



**ENGINEERING INFRASTRUCTURE REPORT  
FOR PROPOSED MIXED-USE DEVELOPMENT  
AT 13-15 MORGAN STREET & 10 CLAYTON  
STREET, NEWMARKET  
FOR SOUTHPARK CORPORATION  
-ISSUED FOR PROPOSED PLAN CHANGE-**

Job No | 40696  
Date | March 2020

## Document History and Status

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Job Manager: Craig Horwood  
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Name of Job: Mixed-Use Development  
Location of Job: 13-15 Morgan Street & 10 Clayton Street, Newmarket  
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## CONTENTS

<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1. Engagement .....	1
1.2. Background.....	1
1.3. Aim.....	1
<b>2. PLAN CHANGE AREA DESCRIPTION AND LAYOUT .....</b>	<b>2</b>
2.1. Plan Change Area Description .....	2
2.2. Topography.....	2
<b>3. PROPOSED DEVELOPMENT .....</b>	<b>3</b>
3.1. Common Access.....	3
3.2. Basements.....	3
3.3. Mixed Use Development.....	3
3.4. Future Consent Requirements.....	4
<b>4. STORMWATER DRAINAGE .....</b>	<b>5</b>
4.1. Public Primary Stormwater (10 Year Piped Flow) .....	5
4.2. Overland Flow Paths .....	5
<b>5. WASTEWATER INFRASTRUCTURE .....</b>	<b>8</b>
5.1. Existing Public Wastewater Infrastructure .....	8
5.2. Proposed Wastewater Infrastructure .....	8
<b>6. POTABLE WATER INFRASTRUCTURE .....</b>	<b>9</b>
<b>7. POWER SUPPLY AND TELECOMMUNICATION.....</b>	<b>10</b>
<b>8. CONCLUSION.....</b>	<b>11</b>

## APENDICES

### Appendix A

#### MSC Consulting Group Ltd

Existing Site Plan	Drawing RC100
Proposed Ground Floor Plan (Development Scenario)	Drawing RC300
Proposed Basement B2 Plan (Development Scenario)	Drawing RC301
Proposed Basement B3 Plan (Development Scenario)	Drawing RC302
Proposed Basement B4 Plan (Development Scenario)	Drawing RC303
<u>Proposed Drainage Plan (Development Scenario)</u>	<u>Drawing RC400</u>
OLFP Diversion Plan (Development Scenario)	Drawing RC410

#### Warren and Mahoney

Masterplan Ground Level (Development Scenario)
Typical West – East Section (Development Scenario)
Typical North – South Section (Development Scenario)

### Appendix B

Auckland Council Flood Mapping Plan

### Appendix C

Pre-Development and Post Development Stormwater Flow Calculations
Stormwater Network Capacity Assessment
Wastewater Discharge Calculation
Wastewater Network Capacity Assessment

### Appendix D

OLFP Catchment - OLFP 2 (Auckland Council GIS Database)
OLFP Calculations – OLFP 2



## 1. INTRODUCTION

### 1.1. Engagement

MSC Consulting Group (MSC) has been engaged by Southpark Corporation (Southpark) to undertake an assessment of the infrastructural and land management requirements for a proposed plan change which will enable a mixed-use development across various properties with existing frontages to George Street (33-37 George Street), Morgan Street (13-15 Morgan Street) and 10 Clayton Street.

The project will be referenced as 33-37 George Street, Newmarket, Auckland.

### 1.2. Background

Southpark is proposing to develop a parcel of land to create a mixed-use development including residential apartments, retail, and office components and parking facilities.

The total site area is 7,873m<sup>2</sup> encompassing 2x individual titles.

The Plan Change development will introduce the George Street Precinct which will enable a variety of heights allowing for high-rise development on top of the shared podium. An indicative architectural package has been prepared by Warren and Mahoney Architects to illustrate a development scenario complying with the relevant provisions and assessment criteria within the George Street Precinct. In particular these relate to building design and external appearance, pedestrian connections and the plaza, activated edges and vehicle access and parking. The architectural plans and renderings are indicative only of the height, bulk, massing and high quality of the design and materials envisaged within the Precinct.

The concept by Warren and Mahoney Architects includes four towers referenced as Tower A, Tower B, Tower C and Tower D.

Tower A: 18 levels including two levels of basement

Tower B: 10 levels including four levels of basement

Tower C: 13 levels including four levels of basement

Tower D: 10 levels including two levels of basement

Under the Warren and Mahoney concept basement levels B1, B2, B3, B4 and a portion of the ground floor will be allocated for car parking. The retail area will be on the ground floor and a supermarket will be located on Level B3 Basement.

The Warren and Mahoney concept indicates that all other areas will be allocated for residential units and the total floor area will be 55,286m<sup>2</sup>.

The George Street Precinct limits vehicle access to identified vehicle access points on George Street, Morgan Street and Clayton Street.

The existing 7,873m<sup>2</sup> site is proposed to be fully developed.

An Existing Site Plan, DWG RC100, is included in Appendix A.

### 1.3. Aim

The purpose of this report is to provide information on the civil engineering aspects of the development which includes stormwater drainage, stormwater overland flow paths, wastewater drainage, potable water, power, communications and firefighting water supply.

This report provides evidence in support of Southparks Plan Change request.

## 2. PLAN CHANGE AREA DESCRIPTION AND LAYOUT

### 2.1. Plan Change Area Description

The Plan Change area is located at 33-37 George Street, Newmarket, Auckland.

The Plan Change area is currently fully developed and the total site area of 7,834m<sup>2</sup> is currently 100% impervious through a combination of roofs and either seal or concrete surfaced pavement areas.

The Plan Change area is located in a Business – Mixed Use Zone and is immediately surrounded by the following:

**North:** immediately north is George Street and further north is the Auckland Domain.

**East:** immediately east is 39 and 47 George Street.

**South:** immediately south is a variety of businesses and Clayton Street.

**West:** immediately west is south is a variety of businesses and Morgan Street.



Figure 1: Existing Site Layout (From Council's GeoMaps)

### 2.2. Topography

The Plan Change area is irregular in shape with a maximum length (north to south) of approximately 113m and maximum width (east to west) of approximately 113m. The Plan Change area generally falls from southeast to northwest from RL 55.5m down to RL 68.0m. Average gradients at the site are approximately 11% (1v:9h).

### 3. PROPOSED DEVELOPMENT

An indicative architectural package has been prepared by Warren and Mahoney Architects to illustrate a development scenario complying with the relevant provisions and assessment criteria within the George Street Precinct.

The proposed development concept is shown on the Proposed Site Plan, DWG RC101 in Appendix A.

The development incorporates the following key elements detailed as following:

#### 3.1. Common Access

It is proposed to provide at-grade vehicular access to the site from the two main streets bounding the Plan Change area.

There will be one vehicular access point (in/out) from George Street, one vehicular access point (out only) from Clayton Street and two vehicular access points (in/out) from Morgan Street. This will provide access for parking and vehicle movement within the four levels of parking proposed as part of the development.

Pedestrian access will be from George Street from Clayton Street, Morgan Street and Clayton Street. There will be two pedestrian access points at George Street as well as one access point at Morgan and Clayton Streets.

#### 3.2. Basements

The development scenario incorporates four levels of basement parking. Some will be above the existing ground level at the perimeter of the site whilst other areas will be below the existing ground level. This will require the construction of retaining walls which will be incorporated into the building structure.

The structural retaining walls will be used to retain material outside the basement, within the Plan Change area boundary. The lowest basement level (Level B4 Basement) is set at a level of RL 52.5m.

#### 3.3. Mixed Use Development

Under the Warren and Mahoney concept the proposal is to develop a parcel of land to create 324 apartments, and 3,297m<sup>2</sup> of commercial space, spread over four blocks.

The concept incorporates four levels of basement car parking, a supermarket, retail area, food and beverage area and a gymnasium at ground floor. Ground Floor Level to Level L15 will be residential apartments.

The concept will be accessed by vehicles from George Street and Morgan Street bounding by the development. There will be four separate pedestrian access points from George Street, Morgan Street and Clayton Street.

All development blocks share the four levels of basement car parking. The proposed Plan Change area is broken down into the following development levels:

Basement 4	RL 52.5m
Basement 3	RL 55.5m
Basement 2	RL 60.0m
Basement 1	RL 63.0m
Ground	RL 66.0m

---

Tower A	18 levels including two levels in basement
Tower B	10 levels including four levels in basement
Tower C	13 levels including four levels in basement
Tower D	10 levels including two levels in basement

### **3.4. Future Consent Requirements**

#### **Engineering Plan Approvals Required from Auckland Council**

- Stormwater connection/s

#### **Network Connection Approval Required from Watercare Services Ltd**

- Wastewater Connection/s

#### **Building Consent from Auckland Council**

- Stormwater reticulation
- Wastewater reticulation
- New potable water connections

#### **Approval Required from Auckland Council**

- Vehicle crossing applications

## 4. STORMWATER DRAINAGE

### 4.1. Public Primary Stormwater (10 Year Piped Flow)

#### Public Stormwater Infrastructure

The Auckland Council GeoMaps identifies existing public networks located within the Plan Change area.

There are three main public lines, three stormwater manholes and four cesspits located within the Plan Change area. The two main public networks will be abandoned as a result of the new development. It is proposed to keep existing 150mm diameter public pipe which is running from manhole ACC\_1313288\_NL1049 to ACC\_1312771\_NL1051.

The pre development Stormwater (SW) runoff from site is calculated as 249.5l/s. The post development SW runoff is calculated at 237.6l/s.

A capacity check of the downstream SW public pipe network has been carried out and there is sufficient capacity available within the SW network to cater for the development enabled by the Plan Change.

SW calculations are attached under Appendix C.

#### Proposed Stormwater Infrastructure

It is proposed to abandon the existing stormwater network within the property and construct a new stormwater network as per the proposed drainage plan shown on drawing RC 400 in Appendix A.

The approval of 2x adjacent property owners will be required for the proposed changes to the SW reticulation.

### 4.2. Overland Flow Paths

The Auckland Council GeoMaps identifies the overland flow path routes and areas of land likely to be affected by stormwater flooding. There are four overland flow paths crossing the Plan Change area.

Overland Flow Path 1: enters the property at northern boundary. This has upstream catchment of 6,268m<sup>2</sup>.

Based on our calculations, the 1% AEP overland flow path will have a flow of 0.125m<sup>3</sup>/s at the road kerb in front of 39 George Street. The typical road cross section across George Street has been considered in the calculation and water depth at the kerb face will be 50mm. This overland flow will not enter into the accessway of 39 George Street and will continue to flow east along George Street.

The proposed development will have no effect on the overland flowpath or any impact on downstream properties.

Overland Flow Path 2: enters the property at eastern boundary and has upstream catchment of 50,096m<sup>2</sup>.

This overland flow path cannot enter into the property as detailed as it is obstructed by the existing building at 47 George Street. The overland flow will flow towards the southern boundary of 47 George Street and exit at the low point located at southwest corner of the same property. The overland flow will then flow along the existing accessway at the southern boundary and then travel towards Clayton Street.

Details of the flow path are shown on the OLFP Details drawing, DWG RC4111 in Appendix A

No additional flow will be contributed to this overland flow as a result of the new development.

The proposed development will have no effect on the overland flowpath or any impact on downstream properties.

We have calculated the depth of flow across the driveway ramp where the overland flowpath travels under the proposed development.

Based on information obtained from the Auckland Council GIS (GeoMaps) website:

Upstream catchment area: 5.70 ha.

Calculated Flow: 1.69 m<sup>3</sup>/sec

Depth of Flow Across Ramp 70mm

Details and the calculation are included under Appendix D.

Overland Flow Path 3: starts within the property near the southern boundary.

This small overland flow path has an upstream catchment of 2700m<sup>2</sup> (<4000m<sup>2</sup>) and it is outside of the definition of overland flow path.

Overland Flow Path 4: starts within the property at the western boundary.

The overland flow path presumably has an upstream catchment of 4,524m<sup>2</sup>.

This is not possible given the existing building inhibiting the overland flow path route. This overland flow path does not exist as detailed in GeoMaps.

The proposed development will have no effect on the overland flowpath or any impact on downstream properties.

### 4.3. Assessment of E1.3 (9)

We provide the following assessment with respect to E1.3 (9) of the Unitary Plan

a. High contaminant generating carparks/roads

N/a in this case. Although the 'Ground Level' of the development includes an access road from George Street this is not considered to be a high contaminant generating road. A carpark is not detailed at 'Ground Level'.

It is proposed to install Enviropod filters (or similar) into any catchpits draining the access road.

b. Gross Pollutants

Refer a. above – it is proposed that Enviropod filters (or similar) be installed into the catchpits draining the carpark and accessway areas

c. Reduce Peak Flow Rates

- i) within SMAF areas  
N/A - not within a SMAF area
- ii) coverage impervious  
N/A coverage is compliant
- iii) flooding / rivers and streams  
N/A

d. Large Scale / Freshwater Systems

N/A for this development – no freshwater systems impacted

e. Appropriate SW Infrastructure

N/A for this development

#### **4.4. Consultation – Healthy Waters**

Consultation with Healthy Waters will occur at the appropriate time within the approval process.

We presume Healthy Waters have been made aware of the project by Auckland Council as a result of the Plan Change Application.

## 5. WASTEWATER INFRASTRUCTURE

### 5.1. Existing Public Wastewater Infrastructure

The Auckland Council GeoMaps identifies two public wastewater networks within the Plan Change area.

A 150 mm diameter public wastewater line enters via the northern boundary of the site into the manhole “GIS ID 533853”. Another 150mm pipe running along the northern boundary will connect to the same manhole. The outlet pipe from the manhole “GIS ID 863669” and manhole “GIS ID 533853” will connect to one manhole “GIS ID 515154” which is located within the site. This line is then upsized to 300mm diameter pipe and connected to the manhole “GIS ID 515155” located at the southern boundary.

The second wastewater network starts with 150mm diameter pipe at western side of the property boundary and connects to the wastewater chamber and then to the manhole “GIS ID 515155”. The above two networks join at the manhole “GIS ID 515155” and then continue to Clayton Street.

### 5.2. Proposed Wastewater Infrastructure

It is proposed to abandon the existing wastewater network within the property and construct a new wastewater network as per the proposed drainage plan shown on drawing RC 400 in Appendix A.

It is proposed to abandon the following items from the existing network.

- One wastewater manhole “GIS ID 515154”
- 150mm diameter pipe segment from manhole “GIS ID 515153” to “GIS ID 515154”
- 150mm diameter pipe segment from manhole “GIS ID 533853” to manhole “GIS ID 515154”
- 300mm diameter pipe segment from manhole “GIS ID 515154” to manhole “GIS ID 515155”

It is proposed to provide a new wastewater pipe network running along the eastern boundary. The proposed 150mm diameter wastewater pipe will start from the manhole “GIS ID 533853” and then connect to the new wastewater manhole located at south east corner of the site. The outlet pipe of size 150mm diameter will be connected to the existing wastewater manhole “GIS ID 515155” located at the northern boundary.

Based on the proposed layout and the Watercare ‘Water and Wastewater Code of Practice for Land Development and Subdivision’, we have estimated a peak wet weather flow for the entire site of 20.45l/se. Calculations have been included in Appendix C.

Wastewater network capacity assessment has been completed for the proposed wastewater discharge. The existing 150mm diameter pipe will be upgraded to a 225mm diameter pipe.

A downstream capacity assessment has been completed up to manhole “GIS ID 515156” and this identifies there is sufficient capacity in the public WW network to cater for the new development.

Refer to calculations and Watercare Development Application Form – Water Supply/Wastewater Planning Assessment in Appendix C.

### 5.3. Consultation – Watercare

Consultation with Watercare will occur at the appropriate time within the approval process.

We presume Watercare has been made aware of the project by Auckland Council as a result of the Plan Change Application.



## **6. POTABLE WATER INFRASTRUCTURE**

### **6.1. Potable Water Supply**

The Auckland Council GeoMaps shows 100mm, 150mm, 175mm, 200mm and 300mm diameter portable networks along either side of George Street.

Two existing connections are shown on GeoMaps. One connection is from southern side of George Street and the other connection is from the northern side of George Street.

#### **Domestic Supply for Apartments and Commercial Area**

A water supply will be required for the proposed development via a new 100mm PE connection to the 100mm infrastructure within George Street.

Based on the proposed layout and the Watercare Water and Wastewater Code of Practice for Land Development and Subdivision, we have estimated a peak day demand for the Plan Change area of 140,000l/day.

### **6.2. Fire Fighting Supply**

The development is classified as FW2 as per the Code of Practice of New Zealand Fire Services (NZFS CoP).

There are multiple fire hydrants located on George Street, Morgan Street, Clayton Street and Alma Street.

- Two hydrants on Clayton Street at a distance of 80m and 137m
- Three hydrants on George Street at a distance of 116m, 135m and 154m
- One hydrant on Morgan Street at a distance of 124m
- Two hydrants on Alma Street at a distance of 113m and 150m

Five hydrants comply with the minimum distance from the site of 135m and three hydrants comply with the minimum distance from the site of 270m

A detailed design of the potable water and firefighting reticulation will be provided at Building Consent stage.

### **6.3. Consultation – Watercare**

Consultation with Watercare will occur at the appropriate time within the approval process.

We presume Watercare has been made aware of the project by Auckland Council as a result of the Plan Change Application.

## **7. POWER SUPPLY AND TELECOMMUNICATION**

Services are available in the general locality of the Plan Change area.

The service provider(s) will be contacted once the loading and point of connection have been accurately determined.

## 8. CONCLUSION

MSC have undertaken an assessment of the civil engineering aspects of the development scenario which includes: stormwater drainage, stormwater overland flow paths, wastewater drainage, potable water, power, firefighting water supply and communications.

Earthworks are required to be undertaken throughout the Plan Change area to facilitate the formation of the basement and access roads.

It is proposed to abandon the existing stormwater network within the property and construct a new stormwater network.

The post development SW runoff from the Plan Change area will not exceed the pre development runoff hence no stormwater mitigation is proposed.

The Auckland Council GeoMaps identifies the overland flow path routes and areas of land likely to be affected by stormwater flooding. There are four overland flow paths crossing the site. The entry and exist points will remain unchanged as a result of the development works. There will be no effects on the downstream properties.

It is proposed to abandon the existing wastewater network within the property and construct a new wastewater network.

The Plan Change area is well serviced by existing public infrastructure and suitable for development. All connections, locations and rates of discharge to the public infrastructure will need to be approved prior to construction.

There are various services near to the site and these will be protected during the development works.

Craig Horwood

MSC Consulting Group Ltd

## Appendix A

### MSC Consulting Group Ltd

Existing Site Plan	Drawing RC100
Proposed Ground Floor Plan	Drawing RC300
Proposed Basement B2 Plan	Drawing RC301
Proposed Basement B3 Plan	Drawing RC302
Proposed Basement B4 Plan	Drawing RC303
Proposed Drainage Plan	Drawing RC400
OLFP Diversion Plan	Drawing RC410

### Warren and Mahoney

Masterplan Ground Level
Typical West – East Section
Typical North – South Section



**NOTES:**

1. SURVEY IS IN TERMS OF GEODETIC DATUM 2000 MT EDEN CIRCUIT.
2. THE HEIGHTS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946.
3. EXISTING CONTOURS ARE OBTAINED FROM AC GIS.
4. CONTOURS AT 0.50m INTERVALS.



**LEGEND**

- 45.0 — EX. CONTOUR (MAJOR)
- 44.5 --- EX. CONTOUR (MINOR)
- 29.8 EX. SPOT HEIGHT
- - - EX. BOUNDARY
- EX. KERB
- ⊙ EX. S/W MANHOLE
- ⊙ EX. S/S MANHOLE
- SW — EX. S/W PIPE
- SS — EX. S/S PIPE
- WM — EX. WATERMAIN PIPE
- EL — EX. POWER LINE

B	04.03.20	FOR INFRASTRUCTURE ASSESSMENT	
A	30.08.19	FOR INFRASTRUCTURE ASSESSMENT	
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**INFRASTRUCTURE ASSESSMENT**

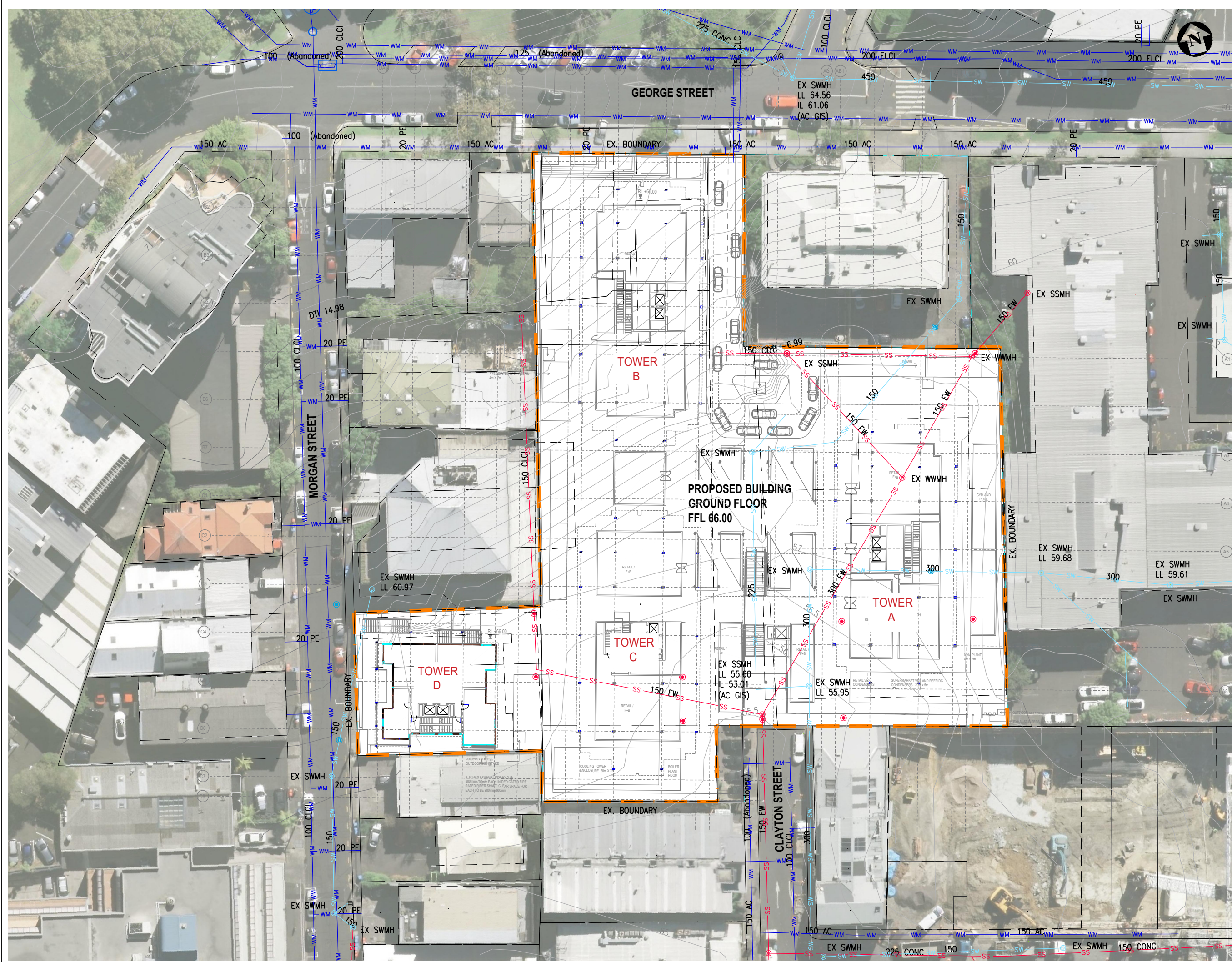
**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**EXISTING  
 SITE PLAN**

DESIGNED	CH	DATE	AUG 2019
DRAWN	WL	CHECKED	CH
A1 SCALE 1:300		A3 SCALE 1:600	
JOB No.	DWG No.	REVISION	
<b>40696</b>	<b>RC100</b>	<b>B</b>	

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⊙	EX. S/S MANHOLE
⊙	EX. W/W MANHOLE
—	EX. S/W PIPE
⊞	EX. S/W CESSPIT
—	EX. W/W PIPE
—	EX. WATERMAIN PIPE
49.50	PR. LEVELS
▭	PR. BUILDING
—	PR. KERB ONLY
⊙	PR. SWMH
⊞	PR. S/W CESSPIT
⊙	PR. WWMH

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**INFRASTRUCTURE ASSESSMENT**

**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**PROPOSED  
 GROUND FLOOR  
 PLAN**

DESIGNED	CH	DATE	AUG 2019
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- 29.8 --- EX. CONTOUR (MINOR)
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- ⊙ EX. S/S MANHOLE
- ⊙ EX. W/W MANHOLE
- SW — EX. S/W PIPE
- ⊠ EX. S/W CESSPIT
- SS — EX. W/W PIPE
- WM — EX. WATERMAIN PIPE
- ▭ 49.50 PR. LEVELS
- ▭ PR. BUILDING
- KO — PR. KERB ONLY
- ⊙ PR. SWMH
- ⊠ PR. S/W CESSPIT
- ⊙ PR. WWMH

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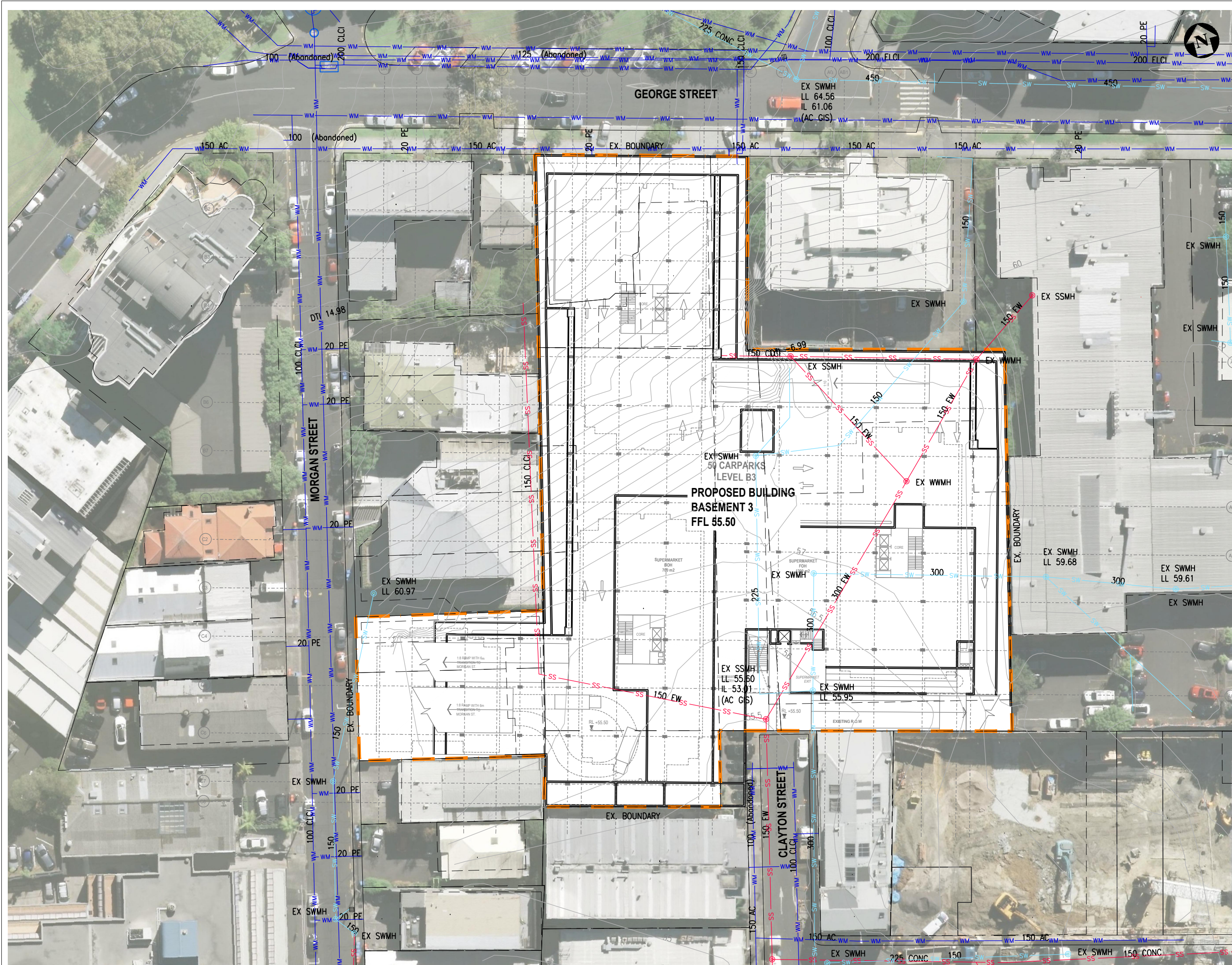
**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**PROPOSED  
 BASEMENT B2  
 PLAN**

DESIGNED	CH	DATE	AUG 2019
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<b>40696</b>	<b>RC301</b>	<b>B</b>	

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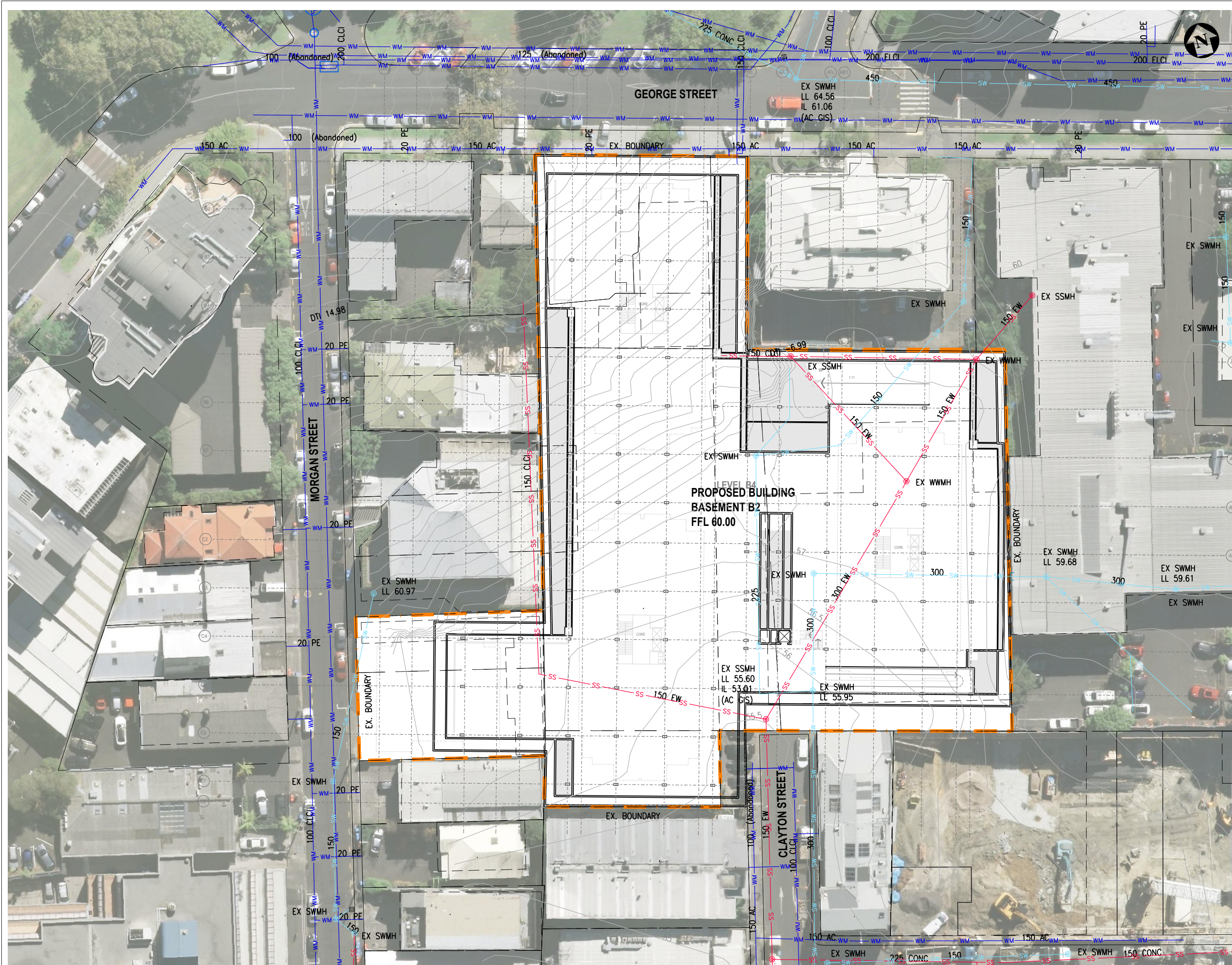
**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**PROPOSED  
 BASEMENT B3  
 PLAN**

DESIGNED	CH	DATE	AUG 2019
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A1 SCALE 1:300		A3 SCALE 1:600	
JOB No. <b>40696</b>	DWG No. <b>RC302</b>	REVISION <b>B</b>	

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**LEGEND**

- 30.0 --- EX. CONTOUR (MAJOR)
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**INFRASTRUCTURE ASSESSMENT**

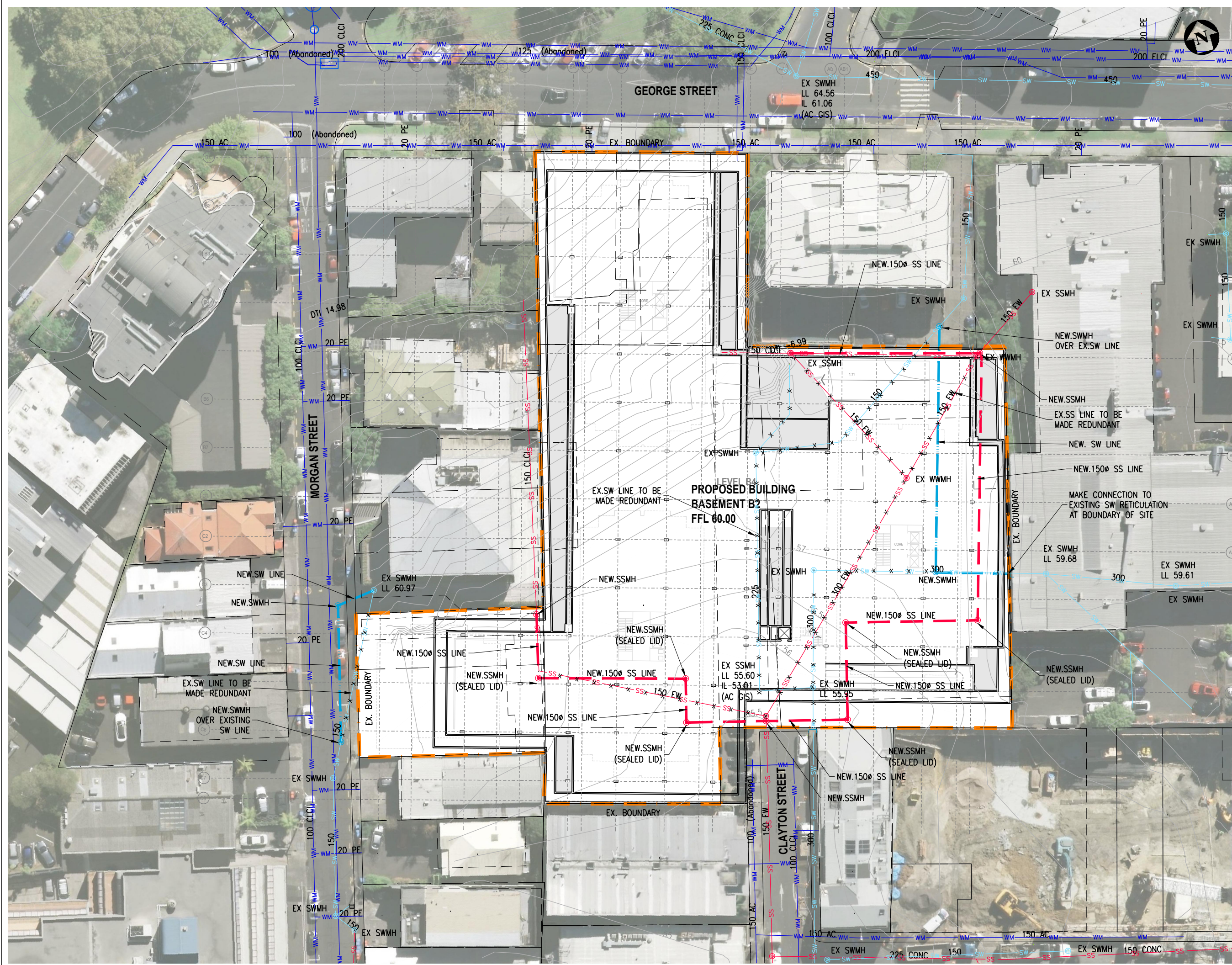
**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**PROPOSED  
 BASEMENT B4  
 PLAN**

DESIGNED	CH	DATE	AUG 2019
DRAWN	WL	CHECKED	CH
A1 SCALE 1:300		A3 SCALE 1:600	
JOB No.	DWG No.	REVISION	
<b>40696</b>	<b>RC303</b>	<b>B</b>	

Mar 04 2020 - 4:15pm C:\Users\lukes\p\l\Local\Temp\luc\publish - 13696\w...\_RC100-RC400\_FOR IA.dwg





**LEGEND**

- 30.0 --- EX. CONTOUR (MAJOR)
- 29.8 --- EX. CONTOUR (MINOR)
- - - - EX. BOUNDARY
- ⊙ EX. S/S MANHOLE
- ⊙ EX. W/W MANHOLE
- SW — EX. S/W PIPE
- ⊠ EX. S/W CESSPIT
- SS — EX. W/W PIPE
- WM — EX. WATERMAIN PIPE
- 49.50 PR. LEVELS
- ▭ PR. BUILDING
- KO — PR. KERB ONLY
- ⊙ PR. SWMH
- ⊠ PR. S/W CESSPIT
- ⊙ PR. WWMH
- x x x EX. ABANDONED DRAINAGE LINES

B	04.03.20	FOR INFRASTRUCTURE ASSESSMENT	
A	30.08.19	FOR INFRASTRUCTURE ASSESSMENT	
REV	DATE	AMENDMENT	BY

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**INFRASTRUCTURE ASSESSMENT**

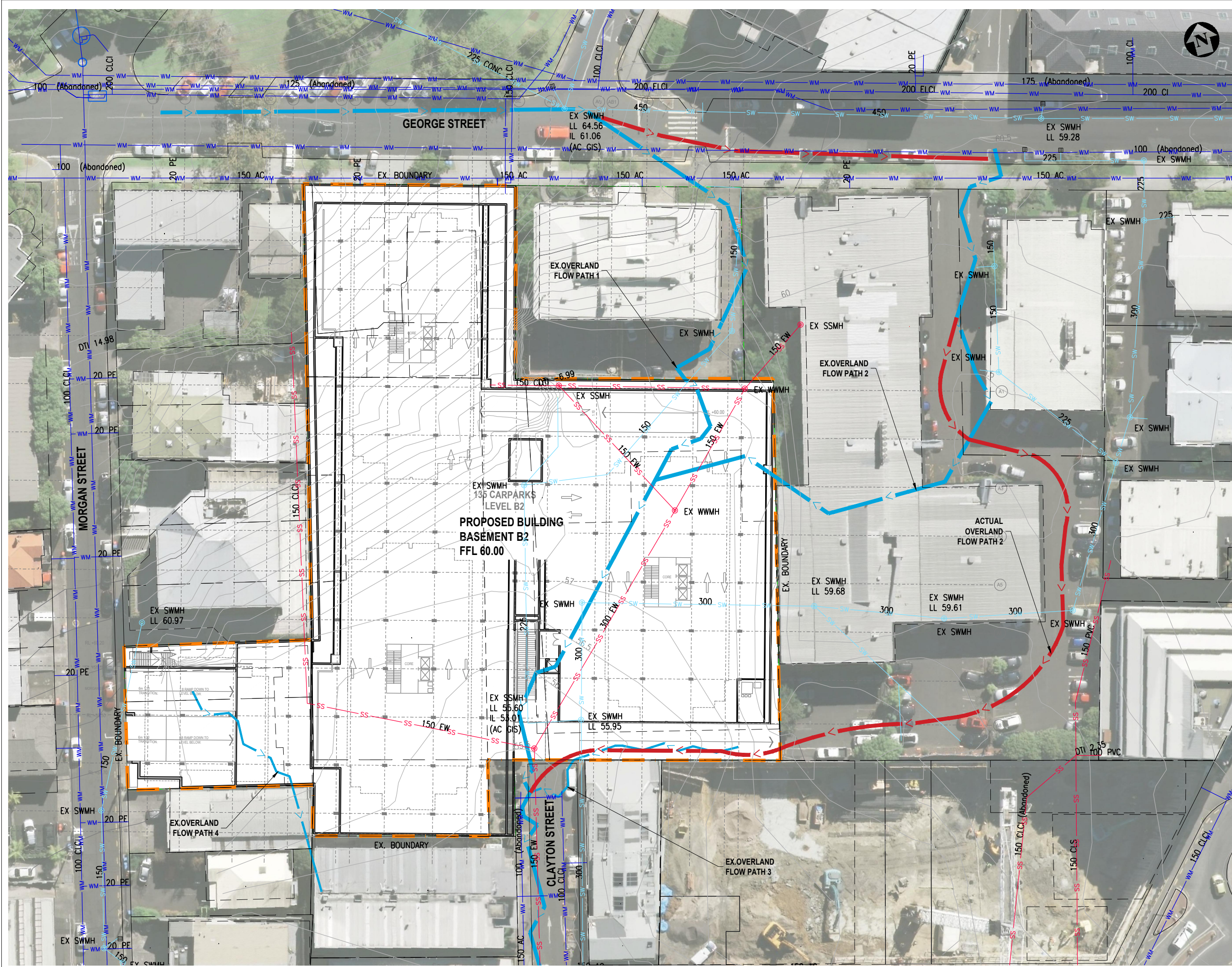
**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**PROPOSED  
 DRAINAGE PLAN**

DESIGNED	CH	DATE	AUG 2019
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A1 SCALE 1:300		A3 SCALE 1:600	
JOB No.	DWG No.	REVISION	
<b>40696</b>	<b>RC400</b>	<b>B</b>	

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**LEGEND**

- OVERLAND FLOW (COUNCIL GIS)
- OVERLAND FLOW (ACTUAL)

REV	DATE	DESCRIPTION	BY
B	04.03.20	FOR INFRASTRUCTURE ASSESSMENT	
A	30.08.19	FOR INFRASTRUCTURE ASSESSMENT	
		AMENDMENT	

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**INFRASTRUCTURE ASSESSMENT**

**PROPOSED DEVELOPMENT  
 GEORGE STREET  
 NEWMARKET**

**OLPF DIVERSION  
 PLAN**

DESIGNED	CH	DATE	AUG 2019
DRAWN	WL	CHECKED	CH
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JOB No.	DWG No.	REVISION	
40696	RC410	B	

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# MASTERPLAN - GROUND LEVEL

KEY

- APARTMENT TOWERS
- VEHICLE MOVEMENT
- PEDESTRIAN MOVEMENT

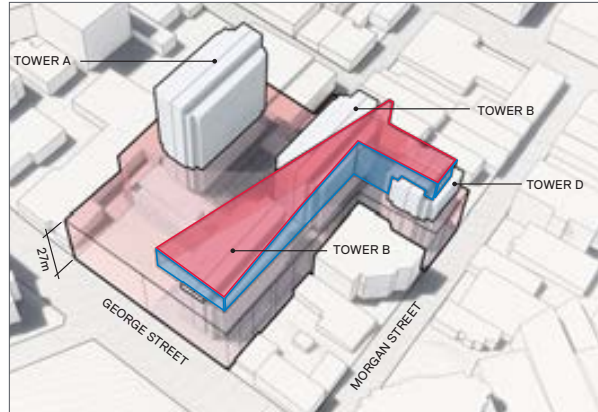
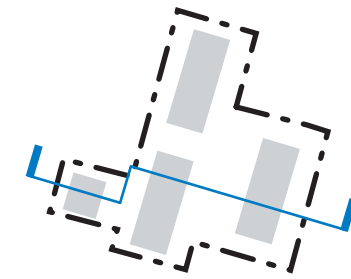




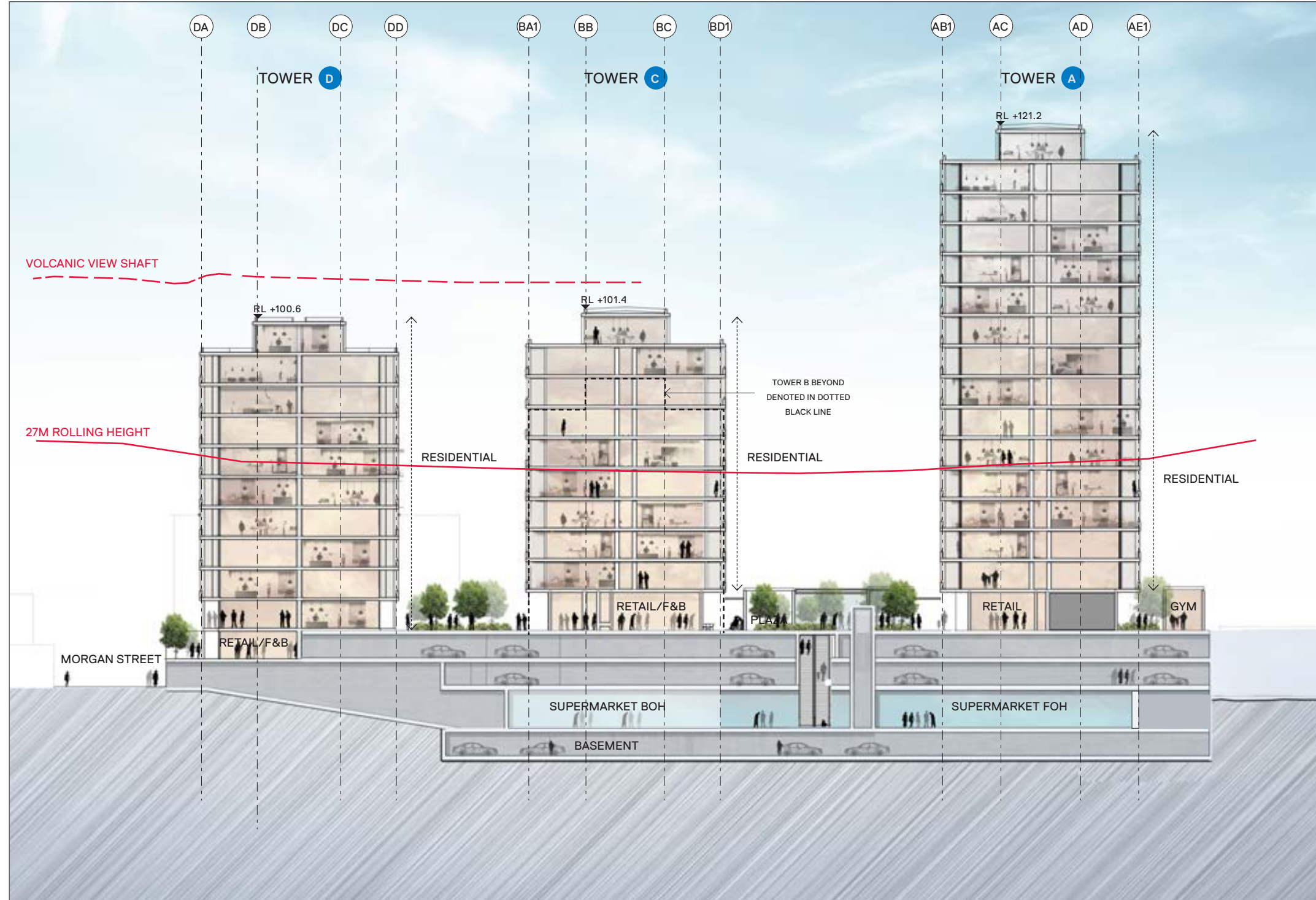


# TYPICAL WEST - EAST SECTION

ALTERNATIVE SUPERMARKET LOCATION



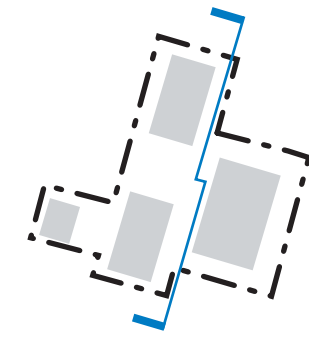
- 27M HEIGHT VARIATION CONTROL
- VOLCANIC VIEW SHAFT
- 6M SETBACK



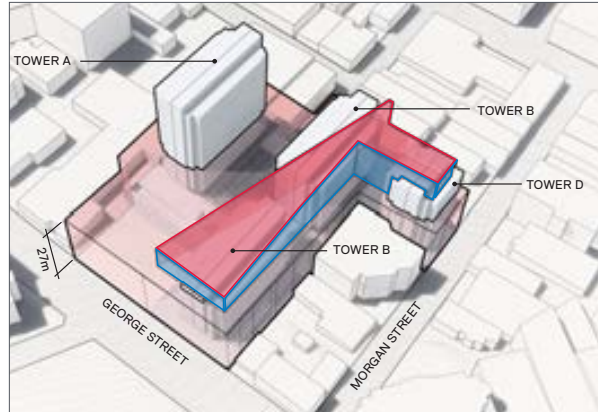
- BOH/PLANT
- CAR PARKING

# TYPICAL NORTH - SOUTH SECTION

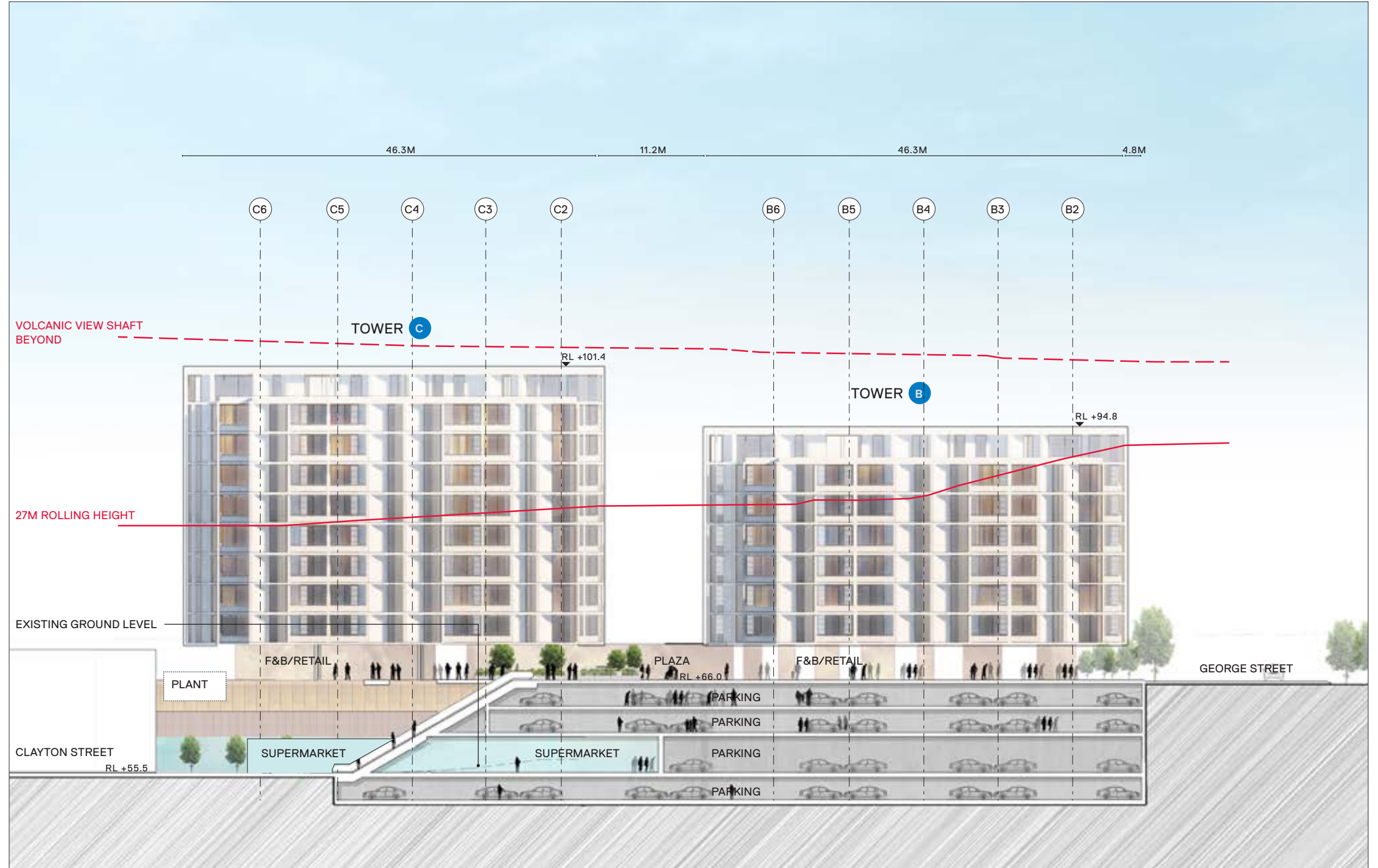
ALTERNATIVE SUPERMARKET LOCATION



SCALE  
1:500 @ A3



- 27M HEIGHT VARIATION CONTROL
- VOLCANIC VIEW SHAFT
- 6M SETBACK



- PARKING
- SUPERMARKET

## **Appendix B**

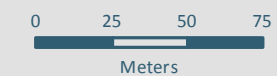
Auckland Council Flood Mapping Plan





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### George Street, Newmarket



Scale @ A3  
= 1:2,500

Date Printed:  
20/08/2019





## **Appendix C**

Pre-Development and Post Development Stormwater Flow Calculations

Stormwater Network Capacity Assessment

Wastewater Discharge Calculation

Wastewater Network Capacity Assessment

**WORKSHEET 1**

**Project: George Street, Newmarket**

**Prepared by: Sumi**

**Catchment Flow Calculations**

**2019 July**

**Predevelopment runoff**

Zone: Business- Mixed Use Zone

Assumption: Maximum impervious 100%

**Total runoff from the site at pre-development stage**

<b>Catchment Area 1 (m<sup>2</sup>)</b>	7834.00	
Design rainfall:	120.62	mm/hr to reflect AC 10% AEP standard & 2.1C <sup>0</sup> climate change

**Runoff Coefficient ( c )**

	<b>c-value</b>
Roof/Driveways	0.95

**Total Site Area**

<b>Area(ha)</b>	<b>C No.</b>	<b>Int(mm/hr)</b>	<b>Q=2.78CiA</b>	
0.7834	0.95	120.62	249.5	Impervious
		<b>Total (l/s)</b>	<b>249.5</b>	

**Total runoff at post development stage**

<b>Total Catchment Area (m<sup>2</sup>)</b>	7834.00	
Design rainfall:	120.62	mm/hr. to reflect AC 10% AEP standard & 2.1C <sup>0</sup> climate change

**Runoff Coefficient ( c )**

	<b>c-value</b>	
Roof/ Driveways	0.95	
Grass	0.3	
Roof/ Driveways	7285.62	
Grass araea	548.38	(NEED TO CONFRIM WITH ARCHITECT)

**Total Site Area**

<b>Area(ha)</b>	<b>C No.</b>	<b>Int(mm/hr)</b>	<b>Q=2.78CiA</b>
0.728562	0.95	120.62	232.1
0.05	0.3	120.62	5.5
		<b>Total (l/s)</b>	<b>237.6</b>

Total flow contributing to MH2 = **237.6** l/s

# Work Sheet 1:ARC Guidline for Stormwater Runoff Modelling in the Auckland Region

**PROJECT: George Street, nwemarket**

1 Runoff Curve Number(CN) and Initial abstraction(Ia)

**Catchment 1** = 4,436.00 m<sup>2</sup> (From GeoMaps)

Assumption: Impervious=60% and pervious 40% of the catchment area

Soil Name and Classification	Cover Description (Cover type, Treatment and Hydrological condion)	Curve Number CN*	Area	Product of CN x Area
	Pasture, lightly grazed, good grass cover	74	1,774.4	131,305.60
	Sealed road, Roof	98	2,661.6	260,836.80
* From Appendix B		Total	4,436.00	392,142.40

CN (Weighted)  $\frac{\text{Total Product}}{\text{Total area}}$  = **88.40**

Ia(Weighted)  $\frac{5 \times \text{Pervious area}}{\text{Total Area}}$  = **2.0** mm

2 Time of Concentration

Channelisation factor C = 0.6  
 Catchment Length L = 0.1139 km  
 Catchment Slope S<sub>c</sub> = 0.140 m/m

Runoff factor, CN/(200-CN) = 0.79

$t_c = 0.14 C L^{0.66} \{CN/(200-CN)\}^{(-0.55)} S_c^{(-0.3)}$  = 0.04 hrs

Minimum t<sub>c</sub> = 0.17 hrs

Hence t<sub>c</sub> = 0.17 hrs

## Wastewater Flow Design

21/08/2019

By: **Sumi**

Reference No:

**Project: George Street , Newmarket**

**ADWF= 65 l/p/day x (net floor area/50)**

**PWWF= ADWFx peak factor (l/s)**

### Commercial - Proposed Development Flows

Retail Area	=	1297	m <sup>2</sup>
Supermarket Area	=	2000	m <sup>2</sup>
Total area	=	3297	m <sup>2</sup>
Net area (80% of Gross area)	=	2637.6	m <sup>2</sup>
Net floor area/50	=	52.752	
Design wastewater flow allowance	=	65 l/day/m <sup>2</sup>	(from Table 5.1.3 of the Watercare Code of Practice)
Design flow	=	3428.88	l/day
Design flow	=	0.04	l/s
Self cleansing peak factor	=	2	(from Table 5.1.1 of the Watercare Code of Practice)
Peak flow peak factor	=	5.0	(from Table 5.1.1 of the Watercare Code of Practice)

**ADWF** = 3,428.88 l/day 0.04 (l/s=)

**Self Cleansing Design Flow** = 6,857.76 l/day 0.08 (l/s=)

**Peak Design Flow** = 17,144.40 l/day 0.20 (l/s=)

### Existing 150Ø downstream public wastewater pipe

	Roughness Factor	Pipe size(mm)	Grade(1 in )	%
	0.6	150	144.93	0.69

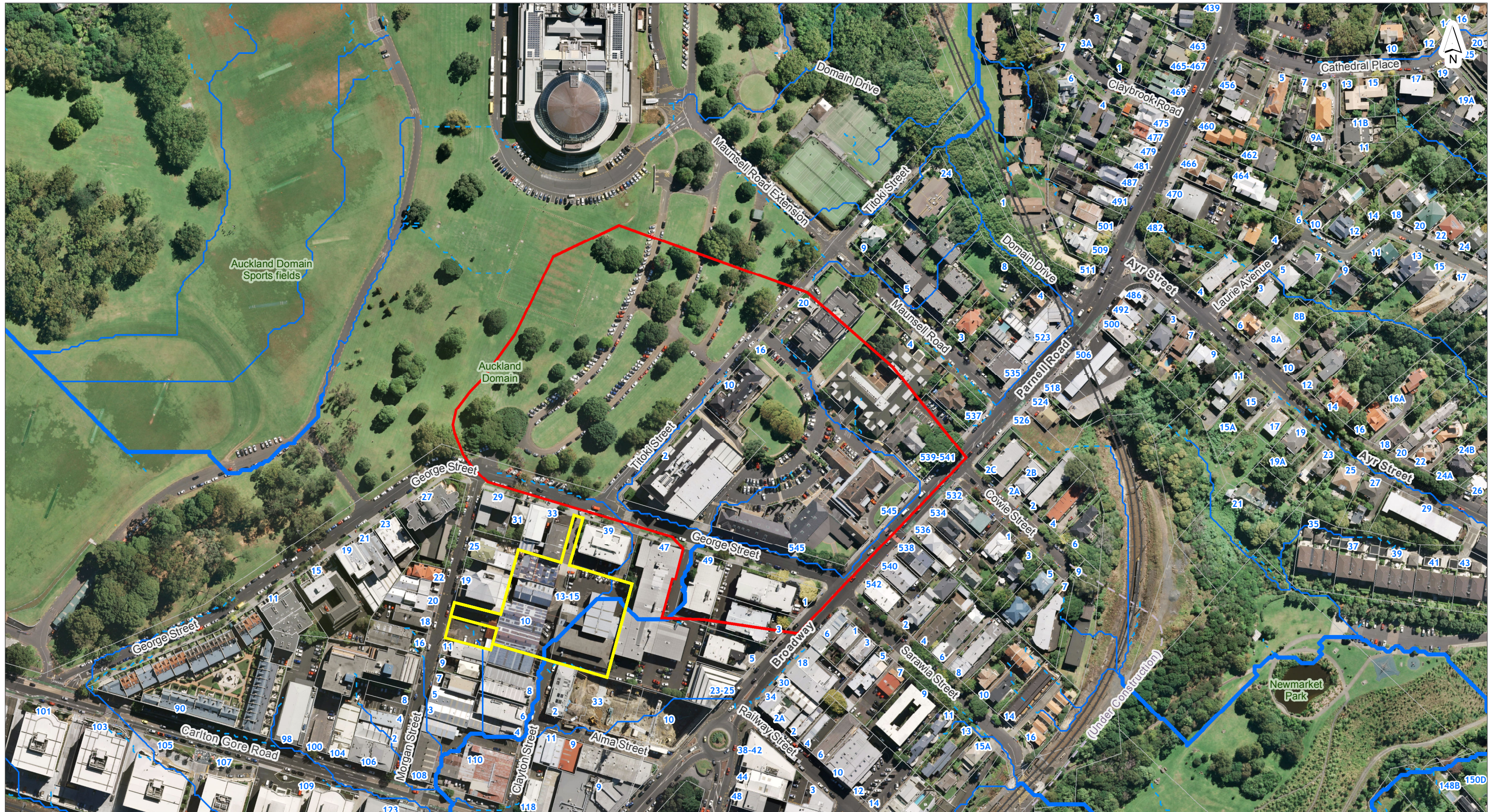
<b>VELOCITY (m/sec)</b>	<b>0.83</b>
<b>CAPACITY Q = VA (l/s)</b>	<b>14.68</b>

## Appendix D

OLFP Catchment - OLFP 2 (Auckland Council GIS Database)

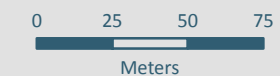
OLFP Calculations – OLFP 2





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### Proposed Development - Overland Flow Path 2 Detail



Scale @ A3  
= 1:2,500

Date Printed:  
4/03/2020





## OVERLAND FLOW PATH CALCULATIONS

04-03-20

By: LP

Reference No: 40696

### Project: **George Street Development**

**Assumptions:**

c=0.90 for roof/carpark/driveway      design rainfall (mm/hr)      HIRDS plus 2.1 C increase  
 c=0.3 for permeable surfaces      142      1% AEP  
 75% Impervious, 25% Pervious

**OLFP**

Area (ha)	C No.	Int (mm/hr)	Q = 2.78CiA	
4.2750	0.90	142	1518.84	
1.4250	0.30	142	168.76	
<b>Max.Flow (L/Sec)</b>			<b>1687.60</b>	

**Mannings Equation - Overland Flow Path 2**

Assumed Roughness (Auckland Council Code Of Practice for Land Development and Subdivision Chapter 4 - Stormwater - Table 4.4)

Mannings n	n	0.011
Slope (m/m)	s	0.07
Hydraulic Radius (m)	R	0.068403909 A/Pw
Area (m <sup>2</sup> )	a	0.42
Depth (m)	d	0.07
Width (m)	b	6
Wp(m)		6.140
Flow Rate (m <sup>3</sup> /s)	Q	<b>1.6896</b>
Velocity (m/s)	v	4.0229

