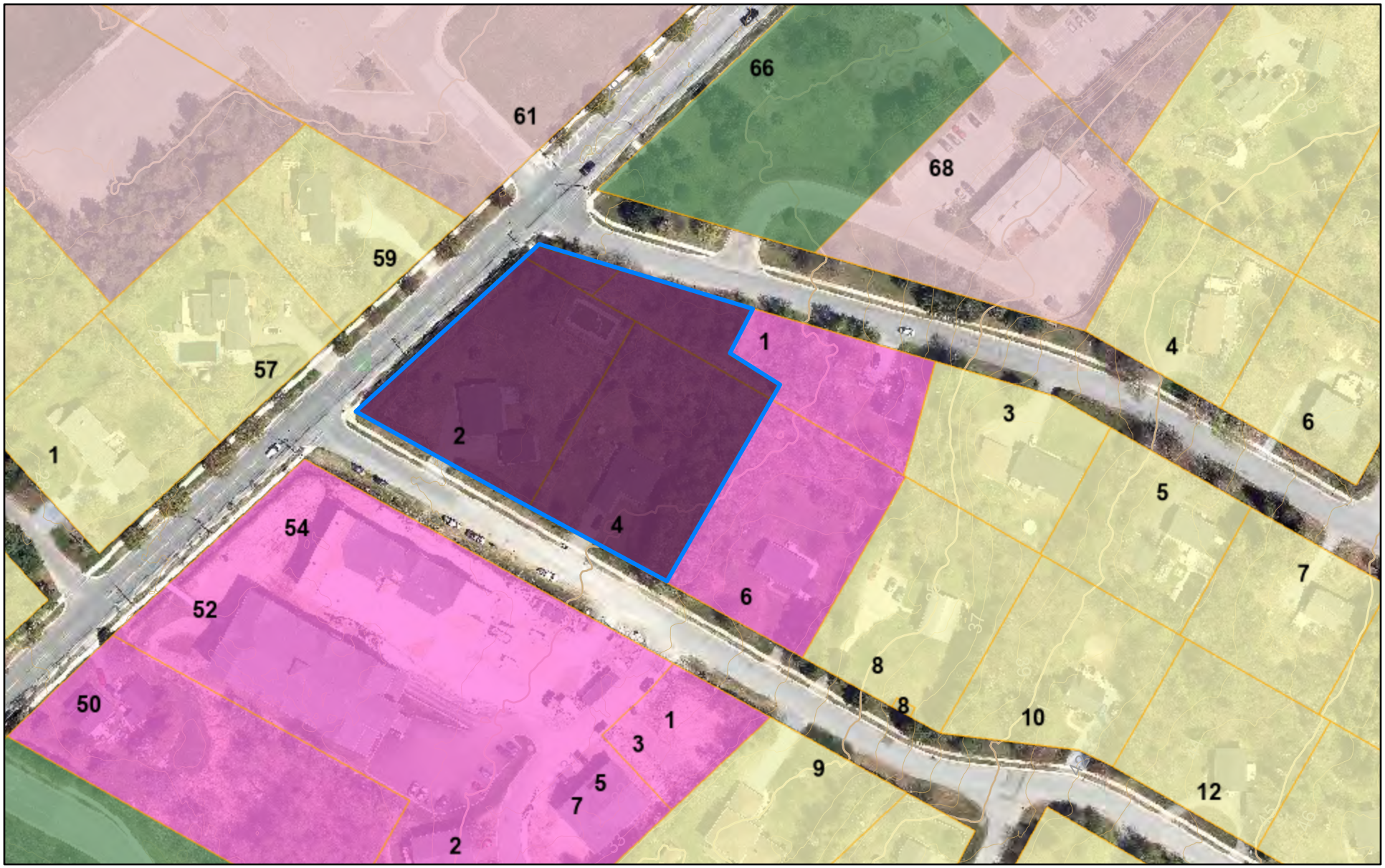
Property Location

2021November30\ACStaff-pt\Highland/Hillcrest_007

1:600

Map 2 - Future Land Designation Subject Properties

2021November30PACStaffRptHighland/Hillcrest_008



11/18/2021, 1:50:48 PM

Future Land Use

Low Density

High Density

Park & Conservation

Institutional

Rothesay Boundary

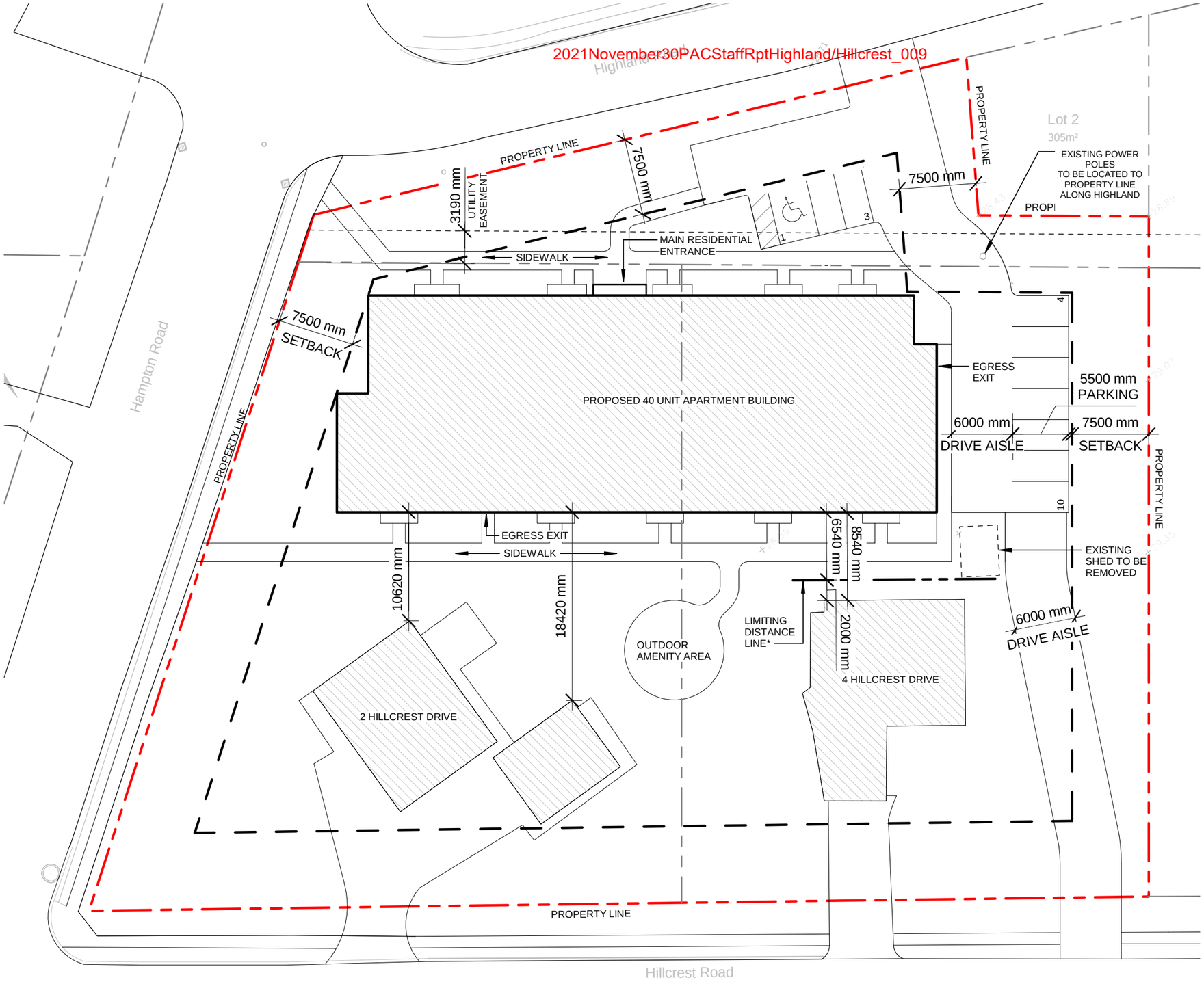
Property

Civic Address

1:2,257

0 0.01 0.03 0.05 mi

0 0.02 0.04 0.08 km



1

LEGEND

- PROPERTY LINE (EXISTING)
- PROPERTY LINE (CONSOLIDATED)
- SETBACKS
- UTILITY EASEMENT
- LIMITING DISTANCE LINE

*ESTABLISHED FROM SITE MEASUREMENTS OF THE EXPOSED BUILDING FACE AT 4 HILLCREST DRIVE TAKEN ON JUNE 14, 2021. DISTANCE TO THE PROPOSED BUILDING EXCEEDS REQUIRED LIMITING DISTANCE PER NBC 3.2.3.1.

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
SITE PLAN

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: October 18, 2021

SCHEDULE
C5

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
Bespoke Suites - 41 Unit Apartment Building
Rothesay, NB

DRAWING
RENDERING

PROJECT NO. 21-079
DRAWN BY: EM
ISSUED FOR DA
DATE: July 16, 2021

SCHEDULE
C4

C:/Users/Anis/Zwicker Zareski Architecture & Planning/Projects - 2021 Projects/21-079 Moffett Highland and Hillcrest/5_ARCH/2_21-079_SD/4_Renderings/Final/21-079_Rendering Layout

EXTERIOR MATERIALS LEGEND	
1	METAL GUARD
2	ALUMINUM FRAMED GLASS GUARD
3	PATIO DOOR
4	PVC WINDOW
5	ALUMINUM CURTAIN WALL SYSTEM
6	MASONRY VENEER
7	PREFINISHED CLADDING TYPE I
8	PREFINISHED CLADDING TYPE II
9	PREFINISHED CLADDING TYPE III
10	PREFINISHED CLADDING TYPE IV

NOTE:
CLADDING TO BE NON-COMBUSTIBLE, NON-VINYL TYPE.

NORTH ELEVATION

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

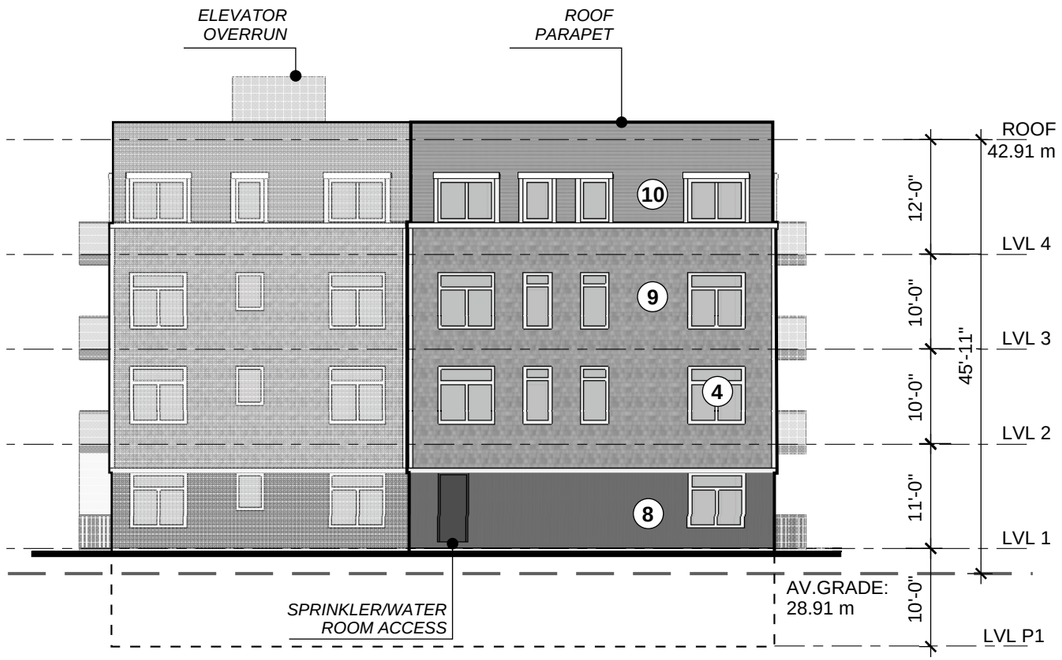
DRAWING
NORTH ELEVATION

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: July 16, 2021

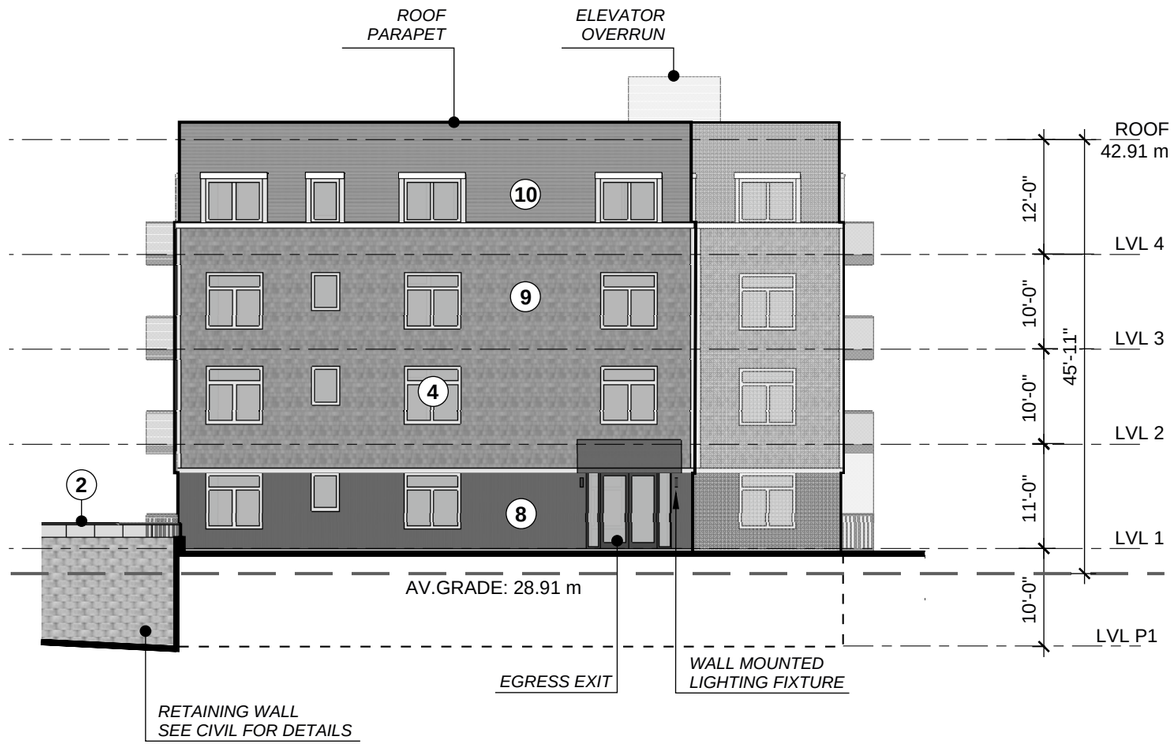
SCHEDULE
C1

EXTERIOR MATERIALS LEGEND	
1	METAL GUARD
2	ALUMINUM FRAMED GLASS GUARD
3	PATIO DOOR
4	PVC WINDOW
5	ALUMINUM CURTAIN WALL SYSTEM
6	MASONRY VENEER
7	PREFINISHED CLADDING TYPE I
8	PREFINISHED CLADDING TYPE II
9	PREFINISHED CLADDING TYPE III
10	PREFINISHED CLADDING TYPE IV

NOTE:
CLADDING TO BE NON-COMBUSTIBLE, NON-VINYL TYPE.



WEST ELEVATION



EAST ELEVATION

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
EAST AND WEST ELEVATIONS

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: July 16, 2021

SCHEDULE
C2

EXTERIOR MATERIALS LEGEND	
1	METAL GUARD
2	ALUMINUM FRAMED GLASS GUARD
3	PATIO DOOR
4	PVC WINDOW
5	ALUMINUM CURTAIN WALL SYSTEM
6	MASONRY VENEER
7	PREFINISHED CLADDING TYPE I
8	PREFINISHED CLADDING TYPE II
9	PREFINISHED CLADDING TYPE III
10	PREFINISHED CLADDING TYPE IV

NOTE:
CLADDING TO BE NON-COMBUSTIBLE, NON-VINYL TYPE.

SOUTH ELEVATION

zzap architecture + planning | 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

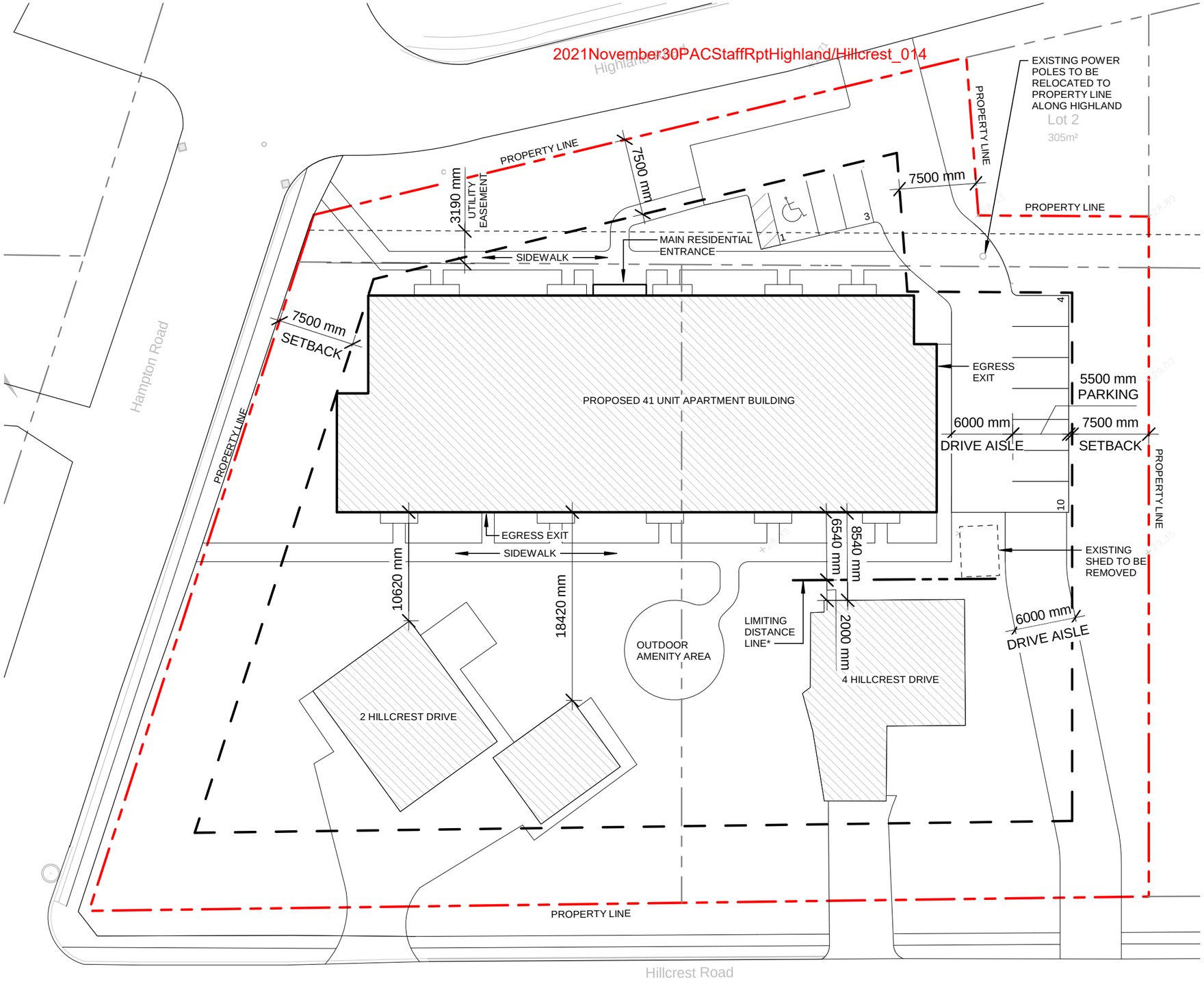
CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
SOUTH ELEVATION

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: July 16, 2021

SCHEDULE
C3



LEGEND

- PROPERTY LINE (EXISTING)
- PROPERTY LINE (CONSOLIDATED)
- SETBACKS
- UTILITY EASEMENT
- LIMITING DISTANCE LINE

*ESTABLISHED FROM SITE MEASUREMENTS OF THE EXPOSED BUILDING FACE AT 4 HILLCREST DRIVE TAKEN ON JUNE 14, 2021. DISTANCE TO THE PROPOSED BUILDING EXCEEDS REQUIRED LIMITING DISTANCE PER NBC 3.2.3.1.

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

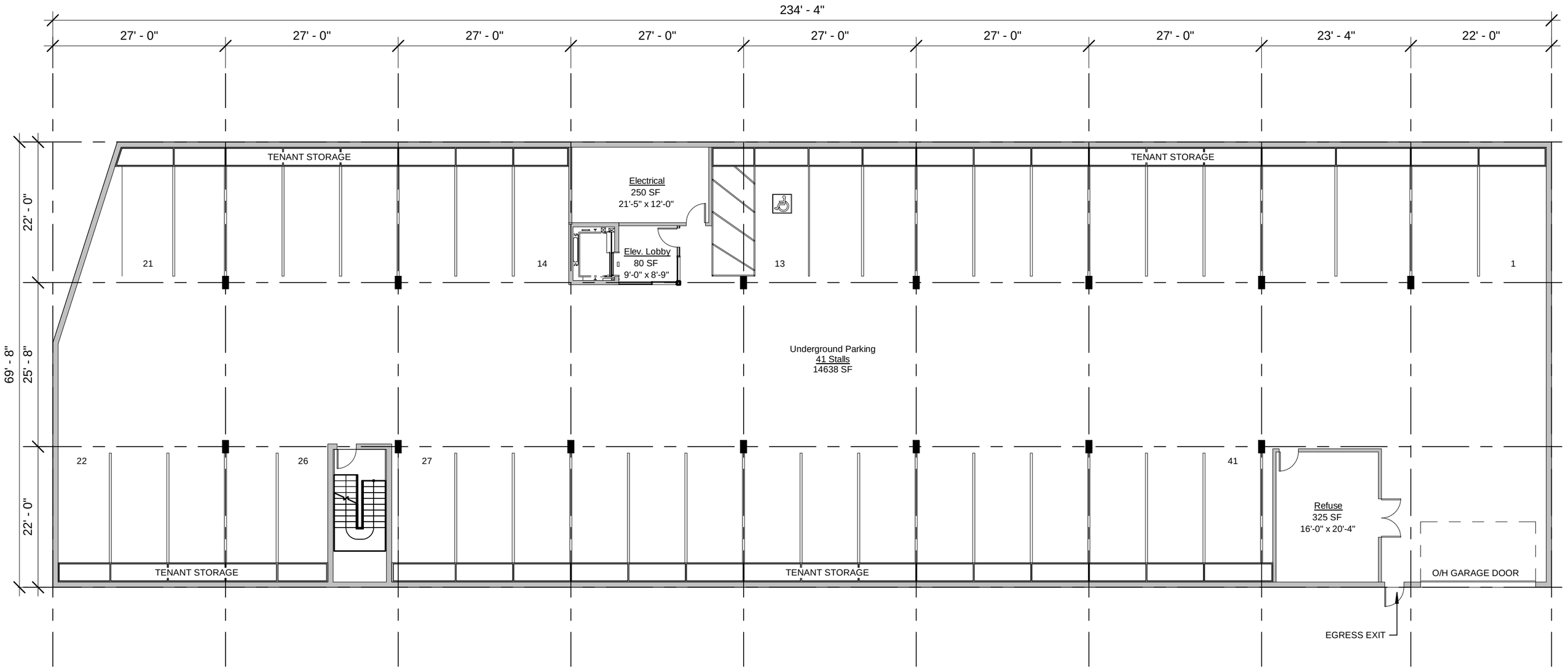
CLIENT
LUKE MOFFETT

PROJECT
41 UNIT APARTMENT BUILDING
Rothesay, NB

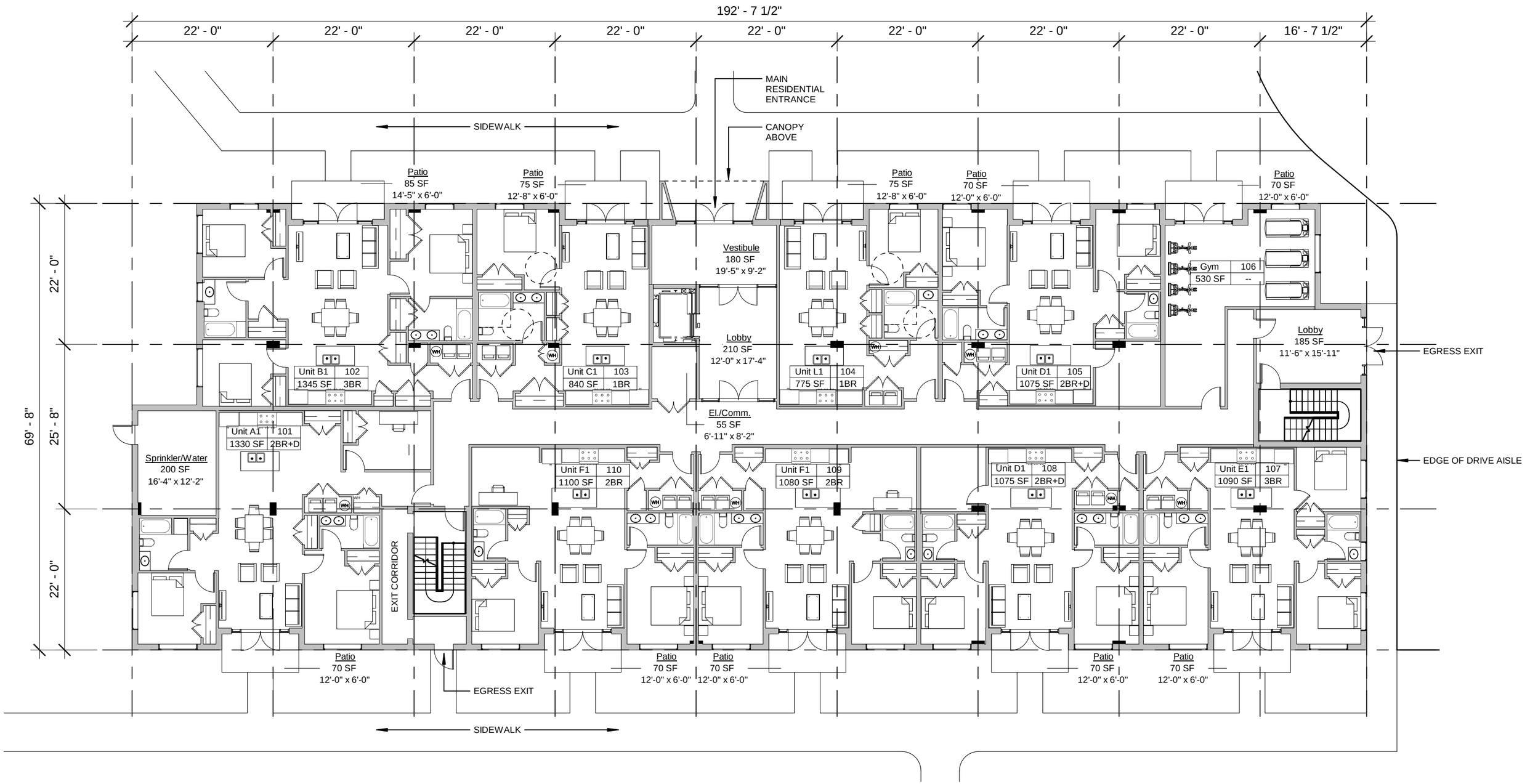
DRAWING
SITE PLAN

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: November 2, 2021

SCHEDULE
C5



zzap architecture + planning 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca	CLIENT **LUKE MOFFETT**	PROJECT **41 UNIT APARTMENT BUILDING** Rothesay, NB	DRAWING **PROPOSED U/G PARKING**	PROJECT NO. **21-079** DRAWN BY: AS ISSUED FOR DA DATE: November 2, 2021 SCHEDULE **C6**



zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

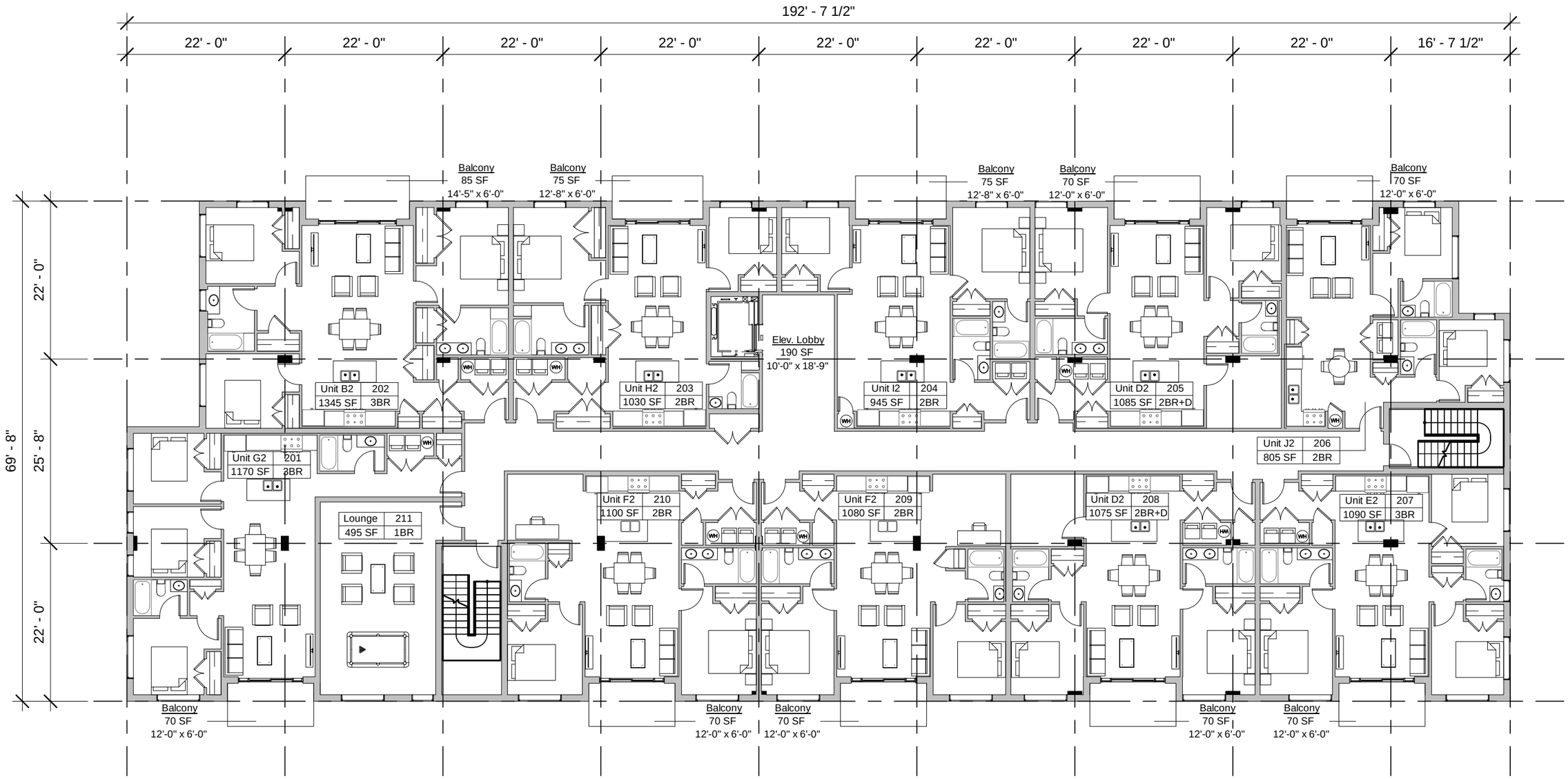
CLIENT
LUKE MOFFETT

PROJECT
41 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
PROPOSED LEVEL 01 FLOOR PLAN

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: November 2, 2021

SCHEDULE
C7



zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

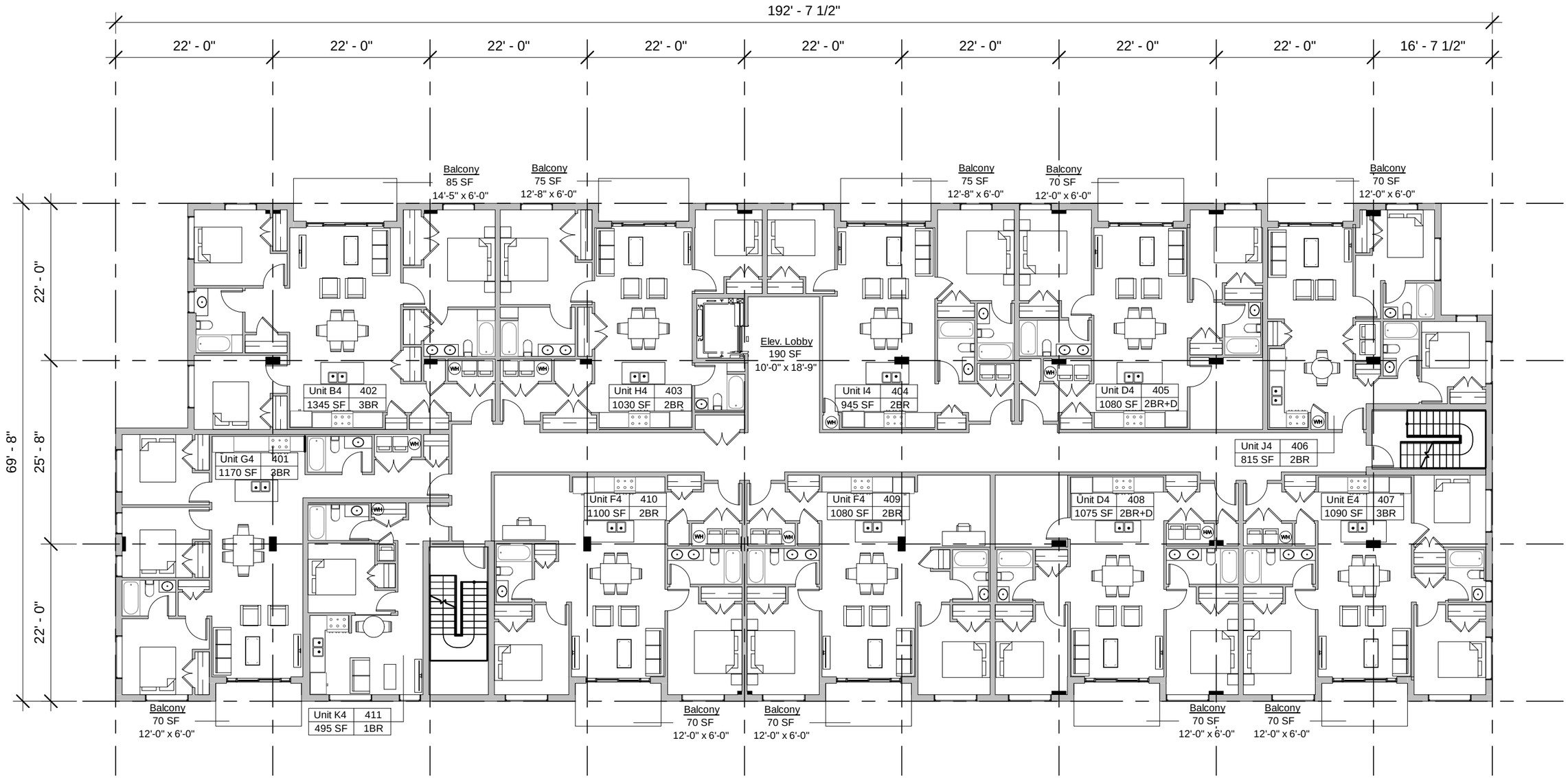
CLIENT
LUKE MOFFETT

PROJECT
41 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
PROPOSED LEVEL 02 FLOOR PLAN

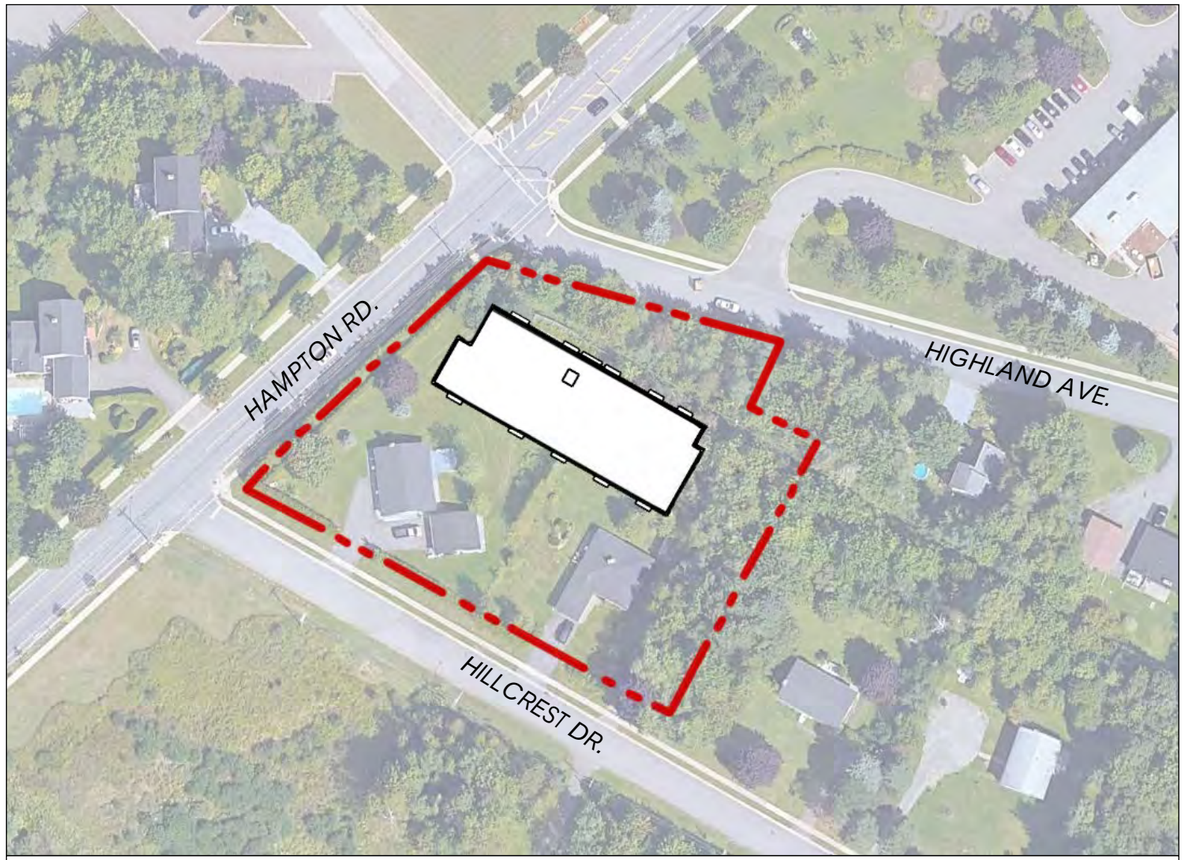
PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR DA
DATE: November 2, 2021

SCHEDULE
C8

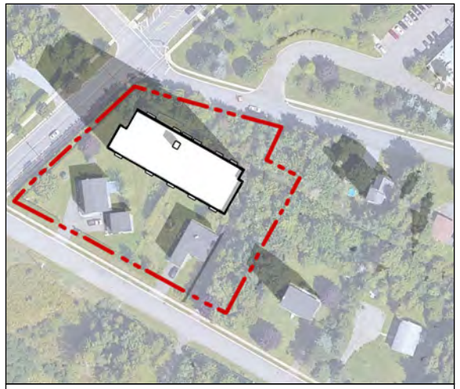


zzap architecture + planning 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca	CLIENT **LUKE MOFFETT**	PROJECT **41 UNIT APARTMENT BUILDING** Rothesay, NB	DRAWING **PROPOSED LEVEL 03/04 FLOOR PLAN**	PROJECT NO. **21-079** DRAWN BY: AS ISSUED FOR DA DATE: November 2, 2021	SCHEDULE **C9**

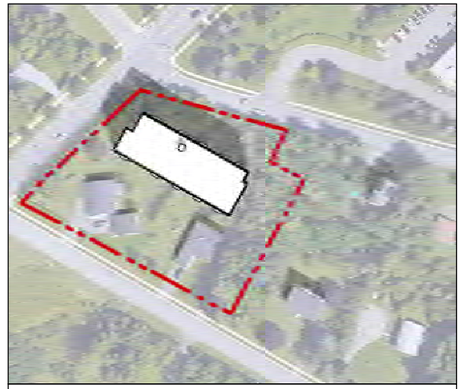
SEPTEMBER 21ST



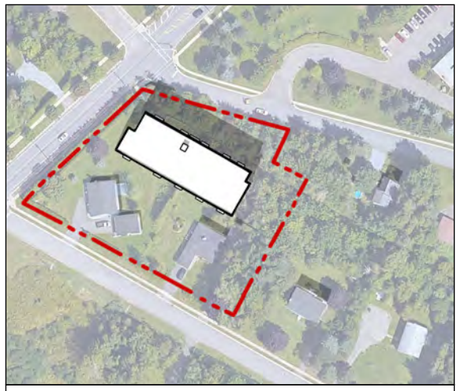
OVERVIEW OF PROPOSED DEVELOPMENT



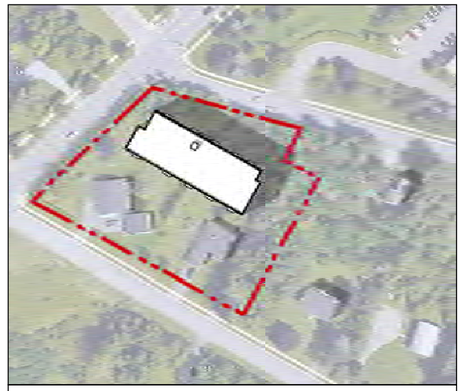
8:00 AM



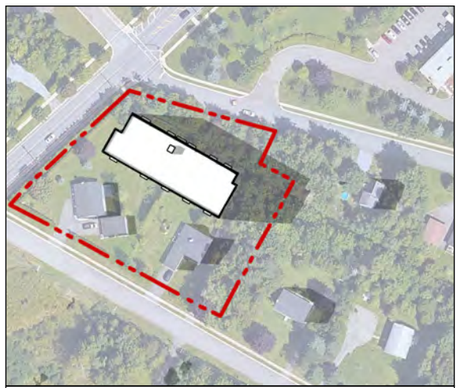
10:00 AM



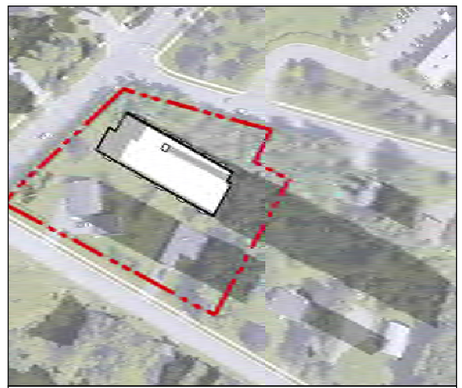
12:00 PM



2:00 PM



4:00 PM



6:00 PM

zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
SHADOW STUDY

PROJECT NO. 21-079
DRAWN BY: EM
ISSUED FOR DA
DATE: July 16, 2021

SCHEDULE
C10

LEGEND

- Site Boundary
- Adjacent Property Boundary
- Proposed Tree
- Proposed Shrub

SITE SUMMARY:

- PAN: 05394616
- Total Land Area: 1.66 acres

NOTES:

- Subject to survey. Property lines and topographic features are approximate only.
- Site subject to by-law review and regulations.

SOURCES:

- Property lines are from Provincial Mapping.

SCALE:

0 1 2 3 4 5 10 15 25m

1 : 500

zzap architecture + planning 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT

-

PROJECT

HIGHLAND AND HILLCREST ROAD
Rothesay, New Brunswick

DRAWING

LANDSCAPING PLAN

PROJECT NO. **21-066**
DRAWN BY: RM
ISSUED FOR REVIEW
DATE: JULY 20, 2021

DRAWING NUMBER
100

FILE: C:\Users\Ross\Zwicker Zareski Architecture & Planning\Projects - 2021 Projects\21-079 Moffett Highland and Hillcrest\4_PLAN_DWG_Site Plan\21-079-LANDSCAPING_PLAN-100.dwg SHEET: Landscaping Plan

877 635 1566 fundy@fundyeng.com www.fundyeng.com

Bio-Resources | Building Systems | Environmental | Geotechnical | Project Management

GEOTECHNICAL INVESTIGATION
4 HILLCREST DRIVE, ROTHESAY, NB

Prepared for:

Mr. Luke Moffett
James Avery Grace Corporation
76 Highland Avenue
Rothesay, NB
E2E 5N6

January 29, 2021

Project No: 14835

FUNDY Engineering

Serving Our Clients' Needs First

OFFICES IN SAINT JOHN AND CLYDE RIVER

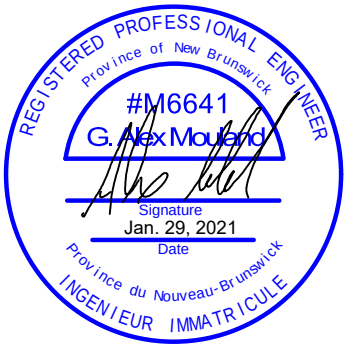
JOB FILE:	14835		
PROJECT TITLE:	Geotechnical Investigation – Hillcrest Drive		
VERSION	**ISSUANCE DATE**	**PREPARED BY**	**REVIEWED BY**
1.0	January 29, 2021	Josh Cosman, *EIT.*	Alex Mouland, *P.Eng., PMP*

FUNDY Engineering

Serving Our Clients' Needs First

This report was prepared for the sole use of the Client. The material and observations presented reflects Fundy Engineering & Consulting Ltd.'s opinion and best judgment based on the information available. Fundy Engineering & Consulting Ltd. accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon the material, observations, and / or opinions by any third-party or for any damages suffered by any third-party resulting from the use of this report.

PROFESSIONAL SEAL:



ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

OQM CERTIFIED

EXECUTIVE SUMMARY

Fundy Engineering & Consulting Ltd. was retained by the James Avery Grace Corporation (the Client) to undertake a geotechnical investigation at 4 Hillcrest Drive in Rothesay, New Brunswick for a proposed multi-unit residential structure.

A test pit program was completed on January 8th, 2021, under the direction of Andy MacVey, *P.Eng,* of Fundy Engineering. A 5.5 Ton excavator provided by Friars Excavation was used to excavate six (6) test pits around the perimeter of the proposed multi-unit residential building.

In general the soil conditions can be described as a surface layer of Saturated Organic PEAT overlaying Loose Light Brown SAND overlaying Compact to Dense Reddish Brown SILT with Trace Sand overlaying Compact to Dense Light Brown Sand and Gravel TILL with Cobbles. At the time of excavation, groundwater was encountered in test pits #1 and #5 at depths of 2.4 m and 2.6 m respectively. In both instances, groundwater was observed above the Compact to Dense Light Brown Sand and Gravel TILL with Cobbles.

Footings may be founded on the Compact to Dense Light Brown Sand and Gravel TILL, which was encountered at depths ranging from 1.2m and 2.6m below the ground surface, or on Engineered Fill. Footings placed on the insitu soil and or engineered fill, as recommended, may be designed with an allowable bearing capacity of 150 kPa (3.0 kips/sq.ft).

It is recommended that all vegetation and organic materials as well as any softened soils in the building area be removed. Footing excavations may then be completed to the bottom of footing elevation.

Engineered Fills under the footings should meet the current NB Department of Transportation and Infrastructure (DTI) specifications for Pit Run Gravel or a 75mm minus crushed rock. Fill material should be placed from the Compact to Dense Light Brown Sand and Gravel TILL with Cobbles to the bottom of the footing elevation in 300 mm lifts and compacted to 100% of its Standard Proctor value (ASTM D698).

Excavations should be planned such that any Fills placed under the footings are constructed with a minimum slope of 1:1 from the edge of the pad to the insitu bearing soils. The 1:1 slope should be protected with compacted materials having a slope no steeper than 2:1.

The Executive Summary is subject to the same limitations as presented in Section 5.0 of this report.

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

Fundy Engineering & Consulting Ltd. was retained by the James Avery Grace Corporation (the Client) to undertake a geotechnical investigation at 4 Hillcrest Drive in Rothesay, New Brunswick.

1.1 SCOPE OF WORK

A geotechnical investigation is an intrusive site investigation, either by means of boreholes (drilling) or test pits (excavating), to assess the underlying soil/rock and groundwater conditions. Geotechnical recommendations are developed based on the site findings. In agreement with the Client, Fundy Engineering has completed the following scope of work:

- Clearance of all underground services prior to any site work;
- Complete test pits at locations and depths required to determine the soil, groundwater and bedrock properties within the development area;
- Reinstate the test pits with existing soil removed;
- Collect test pit location and elevation data;
- Prepare a geotechnical report containing the findings, site plan of test pit locations, laboratory results / interpretations and geotechnical recommendations for earthworks and foundation design.

2.0 BACKGROUND

The proposed site for development is located at 4 Hillcrest Drive in Rothesay, New Brunswick (PID # 00444877). The following section describes the site conditions.

Figure 1 Test Pit Location Plan

2.1 SITE DESCRIPTION AND LOCATION

The subject area of this investigation was vegetated with mature growth of various species of trees. Some of the vegetation was cut to allow access for the excavator. The property is relatively flat and is bounded by; PID# 00441873 to the north, Hillcrest Drive to the south, PID#00445031 to the east and PID# 00444885 to the west.

3.0 SITE WORK COMPLETED AND FINDINGS

3.1 TEST PIT INVESTIGATION

A test pit program was completed on January 8th, 2021, under the direction of Andy MacVey, *P.Eng,* of Fundy Engineering. A 5.5 Ton excavator provided by Friars Excavation was used to excavate six (6) test pits around the perimeter of the proposed multi-unit residential building. Test pit depths were taken to identify the soil conditions within the site. Location and elevation data was collected by Fundy Engineering.

3.2 SOILS ENCOUNTERED

The soil conditions can be described as a surface layer of Saturated Organic PEAT overlaying Loose Light Brown SAND overlaying Compact to Dense Reddish Brown SILT with Trace Sand overlaying Compact to Dense Light Brown Sand and Gravel TILL with Cobbles.

3.3 BEDROCK ENCOUNTERED

Bedrock was not observed in any of the test pits.

3.4 GROUNDWATER ENCOUNTERED

At the time of excavation, groundwater was encountered in test pits #1 and #5 at depths of 2.4 m and 2.6 m respectively. In both instances, groundwater was observed above the Compact to Dense Light Brown Sand and Gravel TILL with Cobbles. Water was also observed beneath the heavily saturated Organic PEAT.

4.0 RECOMMENDATIONS

4.1 ASSUMPTIONS

The following assumptions have been made with regard to the Client's preferred foundation:

- The foundation will be a strip footing; and,
- The building will have underground parking.

4.2 FOUNDATIONS

Footings may be founded on the Compact to Dense Light Brown Sand and Gravel TILL or Engineered Fill. Footings placed on the insitu soil and or engineered fill, as recommended, may be designed with an allowable bearing capacity of 150 kPa (3.0 kips/sq.ft). Total and differential settlements under the proposed loading will be less than 25mm (1") and 19mm (3/4") respectively.

Based on the above assumptions and the observations made during the field investigation it is recommended that all vegetation and organic materials as well as any softened soils in the building area be removed. Footing excavations may then be

completed to the bottom of footing elevation. At the time of this report the finish floor elevation (FFE) and footing elevation were not available. It is anticipated that the foundation footings will be founded at an elevation within the Compact to Dense Light Brown Sand and Gravel TILL with Cobbles. Once the site is excavated to bottom of footing elevation, the bearing surface should be inspected by a geotechnical engineer.

Engineered Fills under the footings should meet the current NB Department of Transportation and Infrastructure (DTI) specifications for Pit Run Gravel (Table 1). Fill material should be placed from the Compact to Dense Light Brown Sand and Gravel TILL with Cobbles to the bottom of the footing elevation in 300 mm lifts and compacted to 100% of its Standard Proctor value (ASTM D698).

The Sand and Gravel TILL will soften significantly in the presence of any moisture which will be compounded by construction traffic. If these conditions exist, it is recommended that the area be over excavated 300mm and covered with 300mm of 75mm minus crushed rock (Table 3). The excavation should be dewatered either by gravity or pumping. Following the placement and leveling of any crushed rock, compaction of the surface is to be completed with an appropriately sized vibratory compactor and compacted to 100% of its Standard Proctor value (ASTM D698).

Excavations should be planned such that any Fills placed under the footings are constructed with a minimum slope of 1:1 from the edge of the pad to the insitu bearing soils. The 1:1 slope should be protected with compacted materials having a slope no steeper than 2:1.

4.3 CONCRETE SLABS

Concrete floor slabs may be cast over Engineered Fill prepared as described above or over the insitu Compact to Dense Light Brown Sand and Gravel TILL. All concrete floor slabs should be placed over a minimum of 150 mm of compacted granular material meeting the DTI specification for 25 mm Crushed Rock (Table 3). A vapour barrier is recommended under all concrete slabs.

4.4 BACKFILLING

Once the footings and foundation walls have been installed and adequately cured, the excavation should be backfilled with Engineered Fill consisting of an approved material which is free from Organics and deleterious materials.

Fill material meeting the current NB Department of Transportation and Infrastructure (DTI) specifications for Pit Run Gravel (Table 1) would be acceptable for use as backfill material.

Exterior backfilling of the foundations should be carried out with free draining Pit Run (Table 1) and compacted to 95% of its Standard Proctor value (ASTM D698). Any particles larger than 100mm shall not be placed within 300mm of the foundation walls.

It is recommended that the placement of backfill be monitored by a geotechnical engineer to ensure that the specified degree of compaction is attained during the placement of the Engineered Fills.

Table 1 - NBDOT Table 201-4, “Grading Limits - Pit Run Gravel”

ASTM Sieve Size (mm)	% Passing
125	100
100	95-100
75	82-100
50	62-100
37.5	52-100
19	30-90
9.5	22-79
4.75	16-66
2.36	12-55
1.18	9-44
0.30	4-25
0.075	0-7

4.5 SEISMIC SITE CLASSIFICATION

Based on Table 4.1.8.4.A Site Classification for Seismic Site Response in the 2005 edition of the National Building Code of Canada (NBC) and a review of the soil and bedrock information, the Site Classification for the project area is "D".

4.6 NON-BUILDING AREAS

We recommend that any non-building areas (i.e. parking lots and roadways) be constructed as described in Table 2.

Either of the base materials illustrated in Table 3 (25mm or 31.5mm) are acceptable to use as base on this site for roadways and parking areas.

The granular sub-base and base layers should be compacted to 100% of their Standard Proctor Maximum Dry Densities (ASTM D698).

Prior to placement of any Engineered Fills and after the excavation of unsuitable materials, the insitu subgrade should be proof rolled under the supervision of a representative of a geotechnical engineering company.

Any soft or highly deformable areas should be repaired as per the direction of the geotechnical engineer.

Surface water should be directed away from any exposed subgrade materials prior to placement of parking lot granular sub-base and base materials.

Table 2 - Parking Lot and Roadway – Recommended Construction for paved areas

Material	Thickness		Comments
	Roadway	Parking	
Asphalt Seal	40 mm	40mm	12.5mm Nominal Aggregate Size Install as per NBDOT Standard Specifications (2011) Section 260 - "Asphalt Concrete".
Asphalt Base	60 mm	40mm	19mm Nominal Aggregate Size Install as per NBDOT Standard Specifications (2011) Section 260 - "Asphalt Concrete".
Granular Base (Class A Gravel, Table 3)	150 mm	150mm	Compacted to 100% Standard Proctor Density (ASTM D698)
Granular Sub-Base (Pit Run Gravel, (Table 1)	450 mm (minimum)	450 mm (minimum)	Compacted to 100% Standard Proctor Density (ASTM D698)

On site materials may not be reused in roadway or parking areas as base or sub-base.

Sub-base and base materials should be placed in lifts not exceeding 300 mm (12 inches) or appropriate for the compaction equipment used to achieve compaction to 100% of its Standard Proctor Value.

Base material shall have a minimum of 40% of particles by mass with at least one fractured face, when tested to ASTM D5821.

Table 3 - NBDOT Table 201-2 "Grading Limits - Crushed Rock Base/Subbase

ASTM Sieve Size (mm)	Aggregate Base / Subbase		
	25mm % passing	31.5mm % passing	75mm %passing
90.0			100
75.0			95-100
63.0			85-100
50.0			73-95
37.5		100	58-87
31.5	100	95-100	
25.0	95-100	81-100	
19.0	71-100	66-90	35-69
12.5	56-82	50-77	
9.50	47-74	41-70	25-54
4.75	31-59	27-54	17-43
2.36	21-46	17-43	12-35
1.18	13-34	11-32	8-28
0.300	5-18	4-19	4-16
0.075	0-8	0-8	0-8

4.7 MATERIAL REUSE

Any overburden material excavated at the site has limited reuse application. These materials could only be used as non-structural Fill in landscaped areas.

5.0 LIMITATIONS

The sole purpose of this report and the associated services performed by Fundy Engineering & Consulting Ltd. was to provide professional services to the James Avery Grace Corporation regarding a geotechnical investigation at 4 Hillcrest Drive in Rothesay, NB.

The observations made and facts presented in this report are based on a site investigation carried out on January 8th, 2021. While every effort has been made to determine the geotechnical concerns pertaining to the subject site as defined herein, discovery or development of additional geotechnical concerns cannot be precluded. Further investigation may reveal additional information that may influence the recommendations included herein. Should such information be revealed, Fundy Engineering should be notified in a timely fashion so that any required amendments to our recommendations can be made.

This report has been prepared on behalf of and for the exclusive use of the Client. The report expresses the professional opinion of Fundy Engineering & Consulting Ltd. experts and is based on their technical / scientific knowledge. No professional responsibility is assumed for the use or interpretation of these findings by others.

6.0 CLOSING REMARKS

We trust you will find the contents of this report satisfactory for your purposes. This report was prepared by Josh Cosman, *EIT.,* and reviewed by Alex Mouland, *P.Eng., PMP.*

Respectfully Submitted,
Fundy Engineering & Consulting Ltd.

Josh Cosman, EIT.

Alex Mouland, *P.Eng., PMP.*

7.0 REFERENCES

ASTM International. 2012. ASTM D698. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

ASTM International. 2012. ASTM D5821. Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

ASTM International. 2012. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

APPENDIX I
Symbols and Terms

FUNDY ENGINEERING SYMBOLS AND TERMS

Borehole, Test Pit, and Monitoring Well Logs

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated.....having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured..... having cracks, and hence a blocky structure
Varved..... .....composed of regular alternating layers of silt and clay
Stratified.....composed of alternating layers of different soil types, e.g. silt and sand or silt and clay
Well Graded.....having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded.....predominantly of one grain size

Terminology used for describing soil strata based upon the proportion of individual particle sizes present:

Trace, or occasional.....less than 10%
Some.....10-20%
Adjective (e.g. silty or sandy).....20-35%
And (e.g. silt or sand.....35-50%

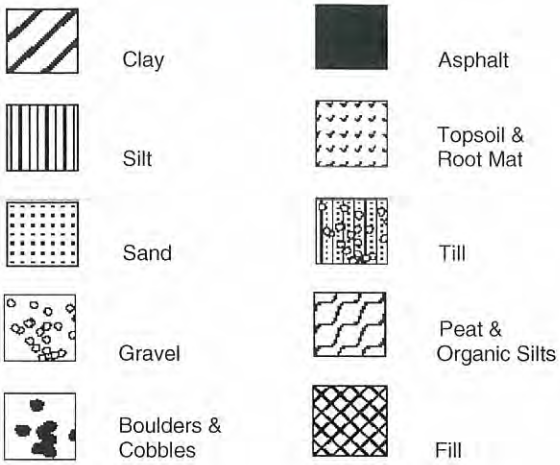
The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64kg) hammer falling 30 inches (50.8mm) O.D. split spoon sampler one foot (305mm) into the soil.

RELATIVE DENSITY	N' VALUE	RELATIVE DENSITY %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

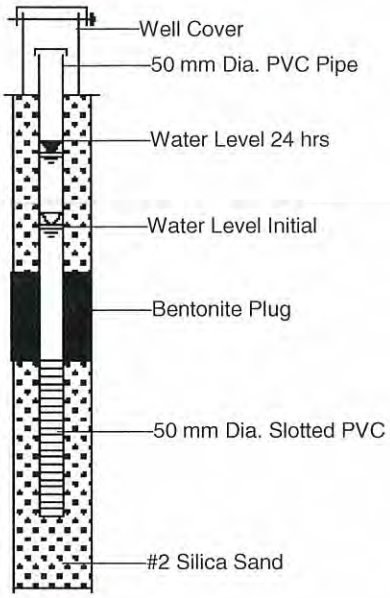
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer test, unconfined compression tests, or occasionally by standard penetration tests.

CONSISTENCY	UNDRAINED SHEAR STRENGTH		'N' VALUE
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

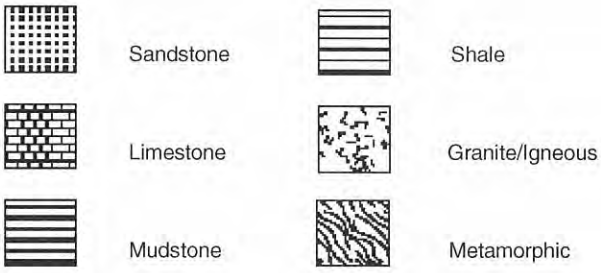
SOILS GRAPHIC LEGEND



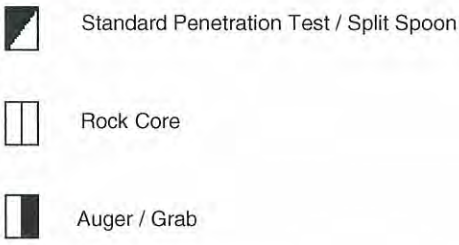
MONITORING WELL SCHEMATIC



BEDROCK GRAPHIC LEGEND



SAMPLER SYMBOLS



LABORATORY TESTS

MC	Moisture Content	P	Field Permeability	CD	Consolidation Drained Triaxial
SG	Specific Gravity	PF	Permeability Falling Head	CU	Consolidation Undrained Triaxial
HA	Hydrometer Analysis	PC	Permeability Constant Head	UU	Unconsolidated Undrained Triaxial
SA	Sieve Analysis	PR	Proctor	DS	Direct Shear

BEDROCK DESCRIPTION

The description of bedrock is based on the rock quality designation (RQD).

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100mm long are expressed as a percentage of total recovery. The small pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. In most cases RQD is measured on NXL core.

RQD	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

APPENDIX II
Test Pit Logs

FUNDY Engineering

TEST PIT LOG
No. TP1

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation **PROJECT NO.:** 14835

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 27.463

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ 2.4 **AFTER 24 HOURS:** ▼ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
	0	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
27	0.5	Compact to Dense Reddish Brown Silty SAND and GRAVEL					
26.5	1	Compact Reddish Brown SILT with Trace Sand					
26	1.5						
25.5	2						
25	2.5	Compact to Dense Light Brown Sand and Gravel TILL with Cobbles					
24.5	3	Test Pit Terminated at 2.9 m					
24	3.5						
23.5	4						
23	4.5						

0.4
0.9
2.4
2.9

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

FUNDY Engineering

TEST PIT LOG
No. TP2

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation 2021November30PASiteRpt\Highland/Hillcrest_037 **PROJECT NO.:** 14835

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 27.05

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▽ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
27	0	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
	0.2	Loose Light Brown Sand FILL					
26.5	0.5	Loose Light Brown SAND					
	0.75	Compact to Dense Reddish Brown SILT with Trace Sand					
26	1						
	1.2	Compact to Dense Light Brown Sand and Gravel TILL with Cobbles					
25.5	1.5						
25	2						
24.5	2.5						
	2.75	Test Pit Terminated at 2.75 m					
24	3						
23.5	3.5						
23	4						
	4.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

FUNDY Engineering

TEST PIT LOG
No. TP3

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation **PROJECT NO.:** 14835

2021November30FAGStantPitHighland/Hillcrest_038

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 26.778

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▽ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
26.5	0	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
	0.45						
	0.5	Loose Light Brown SAND					
26	0.75						
	1	Compact to Dense Reddish Brown SILT with Trace Sand					
25.5							
	1.5						
25		Compact to Dense Light Brown Sand and Gravel TILL with Cobbles					
	2						
24.5							
	2.5						
24	2.75	Test Pit Terminated at 2.75 m					
	3						
23.5							
	3.5						
23							
	4						
22.5							
	4.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

FUNDY Engineering

TEST PIT LOG
No. TP4

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation **PROJECT NO.:** 14835

2021November30FAGStantPtHighland/Hillcrest_039

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 26.957

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
26.5	0 / 0.5	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
	0.3	Loose to Compact Light Brown SAND					
	0.6	Compact to Dense Reddish Brown SILT with Trace Sand					
26	1						
	1.2	Compact to Dense Light Brown Sand and Gravel TILL with Cobbles					
25.5	1.5						
25	2						
24.5	2.5						
	2.9	Test Pit Terminated at 2.9 m					
24	3						
23.5	3.5						
23	4						
22.5	4.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

FUNDY Engineering

TEST PIT LOG
No. TP5

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation **PROJECT NO.:** 14835

2021November30PASiteRpt\Highland/Hillcrest_040

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 26.785

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ 2.6 **AFTER 24 HOURS:** ▼ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
26.5	0	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
	0.4						
	0.5	Loose Light Brown SAND					
26	0.9						
	1	Compact to Dense Reddish Brown SILT with Trace Sand					
25.5	1.5						
25	2						
24.5	2.5						
	2.6			▼			
	2.75	Compact to Dense Light Brown Sand and Gravel TILL with Cobbles Test Pit Terminated at 2.75 m					
24	3						
23.5	3.5						
23	4						
22.5	4.5						

FUNDY Engineering

TEST PIT LOG
No. TP6

PROJECT: GI - 4 Hillcrest Drive

CLIENT: James Avery Grace Corporation **PROJECT NO.:** 14835

2021 November 30 PAC Stan Rpt Highland/Hillcrest_041

PROJECT LOCATION: Rothesay, NB

EXCAVATION CONTRACTOR: Friars Excavations **ELEVATION:** 27.437

LOGGED BY: JC **CHECKED BY:** Andy MacVey

EXCAVATION METHOD: 5.5 Ton Track Excavator **DATE:** 2021-01-08

DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Elevation (meters)	Depth (meters)	Description	Graphic	Groundwater	Sample Type	Sample No.	Remarks
27	0	Minor Surface ORGANICS over Heavily Saturated Dark Brown Silty Organic PEAT					
	0.3	Loose Light Brown SAND					
	0.5						
26.5	0.9	Compact to Dense Reddish Brown SILT with Trace Sand					
	1						
26	1.5	Compact to Dense Light Brown Sand and Gravel TILL with Cobbles					
	1.5						
25.5	2						
25	2.5						
24.5	2.9	Test Pit Terminated at 2.9 m					
	3						
24	3.5						
23.5	4						
23	4.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

APPENDIX III
Site Plan

2021November30PACStaffRptHighland/Hillcrest_043

GENERAL NOTES

1. All dimensions in millimeters unless otherwise specified.
2. Elevations in meters and based on NAD83 (CSRS) Datum.
3. This drawing is not a survey and any property boundaries are shown for reference only.

TP Test Pit
G Grade

No.	REVISION/ISSUE	DATE

FUNDY Engineering

27 Wellington Row
P.O. Box 6626
Saint John, NB
E2L 4S1

Tel. (506) 635-1566
Fax. (506) 635-0206
fundy@fundyeng.com
www.fundyeng.com

Serving Our Clients' Needs First

Project:
GEOTECHNICAL INVESTIGATION
4 HILLCREST DRIVE
ROTHESAY, NB

Drawing:
TEST PIT LOCATION PLAN

Project No.	Designed	Date (yy/mm/dd)
14835	AM	21/1/13
Scale	Drawn	Rev.
1:500	TRH	

Sheet

C1.1

Serving Our Clients' Needs First

Fundy Engineering is proud to be one of the largest employee-owned, full-service multi-disciplinary engineering-consulting companies headquartered in New Brunswick and serving Atlantic Canada and New England

Top-Quality Engineering-Consulting Solutions

Bio-Resources | Building Systems | Environmental | Geotechnical | Project Management

☎ 877.635.1566

✉ fundy@fundyeng.com

www.fundyeng.com

FUNDY Engineering

Thank you for choosing our team for your engineering and consulting needs. We encourage you to visit our website and share your needs and concerns so that we can continue to provide you with top-quality technically sound solutions.

SAINT JOHN OFFICE
27 Wellington Row
PO Box 6626
Saint John, NB E2L 3H4

506.635.1566

Serving the Atlantic Region from Saint John and Clyde River

CLYDE RIVER OFFICE
945AA Upper Meadowbank Road
Clyde River, PE
C0A 1H1

902.675.4885

Englobe
englobecorp.com

HILLCREST DRIVE APARTMENT
TRAFFIC IMPACT STATEMENT

Traffic Impact Statement
Proj. No.2104655

July 28, 2021
Revision No.: 0

James Avery Grace

REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
M8255
J.G. DeMerchant
Signature
July 28, 2021
Date
Province du Nouveau-Brunswick
INGÉNIEURE IMMATRICULÉE

Prepared by:

Jill DeMerchant, P.Eng., M.Eng.
Transportation Engineer
Civil and Transportation Engineering

Reviewed by:

Ryan Esligar, P.Eng., M.Sc.E.
Team Leader - Transportation Engineering
Civil and Transportation Engineering

Englobe Corp.
T: 506.451.4400 • **E:** jd@englobecorp.com | 133 Prince William St, Suite 703, Saint John, New Brunswick E2L 2B5

CONFIDENTIALITY

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 PROJECT BACKGROUND

A new 4-storey residential development has been proposed on Hillcrest Drive near the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue in the Town of Rothesay. The development will consist of up to 40 new residential units as well as an underground parking garage and a small surface parking lot. The proposed development site plan, which is included in **Appendix A**, shows 51 parking spaces, including 10 surface level spaces and 41 underground spaces. The plan also includes 2 barrier free spaces – 1 underground and 1 at surface level. The proposed development will include two accesses, one off Hillcrest Drive and one off Highland Avenue. The Hillcrest Drive access will provide access to the underground parking facility, while the Highland Avenue access will provide access to the surface parking lot.

As part of the development approval process, the Town of Rothesay requires that a Traffic Impact Statement (TIS) be completed for this development. The primary areas of focus are how the development will impact traffic at the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue, if at all. James Avery Grace retained Englobe Corp. to complete this TIS. The Study Area for this TIS includes the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue, as well as the two development accesses, as shown in **Figure 1**.

Figure 1 – Study Area

1.2 STUDY TASKS

The main objectives of this TIS were to estimate how much additional traffic the residential development would generate and determine what impact, if any, the development traffic would have on the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue. The following activities were undertaken as part of this TIS:

- Englobe staff visited the Study Area to review existing conditions;
- Traffic volumes were collected at the intersection of Hampton Road and Highland Avenue;
    - A 1.0 % annual growth rate was applied to these traffic volumes to estimate the future (2028) background traffic volumes for the Study Area. 2028 represents the 5-year horizon period beyond the anticipated full build-out of the development;
- Traffic count data that were collected by the Study Team at the intersection of Hampton Road / Hillcrest Drive in 2016 were reviewed and projected forward to match the 2021 and 2028 volumes at the Hampton / Highland intersection;
- Level of Service (LOS) analyses were completed for the existing traffic conditions;
- ITE Trip Generation rates were used to estimate the amount of traffic that will be generated by the new development. These were added to the background traffic volumes to estimate the 2028 total traffic volumes with the development in place;
- LOS analyses were completed for the 2028 future conditions with full build out of the development;
- A review of pedestrian connectivity in the area of the proposed development was completed; and
- The methodology, findings, and recommendations of the TIS were documented in this written report.

1.3 HORIZON YEAR

A 5-year horizon period was utilized for the analysis. Should all approvals be granted it is expected that the proposed development will be fully operational in 2023, therefore 2028 was chosen as the future horizon year for the analysis.

2 INFORMATION GATHERING

2.1 STREET AND INTERSECTION CHARACTERISTICS

Hillcrest Drive is a local street with an AADT of approximately 800 vehicles/day. Hillcrest Drive is oriented in the east-west direction and runs parallel and to the south of Highland Avenue. Hillcrest Drive has a speed limit of 40 km/h and features a concrete sidewalk along the north side of the street that is separated from the travel lanes by a grass boulevard.

Highland Avenue is a local street with an AADT of approximately 1,800 vehicles/day. Highland Avenue is oriented in the east-west direction. It features one lane in each direction and has a speed limit of 40 km/h. Within the Study Area, Highland Avenue features a sidewalk along the north side of the street that is separated from the travel lanes by a grass boulevard. A narrow gravel shoulder extends along the south side of the street.

Hampton Road is a collector road with an AADT of approximately 7,000 vehicles/day. Hampton Road is oriented in the north-south direction, has one lane in each direction and a speed limit of 50 km/h. South of Highland Avenue, Hampton Road features unidirectional bike lanes and sidewalk along both sides of the street. The bike lanes end at the intersection of Highland Avenue, however the sidewalk continues north of Highland along both sides of the street.

The intersection of Hampton Road and Hillcrest Drive is a stop-controlled t-intersection. Hampton Road is free flowing and a stop sign is present at the east leg on Hillcrest Drive. A painted crosswalk is present across the east leg.

The intersection of Hampton Road and Highland Avenue is a stop-controlled intersection. Hampton Road is free flowing and a stop sign is present at the east leg on Highland Avenue. The west leg consists of one of the accesses to Rothesay High School. Painted crosswalks are present across the east and west legs and the north leg features a crosswalk equipped with overhead flashing beacons (RA-5).

2.2 TRAFFIC DATA AND COVID ADJUSTMENTS

Traffic data that were collected by the Study Team in 2016 at the intersection of Hampton Road / Hillcrest Drive were reviewed and used in the analysis. Traffic volumes were also collected at the intersection of Hampton Road and Highland Avenue on Tuesday, April 27th 2021. The traffic counts were completed during the morning and evening peak periods. The traffic count data are provided in Appendix B.

Since traffic patterns have decreased as a result of the current COVID-19 pandemic, the Study Team determined that the traffic count data collected at Hampton Road / Highland Avenue should be adjusted to better represent typical traffic volumes under normal conditions. Adjustment factors were developed by comparing the 2021 traffic volumes at the intersection to traffic volumes that were collected in 2016 at Hampton Road / Hillcrest Drive. Adjustment factors that were developed by the Study Team as part of a

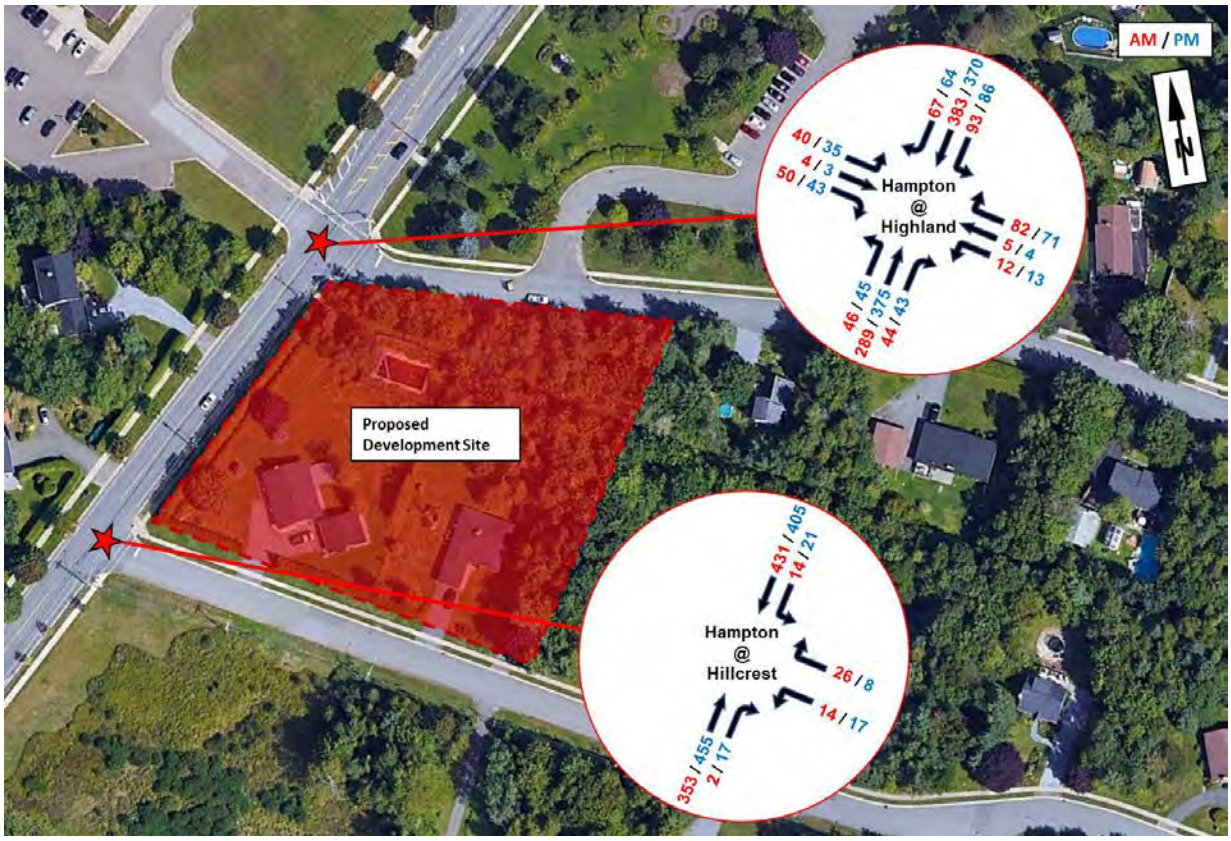
January 2021 study were also considered. The January 2021 study compared traffic data that were collected in 2016 at two locations in Fredericton, NB to traffic volumes that were collected during the COVID-19 pandemic. Using this data, average AM and PM peak hour adjustment factors were calculated and applied to the traffic volume data in this study. The adjustment factors that were used in this study are shown in **Table 1**.

Table 1 – COVID-19 Adjustment Factors

Study	Date	AM Peak	PM Peak
Fredericton, NB	January, 2021	1.26	1.20
Fredericton, NB	January, 2021	1.36	1.25
Rothesay, NB	April, 2021	1.22	1.31
Applied to Hampton Rd / Highland Ave	**April, 2021**	**1.28**	**1.25**

The adjustment factors were applied to the peak hour volumes at the Hampton Road / Highland Avenue intersection. The 2016 peak hour volumes at the Hampton Road / Hillcrest Drive intersection were then adjusted to match the new Hampton Road / Highland Avenue volumes. Upon review of the adjusted volumes at each intersection, it was determined that 100 vehicles should be added to the northbound through movement at each intersection to maintain consistency with the pre-COVID traffic volumes on Hampton Road. The adjusted 2021 AM and PM background traffic volume estimates for the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue are shown in **Figure 2**.

Figure 2 – 2021 Background Peak Hour Volumes



3 EXISTING LEVEL OF SERVICE

A Level of Service (LOS) analysis was completed for the existing and future (2028) traffic conditions at the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue. The findings are discussed in this section.

3.1 LEVEL OF SERVICE CRITERIA

The LOS analyses were completed with Synchro 10, which is a traffic analysis software that uses the Highway Capacity Manual and Intersection Capacity Utilization procedures.

The intersection performance was evaluated mainly in terms of the level of service (LOS), which is a common performance measure of an intersection. LOS is determined based on vehicle delay and is expressed on a scale of A through F, where LOS A represents very short delay (<10 seconds per vehicle) and LOS F represents very long delay (>50 seconds per vehicle at a stop controlled intersection and >80 seconds per vehicle at a signalized intersection). A LOS D is often considered acceptable in urban locations; however, some communities will accept a LOS E. The LOS criteria for both signalized and stop control intersections are shown in Table 2.

Table 2 – Intersection Level of Service Criteria

LOS	LOS Description	Control Delay (seconds per vehicle)	
		Signalized Intersections	Stop Controlled Intersections
A	Very low delay; most vehicles do not stop (Excellent)	less than 10.0	less than 10.0
B	Higher delay; more vehicles stop (Very Good)	between 10.0 and 20.0	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	between 20.0 and 35.0	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 35.0 and 55.0	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	between 55.0 and 80.0	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	greater than 80.0	greater than 50.0

3.2 EXISTING LOS ANALYSIS

A LOS analysis was completed for the existing traffic conditions at the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue. The LOS results are summarized as follows:

- Both intersections operate efficiently at an overall LOS A during both peak periods.
- At Hampton Road / Hillcrest Drive, all individual turning movements operate efficiently at a LOS C or better during both peak periods.
- At Hampton Road / Highland Avenue, the eastbound approach operates at LOS F and E with a v/c ratios of 0.67 and 0.44 during the AM and PM peak periods, respectively. All other movements at the intersection operate efficiently at a LOS C or better during both peak periods.

The LOS results indicate that the eastbound approach at the Hampton Road / Highland Avenue intersection experiences delay during both peak periods; however, the approach is well below capacity.

The LOS results, including average delay, volume to capacity (v/c) ratios, and the 95th percentile queue lengths for the existing conditions are summarized in **Table 3**. Detailed Synchro analysis outputs are included in **Appendix C**.

3.3 FUTURE BACKGROUND LOS ANALYSIS

A LOS analysis was completed for the future 2028 background traffic volumes at the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue. The peak hour traffic volumes for the 2028 horizon year were estimated by applying an annual growth rate of 1.0 % to the 2021 background traffic volumes.

The future background LOS results indicate that the intersection of Hampton Road / Hillcrest Drive will continue to operate efficiently in 2028. At the intersection of Hampton Road / Highland Avenue, the delay for the eastbound approach at the intersection will increase by 15 - 45 seconds per vehicle as a result of the background traffic growth; however, the movements will remain well below capacity and the intersection will continue to operate efficiently overall.

The LOS results, including average delay, volume to capacity (v/c) ratios, and the 95th percentile queue lengths for the future background conditions are summarized in **Table 3.** Detailed Synchro analysis outputs are included in **Appendix C**.

The study team completed a traffic signal warrant for the intersection of Hampton Road / Highland Avenue for the future 2028 background conditions. A score of 100 points or more would typically warrant traffic signals. A warrant score of 53 points was achieved for the intersection, therefore traffic signals would not be warranted in the future condition. A signal warrant analysis was not completed for the intersection of Hampton Road / Hillcrest Avenue as this intersection is projected to operate efficiently in the future. The signal warrant worksheet is provided in **Appendix D**.

Table 3 – 2021 Existing and 2028 Background LOS Results

Intersection			Overall LOS, Delay (sec/veh)	Turning Movement LOS Average Delay (seconds per vehicle) [Volume to Capacity Ratio (v/c)] 95th Percentile Queue (m)											
				Eastbound			Westbound			Northbound			Southbound		
East-West Street @ North-South Street	Traffic Control	Time Period		L	T	R	L	T	R	L	T	R	L	T	R
2021 Existing															
Hampton Road @ Hillcrest Drive	STOP	AM Peak	LOS A 0.8	-	-	-	Shared	C 16.9 [0.08] 2	Shared	Shared	A 0.0 [0.30] 0	Shared	Shared	A 0.7 [0.02] <1	Shared
		PM Peak	LOS A 0.8	-	-	-	Shared	C 15.2 [0.07] 2	Shared	Shared	A 0.0 [0.24] 0	Shared	Shared	A 0.6 [0.02] <1	Shared
Hampton Road @ Highland Avenue	STOP	AM Peak	LOS A 8.3	Shared	F 67.5 [0.67] 31	Shared	Shared	C 24.0 [0.37] 13	Shared	Shared	A 1.5 [0.06] 1	Shared	Shared	A 2.6 [0.10] 3	Shared
		PM Peak	LOS A 5.4	Shared	E 35.6 [0.44] 16	Shared	Shared	C 18.2 [0.26] 8	Shared	Shared	A 1.3 [0.05] 1	Shared	Shared	A 2.3 [0.09] 2	Shared

Intersection			Overall LOS, Delay (sec/veh)	Turning Movement LOS Average Delay (seconds per vehicle) [Volume to Capacity Ratio (v/c)] 95th Percentile Queue (m)											
				Eastbound			Westbound			Northbound			Southbound		
East-West Street @ North-South Street	Traffic Control	Time Period		L	T	R	L	T	R	L	T	R	L	T	R
2028 Future Background															
Hampton Road @ Hillcrest Drive	STOP	AM Peak	LOS A 1.1	-	-	-	Shared	C 16.8 [0.16] 4	Shared	Shared	A 0.0 [0.29] 0	Shared	Shared	A 0.5 [0.02] <1	Shared
		PM Peak	LOS A 0.8	-	-	-	Shared	C 18.2 [0.10] 3	Shared	Shared	A 0.0 [0.32] 0	Shared	Shared	A 0.7 [0.02] <1	Shared
Hampton Road @ Highland Avenue	STOP	AM Peak	LOS B 13.4	Shared	F 110.6 [0.89] 48	Shared	Shared	C 24.2 [0.42] 16	Shared	Shared	A 1.8 [0.06] 2	Shared	Shared	A 2.7 [0.11] 3	Shared
		PM Peak	LOS A 6.7	Shared	E 48.3 [0.55] 23	Shared	Shared	C 20.9 [0.32] 11	Shared	Shared	A 1.4 [0.05] 1	Shared	Shared	A 2.4 [0.10] 3	Shared

4 DEVELOPMENT TRAFFIC GENERATION

4.1 TRAFFIC GENERATION AND ASSIGNMENT

Trip generation rates for the proposed development were estimated using the ITE TripGen Web-based App, which is based on the 10th Edition of the Institute of Transportation Engineer's (ITE) *Trip Generation Manual*. The Developer provided information regarding the size and type of development that is planned. The building will consist of 4 stories with a total of 40 dwelling units.

ITE Land Use #221 (Multifamily Housing – Mid-Rise) was used to generate trips for the development. The resulting vehicle trip generation is shown in **Table 4**. It was assumed that all of these trips would be made by motor vehicle as that would represent a conservative approach in estimating traffic generation.

Table 4 - Traffic Generation for the Proposed Development

Development	Size	AM Peak Hour			PM Peak Hour			Daily Total
		In	Out	Total	In	Out	Total	
Multifamily Housing - Mid-Rise (ITE Land Use #221)	40 Dwelling Units	4	10	14	11	7	18	218

The development traffic was assigned to the two development accesses assuming that 80% of the development traffic would use the Hillcrest Drive access and 20% of the development traffic would use the Highland Avenue access. These assumptions were based on the capacity of both parking facilities. The development traffic were then distributed to the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue based on the existing traffic volume distributions along Hampton Road and at the intersection. The traffic assignments are shown in **Figure 3**.

The peak hour traffic volumes for the 2028 horizon year were estimated by applying an annual growth rate of 1.0 % to the 2021 background traffic volumes and adding the traffic generated by the development. The 2028 traffic volumes with the development in place are shown in **Figure 4**.

Figure 3 – Development Traffic Assignments

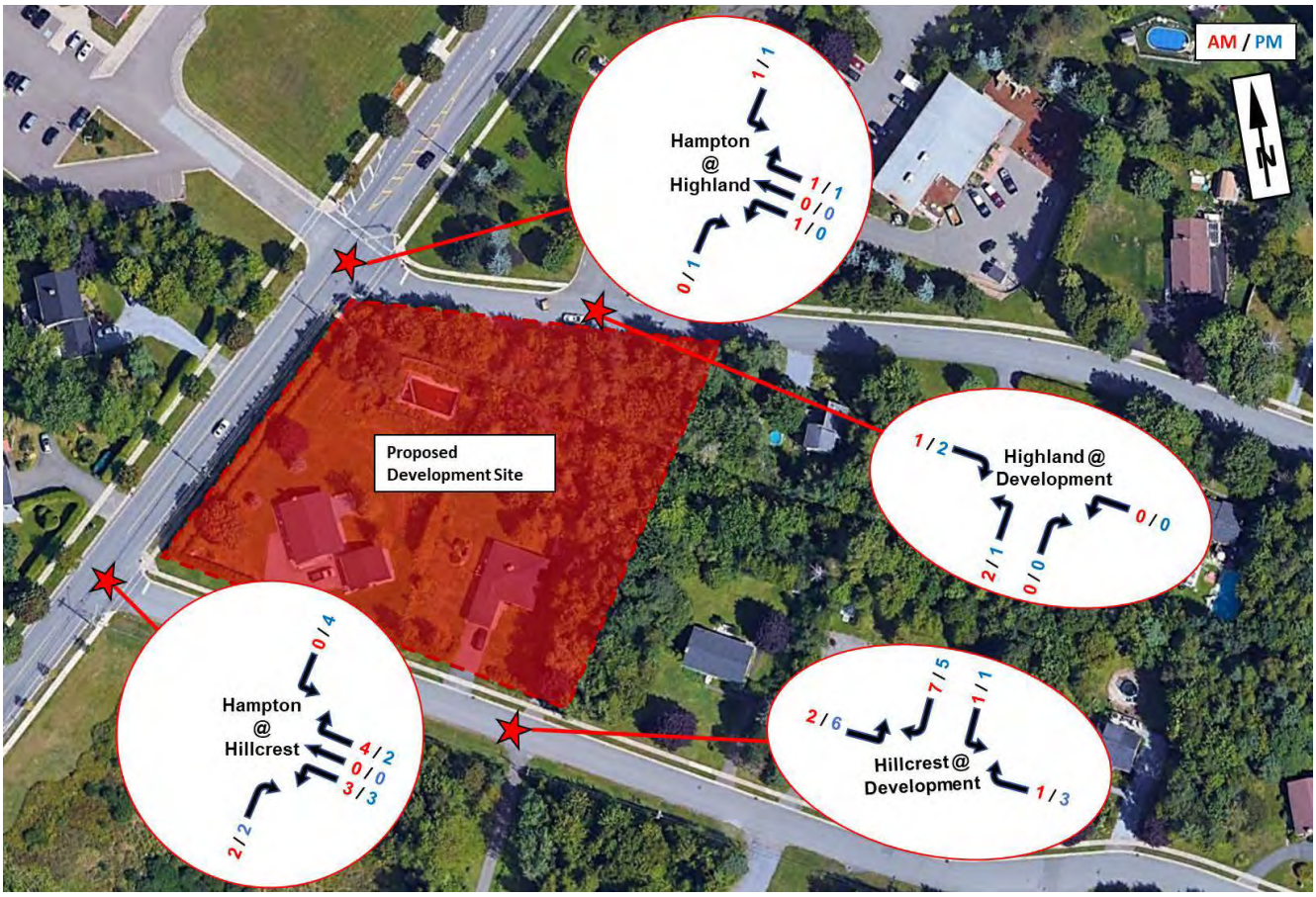
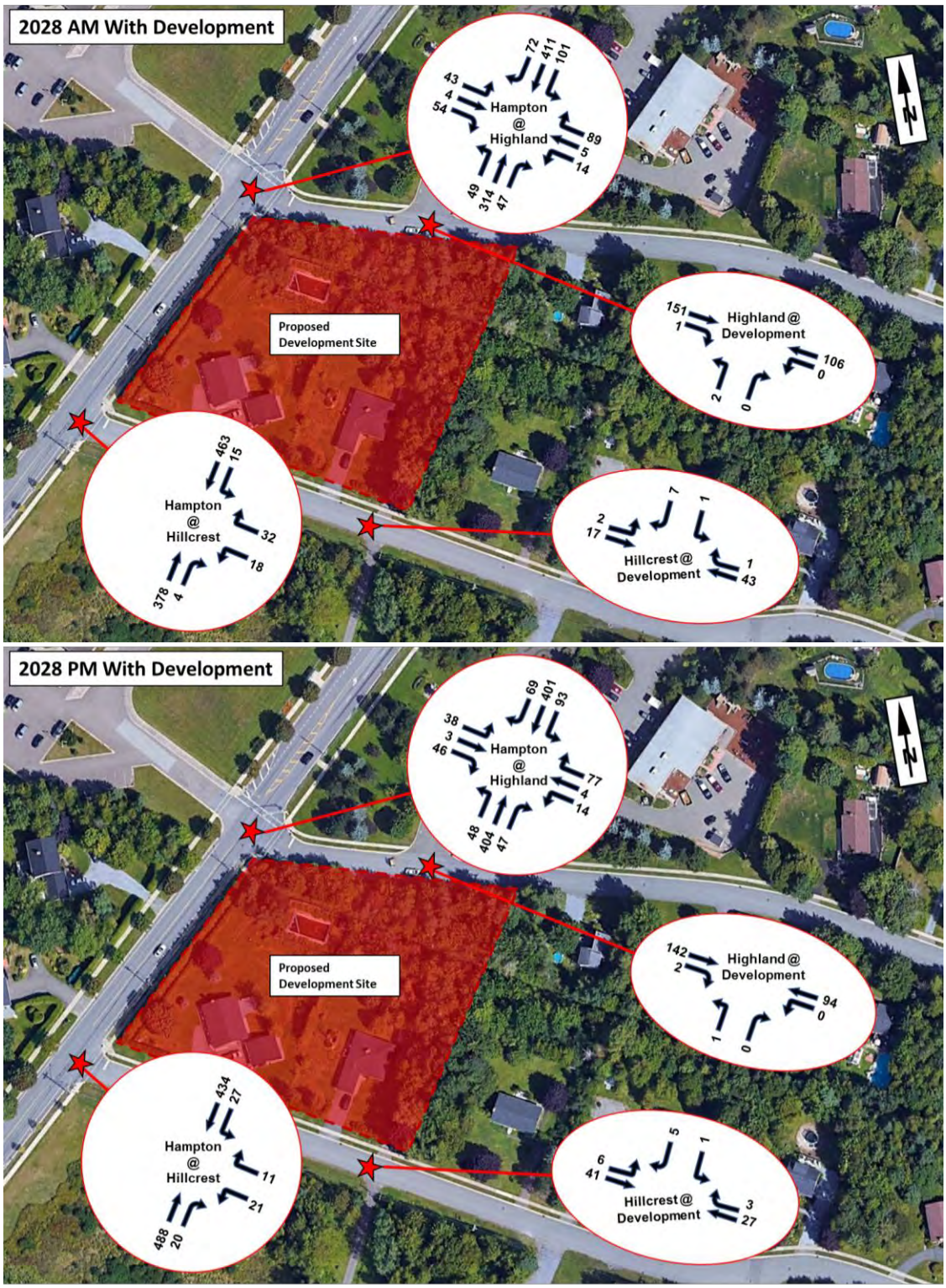


Figure 4 – 2028 Peak Hour Traffic Volumes with Development in Place



5 LOS ANALYSIS WITH DEVELOPMENT

A Level of Service (LOS) analysis was completed for the 2028 traffic conditions with the proposed residential development in place. The analysis included the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue, as well as the two proposed development accesses. The LOS results are summarized as follows:

- In 2028, the Hampton Road / Hillcrest Drive intersection, Hampton Road / Highland Avenue intersection and the two proposed development accesses would operate efficiently at overall LOS B or better during both peak periods.
- At the Hampton Road / Hillcrest Drive intersection, all individual turning movements would operate at a LOS C or better during both peak periods.
- At the Hampton Road / Highland Avenue intersection, the eastbound approach would operate at LOS F with v/c ratios of 0.91 and 0.57 during the AM and PM peak periods, respectively. All other movements at the intersection would operate efficiently with a LOS D or better during both peak periods.
- In 2028, all movements at the proposed development accesses would operate efficiently with a LOS B or better during both peak periods.

The LOS results indicate that at the Hampton Road / Highland Avenue intersection in 2028 with the additional development traffic, the delays at the eastbound approach out of Rothesay High are expected to increase slightly (3 – 4 seconds more than in the background conditions); however, these movements will remain below capacity. This is not uncommon at stop control intersections where the traffic volumes on the major street are much higher than the volumes on the minor street. The overall intersection delay and LOS at both Hampton Road intersections are expected to remain acceptable up to 5 years beyond the anticipated full build-out. The development accesses on Hillcrest Drive and Highland Avenue are expected to operate efficiently with minimal delay.

The LOS results, including average delay, volume to capacity (v/c) ratios, and the 95th percentile queue lengths for the 2028 traffic conditions with the development in place are summarized in **Table 5**. Detailed Synchro analysis outputs are included in **Appendix C**.

Table 5 – 2028 LOS with Development

Intersection			Overall LOS, Delay (sec/veh)	Turning Movement LOS Average Delay (seconds per vehicle) [Volume to Capacity Ratio (v/c)] 95th Percentile Queue (m)											
				Eastbound			Westbound			Northbound			Southbound		
East-West Street @ North-South Street	Traffic Control	Time Period		L	T	R	L	T	R	L	T	R	L	T	R
Hampton Road @ Hillcrest Drive	STOP	AM Peak	LOS A 1.2	-	-	-	Shared	C 17.4 [0.18] 5	Shared	Shared	A 0.0 [0.30] 0	Shared	Shared	A 0.5 [0.02] <1	Shared
		PM Peak	LOS A 1.0	-	-	-	Shared	C 18.7 [0.12] 3	Shared	Shared	A 0.0 [0.32] 0	Shared	Shared	A 0.8 [0.03] <1	Shared
Hampton Road @ Highland Avenue	STOP	AM Peak	LOS B 13.9	Shared	F 114.5 [0.91] 49	Shared	Shared	D 25.8 [0.44] 17	Shared	Shared	A 1.7 [0.06] 2	Shared	Shared	A 2.7 [0.11] 3	Shared
		PM Peak	LOS A 6.8	Shared	F 51.0 [0.57] 24	Shared	Shared	C 21.5 [0.33] 11	Shared	Shared	A 1.4 [0.05] 1	Shared	Shared	A 2.4 [0.10] 3	Shared
Hillcrest Drive @ Development Access	STOP	AM Peak	LOS A 1.3	Shared	A 0.8 [0.00] 0	-	-	A 0.0 [0.03] 0	Shared	-	-	-	A 8.6 [0.01] <1	-	A 8.6 [0.01] <1
		PM Peak	LOS A 1.2	Shared	A 0.0 [0.00] <1	-	-	A 0.0 [0.02] 0	Shared	-	-	-	A 8.6 [0.01] <1	-	A 8.6 [0.01] <1

Intersection			Overall LOS, Delay (sec/veh)	Turning Movement LOS Average Delay (seconds per vehicle) [Volume to Capacity Ratio (v/c)] 95th Percentile Queue (m)											
				Eastbound			Westbound			Northbound			Southbound		
East-West Street @ North-South Street	Traffic Control	Time Period		L	T	R	L	T	R	L	T	R	L	T	R
Highland Avenue @ Development Access	STOP	AM Peak	LOS A 0.1	-	A 0.0 [0.10] <1	Shared	Shared	A 0.0 [0.00] <1	-	B 10.1 [0.00] <1	-	B 10.1 [0.00] <1	-	-	-
		PM Peak	LOS A 0.0	-	A 0.0 [0.09] 0	Shared	Shared	A 0.0 [0.00] 0	-	B 11.7 [0.00] 0	-	B 11.7 [0.00] 0	-	-	-

6 ADDITIONAL CONSIDERATIONS

6.1 PEDESTRIAN ACCESS

The Study Team completed a review of the existing pedestrian infrastructure near the proposed development. Highland Avenue currently features a sidewalk along the north side of the street that connects to the pedestrian facilities along Hampton Road, which extend along both sides of the street. As per the proposed development site plan, a sidewalk is planned along the north and south perimeters of the apartment building. Both sidewalks will be extended to the west, where they will connect with the existing sidewalk along Hampton Road. This should provide adequate connectivity between the development and the existing surrounding pedestrian infrastructure.

6.2 COMMERCIAL VEHICLE ACCESS

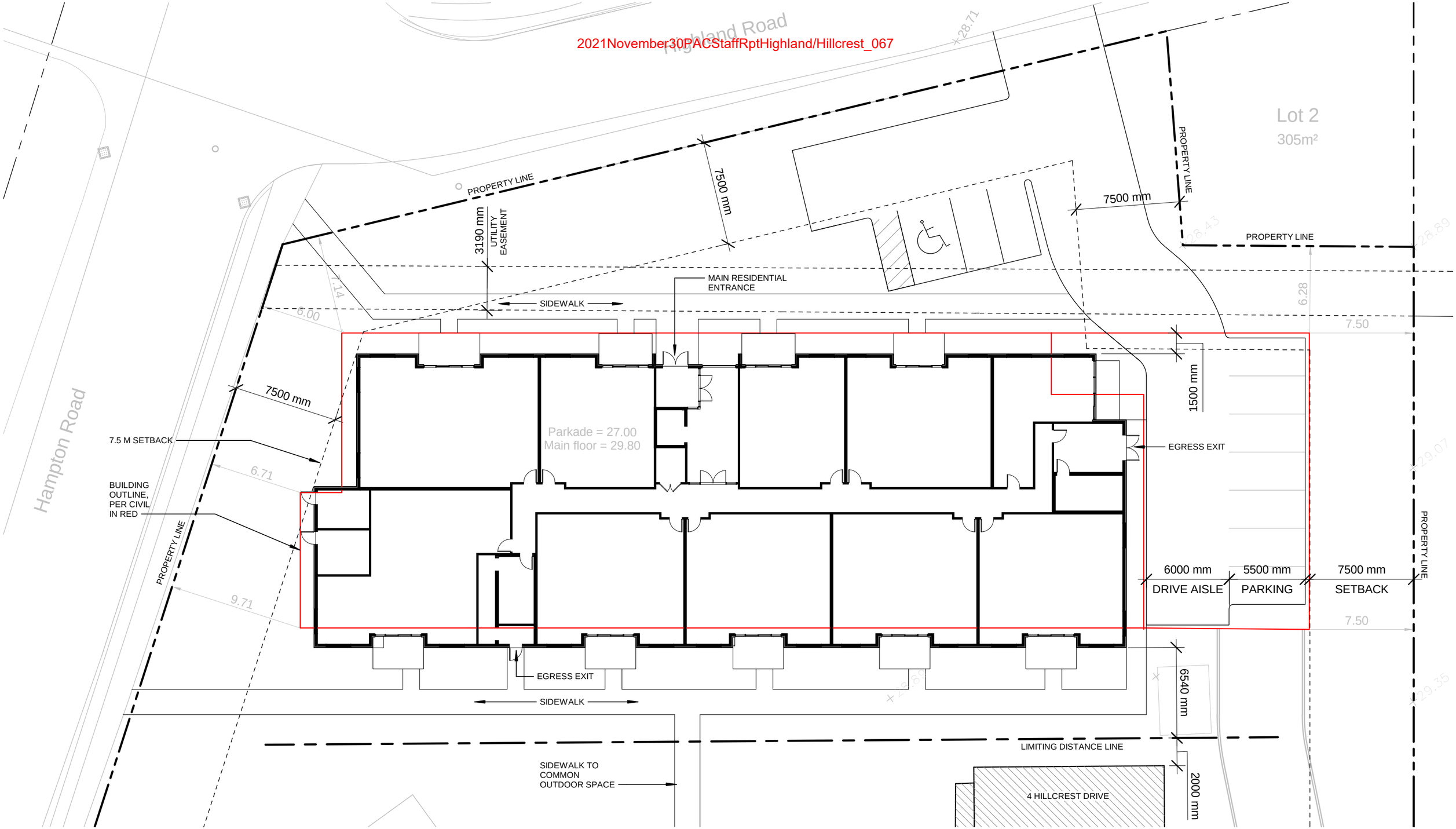
Commercial vehicle access will be dependent on vehicle type. Delivery, moving and similar types of service vehicles will be able to access the building using the surface level parking lot access on Highland Avenue. The garbage receptacles will be located within the underground parking facility and, therefore, garbage trucks will be able to access these from the Hillcrest Drive access. It may be beneficial to provide a turn-around area along the Hillcrest Drive access to allow garbage trucks to turn around without having to enter the parking garage.

7 CONCLUSIONS AND RECOMMENDATIONS

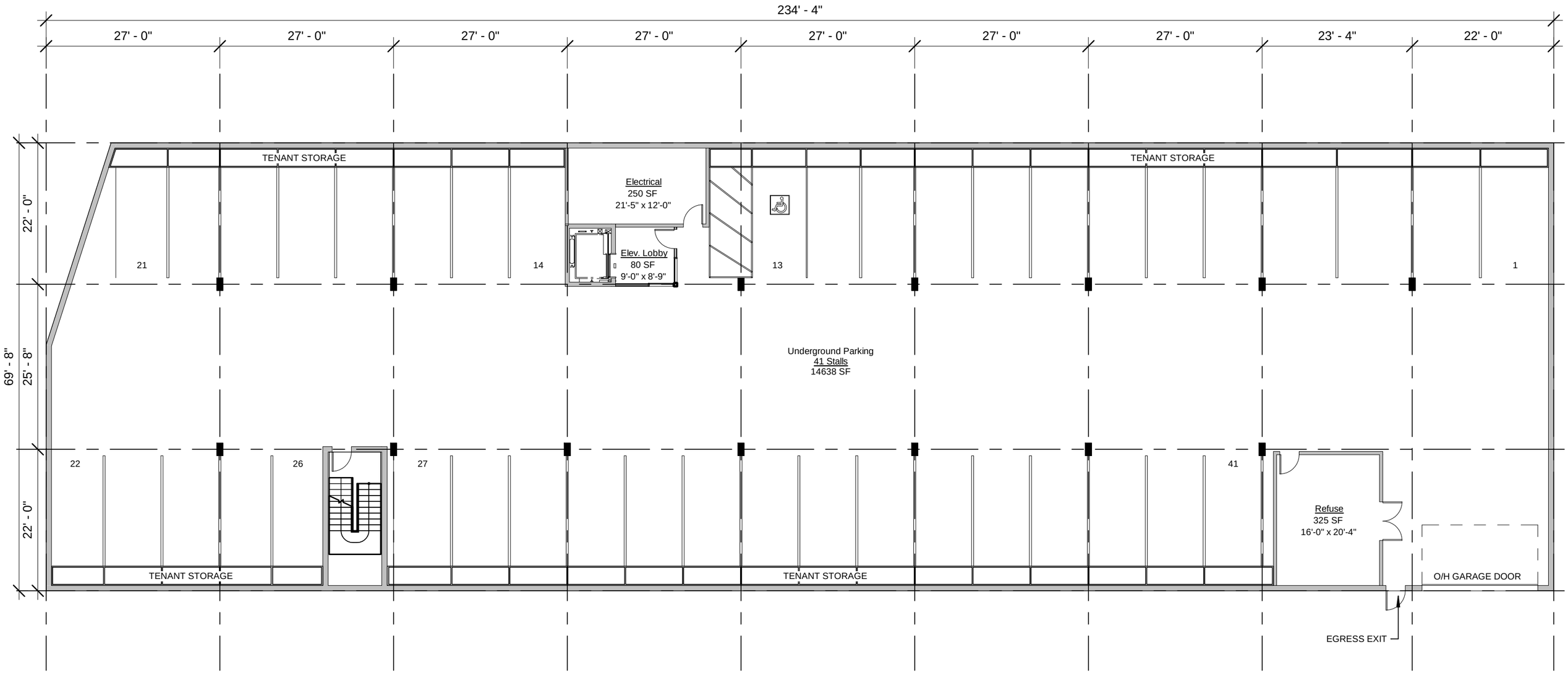
The key findings and recommendations of this Traffic Impact Statement are summarized as follows:

1. The proposed development, which would be located near the corner of Hampton Road and Highland Avenue, is a 4-storey apartment complex consisting of new 40 dwelling units. The proposed development plan shows 51 parking spaces, including 9 regular and 1 barrier-free surface level parking spaces and 40 regular and 1 barrier-free underground parking spaces. The development would include two accesses – one off Hillcrest Drive and one off Highland Avenue.
2. The LOS results for the 2021 existing scenario show that the intersections of Hampton Road / Hillcrest Drive and Hampton Road / Highland Avenue currently operate efficiently overall, however the eastbound approach at the Hampton Road / Highland Avenue intersection experiences some delay.
3. It is expected that the proposed development will generate 14 vehicle trips during the AM Peak hour (4 entering/10 exiting) and 18 vehicle trips during the PM Peak hour (11 entering/7 exiting) and a total of 218 trips daily.
4. The LOS results for the 2028 horizon period with the development in place indicate that delays at the eastbound approach of the Hampton Road / Highland Avenue intersection will increase slightly (3 - 4 seconds per vehicle); however the approach will remain below capacity and the intersection will continue to perform efficiently overall. Traffic signals are not warranted at the intersection in the 2028 horizon period. The intersection of Hampton Road / Hillcrest Drive and both development accesses are expected to operate efficiently with minimal delay during both peak periods.
5. Based on a review of the existing pedestrian facilities near the development property, the proposed sidewalk connections between the apartment building and the Hampton Road sidewalk should provide sufficient connectivity.
6. Commercial vehicles will be able to access the development via either of the proposed accesses. Delivery, moving and other service vehicles will be able to access the development from Highland Avenue at the buildings main entrance and garbage trucks will access the development from Hillcrest Drive through the underground parking facility.

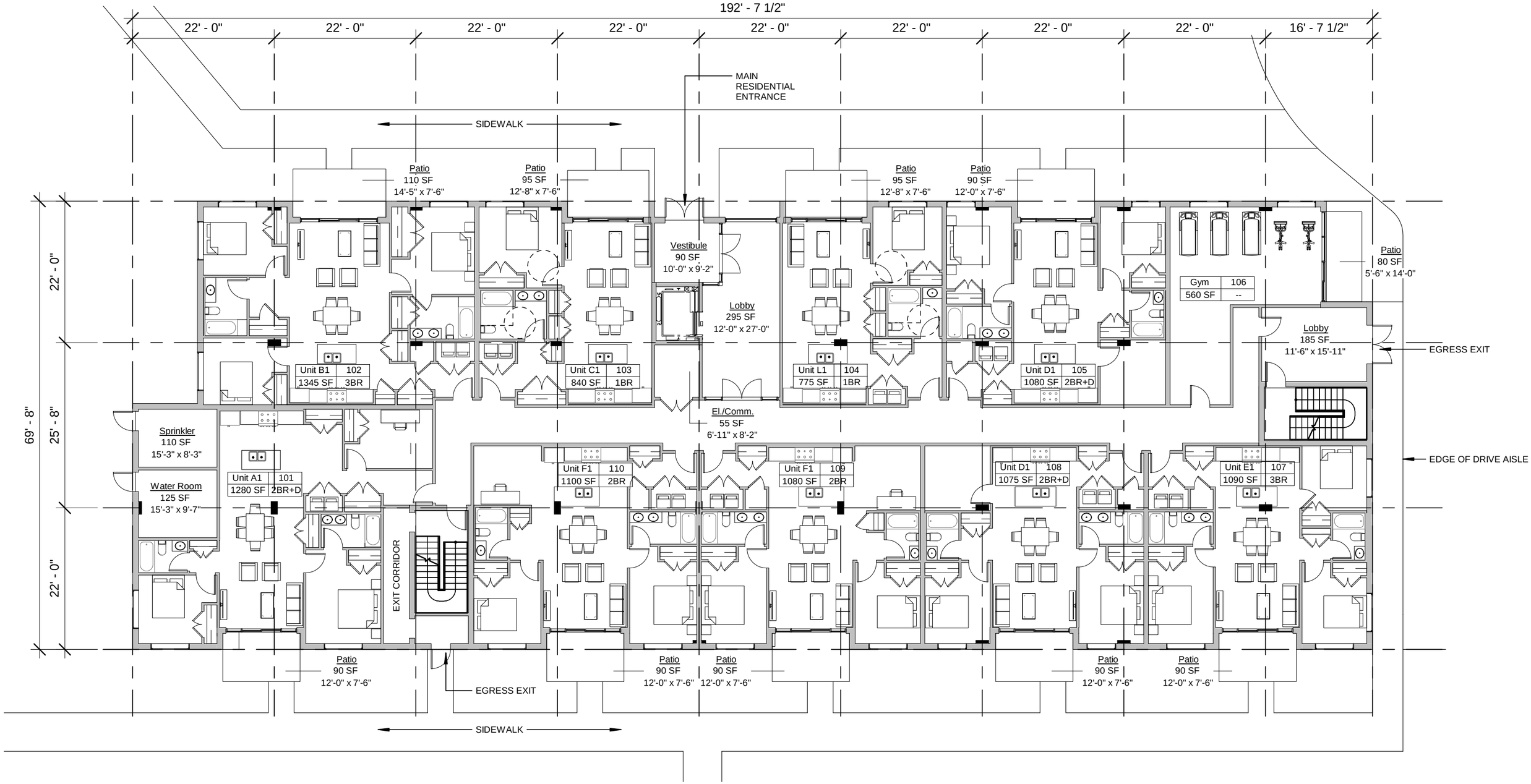
Appendix A: Development Site Plans



zzap architecture + planning 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca	CLIENT **LUKE MOFFETT**	PROJECT **40 UNIT APARTMENT BUILDING** Rothesay, NB	DRAWING **SITE PLAN**	PROJECT NO. **21-079** DRAWN BY: AS ISSUED FOR REVIEW DATE: JUNE 25, 2021 DRAWING NUMBER **SK-01**



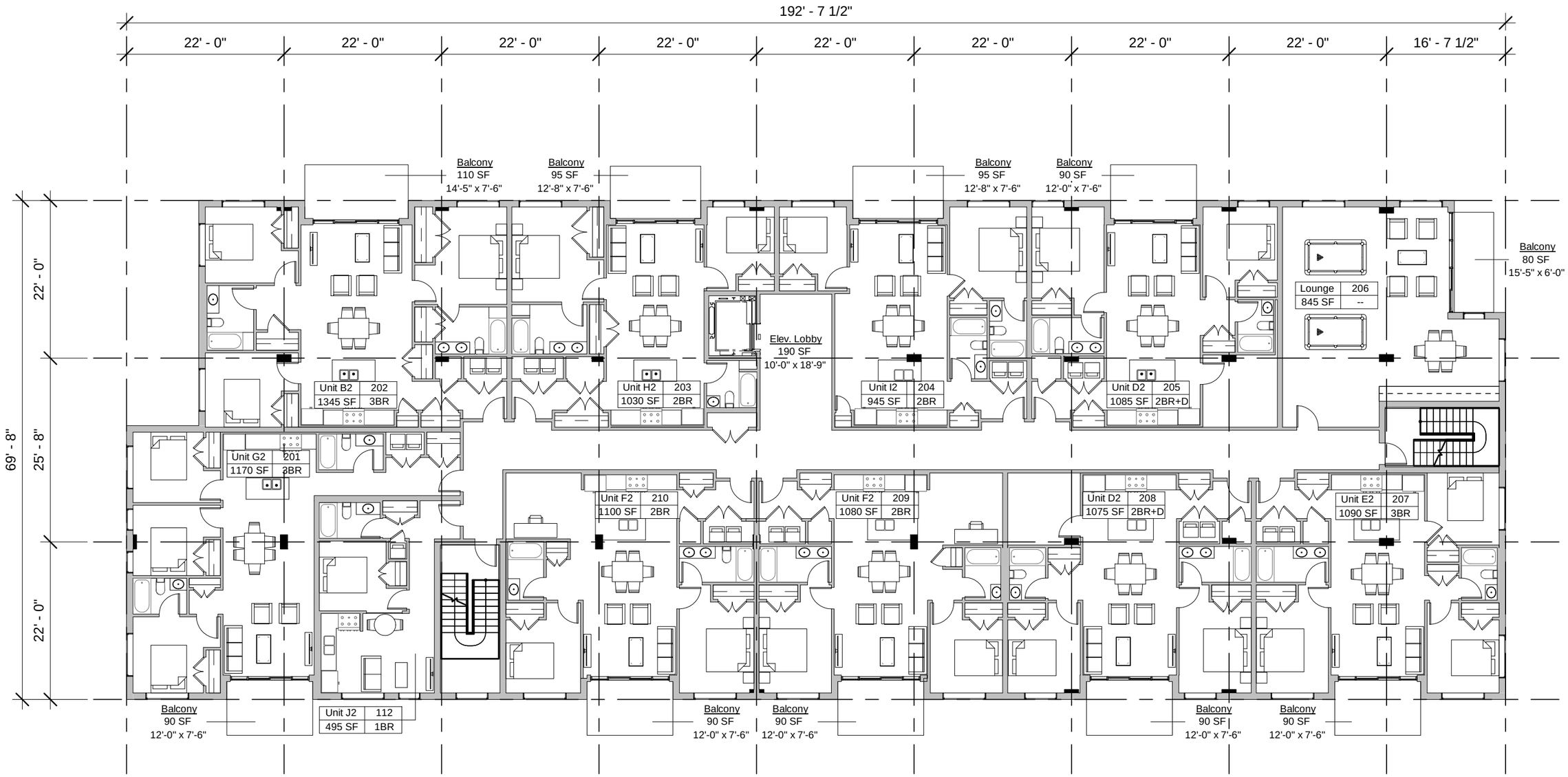
zzap architecture + planning 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca	CLIENT **LUKE MOFFETT**	PROJECT **40 UNIT APARTMENT BUILDING** Rothesay, NB	DRAWING **PROPOSED U/G PARKING FLOORPLAN**	PROJECT NO. **21-079** DRAWN BY: AS ISSUED FOR REVIEW DATE: JUNE 25, 2021 DRAWING NUMBER **SK-02**



zzap architecture + planning — 1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca	CLIENT: **LUKE MOFFETT**	PROJECT: **40 UNIT APARTMENT BUILDING** Rothesay, NB	DRAWING: **PROPOSED LEVEL 01 FLOOR PLAN**

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR REVIEW
DATE: JUNE 25, 2021

DRAWING NUMBER **SK-03**



zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

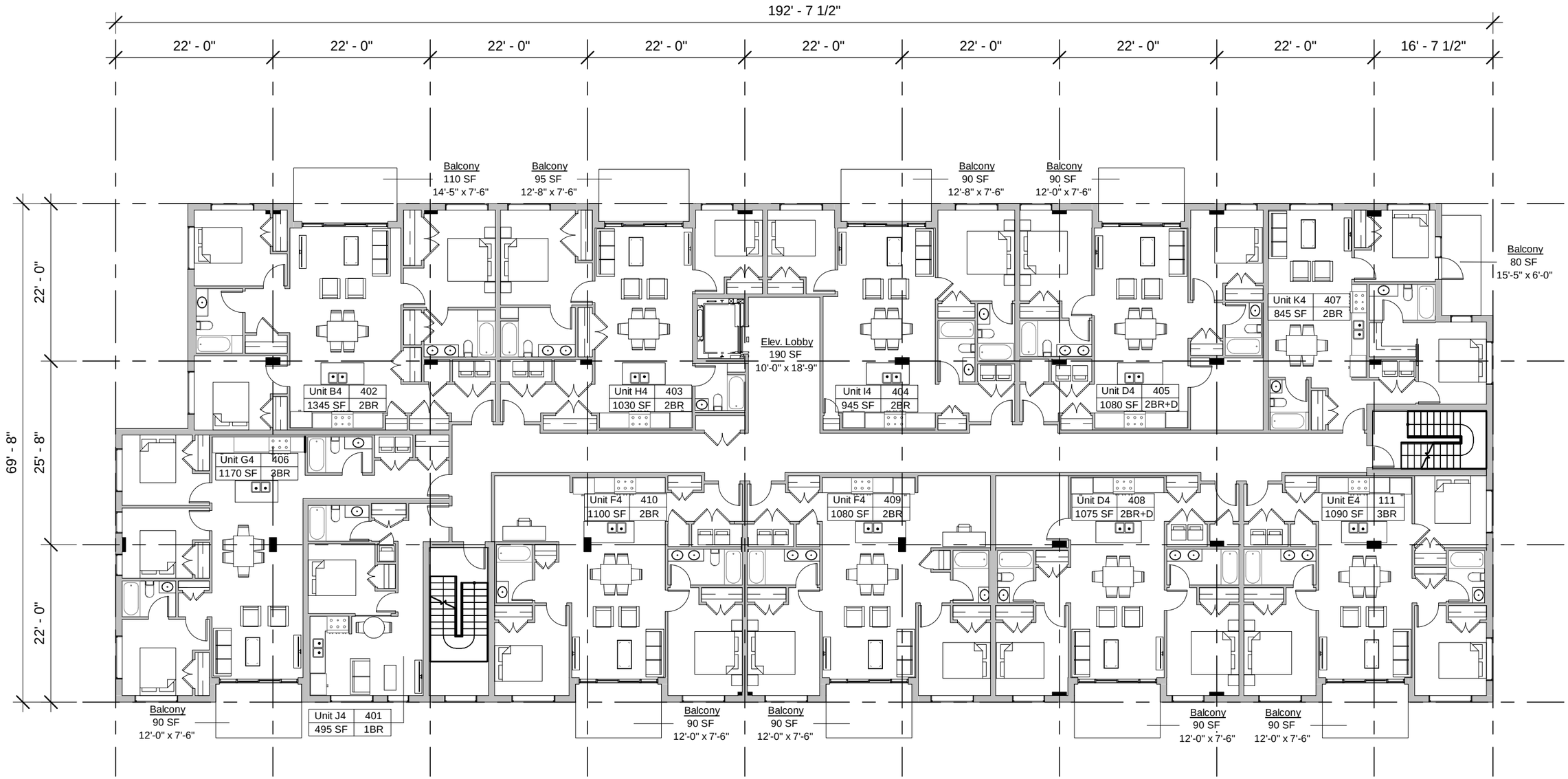
CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
PROPOSED LEVEL 02/03 FLOOR PLAN

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR REVIEW
DATE: JUNE 25, 2021

SCHEDULE
SK-04



zzap architecture + planning
1 Canal St, Dartmouth NS B2Y 2W1 | zzap.ca

CLIENT
LUKE MOFFETT

PROJECT
40 UNIT APARTMENT BUILDING
Rothesay, NB

DRAWING
PROPOSED LEVEL 04 FLOOR PLAN

PROJECT NO. **21-079**
DRAWN BY: AS
ISSUED FOR REVIEW
DATE: JUNE 25, 2021

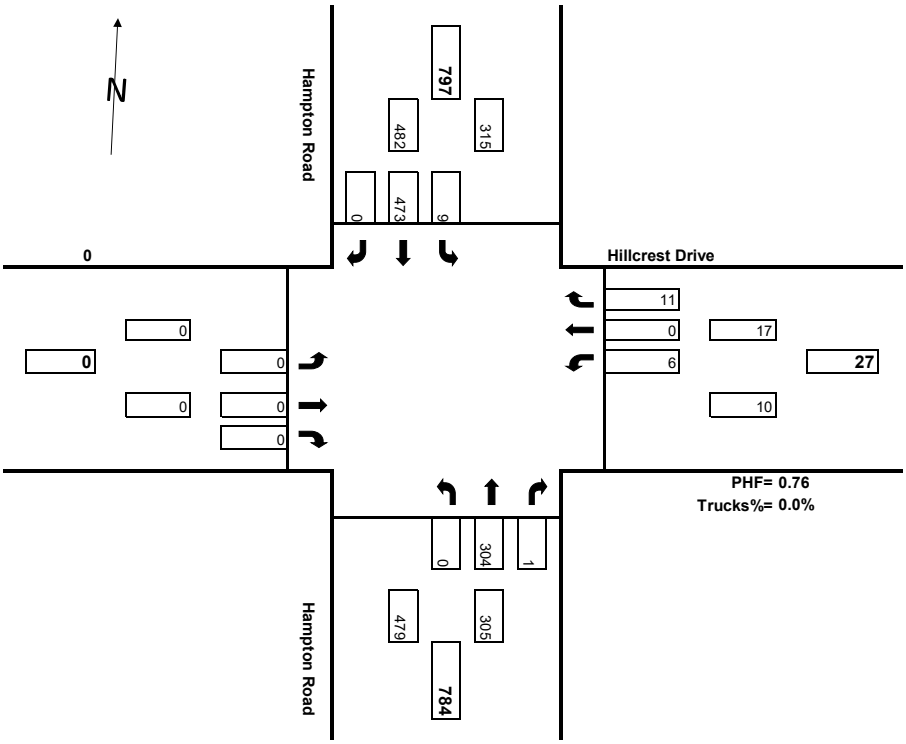
SCHEDULE
SK-05

Appendix B: Traffic Count Data

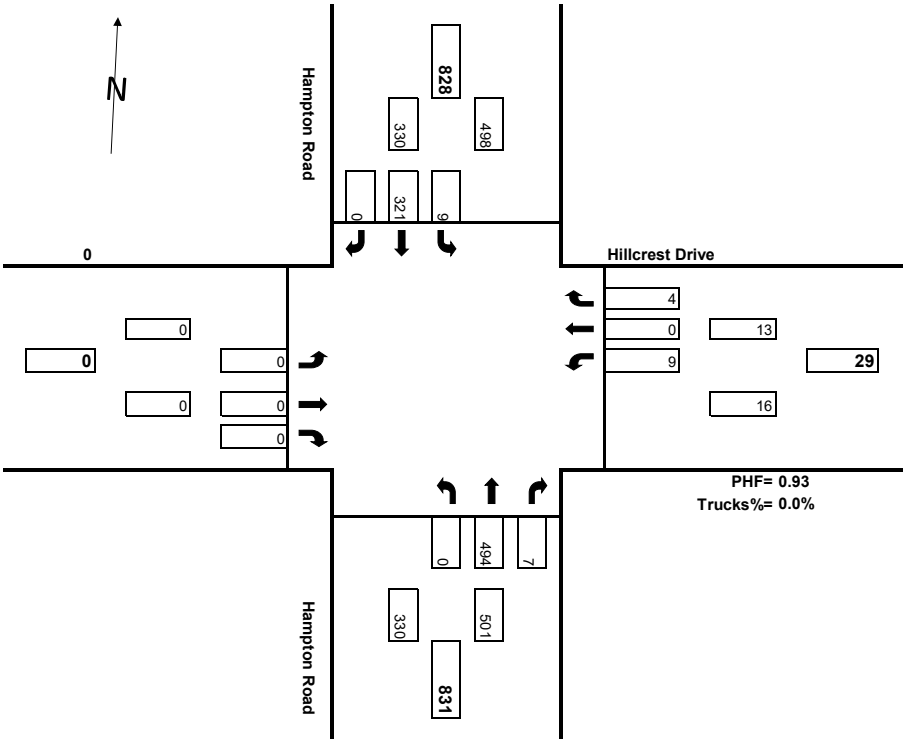
Traffic Count Summary
AM and PM Peak Hours

Hampton Road/Hillcrest Drive

AM Peak Hour 08:15 - 09:15



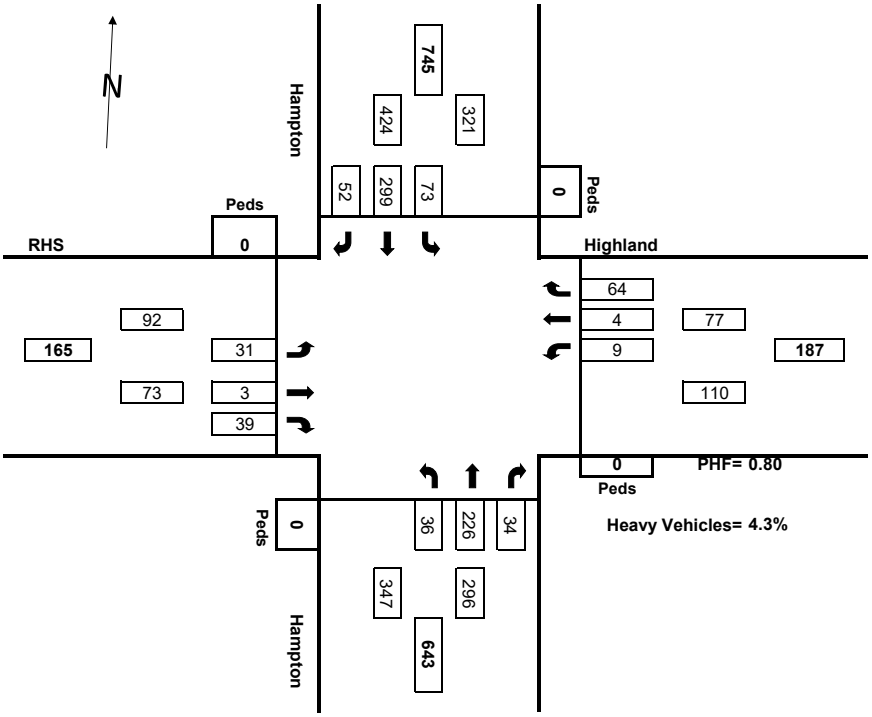
PM Peak Hour 16:00 - 17:00



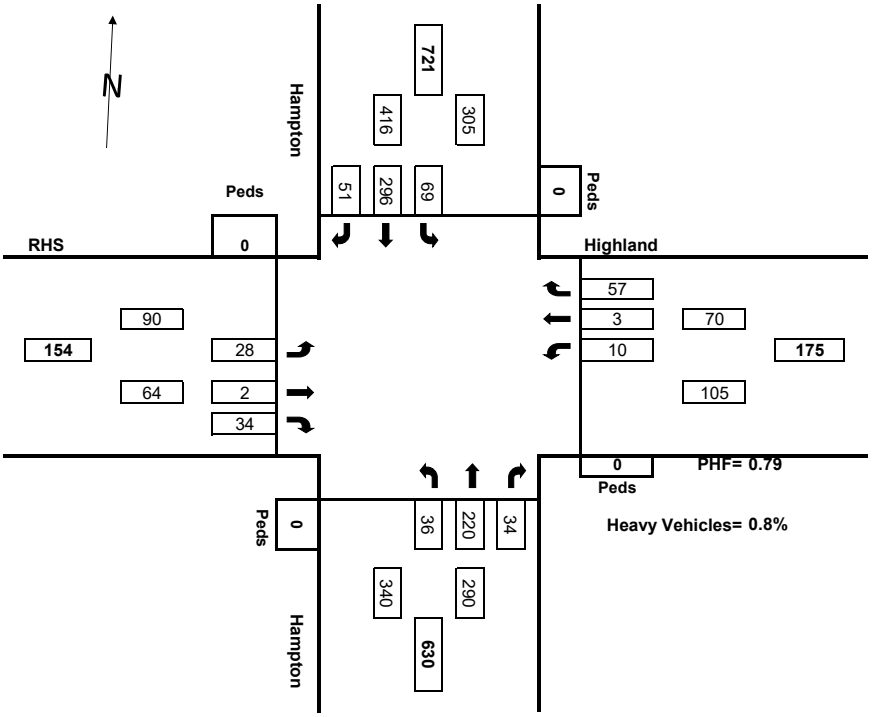
Traffic Count Summary
AM and PM Peak Hours

Hampton @ Highland

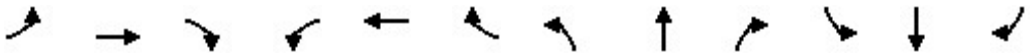
AM Peak Hour 07:45 - 08:45



PM Peak Hour 16:15 - 17:15



Appendix C: Level of Service Reports



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	4	50	12	5	82	46	289	44	93	383	67
Future Volume (Veh/h)	40	4	50	12	5	82	46	289	44	93	383	67
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	50	5	63	15	6	103	58	361	55	116	479	84
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1364	1285	521	1323	1300	388	563			416		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1364	1285	521	1323	1300	388	563			416		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	45	96	89	85	96	84	94			90		
cM capacity (veh/h)	91	140	557	102	137	662	1013			1148		

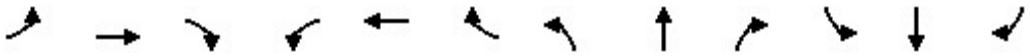
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	118	124	474	679
Volume Left	50	15	58	116
Volume Right	63	103	55	84
cSH	168	358	1013	1148
Volume to Capacity	0.70	0.35	0.06	0.10
Queue Length 95th (m)	33.7	12.1	1.5	2.7
Control Delay (s)	65.3	20.3	1.7	2.5
Lane LOS	F	C	A	A
Approach Delay (s)	65.3	20.3	1.7	2.5
Approach LOS	F	C		

Intersection Summary				
Average Delay	9.1			
Intersection Capacity Utilization	62.9%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	14	26	353	2	14	431
Future Volume (Veh/h)	14	26	353	2	14	431
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	18	34	464	3	18	567
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1068	466			467	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1068	466			467	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	94			98	
cM capacity (veh/h)	241	597			1094	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	52	467	585
Volume Left	18	0	18
Volume Right	34	3	0
cSH	395	1700	1094
Volume to Capacity	0.13	0.27	0.02
Queue Length 95th (m)	3.6	0.0	0.4
Control Delay (s)	15.5	0.0	0.5
Lane LOS	C		A
Approach Delay (s)	15.5	0.0	0.5
Approach LOS	C		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	3	43	13	4	71	45	375	43	86	370	64
Future Volume (Veh/h)	35	3	43	13	4	71	45	375	43	86	370	64
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	3	48	14	4	79	50	417	48	96	411	71
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1260	1204	446	1229	1215	441	482			465		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1260	1204	446	1229	1215	441	482			465		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	66	98	92	89	97	87	95			91		
cM capacity (veh/h)	114	161	614	127	159	618	1086			1102		

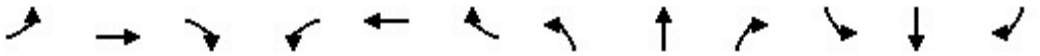
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	90	97	515	578
Volume Left	39	14	50	96
Volume Right	48	79	48	71
cSH	205	369	1086	1102
Volume to Capacity	0.44	0.26	0.05	0.09
Queue Length 95th (m)	16.4	8.3	1.2	2.3
Control Delay (s)	35.6	18.2	1.3	2.3
Lane LOS	E	C	A	A
Approach Delay (s)	35.6	18.2	1.3	2.3
Approach LOS	E	C		

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	62.4%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	8	455	17	21	405
Future Volume (Veh/h)	17	8	455	17	21	405
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	18	9	489	18	23	435
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	979	498			507	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	979	498			507	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	98			98	
cM capacity (veh/h)	271	572			1058	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	507	458
Volume Left	18	0	23
Volume Right	9	18	0
cSH	329	1700	1058
Volume to Capacity	0.08	0.30	0.02
Queue Length 95th (m)	2.1	0.0	0.5
Control Delay (s)	16.9	0.0	0.7
Lane LOS	C		A
Approach Delay (s)	16.9	0.0	0.7
Approach LOS	C		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	4	50	12	5	82	46	289	44	93	383	67
Future Volume (Veh/h)	40	4	50	12	5	82	46	289	44	93	383	67
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	54	5	67	16	7	110	62	387	59	124	512	90
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1459	1375	557	1415	1390	416	602			446		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1459	1375	557	1415	1390	416	602			446		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	27	96	87	81	94	83	94			89		
cM capacity (veh/h)	74	122	532	85	119	638	980			1120		

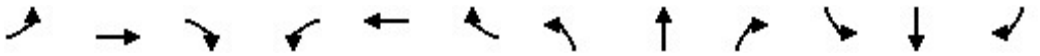
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	126	133	508	726
Volume Left	54	16	62	124
Volume Right	67	110	59	90
cSH	141	318	980	1120
Volume to Capacity	0.89	0.42	0.06	0.11
Queue Length 95th (m)	48.0	15.9	1.6	3.0
Control Delay (s)	110.6	24.2	1.8	2.7
Lane LOS	F	C	A	A
Approach Delay (s)	110.6	24.2	1.8	2.7
Approach LOS	F	C		

Intersection Summary				
Average Delay	13.4			
Intersection Capacity Utilization	66.3%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	28	378	2	15	462
Future Volume (Veh/h)	15	28	378	2	15	462
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	20	37	497	3	20	608
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1146	498			500	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1146	498			500	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	94			98	
cM capacity (veh/h)	216	572			1064	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	57	500	628
Volume Left	20	0	20
Volume Right	37	3	0
cSH	362	1700	1064
Volume to Capacity	0.16	0.29	0.02
Queue Length 95th (m)	4.4	0.0	0.5
Control Delay (s)	16.8	0.0	0.5
Lane LOS	C		A
Approach Delay (s)	16.8	0.0	0.5
Approach LOS	C		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	3	43	13	4	71	45	375	43	86	370	64
Future Volume (Veh/h)	35	3	43	13	4	71	45	375	43	86	370	64
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	42	4	51	15	5	84	54	446	51	102	440	76
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1348	1287	478	1314	1300	472	516			497		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1348	1287	478	1314	1300	472	516			497		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	56	97	91	86	96	86	95			90		
cM capacity (veh/h)	96	142	589	108	139	594	1055			1072		

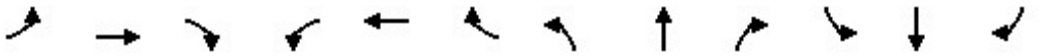
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	104	551	618
Volume Left	42	15	54	102
Volume Right	51	84	51	76
cSH	175	329	1055	1072
Volume to Capacity	0.55	0.32	0.05	0.10
Queue Length 95th (m)	23.0	10.6	1.3	2.5
Control Delay (s)	48.3	20.9	1.4	2.4
Lane LOS	E	C	A	A
Approach Delay (s)	48.3	20.9	1.4	2.4
Approach LOS	E	C		

Intersection Summary				
Average Delay	6.7			
Intersection Capacity Utilization	66.3%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	9	488	18	23	434
Future Volume (Veh/h)	18	9	488	18	23	434
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	19	10	525	19	25	467
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1052	534			544	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1052	534			544	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	98			98	
cM capacity (veh/h)	245	546			1025	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	29	544	492
Volume Left	19	0	25
Volume Right	10	19	0
cSH	302	1700	1025
Volume to Capacity	0.10	0.32	0.02
Queue Length 95th (m)	2.5	0.0	0.6
Control Delay (s)	18.2	0.0	0.7
Lane LOS	C		A
Approach Delay (s)	18.2	0.0	0.7
Approach LOS	C		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	4	54	14	5	89	49	314	47	101	411	72
Future Volume (Veh/h)	43	4	54	14	5	89	49	314	47	101	411	72
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	54	5	68	18	6	111	61	393	59	126	514	90
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1470	1385	559	1426	1400	422	604			452		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1470	1385	559	1426	1400	422	604			452		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	26	96	87	78	95	82	94			89		
cM capacity (veh/h)	73	120	530	84	117	633	979			1114		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	127	135	513	730
Volume Left	54	18	61	126
Volume Right	68	111	59	90
cSH	140	306	979	1114
Volume to Capacity	0.91	0.44	0.06	0.11
Queue Length 95th (m)	49.1	17.3	1.6	3.1
Control Delay (s)	114.5	25.8	1.7	2.7
Lane LOS	F	D	A	A
Approach Delay (s)	114.5	25.8	1.7	2.7
Approach LOS	F	D		

Intersection Summary				
Average Delay	13.9			
Intersection Capacity Utilization	67.0%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	151	1	0	106	2	0
Future Volume (Veh/h)	151	1	0	106	2	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	164	1	0	115	2	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			165		280	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		280	164
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1413		710	880

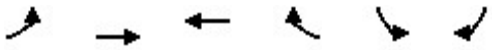
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	165	115	2
Volume Left	0	0	2
Volume Right	1	0	0
cSH	1700	1413	710
Volume to Capacity	0.10	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.0	10.1
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	32	378	4	15	463
Future Volume (Veh/h)	18	32	378	4	15	463
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	24	42	497	5	20	609
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1148	500			502	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1148	500			502	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	93			98	
cM capacity (veh/h)	215	571			1062	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	502	629
Volume Left	24	0	20
Volume Right	42	5	0
cSH	357	1700	1062
Volume to Capacity	0.18	0.30	0.02
Queue Length 95th (m)	5.3	0.0	0.5
Control Delay (s)	17.4	0.0	0.5
Lane LOS	C		A
Approach Delay (s)	17.4	0.0	0.5
Approach LOS	C		

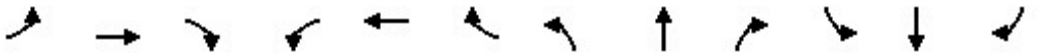
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	17	43	1	1	7
Future Volume (Veh/h)	2	17	43	1	1	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	18	47	1	1	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	48				70	48
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	48				70	48
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1559				934	1022

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	20	48	9
Volume Left	2	0	1
Volume Right	0	1	8
cSH	1559	1700	1011
Volume to Capacity	0.00	0.03	0.01
Queue Length 95th (m)	0.0	0.0	0.2
Control Delay (s)	0.7	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	3	46	14	4	77	48	404	47	93	401	93
Future Volume (Veh/h)	38	3	46	14	4	77	48	404	47	93	401	93
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	42	3	51	16	4	86	53	449	52	103	446	103
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1372	1310	498	1337	1336	475	549			501		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1372	1310	498	1337	1336	475	549			501		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	54	98	91	85	97	85	95			90		
cM capacity (veh/h)	92	137	575	104	132	592	1026			1068		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	96	106	554	652
Volume Left	42	16	53	103
Volume Right	51	86	52	103
cSH	169	322	1026	1068
Volume to Capacity	0.57	0.33	0.05	0.10
Queue Length 95th (m)	23.7	11.2	1.3	2.6
Control Delay (s)	51.0	21.5	1.4	2.4
Lane LOS	F	C	A	A
Approach Delay (s)	51.0	21.5	1.4	2.4
Approach LOS	F	C		

Intersection Summary				
Average Delay	6.8			
Intersection Capacity Utilization	68.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	141	2	0	94	1	0
Future Volume (Veh/h)	141	2	0	94	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	153	2	0	102	1	0
Pedestrians					141	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					12	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			296		397	295
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			296		397	295
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1117		537	657

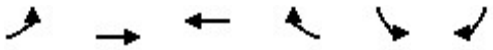
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	155	102	1
Volume Left	0	0	1
Volume Right	2	0	0
cSH	1700	1117	537
Volume to Capacity	0.09	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	11.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	21	11	488	20	27	434
Future Volume (Veh/h)	21	11	488	20	27	434
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	23	12	525	22	29	467
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1061	536			547	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1061	536			547	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	98			97	
cM capacity (veh/h)	241	545			1022	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	35	547	496
Volume Left	23	0	29
Volume Right	12	22	0
cSH	298	1700	1022
Volume to Capacity	0.12	0.32	0.03
Queue Length 95th (m)	3.2	0.0	0.7
Control Delay (s)	18.7	0.0	0.8
Lane LOS	C		A
Approach Delay (s)	18.7	0.0	0.8
Approach LOS	C		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	41	27	3	1	5
Future Volume (Veh/h)	6	41	27	3	1	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	45	29	3	1	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	32				90	30
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	32				90	30
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1580				907	1044

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	52	32	6
Volume Left	7	0	1
Volume Right	0	3	5
cSH	1580	1700	1018
Volume to Capacity	0.00	0.02	0.01
Queue Length 95th (m)	0.1	0.0	0.1
Control Delay (s)	1.0	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	1.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	17.2%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D: Signal Warrant Worksheet

Town of Rothesay - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hampton Rd	Direction (EW or NS)	NS	Road Authority:	Town of Rothesay
Side Street (name)	Highland Ave	Direction (EW or NS)	EW	City:	Rothesay
Quadrant / Int #		Comments	2028 without Development	Analysis Date:	2021 May 06, Thu
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	2021 Apr 27, Tue
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	UpStream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hampton Rd	NB				1				1,000	1	perm	y	y
Hampton Rd	SB				1				550	1	perm	y	y
Highland Ave	WB				1				1,000	1	perm	y	y
Highland Ave	EB				1				1,000	1	perm	y	y

Saturation Flow Rates (if not default) (vphpl)		Default Saturation Flow Rates (vphpl)
Left Turn		1,650
Through		1,800
Right Turn		1,500

Are the Highland Ave WB right turns significantly impeded by through movements? (y/n)	n
Are the Highland Ave EB right turns significantly impeded by through movements? (y/n)	n
Are the Hampton Rd NB right turns significantly impeded by through movements? (y/n)	n
Are the Hampton Rd SB right turns significantly impeded by through movements? (y/n)	n

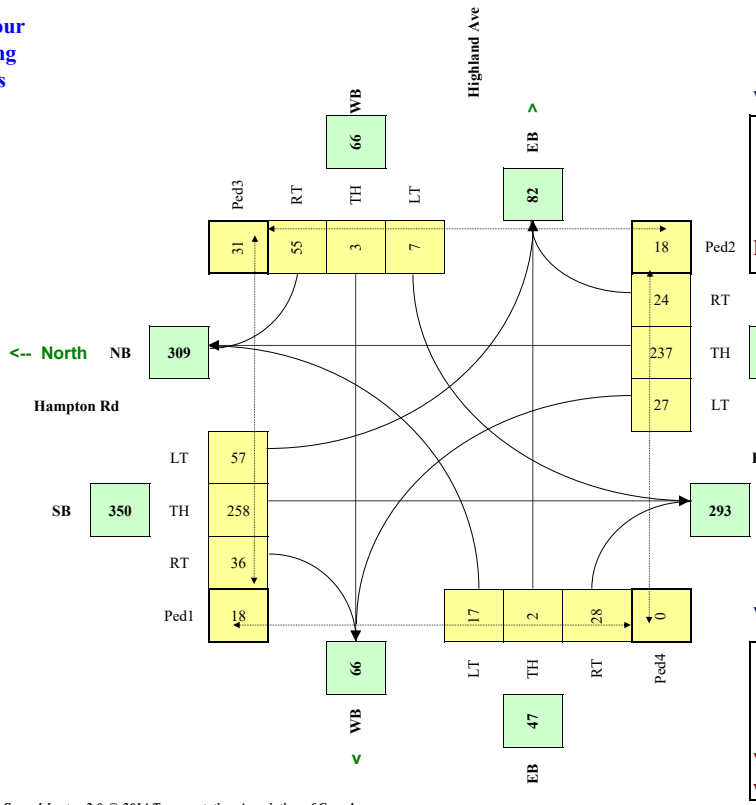
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	11,659
Central Business District	(y/n)	y

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hampton Rd	NS	50	2.0%	n	0.0
Highland Ave	EW	40	2.0%	n	0.0

Set Peak Hours

Traffic Input		NB			SB			WB			EB			Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
		LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
7:00 - 8:00		26	228	35	83	326	40	9	2	72	16	2	28	20	20	40	
		24	194	6	14	167	26	3	4	18	33	3	28	20	20	40	
		30	177	30	73	271	39	9	4	77	4	0	29	20	20	30	
		32	189	32	78	291	43	9	5	84	5	0	30	20	20	30	
		26	330	35	77	322	39	10	2	63	14	1	24	15	15	30	
		24	303	6	14	168	26	4	3	17	32	3	27	15	15	15	
Total (6-hour peak)		162	1,421	144	339	1,545	213	44	20	331	104	9	166	110	110	185	0
Average (6-hour peak)		27	237	24	57	258	36	7	3	55	17	2	28	18	18	31	0
														Actual Pedestrian Crossing Distance (m)			

Average 6-hour Peak Turning Movements



$W_{SIG} = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$

W =	53	29	24
		Veh	*Ped*

Not Warranted - Vs<75

RESET SHEET

$W_{PED} = [F ((Xped_m)d_m/K_2) + (Xped_s)d_s/K_3)]$

W = 27

Warranted – Actuated Side St and wide intersection

506.433.4427 (Sussex)
506.652.1522 (Saint John)
info@dmse.ca
www.dmse.ca

Ref: 20010-WaterDemands

November 23, 2021

Mr. McLean,

Re: 4 Hillcrest Drive - Water Demands - Luke Moffett

Don-More Surveys & Engineering Ltd. (Don-More) has been engaged to perform hydrant flow testing and analyse available flows relative to projected demands for a proposed new development located at 4 Hillcrest Drive.

We understand the proposed development is a 4 story building. There are 40 proposed apartment units.

Using the Fire Underwriters Survey 1999 version, we can calculate the projected firefighting demands for the building. Full calculations are included in Appendix A. From this we see for non-combustible construction a peak demand of 985gpm, and for limited combustible construction a peak demand of 1116gpm.

We can then calculate the peak domestic demands for the building. 40 residential units create a max hourly demand of 19gpm.

A hydrant flow test was conducted on November 23, 2021. Details of this test are included in schedule B.

Looking at a total combined projected demand of 1135gpm (1116gpm+19gpm), and comparing to the hydrant flow test we see a projected system pressure of about 40psi at peak demand. This is considered acceptable and based on this information we feel the system will support this development.

Closing

We trust this is sufficient for your present needs. Please feel free to contact the undersigned at 506.636.2136 or at at@dmse.ca for any additional information or clarification.

Yours truly,

Don-More Surveys & Engineering Ltd.

Andrew Toole

Andrew Toole, NBLS, P.Eng.

Appendix A

Projected Flow Calculations

T 506.433.4427
T 506.652.1522
4-60 Maple Avenue, Sussex, NB E4E 2N5
16 Fulton Lane, Saint John, NB E2H 2W4
www.dmse.ca
info@dmse.com

Fire Flow Calculations
20010 Hilcrest

From "Fire Underwriters Survey- 1999 Water Supply for Public Fire Protection"

F= 220C√A

where: F= required fire flow in litres per minute (LPM)
C= Coefficient related to the tyoe of construction
A= Total floor area (m²)

Part 1: Determining an Esitmate of Fire Flow

Assuming fire resistive construction (**C=0.6**)

Note: For fire resistive buildings, consider the two largest ajoinging floors plus 50% of each floor immediatley above them.

A= 1157.8 + 1157.8 + 1157.8*0.5 = **2894.5 m²** ***(This assumes ground floor parking is ignored as it is at least 50% buried)***

F= **7101.67 LPM**

Part 2: Reduction for Non-Combustible or Limited Combustible

For Non-Combustible (-25%)	**F=**	**5326.26**	**LPM**
For Limited Combustible (-15%)	**F=**	**6036.42**	**LPM**

Part 3: Reduction for Sprinklers (-30%)

For Non-Combustible	**F=**	**3728.38**	**LPM**
For Limited Combustible	**F=**	**4225.50**	**LPM**

Range of Demands depending on Non-Combustible vs Limited Combustible:

985.0	**GPM**
1116.4	**GPM**

Note: The are additional reductions related to sprinklers therefore this should be considered a consetvative flow rate

Domestic Demand Calculations

20010 Hilcrest

Units	40	Units
Population	100	Persons (2.5 people/unit)
Site area	N/A	m²

Domestic Demands

Average Daily Demand	410	L/person				
Max daily demand	680	L/person				
Max hourly demand	1025	L/person				
Avg Day	0.475	l/s	28.5	l/min	7.5	Gal/min (US)
Max day	0.787	l/s	47.2	l/min	12.5	Gal/min (US)
Max hour	1.186	l/s	71.2	l/min	18.8	Gal/min (US)

Appendix B

Hydrant Flow Test

T 506.433.4427
T 506.652.1522
4-60 Maple Avenue, Sussex, NB E4E 2N5
16 Fulton Lane, Saint John, NB E2H 2W4
www.dmse.ca
info@dmse.com

Project:	**Luke Moffett**
Date:	**November 23, 2021**
Location:	**Hillcrest Drive, Rothesay**

DON - MORE
SURVEYS & ENGINEERING LTD.

System Info:

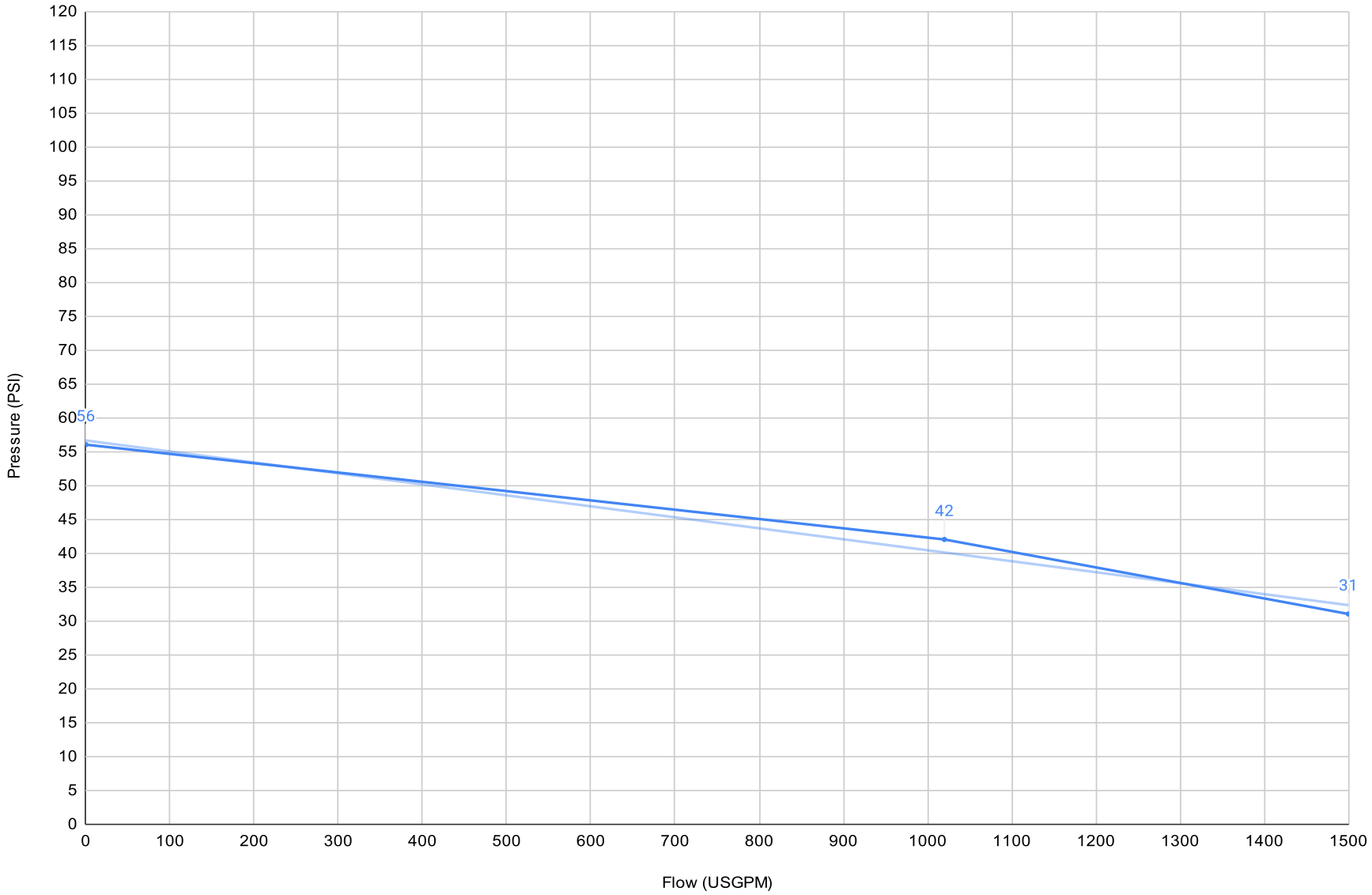
Pipe size:	200mm
Looped:	Yes
Notes:	

Test Data:

Residual Hydrant:	Northeast of Rothesay High School
Flow Hydrant:	Intersection of Hillcrest & Hampton Roads
Static pressure:	56 psi
Time of Test:	9:50 AM
Pitot coefficent:	0.88

Test #	# of outlets	Orifice sizes (inches)	Pitot readings (psi)	Equivalent flow (usgpm)	Total flow (usgpm)	Residual Pressure (psi)
0	0			0	0	56
1	1	2.5	39	1020	1020	42
2	2	2.5	21	750	1500	31
3	1	2.5		0	0	
4	2	2.5		0	0	
5	1	2.5		0	0	
6	2	2.5		0	0	

Water Flow Test Summary



2021November30PACStaffRptHighland/Hillcrest_102