Under the Resource Management Act 1991
In the matter of Notices of Requirement to enable the construction, operation and maintenance of the City Rail Link

Between

Auckland Transport

Requiring Authority

and

Auckland Council

Consent Authority

Statement of Evidence of John Henry Fellows

Qualifications and Experience

1. My full name is John Henry Fellows.

2. I hold the degree Bachelor of Science (Architecture), Polytechnic of North London (1986). In addition, I also hold a Higher National Certificate and Ordinary National Diploma in Building Construction.

3. I have thirty eight years' of experience in station design, design integration, design coordination, design management, asset management and design leadership within the rail sector. I have a detailed knowledge of requirements for station design, construction and maintenance of rail facilities. I also have specialist knowledge of passenger space planning and passenger capacity requirements at stations and the translation of pedestrian modelling techniques into practical design parameters. I have a proven UK project development and delivery record having had leading design management roles on the Thameslink, East London Line, High Speed 2 and Crossrail major projects. My other international experience includes peer review of Kuala Lumpur Blue Line stations and Melbourne Metro stations.

4. I am currently employed as Projects Director in the rail sector management team of the Project and Commercial Management Division of Mott MacDonald, based at Fleet Place, London, providing project management, design management and stakeholder management expertise for rail property and station infrastructure projects around the world. I am currently on secondment to the Mott MacDonald Auckland office in New Zealand.

5. In terms of project experience that is directly relevant to the CRL project, I note the following:

   (a) Design Package Manager and Interface Manager for the multi-discipline design team, $NZ1Bn Crossrail Liverpool Street underground station and detailed design. London UK.

   (b) Design Package Leader for the development of the $NZ32Bn Crossrail design guide for detail design. London UK.

(c) Peer Reviewer for High Speed 2 stations North of Brimingham and Old Oak Common sub-surface interchange station preliminary design. London UK.

(d) Peer Reviewer Kuala Lumpur Blue Line underground stations concept design. Malaysia.

(e) Architecture and Design Manager $NZ7Bn Thameslink Project. London UK.

(f) Expert Witness for all core area architecture and civil engineering designs at the Thameslink Project Public Inquiry. London UK.

(g) Head of Station Design and leader of the national specialist team in Network Rail for the 2500 stations portfolio. UK.

(h) Client Sponsor and budget holder for design development of the $NZ700m Birmingham Gateway project. UK.

(i) Client Sponsor and budget holder for developing commercially viable masterplans for 6 Network Rail major stations. UK.

(j) Teaching a module for the MSc course in railway engineering, Birmingham University annually UK.

6. A more detailed summary of the abovementioned projects is included in **Appendix 1** to my evidence.

Background and role

7. The City Rail Link (CRL) project is a 3.4km underground passenger railway (including two tracks and three underground stations) running between Britomart Station and the North Auckland Line (NAL) in the vicinity of the existing Mount Eden Station. CRL also requires an additional 850m of track modifications within the NAL. The stations included in the CRL Notice of Requirement (NoR) have been temporarily named Aotea Station, Karangahape Station, Newton Station.

8. Mott MacDonald was engaged by Auckland Transport as part of the Principal Advisor team (PA) for the CRL project. The PA is led by Aurecon NZ Ltd and comprises the principal partners of Aurecon NZ Ltd, Mott MacDonald, Jasmax and Grimshaw. The PA reports directly to Auckland Transport's Delivery work stream which is responsible for delivery of the CRL project. The PA is also supporting the NoR and Property work streams.

9. My role in the CRL project team includes:

   (a) Leading the multi-disciplinary design team for the development of concept designs for the altered Britomart station (as a result of the CRL tracks continuing west) and the proposed railway stations at Aotea, Karangahape and Newton as described in the Concept Design Report (CDR)[1].

   (b) Assisting Auckland Transport in defining the anticipated level of station patronage and the space planning criteria appropriate for planning the indicative station designs (which helped to define the extent of the designation footprint), integrating the civil engineering, architecture, fire and life safety and mechanical, electrical, and public health systems for each station location as set out in sections 2.1, 3.1 and 3.4 of the CDR.

   (c) Managing the integration of the space planning requirements for passengers, staff, plant and equipment at each indicative station design (as set out in sections 2.1, 3.1 and 3.4 of the CDR). This has included station entrance designs and the integration of the station footprints within the established designation footprint, as indicated in Appendix B to the CDR.

   (d) Managing the integration requirements for tunnel ventilation and line-wide systems as described in section 3.3 of the CDR, as they manifest themselves within each of the station locations, ensuring that sufficient space is allocated within the indicative designs for accommodating the technical requirements.

[1] Appendix 13, Volume 3 CRL NoR suite of documents

(e) Integration of the station designs with the civil engineering and track alignments beyond the indicative station design footprints as set out in Appendix A to the CDR.

(f) Reviewing indicative design outputs and producing key project technical support information for the project as described in the CDR as part of the PA.

10. I am familiar with the project location, track alignment and the site specific locations for each proposed station. I have walked the proposed route and visited all proposed station sites and I am familiar with the physical environment within which the CRL station indicative designs have been developed.

11. I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this hearing was before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of Evidence

12. My evidence will address the following:

(a) The integration of underground railway station indicative designs including the architectural approach, architectural principles, functionality and performance;

(b) The description of passenger space planning of station elements and the design rationale for the organisation of station entrances, passenger circulation and operational spaces;

(c) Integration of plant and operational equipment within the station designs including the station and trackside ventilation, electrical installation, overhead line equipment, signalling equipment and station drainage systems;

(d) Establishing appropriate design requirements that underpin the concept station designs for platform length, platform width, revenue control, vertical circulation, ticket purchase, wayfinding and station control;

(e) Integration of the station concept design footprints with the civil engineering and track alignment designs beyond the station sites;

(f) The ability of station architectural concepts to contribute to the sense of place, life and activation of the urban environment within which they sit.

(g) Response to submissions;

(h) Response to Planner's Report; and

(i) Proposed conditions.

Summary of Evidence

13. The CRL indicative station designs have been developed with reference to a range of technical design considerations, physical design constraints and architectural design principles that apply to each of the station sites. These include:

(a) The CRL track alignment that establishes the below ground vertical and horizontal position of station platforms;

(b) The rolling stock type and train length proposed for operating on CRL that establishes the platform length and positions of platform screen doors[2];

(c) The location and size of station circulation concourses and entrances and their relative position with respect to surrounding buildings and the urban realm;

[2] The assumed rolling stock type for the purpose of concept design is CAF Electric Multiple Units (EMU's) that are currently being procured under a separate project for use on the existing rail network.

(d) The expected passenger demand that establishes the space planning requirements and size for public circulation areas within the station;

(e) The vertical transportation that efficiently moves passengers between platform level and the entrances and provides step free access for passengers with special needs;

(f) The spatial requirements to accommodate line wide and station specific mechanical, electrical and public health systems and their integration within the station footprint;

(g) The requirements for fire and life safety provisions to accommodate safe evacuation of passengers and staff from all areas of the station; and

(h) The establishment of architectural principles with the appropriate balance between functional design, engineering demands, performance objectives, cost with an appropriate personality and passenger experience whilst ensuring a maintainable facility for its expected life.

14. The technical requirements and design constraints for the indicative station designs have influenced the structural form and location of the station elements that reflect the ground conditions of each site, the construction methods envisaged and the overall footprint of the stations above and below ground.

15. In summary my evidence refers to the following sections of the Concept Design Report: 2.1- Technical Parameters; 3.4- Indicative Station Design; 3.1- Table 3-3, key information, stations and the integration of elements described in section 3.3, Indicative Tunnel Design within the stations; Appendix A to the CDR- Rail Alignment Concept; Appendix B to the CDR- Station location drawings.

City Rail Link (CRL) - Concept Design

16. The Concept Design Report (CDR) contains a description of the concept designs for stations developed for the CRL project. This

description is primarily within section 3.4 of the CDR but references are also included in section 4.2 within the indicative construction methods and 4.3, indicative construction sequencing. Mr William Newns explains this in more detail in his evidence.

17. Stations are the ‘front doors’ to the rail network and the CRL concept station designs are intended to assist in generating a modal shift in transport habits in Auckland and provide a positive, memorable and convenient passenger experience to passengers and staff.

18. The concept station designs for CRL provide practical station footprints with sufficient inherent flexibility to allow for further refinement in the future stages of design development. The concept designs indicate safe, functional clear transport solutions for each site that meet technical and operational requirements. Step free access is provided at each station to enable access for passengers with special needs between street level and station platforms.

19. Two station typologies have been adopted with respect to the station designs. These typologies include ‘cut and cover’ for Aotea and ‘mined side platforms’ for Karangahape and Newton stations. Mr William Newns has provided a detailed overview of the associated construction approaches in his evidence. In addition, an indicative design has also been developed for alteration to the existing Britomart station to accommodate requirements for CRL operation.

General Comments relating to all Stations

20. Station entrances, platforms, circulation passageways, gate lines, the associated plant, equipment and staff accommodation have been space proofed within each station concept footprint to provide sufficient capacity for the anticipated passenger demand.

21. All three new stations have been provided with space for staff facilities including station management, ticket issue and station control.

22. All station concept designs have been developed with the inclusion of cycle parking facilities adjacent to station entrances and all station entrances include for weather protecting canopies extending from the

building frontages. It is envisaged that the development of the design concepts will provide for active retail frontages to public spaces where possible. The designs will also be developed to provide an expression of the local urban context and cultural identity.

23. Station and tunnel ventilation fans, ducts and associated equipment rooms for line wide and station specific systems are provided within and above each station footprint along with ventilation ducts and service risers connecting platform level to street level. Street level access to all equipment rooms has been provided within the indicative concept designs to enable ongoing maintenance to be undertaken.

24. Power supplies to each station has been considered as part of the indicative concept design with two independent supplies being provided from the Hobson Street high voltage (HV) sub-station. The two station supplies are independent from the traction HV supply system. All plant and equipment within the station that is part of emergency response, such as tunnel ventilation fans, smoke exhaust fans, intervention lifts and selected electrical distribution boards has been designed to be fed by two independent supplies with local change over points.

25. The indicative concept designs for stations provides for ventilation, heating and cooling of selected areas of the station with the intention to further investigate the use of ground source heat pumps to reduce energy consumption in future stages of design development.

26. Hydraulic services for stations have been considered and included within the indicative designs including potable water, fire fighting water, ground water drainage, sewer drainage, pumps, sumps and water retention facilities.

27. Step free universal access is provided from each station to platform level. At Aotea this is via three 26 person lifts from street level to concourse level and one 26 person lift from concourse level to platform level. At Karangahape Road each entrance is provided with a 26 person lift from street level to platform level. At Newton the primary access to platform level is via four 53 person lifts from entrance level to platform level. Lift access is also provided for mobility impaired

persons as part of the emergency escape provisions at each station. This is in addition to the lifts used for normal access. Once on the platform, help points and seating is located to specifically align with the stopping position of coach 2 and 5 in the six carriage train (see table 2-1 in the CDR) to coincide with the level access from platform to train in those carriages. The use of tactile surfaces for passengers with visual impairment and the use of sonic loops for those with a hearing impairment are proposed within each station concept design along with carefully chosen tonal and colour contrasts for materials used within the station footprint.

Station Patronage

28. The Station concept designs have been future proofed for projected passenger volumes. This has been derived from an assessment of the maximum normal peak operating capacity of the assumed rolling stock[3] and all trains entering the city centre from both directions being full and to an operating frequency to 20 trains per hour in each direction in the peak operating hour. It is assumed that all seats are taken within each carriage and that passengers are standing at a density of 2.5 passengers in each square meter of available floor space. This equates to 760 passengers on each 6 carriage length train.

29. The distribution of passengers boarding and alighting trains at each station has been developed with Auckland Transport based on passenger demand for each station precinct. The one hour peak patronage levels have then been factored using benchmarked values to establish the peak fifteen and peak five minute operating period volumes. The resultant boarding and alighting figures have then been used in conjunction with London Underground space planning standard S-1371 to establish the dimensions for platform widths, passageway widths, concourse and entrance sizes, the size of station revenue protection gatelines and the size and number of stairs, escalators and lifts to provide for vertical circulation. The patronage for each station has also been used to establish the size and location of customer facilities such as ticketing and public toilets

[3] 6 carriage CAF EMU's

Space Planning of Station Elements

30. The station concept designs have been space proofed using London Underground station planning standard S-1371 to provide for adequate platform widths, passageway widths, and escalator and lift capacity, gateline capacity and entry/exit capacity to respond to the passenger flows and movements within each station from train to station entrance. The target space planning comfort level within the stations is FRUIN Level C [4]under normal operating conditions and not below FRUIN Level D[5] in abnormal[6] operating conditions.

Emergency Evacuation Provisions

31. The patronage levels under emergency operating conditions along with an abnormally loaded train capacity have been used to establish the emergency evacuation passenger loads within stations. The worse case fire condition at a station is considered to be a fully loaded train on fire within the station platform and the worse case station fire is considered to be a luggage fire in public circulation areas within the station. These have been used to determine the appropriate size and number of emergency escape stairs and evacuation routes from each station to enable passengers to reach a place of safety from a platform in 4 minutes and out of the station in six minutes.

32. The necessary smoke extract ventilation systems have been included within each station to remove smoke generated from the fire scenarios assessed, including over track extract ventilation along the length of the station platforms with a cross sectional area of 6 m2 and ventilation

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[4] FRUIN Levels of service are derived from a study by JJ Fruin to establish comfort for people at different density levels. Typically FRUIN Level C equates to an average passenger density of 0.8 sq m per person waiting on platforms.

[5] FRUIN Level D equates an average passenger density of 0.5 sq m per person waiting on platforms.

[6] Abnormal operating conditions are considered to be where a train is delayed and misses its operating headway, leading to an increase in passengers waiting for the train on the platform and more passengers aboard the delayed train.

ducts of 20 m2 rising up within each station footprint to ventilation fan rooms and the electrical supplies and controls associated with the extract requirements. Fire detection systems and audible warning systems have been included within the space planning requirements of station concept designs. Fire compartmentation of certain station areas, fire doors, fire services intervention access and fire control points have been discussed with the New Zealand Fire Service and are included within the space proofing of the station footprints. A 2- hour fire resistance between the station footprint and surrounding property has been included in the station concept designs.

Britomart Station

33. An indicative design has been developed for alteration to the existing Britomart station to accommodate requirements for CRL operation. These requirements include alteration to the existing track alignment to provide two through tracks to the west of the existing buffer stops for platforms 1 and 5, a reconfiguration of the existing platform layout that maintains a reduced terminating train capacity between the two through tracks and improved vertical passenger circulation. There is provision for tunnel ventilation and equipment rooms for line wide and station systems which are located under Queen Street and Queen Elizabeth Square and have been developed as part of the indicative design for Britomart station.

34. Under the CRL Concept Design, a new ventilation shaft outlet rises to the surface within the wide pavement in Queen Elizabeth Square. The size of the ventilation shaft is determined by the ventilation extract requirements. The visual appearance, bulk, scale and massing of this shaft is to be determined in future stages of design, guided by the UDF principles and the designation conditions. Works to Britomart station, under the Central Post Office Building are proposed in four primary stages which allows 50% of the existing western main street level concourse to be operational at all times (see figure 4-2 in the CDR). Evidence from Mr William Newns describes the structural alterations required under the Central Post Office building to maintain structural integrity of the building for the duration of the works and in the final built condition.

35. The indicative design for Britomart Station is attached as **Appendix 2** to my evidence (Drawing No. ASK-B 001 Rev. C and ASK-B 002 Rev. C). These drawings were included in appendix B to the CDR. . Appendix 4 to my evidence includes an indicative three dimensional drawing of the station.

Aotea Station

36. At Aotea Station, the station diaphragm wall box is located under Albert Street and contains a central island platform that is 150m long, 11.8m wide and at a depth of approximately 13.5m under Albert Street. The station depth is dictated by the track gradient rising from Britomart station and this precludes mined or cavern type station construction at this location due to its proximity to the surface (I note that Mr William Newns, in his evidence, has provided the overview of the constraints that have dictated the concept design and the construction methods envisaged to construct the design).

37. The location of the station box below ground containing the operational station elements is dictated by the desire to remain within the Albert Street footprint and thus minimise the impact on existing buildings both sides of the street. Mr William Newns includes a more detailed description of the position and structure of the station box in his evidence.

38. Under the CDR, four heavy duty metro style escalators[7]and one 26 person lift provide the vertical transportation elements that rise from platform level to a station concourse approximately 7m under Albert Street. This concourse extends north with entrances to both east and west sections of Victoria Street and to the south with entrances from the corner of Albert Street and Wellesley Street and the corner of Wellesley Street and Mayoral Drive.

[7] Heavy duty metro style escalators are a generic type of machine that have an inclined angle of 30 degrees, four level treads before the first rising tread, 1m wide tread width, 0.65m per second operating speed and are manufactured to have an extended life compared with commercial escalators but still have the main drive machinery located between the supporting trusses.

39. The entrance design to Victoria Street West is within the boundary of the building known as the Martha's Corner property and has within it three heavy duty metro style escalators and one 26 person lift linking the concourse to street level. This entrance location was chosen on the basis of its close proximity to the passenger concourse under Albert Street and its proximity to the tunnels under Albert Street heading north to which the ventilation plant and equipment within the entrance building must be connected. The entrance to Victoria Street East is via a stair within a locally widened section of pavement at street level. The southern entrance to Albert Street is within the existing property boundary of the Auckland Central City Lodge Hotel and contains within it two heavy duty metro style escalators, a stair and a 26 person lift linking the concourse to street level. The Wellesley Street entrance is within the property boundary of the Griffiths Building and contains within it two heavy duty metro style escalators, a 26 person lift and stair linking the concourse to street level. The chosen form of top down construction for the Aotea station box constructed under Albert Street does not preclude other entrance opportunities to be included in later stages of design development.

40. Staffed ticket offices, ticket machines, customer information boards and revenue protection gate lines are located at each end of the station concourse beneath Albert Street. Large areas of the platform are not covered by the station concourse and are open to the station roof deck under Albert Street, creating a three storey high space within which passengers will move via the escalators between platform and concourse levels. Emergency evacuation stairs are provided from each end and centrally on the platform. The emergency escape stairs exit to street at the Wellesley Street, Victoria Street west and the Albert Street service road respectively. An emergency services intervention 26 person lift is provided with access from the Albert Street service road. Station and line wide systems ventilation and plant room equipment is located at platform level, on four floor levels above the Victoria Street West entrance and the Albert Street entrance.

41. The tunnel ventilation system located within these station plant areas includes two ventilation fans, each capable of providing the ventilation for the length of tunnel they serve. These fans are approximately 20m

in length, including the associated attenuators and are approximately 4.5m square in cross section at the attenuators. The redundancy built into the system permits replacement, should one fan fail in each location, without impacting upon the safe operation of the CRL tunnels. Separate station ventilation fans are similarly duplicated within the plant areas to ensure that if one fan should need to be replaced then the system can continue to operate safely. All fans are designed to operate with and have been space proofed to include noise attenuation.

42. This aspect of the design has been considered in the evidence of Mr Craig Fitzgerald. The space proofing of cooling plant, for station areas that require it, is located on the rooftop areas of the shafts and entrances as required to maintain acceptable temperatures within the station.

43. The current concept design of the station entrance – which requires sufficient size for passenger circulation, vertical transportation components such as escalators, lifts, emergency escapes and ventilation ducts and risers effectively fill the plan area of both the Martha's Corner and Griffiths buildings. This design requires the removal of all internal walls and structural supports. The extent of major plant and equipment on the four floors above the entrance at Martha's Corner also requires the removal of all intermediate floors of the building.

44. The depth of the station entrance structure below ground to provide the entrance, vertical transportation elements and emergency escape passageways and stairs to both Martha's Corner and The Griffiths building requires the removal of the external walls of the existing buildings and at Martha's Corner the part of the building known as the Mexican Cafe is also required to be removed due to the impact of the works on the party wall on the western edge of the new entrance structure. This is further explained in the evidence from Mr William Newns. Whilst record information with respect to both the Martha's Corner building and the Griffiths building is not complete some relevant record plans and sections of both buildings are included in Appendix 3 to my evidence to illustrate the existing cellular nature of the structure and form of the buildings and these highlight the difficulty of locating

passenger circulation, vertical circulation and ventilation fan elements required for station operations within the existing building envelopes.

45. Whilst appreciating the heritage value placed upon the Martha's Corner and the Griffiths buildings, as explained in the evidence by Mr Bruce Petry, if the current concept design is implemented it is unlikely that the retention of facades, interior fabric and interior floors of these buildings with a view to adaptive re-use will be possible. Further examination of this aspect of the concept design will be undertaken in the future stages of design development to see if there are realistic alternatives to the demolition of these buildings. At this stage, based on my knowledge of the technical requirements for a station entrance at this location, it is my opinion that a replacement building that fulfils the needs of a modern station entrance will need to be developed in these two locations and therefore complete demolition must be, at least contemplated at this point in time.

46. If demolition is required the footprint for the station entrances is flexible enough to allow development to be sympathetic with the surrounding urban form and positively re-provide active frontages to public spaces. Historic references and components from the original buildings may prove useful for possible inclusion within the new station entrances. A successful approach to the station entrance design that is likely to replace the existing heritage buildings will be demonstrated by the visual quality and technical excellence of the replacement buildings to be developed in future stages of design, consistent with the Urban Design Framework.

47. The Aotea Station concept design has been future proofed for potential platform level interchange between CRL and the potential North Shore Line (see table 1-2 of the CDR) by identifying space within the station box for the provision of two heavy duty metro style escalators and one 26 person lift, connecting passageways and additional structural works that would provide this connection. In addition the concept design has identified the potential location of additional entrance capacity that can be added to the CRL entrance in Wellesley Street to support the additional passenger volume from a potential North Shore Line.

48. The indicative design for Aotea Station is attached as **Appendix 2 to m**y evidence (Drawing Nos ASK-A 001 Rev C and ASK-A 002 Rev. D). These drawings were included in appendix B to the CDR. Appendix 4 to my evidence includes an indicative three dimensional drawing of the station.

In summary I can confirm that the Aotea station concept design meets all of the objectives and requirements for the CRL project and provides a practical station footprint with sufficient inherent flexibility to allow for further refinement in more detail in the forthcoming stages of design development.

Karangahape Station

49. Karangahape Station has two mined side platform tunnels with 4.5m wide and 150m long platforms at a level approximately 33m below Beresford Square. The depth of the station at this location is determined by the maximum track gradients of the line between Aotea station and Newton station (as described in evidence by Mr Newns).

50. In addition, the width of Pitt Street, the proximity of the adjacent heritage buildings and the station depth combine to dictate the change in station construction from that used at Aotea Station from top down station box to a mined tunnel configuration and from an island platform configuration to mined single face platforms. The evidence provided by Mr William Newns outlines the construction constraints, geological conditions and the method of construction chosen for the station.

51. The desire to limit impacts upon existing buildings has dictated the use of Beresford Square as the site for the main station entrance. This requires the demolition of the buildings and structures within the square to accommodate the new station entrance, shaft and associated plant and equipment building. Options that avoid these buildings within Beresford Square would require the acquisition and potential demolition/substantial alteration of other buildings nearby, many of which are of heritage value. The new station entrance buildings have been carefully considered to minimise impacts on the heritage buildings

on both sides of Beresford Square. The status and importance of these buildings is described in more detail in evidence from Mr Bruce Petry

52. The Beresford Square entrance contains three heavy duty metro style escalators that rise initially within inclined escalator shafts and then within diaphragm wall shafts to entrances at each end of the station: Beresford Square to the north and Mercury lane to the south. Each entrance is also provided with one 26 person lift between entrance and platform level to provide universal access from train to street. Each entrance contains a manned ticketing facility, main customer information display board and revenue protection gate line.

53. A second street level building in Beresford Square contains ventilation shafts and plant rooms, access to the plant and equipment below ground and emergency evacuation stairs from the northern end of the platforms. Emergency evacuation from the southern end of the platforms rises to street level, emerging from the Mercury Lane entrance building into Mercury lane. An emergency services 26 person intervention lift from street to platform level is provided within the Mercury Lane entrance building.

54. The buildings that occupy the space for the entrance in Mercury lane are required and will need to be demolished to provide for the location of the proposed Mercury Lane entrance. The station shaft, entrance building and plant above the station building entrance effectively occupy the entire site of the existing buildings fronting onto Mercury Lane at this location. The shaft location is critical for this entrance in that it must either be clear or extend beyond the northbound running tunnel western edge otherwise the construction of the running tunnels becomes problematic. The shaft must also be located to enable the tunnel ventilation to the south of Karangahape station to be connected to the fans in the shaft. The inclined escalator shaft must also be located between the platform mined tunnels to enable passengers to distribute to the platforms on each side.

55. The tunnel ventilation system located within these station plant areas includes for two ventilation fans, each capable of providing the ventilation for the length of tunnel they serve. The redundancy built into

the system permits replacement, should one fan fail in each location without impacting upon the safe operation of the CRL tunnels. Separate station ventilation fans are similarly duplicated within the plant areas to ensure that if one fan should need to be replaced then the system can continue to operate. All fans are designed to operate with and have been space proofed to include noise attenuation. This aspect of the design has been considered in the evidence of Mr Craig Fitzgerald. The space proofing of cooling plant for station areas that require it is located on the rooftop areas of the shafts and entrances at each station building as required to maintain acceptable temperatures within the station footprint.

56. The indicative design for Karangahape Station is attached as **Appendix 2** to my evidence (Drawing No.s ASK-K 0012B rev. D and ASK-K 002 2B Rev. D). These drawings were included in appendix B to the CDR. . Appendix 4 to my evidence includes an indicative three dimensional drawing of the station.

57. In summary I can confirm that Karangahape station concept design meets all of the objectives and requirements for the CRL project and provides a practical station footprint with sufficient inherent flexibility to allow for further refinement in more detail in the forthcoming stages of design development

Newton Station

58. Newton station consists of two mined side platform tunnels with 4.5m wide, 150m long platforms approximately 42m below Symonds Street. The depth of the station at this location is determined by the maximum track gradients of the line from Newton station. The width of Symonds Street, the proximity of the adjacent water reservoir and the station depth combine to dictate the change in station construction from that used at Aotea Station from top down station box to mined configuration and from an island platform configuration to mined single face platforms.

59. The anticipated initial patronage at Newton station is lower than Aotea or Karangahape stations and in considering this in the context of the

depth of the station 42m below the surrounding streets, has influenced the use of a single station entrance with four 53 person lifts as the primary means of access for passengers, at this stage. A second entrance is not precluded in the in future from a design point of view if justified by increased patronage. This form of vertical transportation provides a more rapid means of travelling between street and platform level than multiple escalator banks and results in a smaller overall shaft and station footprint than would otherwise be required to support other options such as a combination of stairs and escalators. Modern design of glass lifts rising and descending within a well lit shaft within which the primary structure is expressed as a design feature, will provide an attractive and memorable experience for passengers using this station. The lifts operate from platform level within a diaphragm wall shaft to an entrance within the property on the corner of Symonds Street and New North Road. A secondary entrance, described below is utilised for emergency access/egress and for plant and equipment.

60. The station entrance provides for a manned ticketing facility, main customer information display board and revenue protection gate line. The main entrance shaft also contains, ventilation and mechanical and electrical risers for station and line wide systems. The emergency services intervention lift and emergency evacuation stair also rise up within the station entrance shaft with access to the rear of the building at surface level. A second diaphragm wall shaft is located withina property on Dundonald Street containing emergency evacuation stair, electrical and mechanical plant and equipment. Ventilation plant and electrical equipment is placed on the two floors above the station entrance and within and on two floors above the second shaft emergency exit level.

61. The tunnel ventilation system located within these station plant areas includes for two ventilation fans, each capable of providing the ventilation for the length of tunnel they serve. The redundancy built into the system permits replacement, should one fan fail in each location without impacting upon the safe operation of the CRL tunnels. Separate station ventilation fans are similarly duplicated within the plant areas to ensure that if one fan should need to be replaced then the system can continue to operate. All fans are designed to operate with and have

been space proofed to include noise attenuation. This aspect of the design has been considered in the evidence of Mr Craig Fitzgerald. The space proofing of cooling plant for station areas that require it is located on the rooftop areas of the shafts and entrances at each station building as required to maintain acceptable temperatures within the station footprint.

62. The indicative design for Newton Station is attached as **Appendix 2** to my evidence (Drawing No.s ASK-N 001 Rev. C and ASK-N 002 Rev. D). These drawings were included in appendix B to the CDR. Appendix 4 to my evidence includes an indicative three dimensional drawing of the station.

63. In summary I can confirm that Newton station concept design meets all of the objectives and requirements for the CRL project and provides a practical station footprint with sufficient inherent flexibility to allow for further refinement in more detail in the forthcoming stages of design development

Response to submissions

64. I have read the submissions lodged and focus on those which have raised matters in relation to CRL station design. In this section of my evidence I will address matters raised.

Submission 83 (Luke Turner) and other submissions related to station entry points

65. *This submitter and others have questioned whether an appropriate level of future proofing of the station designs for future rail demand of rail projects has been undertaken.*

66. The Station concept designs have been developed in line with the anticipated train frequency of 20 trains per hour (see table 3-1 in the CDR),a peak hour train carrying capacity of 760 passengers and assumed to be full upon entering the CRL network in the peak operating periods and the anticipated patronage splits between

stations. This establishes peak period boarding and alighting profiles for each station. My evidence at paragraphs 28 to 31 and 47sets out how the future proofing of station footprints has been undertaken.

67. I further note that the station concept designs have been space proofed using London Underground station planning standard S-1371 to provide for adequate platform widths, passageway widths, escalator and lift capacity, gateline capacity and entry/exit capacity to respond to the passenger flows and movements within each station from train to station entrance. My evidence confirms in paragraph 47 that the Aotea Station concept design has been future proofed for potential platform level interchange between CRL and the potential for a future North Shore Line (see table 1-2 of the CDR)

68. *In addition the submitter and others request the provision of good access to and from Aotea station to Queen Street, Elliott Street, Darby Street and Aotea Square are provided from station entrances and that provisions for the mobility impaired are included within the station design.*

69. The Aotea station entrances are located at each end of the station box that is located under Albert Street. Access to Queen Street, Darby Street and Elliott Street is via the Wellesley Street and Albert Street station entrances, to the South using Wellesley Street and via the Victoria Street entrances to the North using Victoria Street. The positions of entrances and their configuration is described in more detail in paragraphs 36 to 48 of my evidence

70. I also note that step free universal access is described for each station in paragraph 27 of my evidence.

71. *In terms of Newton Station, the submitter raises the issue of the use of elevators to access the station platforms and safe crossings of roadways.*

72. The station depth is approximately 42m below Symonds Street and the patronage levels at this station are anticipated to be lower than either Aotea or Karangahape station. Four 53 person lifts will provide a more rapid route between platforms and street entrance than escalators or

stairs. Paragraph 58 to 63 of my evidence describes the concept design for Newton station.

73. The concept station designs have considered the exit points from station entrances in the context of potential pavement widening, creation of central pedestrian islands within roadways and provision of additional pedestrian crossings. Further development of this concept is proposed in future design development and needs to respond to other Auckland Council initiatives being considered, the UDF principles and traffic management schemes being investigated outside of the CRL project. In his evidence Mr Alistair Ray provides more detail on this aspect of the concept design.

74. Submission 83 has raised an issue that all stations should have dual tracks. The station and track concept designs for CRL have been configured for 20 trains per hour for six carriage rolling stock. Each station has two CRL operational platform faces served by the respective up and down line tracks. Additional tracks and connecting crossovers would increase the size of tunnels and station footprints and are not considered necessary to achieve reliable delivery of the anticipated operational timetable.

Submission 121 (Anthony Segedin)

75. *The submitter has raised an issue with respect to the likely noise and vibration caused by the operation of ventilation in the shaft at 9 Mercury Lane and the increased street noise and disturbance to the amenity of the area arising from vehicle drop off and parking areas.*

76. The Mercury Lane station entrance building and shaft below ground houses the tunnel and station ventilation equipment for the southern end of the station. This equipment discharges its ventilation air vertically from the roof of the building, approximately 11m above road level.

77. The ventilation fans have been space proofed to accommodate noise attenuation to reduce environmental impact to local noise receptors. The tunnel and over-track ventilation fans will operate at times of an emergency incident within the station or tunnel, when temperatures

need to be reduced within the tunnel sections of the line and during maintenance works within the tunnels. The ventilation shafts also accommodate draught relief functions that permit air to be moved through the ducts by virtue of train movements without the assistance of the fans. The noise and vibration effects of the construction of the station shaft at Mercury Lane and the noise effects of the operation of these fans during normal and abnormal operational circumstances are examined in evidence from Mr Craig Fitzgerald and Mr James Whitlock. Issues raised in association with disturbance to the general amenity of the area are addressed in evidence from Ms Fiona Blight.

78. It is not anticipated that there will be street parking or drop off facilities at the Mercury Lane entrance to the station given the width of Mercury Lane and that these functions are anticipated to take place at the Beresford Square station entrance where there is room to accommodate them if required.

Submission 72 (New Zealand Historic Places Trust)

79. *The submitter requests that consideration be given for retention or adaptive re-use of heritage structures where possible.*

80. I note in my response that the buildings identified by this submission are required for the purposes associated with the provision of station entrances and associated plant and equipment. Paragraphs 33 to 63 of my evidence describe the issues associated with each station concept design. The evidence from Mr Bruce Petry describes the heritage issues associated with these buildings.

Submission 201 (Adam Weller)

81. *Entrances are provided in the NW corner of Albert Street and Victoria Street and the submitter asks the question, why not use Elliott Tower site?*

82. The station concept design is based on a top down construction approach and provides a continuous concourse under Albert Street. This concept design does not preclude a future entrance from being attached to the station from within the site identified at some time in the

future. The site chosen for the station entrance in the concept design is in the optimum location to connect the tunnel ventilation from the running tunnels to the north of the station box and also to allow the passenger demand crossing Victoria Street to proceed down Albert Street in a northerly direction.

83. *Why no exit via a tunnel from the station to Queen Street or Elliott Street is a question raised by the submitter.*

84. Access directly from the station platforms to Queen Street or Elliott Street would require the construction of escalators down from the platforms, a passageway under the track formation and the construction of a passenger tunnel 140m and 70m in length respectively along with ticketing and gating facilities somewhere on the route. The passenger experience within such a long underground passageway could be unacceptable and the preference for pedestrians to stay at street level is generally accepted as the appropriate choice for such movements where possible. The station entrances in the concept design have been located in the optimum location to respond to the physical constraints of the station platform location and the passenger demand from within the precinct that the station serves to the north, south east and west.

85. *Why not have an entrance directly onto Karangahape Road is a question raised by the submitter.*

86. The entrance in Beresford Square is close (50m) to the intersection of Pitt Street and Karangahape Road and this provides immediate access to the main shopping area. The entrance location and its associated below ground connecting tunnels and operational plant space has been chosen to have the least impact on the existing buildings in the area, many of which are important from a built heritage perspective. The location of the entrance also provides circulation space around the station building without immediate impact on Pitt Street or Karangahape Road. The depth of the station and its construction in mined tunnels described in paragraphs 49 to 57 of my evidence results in less flexibility than the top down approach to Aotea station, where

the provision of numerous station entrance options does exist and has been provided for in the concept design.

87. *Why only one entrance at Newton Station is a question raised by the submitter.*

88. The concept design for Newton Station has been developed to meet the anticipated levels of patronage. This level of patronage can be accommodated within a single entrance that has been placed to locate passengers centrally along the length of the platforms below ground and also to occupy a street level location that provides good access to the surrounding area. A second entrance is not required at this location. See paragraphs 58 to 63 of my evidence that describes the rationale of the single entrance.

89. *Why not provide a public stair in addition to lifts at Newton Station is a question raised by the submitter.*

90. Emergency evacuation stairs are provided to serve each end of the operational platform but the normal route to the surface is expected to be via the four 53 person lifts. Public stairs rising from platforms at this depth are not considered a practical way of moving passengers at railway stations. Paragraphs 58 to 63 of my evidence describe the rationale of the station entrance configuration in the concept design.

Response to Planner's Report

91. I note in the Planners Report in the description of Aotea station that three entrances are provided to the station[8]. My evidence in paragraphs 36 to 48 confirms that there are four entrances provided to the station. This is also shown on the plans in Appendix B to the CDR and appended once more to my evidence in Appendix 2

92. I note in the Planners Report in the description of the second shaft at Newton station that this contains an alternative emergency egress.[9]

[8] Section 2.2.2.1, first paragraph second line

[9] Section 2.2.2.3 4th and 5th lines of the second paragraph

This shaft also contains station and line wide plant and equipment as described in paragraphs 58 to 63 of my evidence

93. I note in the Planners Report that the demolition of the Martha's Corner building and the Griffiths Holdings (Glengarry Building) building are described as a 'worst case scenario' and considers the possibility of adaptive re-use [10] In paragraphs 36 to 48 of my evidence I describe the extent of works required to accommodate station entrances and the associated plant and operational equipment at these locations in the concept design. I also describe the limitations on being able to adaptively re-use the existing buildings. In the discussion section of the Planners Report[11] it states that 'Built heritage should certainly not be seen as a constraint to the project; the introduction of the CRL can be considered an opportunity to breathe new life into Auckland's heritage context and to create a more vibrant, liveable and multi-faceted urban environment as part of the ongoing change that has shaped modern Auckland' Retention of the Martha's Corner and Griffiths Holdings (Glengarry Building) buildings will constrain CRL with respect to the ability to provide station entrances and the associated plant and equipment necessary to operate the station and the line wide systems for CRL. Retention will also limit the projects ability to deliver a design solution that responds to the Urban Design section of the Planners Report[12] with respect to function, performance and personality.

Proposed Conditions

94. I note that the proposed draft conditions for built heritage[13] provide that the Requiring Authority is to explore the adaptive re-use of the Martha's

[10] Section 9.11.1, page 135 penultimate paragraph, Section 9.11.4.5.3 and Section 9.11.5

[11] Section 9.11.4.1.3 second paragraph

[12] Section 9.16.2 final set of bullet points

[13] Condition 22 paragraph (c)

Corner and Griffiths Holdings (Glengarry) building with complete demolition only to be considered as a last resort. The condition also defines an appropriate level of adaptive re-use including facade retention in three dimensions, the placing of floor levels within any new building that align with the original floor levels and where possible retaining fabric of the building beyond the facade, In paragraphs 36 to 48 of my evidence I conclude that the space planning requirements for station entrances and the size and scale of plant and equipment required to support the station and line wide systems on these sites will most likely preclude retention and adaptive re-use of the buildings and thus complete demolition is the most likely outcome. Whilst this issue will be examined in more detail in future design development the condition is seen as unrealistic and unachievable in the context of the concept design.

95. I note that a condition[14] is sought with respect to facilitating an improvement to the crossing of New North Road, Symonds Street and Mt Eden Road at Newton station to access an existing bus stop. I can confirm that the concept design does not preclude this improvement to existing pavements and roadways should this be required in future.

96. I note that a condition[15] is sought with respect to seeking an improvement to Aotea Square from the Wellesley street station entrance. The importance of Aotea Square and its proximity to the proposed station entrance in Wellesley Street is understood and the concept design does not preclude improvements to the route to Aotea Square, should this be required in future.

97. I note that a condition[16] is sought with respect to adaptive re-use strategies for built heritage being considered to preserve the buildings role in establishing the streetscape and urban character. Paragraphs 36 to 48 of my evidence explains the scale and content of the station

[14] Condition 29, final bullet point

[15] Condition 29, 6th bullet point

[16] Condition 36 (b) 6th bullet point

entrances at Aotea station and the difficulties that retention and adaptive re-use of heritage buildings in this location will present to the concept design.

98. I note that a condition is sought with respect to land acquired for Newton station, the opportunity for a continuous adaptive building frontage to the road reserve and the need for an active frontage to be presented to the street. Paragraphs 58 to 63 of my evidence describe the station entrance building and the secondary shaft for the station. Where possible retail frontages are envisaged along part of the station entrance building but part of the entrance building frontage is, by necessity there to provide a station entrance facility that is by its nature not continuously adaptive. In addition the secondary shaft serving Newton station on Dundonald Street has limited capacity to incorporate active frontages and again its utilitarian function in providing key emergency escape and plant accommodation for the station results in a fixed use. If additional functions were to be incorporated within the shaft it would grow in size and could require additional land to provide the facility.

John Henry Fellows

2 July 2013

Appendix 1

Design Package Manager for the delivery of RIBA E and RIBA F detail design for the circa £500m Liverpool Street Station project. The role included leading the multi-discipline team of architects, QS's, MEP and Civil/structural engineers, leading discussions with London Underground and Network Rail in meeting their aspirations for design delivery of an integrated project. Presenting the designs at key milestone meetings with the client team and ensuring that all design delivery dates were met and approvals obtained.

Design Package Leader in assisting the client team in the development of the Architecture and Design Manual for the detail design stage of the £16Bn Crossrail project.

Interface Manager for the Crossrail Liverpool Street Station detail design, the preparation of the Interface Management Plan and Interface Control Documents for the project. The role includes leading the interface co-ordination and management of internal CRL appointed design contracts, presenting interface issues as an integrated part of the design to client organisations. Chairing interface meetings and the management of external stakeholders within the management processes and procedures required by the client team and delivery partner.

Peer Reviewer, requested by the High Speed 2 (HS2) client team to review all station designs north of Birmingham to establish sound design principles upon which the intended designs can be taken forward by the respective design teams. Detailed peer review of the Old Oak Common HS2 multilevel multi-moda interchangel station concept design. Peer review of the Kuala Lumpur Blue Line station concept designs. Peer review of the outline design stages of Gogar new station for Edinburgh Airport, leading the design reviews with the client team in Network Rail and Transport Scotland and working with the design team to obtain the best design solutions at each stage of development.

Architecture and Design manager for the £3.5Bn Thameslink Project with new stations at Blackfriars, Farringdon, London Bridge, St Pancras Midland Road to RIBA Stage D and Civil engineering infrastructure in sensitive areas such as the dive under at Bermondsey and the viaduct over Borough Market. Project presentations to consultation groups including CABE, English Heritage, London

Boroughs and private individuals in addition to the attendance of the public consultation mobile public exhibition.

Architecture and design manager for the Ashford International station project from inception to completion of construction on site. The role included setting the clients design requirements, reviewing and approving the detail designs for construction and monitoring construction delivery on site.

Expert witness preparing and delivering expert witness testimony for all civil engineering and station architectural designs in the core area of the Thameslink project at the 11 month Transport and Works Act Public Inquiry and station closure hearings.

Design manager for the detail design of the £9m Crystal Palace Station Enhancement Project for the Grade II heritage listed station, on behalf of TfL London Overground Engineering, including writing the design brief, managing the design delivery and reviewing the multi-discipline designs. The role included consultation with Railway Heritage Trust, London Borough of Bromley, English Heritage and The Victorian Society with close liaison with Network Rail.. The role included passing the TfL East London Line Project Engineering Assurance Competency Assessment for engineering review of architectural and building design outputs on behalf of London Overground .

Head of Station Design – Network Rail Civil Engineering A direct report to the director of civil engineering and a member of the civil engineering executive of Network Rail this role required leadership of a national specialist team of architects and design specialists with the responsibility to achieve the required design quality for a portfolio of 650 live projects for the Network Rail portfolio of 2500 stations on the main line network. Setting design policy and visual quality standards for the 17 managed station portfolio, the franchised estate and listed buildings and conservation guidance across the network. Leading design reviews of project outputs. Leading the team development of the Managed

Station Design Guide and the Conservation Guidelines for heritage infrastructure for Network Rail.

Client Sponsor and budget holder of master plan developments at Birmingham New Street, Victoria, Gatwick Airport, Waterloo, Charing Cross and Cannon Street stations, integrating commercial and operational requirements to deliver best value to Network Rail.

Project sponsor and stakeholder management for the development of the £350m Birmingham Gateway project included writing the design development remit, being a member of the consultant selection team. This role included leading the Value Management of the project down from an unaffordable £840m to £350m, with no loss of operational functionality, alongside the development of a comprehensive business case with a benefit cost ratio of 4.2:1 to achieve funding approval. The role also included the management of external funding agencies including Centro, Birmingham City Council, Advantage West Midlands, Strategic Rail Authority and Department for Transport to achieve funding contributions of £300m and management of their expectations whilst retaining their enthusiasm for the project. This role also included presentations to MP's at Westminster, presenting the Birmingham project to the Transport Minister and HM Treasury officials in Birmingham.

Teaching : I an a guest lecturer and deliver a module on station design to students in the MSc Railway Engineering course at Birmingham University in the UK each year as part of the Mott MacDonald contribution to the education of engineering students.

Appendix 2

Station Plans from Concept Design Report

LOCATION PLAN

City Rail Link - Indicative Britomart Station Concept

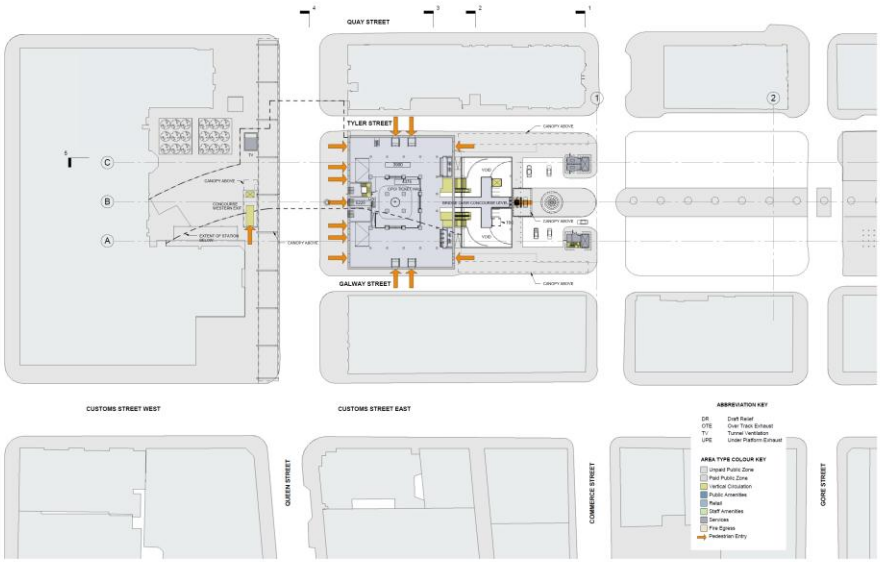
PREPARED FOR Auckland Transport
JOB No. 212005

LOCATION PLAN

SCALE @ A1 1 : 1250
SCALE @ A3 1 : 2500

DRAWING No. ASK-B 001
REV. C

aurecon Matt MacDonald GRIMSHAW Jasmax



SITE PLAN

City Rail Link - Indicative Britomart Station Concept

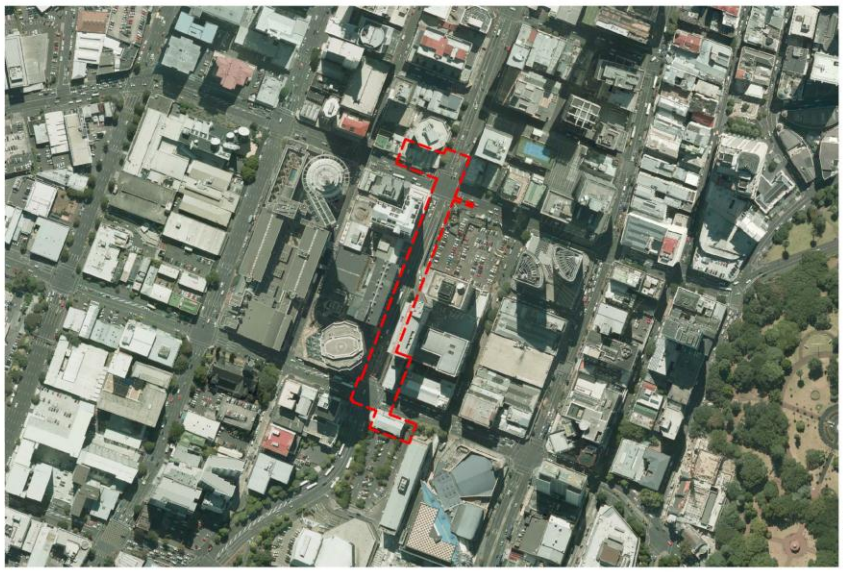
PREPARED FOR Auckland Transport
JOB No. 212005

SITE PLAN

SCALE @ A1 1 : 500
SCALE @ A3 1 : 1000

DRAWING No. ASK-B 002
REV. C

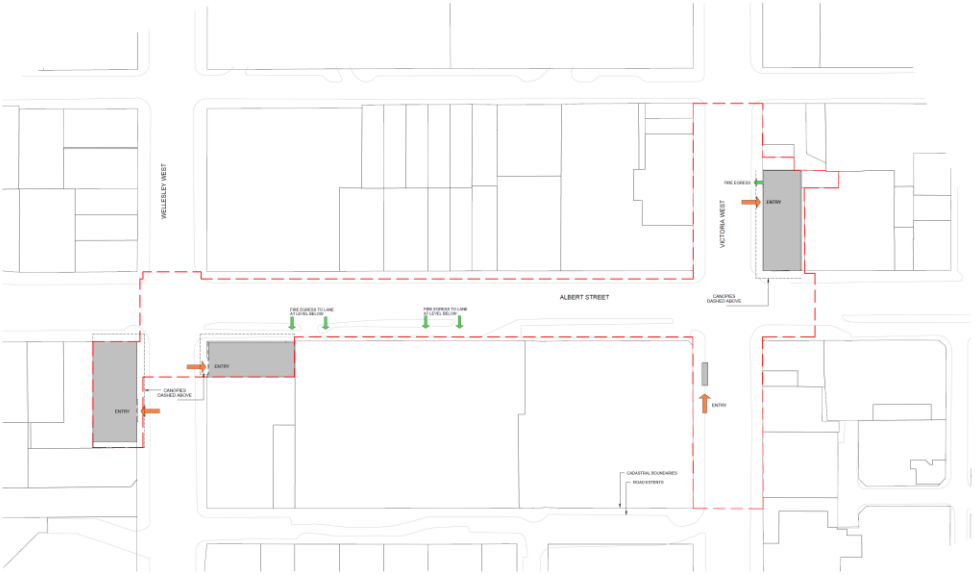
aurecon Matt MacDonald GRIMSHAW Jasmax



DRAWING LIST	
Number	Name
S01	3 LOCATION PLAN
S02	CADASTRAL SITE PLAN
S10	STREET LEVEL PLAN
S11	CONCOURSE & PLATFORM LEVEL PLANS
S12	PLANT LEVELS 2 & 3 PLANS
S13	PLANT LEVELS 4 & 5 ROOF PLANS
S15	5 LONGITUDINAL SECTION
S17	1 CROSSTIONAL SECTION
S32	CROSS SECTIONS

Plan
LOCATION PLAN

City Rail Link - Indicative Aotea Station Concept		REVISIONS	
PREPARED FOR Auckland Transport JOB No. 212005	LOCATION PLAN	SCALE @ A1 1 : 1250 SCALE @ A3 1 : 2500	DRAWING No. ASK-A REV. C



Plan
CADASTRAL SITE PLAN

City Rail Link - Indicative Aotea Station Concept		REVISIONS	
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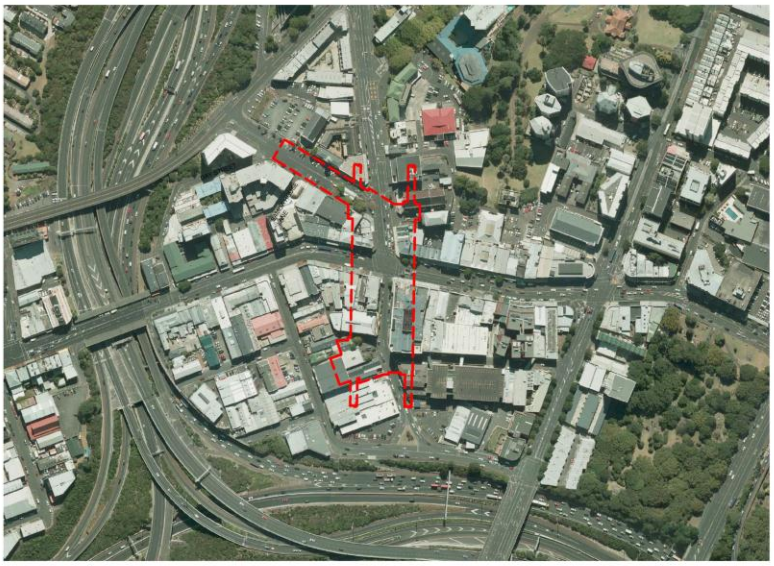

LOCATION PLAN

City Rail Link - Indicative Karangahape Station Concept

PREPARED FOR Auckland Transport
JOB No. 212005

LOCATION PLAN

SCALE @ A1 1 : 1250
SCALE @ A3 1 : 2500

DRAWING No. ASK-K 001 DB
REV. D

CADASTRAL SITE PLAN

City Rail Link - Indicative Karangahape Station Concept

PREPARED FOR Auckland Transport
JOB No. 212005

CADASTRAL SITE PLAN

SCALE @ A1 1 : 500
SCALE @ A3 1 : 1000

DRAWING No. ASK-K 002 DB
REV. D


LOCATION PLAN
City Rail Link - Indicative Newton Station Concept
PREPARED FOR Auckland Transport
JOB No. 212005
LOCATION PLAN
REVISIONS
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SCALE @ A3 1 : 2500
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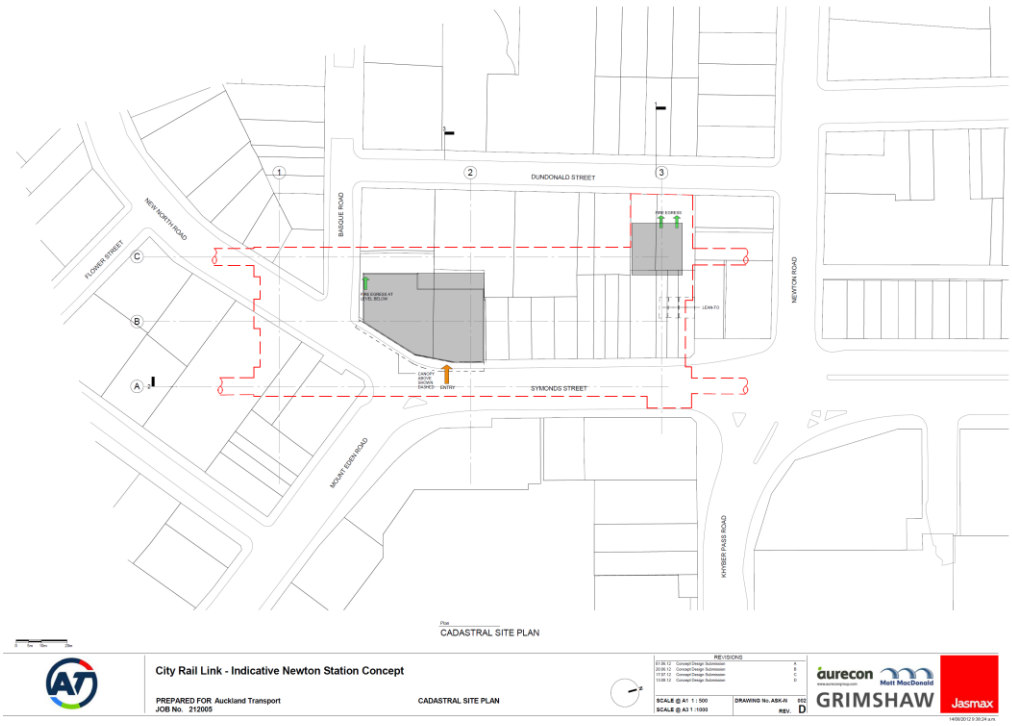
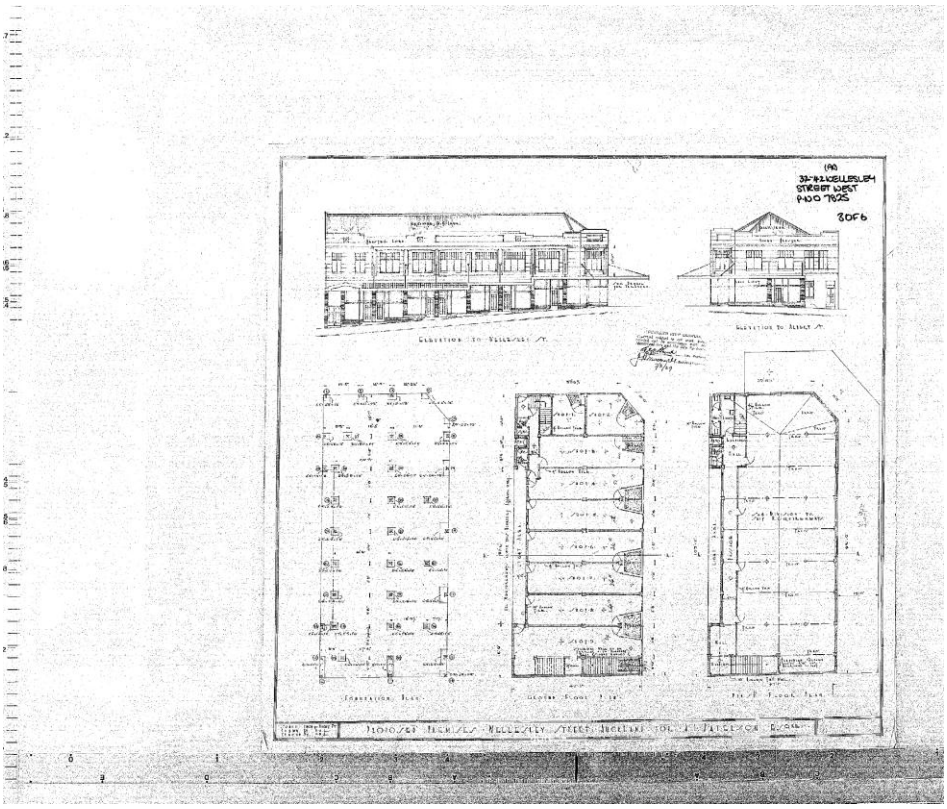
REV. C
aurecon
Mott MacDonald
GRIMSHAW
Jasmax

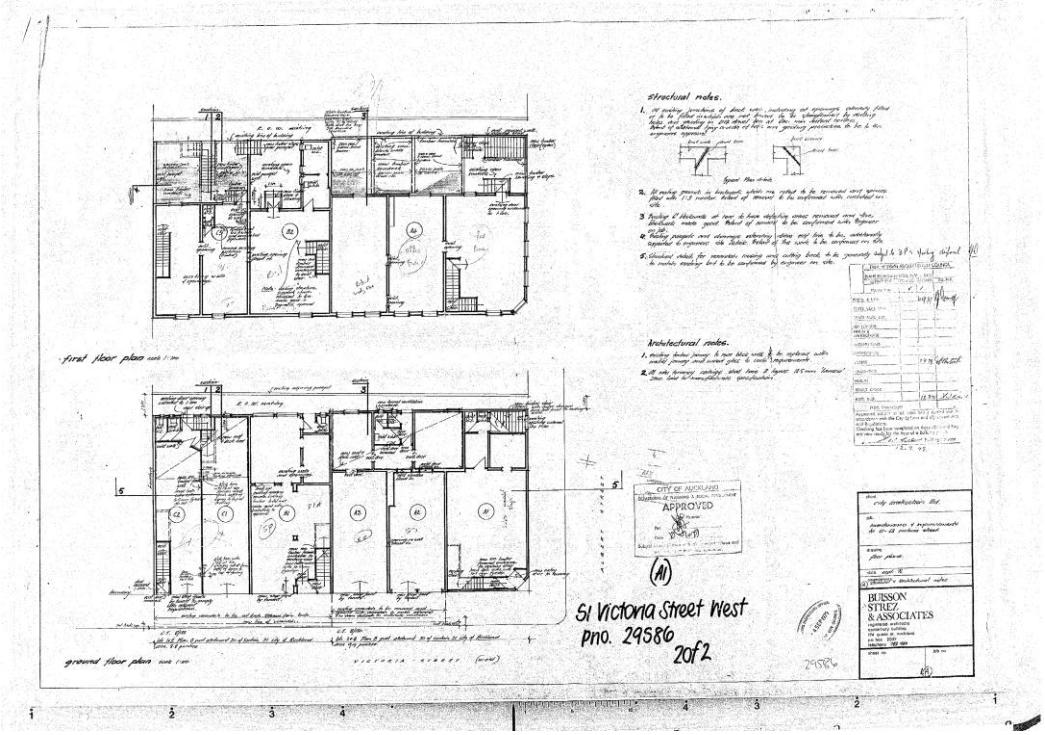

DUNDONALD STREET
SYMONDS STREET
BASQUE ROAD
NEW NORTH ROAD
FLOWER STREET
MOUNT EDEN ROAD
NEWTON ROAD
KHYBER PASS ROAD
ENTRY
CADASTRAL SITE PLAN
City Rail Link - Indicative Newton Station Concept
PREPARED FOR Auckland Transport
JOB No. 212005
CADASTRAL SITE PLAN
REVISIONS
SCALE @ A1 1 : 500
SCALE @ A3 1 : 1000
DRAWING No. ASK-N
REV. D
aurecon
Mott MacDonald
GRIMSHAW
Jasmax

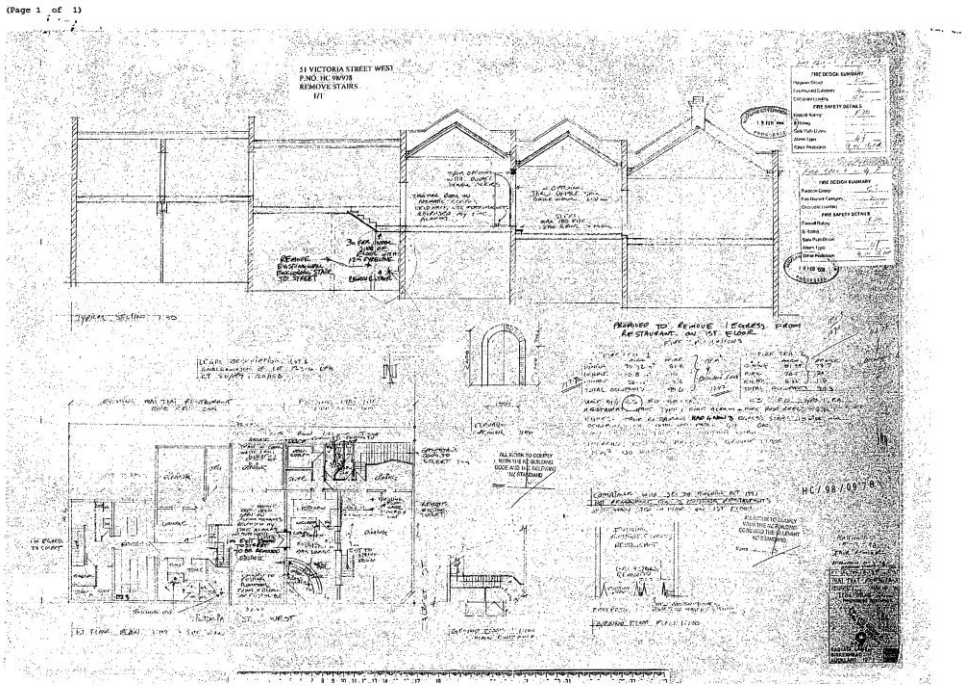
Appendix 3

Griffiths Holdings (Glengarry's) building



Martha's corner

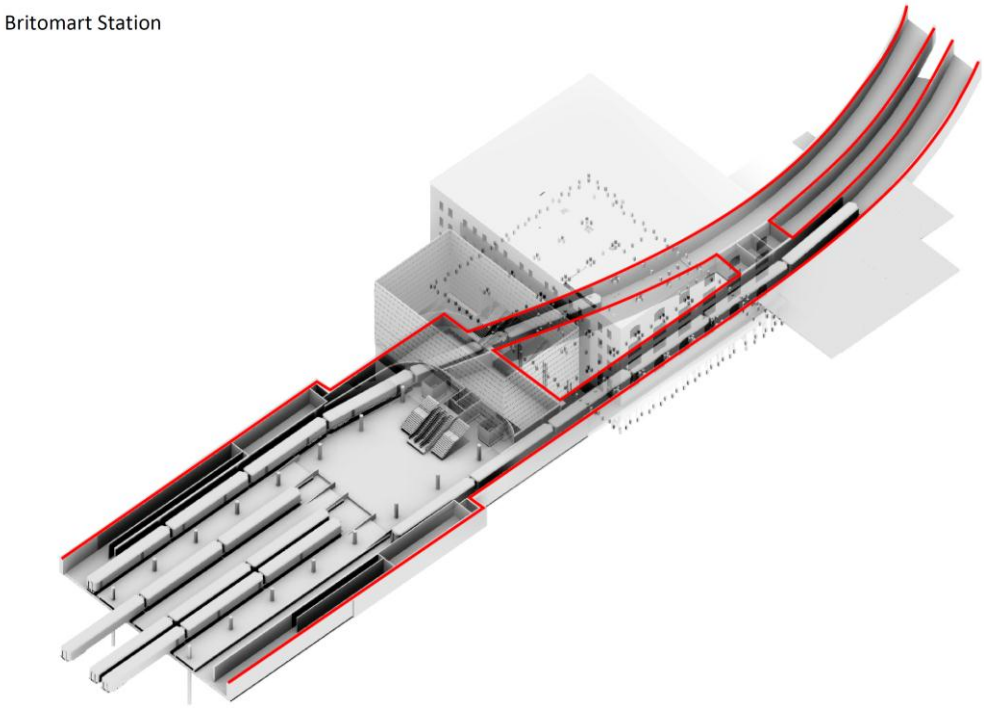


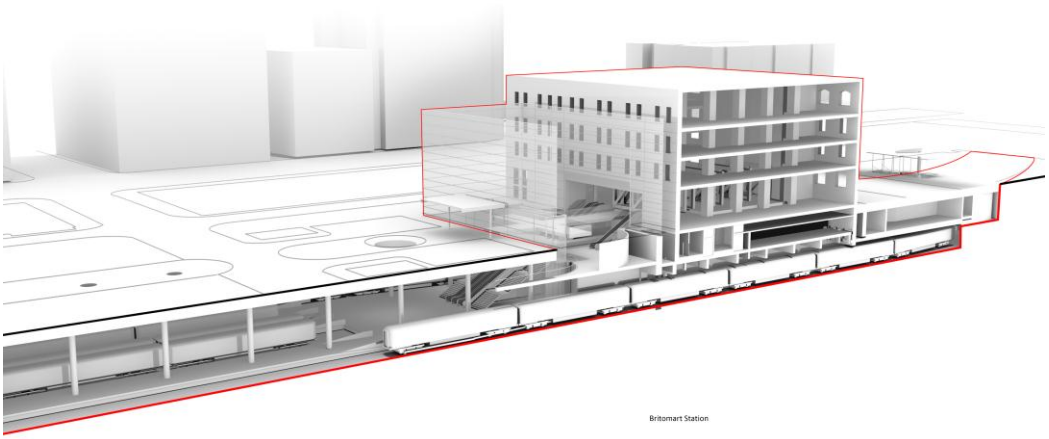


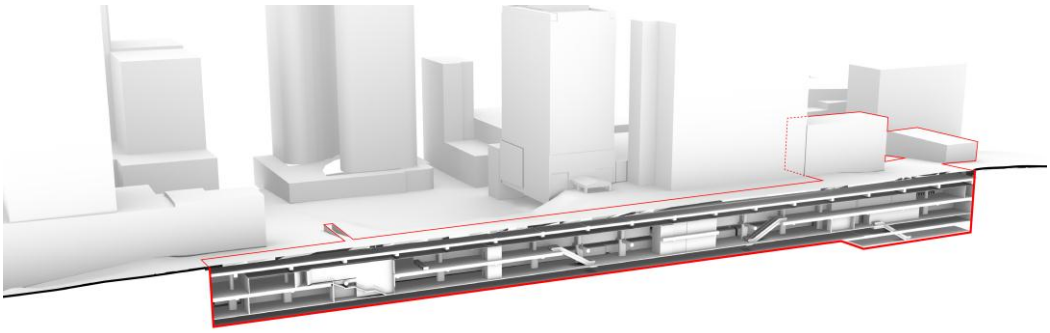
Appendix 4

Indicative three dimensional images of stations

Britomart

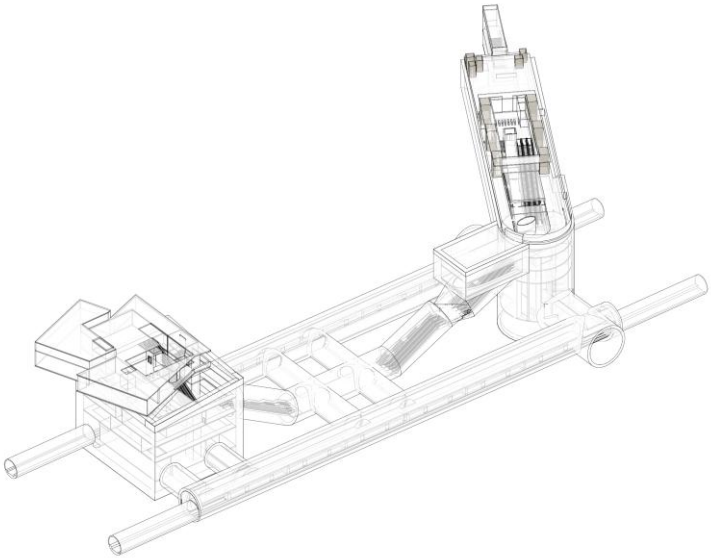




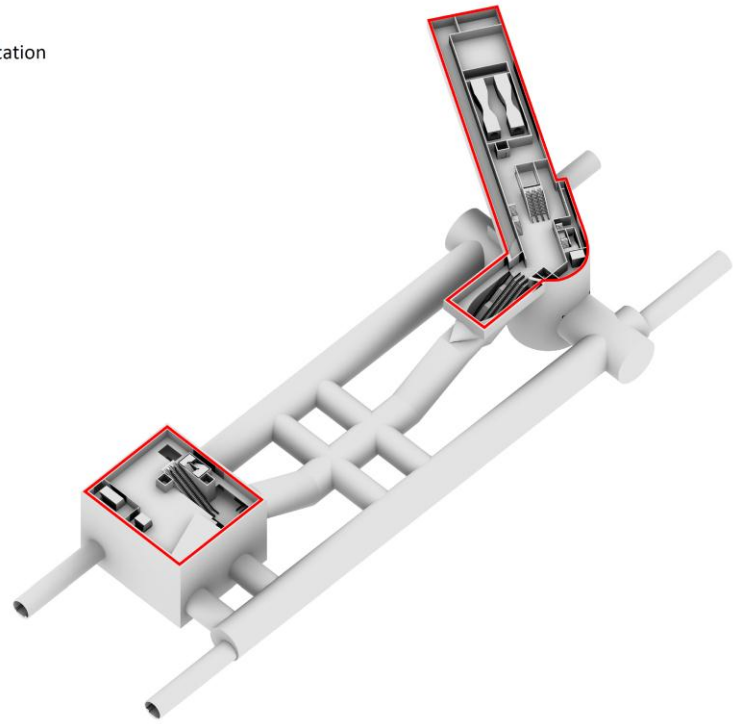


Aotea Station

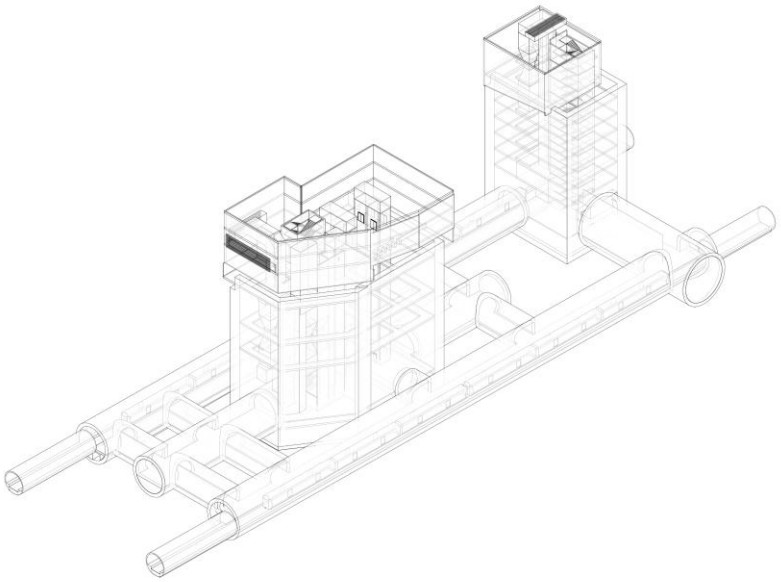
Karangahape Station



Karangahape Station



Newton Station



Newton Station