Chairman's Introductory Note

Sarawia Street Level Crossing Closure: High Level Independent Expert Options Review for the Auckland Transport Board

Following a decision made by the Auckland Transport Board to select the Cowie Street Over Bridge option as the preferred option for the Sarawia Street level crossing closure, there was a request from the Cowie Street Residents Association to present an alternate Underpass Proposal. This request was agreed to and the final proposal presented was subject to both an internal Auckland Transport review as well as an external expert review (Opus), neither of which substantiated the underpass proposal as a superior option to the Cowie Street Over Bridge option.

The Auckland Transport Board determined that Opus was not fully independent of Auckland Transport in relation to this project and in order to ensure a fully independent view, the Auckland Transport Board itself directly mandated AECOM to undertake a high level independent review of the options to facilitate the closure of the Sarawia Street level crossing in Newmarket.

As Chairman I wrote (7th October 2014) to the AECOM Group Director Transportation and Environment requesting that AECOM prepare a report to the Auckland Transport Board by 23rd October 2014 (in time for its October Board meeting), that included:

- A high level Multi Criteria Assessment Review of the Sarawia Street Level Crossing replacement options considered in the 2013 AT Newmarket Level Crossing Scheme Assessment Report as well as the subsequent underpass option proposed by the Cowie Street Residents Association.
- A detailed review of the underpass and bridge options.

The AECOM Group Director Transportation and Environment confirmed to me that in the available time it was only possible to undertake the high level review and there was not sufficient time to also undertake a detailed review of the underpass and bridge options. As Chairman I accepted AECOM's proposal on 9th October 2014 on the basis that if there was insufficient detail in the report, the more detailed review could follow (if required) after the October Auckland Transport Board meeting on the 28th October 2014.

As it transpired the detail provided in the independent review has been sufficient for decision making and at the Auckland Transport Board meeting on 28th October 2014, the original decision to proceed with the Cowie Street Over Bridge option was upheld - the complete AECOM review follows.

Dr Lester Levy
Chairman
Auckland Transport

03rd November 2014

Auckland Transport
23-Oct-2014

Sarawia Street Level Crossing Closure

High Level Options Review for Auckland Transport Board

Sarawia Street Level Crossing Closure

High Level Options Review for Auckland Transport Board

Client: Auckland Transport

Co No.: N/A

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Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
1	21-Oct-2014	Draft Options Review	Michael O'Halloran Group Director - Transportation and Environment	Michael O'Halloran
2	23-Oct-2014	Final Options Review	Michael O'Halloran Group Director - Transportation and Environment	

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Executive Summary

Introduction

AECOM has been commissioned by Auckland Transport (AT) Board of Directors to undertake a high level independent review of the options available to facilitate the closure of the Sarawia Street level crossing in Newmarket, Auckland.

The purpose of this review is for an expert multidisciplinary engineering consultancy to undertake a high level review of the options considered in the AT Newmarket Level Crossing Scheme Assessment Report in order to provide the Board with an independent opinion of the preferred option for replacing the level crossing.

Brief Background

The Sarawia Street level crossing is the busiest in New Zealand in terms of train movements and closure is proposed due to safety issues based on the 2015 high frequency electric train timetable rollout outlined in the AT Business Case for Design, Newmarket Level Crossing report.

A number of studies have been undertaken in recent years by AT, ARTA, Opus, URS, TPC and KiwiRail that identified a number of options. In addition, in 2014 a local resident's group, the Cowie Street Residents Association (CSRA) commissioned their own consultants to prepare a revised Sarawia Street underpass design option.

Review Process

AECOM has considered the options identified in the AT Newmarket Level Crossing Scheme Assessment Report, September 2013 and the CSRA Underpass Proposal Report, August 2014 with the review was based on available data and information.

The review included an engineering assessment of the options conducted through a workshop and a Multi Criteria Assessment (MCA) to enable comparison of the options across a number of appropriate criteria, which include economic efficiency, safety, environment effects, social impacts and access, the details of which are outlined in this report.

Review Findings

The expert's review of existing information has considered the benefits and issues of the options and is the basis of the approach to the MCA assessment. The review of the options and the MCA process completed by AECOM has adopted and been guided by the project objectives to ensure alignment. A number of options were discarded through an initial screening process as a result of geotechnical, geometric and topographical issues.

The MCA process resulted in the following findings:

- Options 1a Cowie Street Over Bridge, 2a Furneaux Way – Two Lane and 2b Furneaux Way – One Lane were clearly preferable to the remaining options and therefore the remaining options were therefore discounted.
- The rankings from the MCA process for the three preferred options were close with Option 1a, Cowie Street Over Bridge, ranked the highest in most of the assessments. Second ranking was Option 2a Furneaux Way – Two Lane with third rank Option 2b Furneaux Way – One Lane.

The key advantages and disadvantages of each of the preferred options are:

- **Option 1a:** The key advantage is the little change for Laxon residents where there is small reduction in the level of service for the Laxon Terrace and Young Lane residents with the exit onto Parnell Road remaining. The key disadvantage with this option is land required on one or possibly both sides of the rail corridor which affects one property at the end of Cowie Street along with the increase in traffic movements for the Cowie Street residents.
- **Option 2a:** The key advantage with this option is maintaining dual lane access expected for a local road. The key disadvantage with this option is the land acquisition and potential dwelling procurement makes this an expensive and disruptive option. In addition, the Local Government or Public Works Act may need to be used to change the status of the road from private to public road and the Laxon Terrance and Young Lane residents have a reduced level of service with potentially increased distance to access Parnell Road.

- **Option 2b:** The key advantage with this option is that no land acquisition is required and constructed in a relatively short period of time with minimal disruption to nearby residents. The key disadvantage with this option is Local Government or Public Works Act may need to be used to change the status of the road from private to public road. In addition, the Laxon Terrance and Young Lane residents have a further reduction in the level of service.

The MCA process is a tool to guide decision making and has been used by the Expert Panel to assist them in their decision making. The outcome of the MCA identified Option 1a as the preferred option and was reinforced through sensitivity testing.

In considering the advantages and disadvantages of each option, the preference for Option 1a is further reinforced. Option 1a will provide a slightly reduced level of connectivity for residents of Laxon Terrace and pedestrians. Cowie Street will have an increase in traffic that will impact residents, however, the traffic volume is relatively small and in keeping with a local road designation.

In comparison Option 2a and 2b diminish current connectivity for Laxon Terrace residents and increase traffic for Furneaux Way residents (a private road). Furthermore, Option 2a would require the purchase of existing private homes and will increase the level of disruption for all residents.

Conclusion

On the basis of the MCA process and consideration to the wider connectivity issues Option 1a Cowie Street to Laxon Terrace Over-Bridge was found to be the preferred option.

1.0 AECOM Review Remit

The Chairman of AT, wrote to Mike O'Halloran, Group Director Transportation and Environment, AECOM New Zealand Limited on 7 October 2014, and requested that AECOM prepare a report to the AT Board by 23 October 2014 that included:

- A high level MCA review of the Sarawia Street level crossing replacement options considered in the 2013 AT Newmarket Level Crossing Scheme Assessment Report as well as the subsequent underpass option proposed by the Cowie St Residents Association (CSRA).
- A detailed review of the underpass and bridge options.

On 9 October 2014 Mike O'Halloran confirmed to the Chairman with AECOM's proposal for the review, which was limited to undertaking a high level review and multi- criteria assessment of the options, as AECOM considered that there was insufficient time to complete a detailed review of the underpass and bridge options before 23 October. AECOM's proposal was subsequently accepted by the Chairman on 9 October 2014.

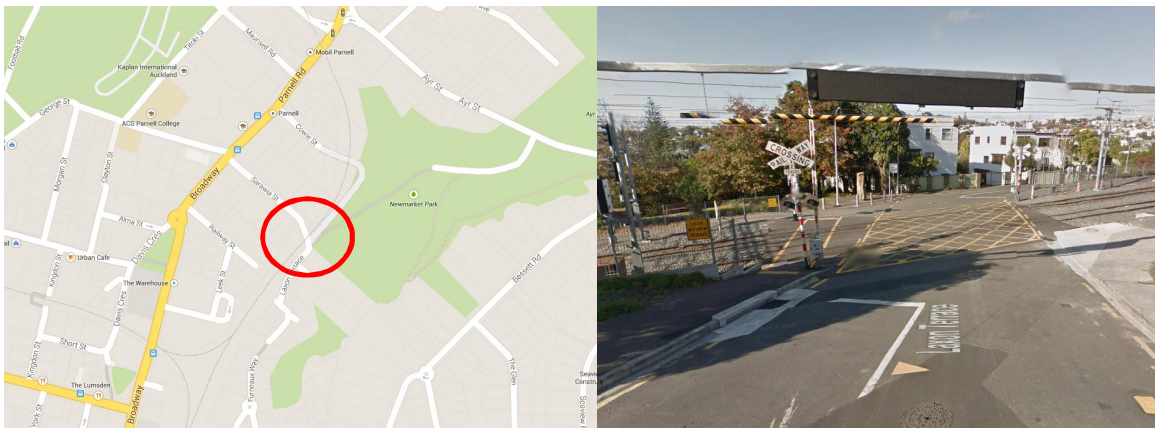
2.0 Project Background and Objectives

2.1 Brief Background

The Sarawia Street level crossing in Newmarket is the busiest level crossing in New Zealand in terms of train movements; currently there are 18 trains per hour scheduled across the crossing in peak periods and the level crossing barriers are lowered on average 40% of each hour. The continued presence of the level crossing prevents further increases in service frequency, planned for 2015, on both safety and line capacity grounds, so it is proposed to close the crossing.

The level crossing provides access from Sarawia Street to Laxon Terrace and Youngs Lane, as well as a pedestrian access to Newmarket Park. The area is predominantly residential and traffic counts taken in 2012 for AT indicate daily traffic volumes in Laxon Terrace and Youngs Lane of around 400 cars per day. Refer plan and photograph shown as Figure 1 showing the location.

Figure 1: Sarawia Street Level Crossing



A number of studies have been undertaken in recent years by AT, ARTA, Opus, URS, TPC and KiwiRail which identified a range of options for replacing the Sarawia Street level crossing. Although AT has identified an over-bridge at Cowie Street as its preferred option, this has not been supported by some parties and in 2014 a local resident's group, the CSRA commissioned their own consultant team to prepare a concept design for an alternative option of a Sarawia Street to Laxon Terrace underpass.

2.2 Project Objectives

The AT Newmarket Level Crossing Project Initiation Document (PID) of 23 July 2013 (*ref. (7) in Section 9.0*) listed the following objectives for the project:

- Remove the level crossing connecting Sarawia Street and Laxon Terrace by March 2015 to allow removal of signal safety restrictions preventing efficient rail operations in the area.
- Provide alternative vehicle access to/from Laxon Terrace and Youngs Lane by March 2015, otherwise cut off from the surrounding area if the crossing is removed.
- Retain pedestrian and cycle connectivity between Parnell Road and the Newmarket Park area.
- Manage these solutions to take into account the interests and preferences of stakeholders, including the Local Board, community groups, park users and local residents.

These objectives provided the basis for AECOM's review of the Sarawia Street level crossing options, but it was considered that they were too general to fully distinguish between options so a revised set of options were developed by AECOM for the purposes of the review as follows:

- To improve the operation of the railway crossing by removing the potential safety issue with trains and the rail level crossing. *(NB: This objective will cover off policy and statutory context documents, Auckland Plan, Auckland Transport Code of Practice (ATCOP) and Integrated Transport Programme)*.
- Provide alternative vehicle access to/from Laxon Terrace and Youngs Lane, otherwise cut off from the surrounding area if the crossing is removed. *(NB: This objective is based on ignoring the March 2015 timeline in the AT objective as it was seen to undermine the MCA process at this stage)*.
- Retain pedestrian and cycle connectivity between Parnell Road and the Newmarket Park area.
- Manage these solutions to take into account the interests and preferences of stakeholders, including the Local Board, community groups, park users and local residents. *(NB: This is a project objective rather than an outcome objective)*.
- Has a compatible urban design that is safe and is environmentally sensitive.

3.0 Independent Review Process and Personnel

AECOM undertook a high level review of the Sarawia Streel Level Crossing Closure options including a MCA process to enable comparison of all options across a range of appropriate criteria including economic efficiency, constructability, cost, safety, environment effects, social impacts and access. Details of these criteria are outlined in subsequent sections of this report.

AECOM has based its review on current publically available information and assumptions, including geotechnical information and our knowledge of KiwiRail's 'block of line' (BOL) planning processes. Section 9 lists the documents forming part of the review.

The review was undertaken by an experienced team of AECOM specialists within their respective fields to provide a multi-disciplinary view of the options that have been presented in the AT Newmarket Level Crossing Scheme Assessment Report, September 2013 (Section 9 *ref. (1)*) and the CSRA Underpass Proposal Report, August 2014 *(4)*.

AECOM Review Team Specialists are listed in Table 1 below:

Table 1 Review Specialists

No.	Name	Position	Specialist
1	Andrew Foy	Associate Director	Transport Planner
2	Emma Trembath	Team Leader	Remediation Consulting Engineering
3	Graham Brooke-Smith	Team Leader	Road Geometrics Engineer
4	John Cooper	Technical Director	Geotechnical Engineering and Civil Construction
5	Lloyd Barton	Associate Director	Environment Impact Assessment
6	Simon Wood	Associate Director	Rail Operations and Engineering
7	Yadav Khwaounjoo	Associate Director	Bridge Engineering

The review team individually reviewed the documentation provided by AT in preparation for the MCA workshop, which was held on 17 October 2014. During this workshop, the MCA process (see Section 6.1 for details) was completed to determine the most appropriate option based on the multiple criteria identified and scoring system. Subsequent to the workshop a sensitivity analysis was undertaken using these results to determine their robustness and the findings of these results is presented in Section 6.5.

4.0 Proposed Options

4.1 AT Option Identification and Review Process

There have been a number of reports commissioned since 2004 to outline the various options for providing an alternative access to Laxon Terrace and Young's Lane for vehicles, pedestrians and cyclists if the Sarawia Street level crossing was to be closed.

AT has studied the previous reports and has progressed the findings from both KiwiRail's 2011 report 'Justification Report for the closure of Sarawia Street Level Crossing and replacement with a new over-bridge at Cowie Street' *(9)* and the Opus 2012 report for AT 'Laxon Terrace Grade Separation Alternative Access Options Report' *(8)*.

This progression has involved the refinement of the favoured options, by way of design changes, cost estimates, pedestrian access requirements, resource consent requirements, benefit cost ratio calculations and transportation assessments, each of which are explored in more detail throughout AT's Newmarket Level Crossing Scheme Assessment Report (SAR) of 2013 *(1)*. It is noted however that this SAR does not include a complete description of the assessment process and criteria used to shortlist options for further development.

The SAR options had been subject to detailed analysis and were considered to feasibly allow closure of the crossing whilst providing alternative vehicle, cycling and pedestrian access to Laxon Terrace, Youngs Lane and Newmarket Park. The options considered were:

- **Option 1:** Removal of the Crossing and construction of a two-lane road bridge from Cowie Street to Laxon Terrace.
- **Option 2:** Replacement of the Crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and accommodating vehicle traffic to/from Laxon Terrace by expanding an existing walkway to a double (Option 2a) or single (Option 2b) lane road connecting to Furneaux Way, a private road.
- **Option 3:** Replacement of the Crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and construction of a two-lane road from Laxon Terrace through Newmarket Park to Ayr Street.
- **Option 4:** Replacement of the Crossing with a two-lane underpass running from Sarawia Street to Laxon Terrace.

A number of underpass options originally developed by Opus were initially not considered by AT for further analysis, but Option 4 was re-investigated subsequently at the request of the Parnell Community Committee (PCC).

As part of AT's Newmarket Crossing Project options analysis, the option of an underpass was re-evaluated and considered at a high level and again considered an inferior option and not suitable to progress.

In June 2013 representatives from the PCC and CSRA approached AT with a proposal for an alternative underpass alignment. The underpass was proposed as an alternative option to allow closure of the Sarawia Street crossing while retaining vehicle access to Laxon Terrace and Youngs Lane. It was suggested by the PCC and Cowie Street residents that this would be more acceptable to residents.

AT investigated the underpass option further, soliciting advice and investigative work from Opus, Hawkins, Xigo and Fraser Geologics, with cost estimates prepared by Cuesko. The outcome of this investigation was that variants of the alignment proposed by the PCC were feasible to construct. However the construction risks, extent of rail disruption requirement, Crime Prevention through Environmental Design (CPTED) issues, traffic safety challenges and cost associated with the underpass option concluded that the underpass was an inferior option compared to other options considered. The AT project team met with the PCC and Cowie Street representatives to discuss the option and results of AT's analysis *(2)*.

Following the conclusion of the project SAR and the AT Board decision to progress the over-bridge option from Cowie Street to Laxon Terrace, the CSRA commissioned a further investigation into the feasibility of an underpass. This report *(3)* was presented to the Waitemata Local Board in early May 2014 and the Local Board requested that AT re-evaluate the underpass option in light of this report.

AT assessed the latest report against the previous SAR underpass investigation in 2013 to identify any points of difference and to what extent the new information addressed the challenges associated with the underpass option.

Subsequently, CSRA presented a revised August 2014 report to the Waitemata Local Board and AT *(4)*, which claimed to show an innovative approach to an underpass design and construction that overcame the issues and risks identified by AT's analysis of the option, and accordingly justify a reassessment of the Cowie Street bridge option being progressed.

AT's assessment *(2)* of both the April 2014 and August 2014 CSRA reports did not convincingly make the case for overcoming the principal issues associated with an underpass at Sarawia Street that were:

- High risk and disruptive construction phase when compared to alternative options.
- Most challenging CPTED concerns compared to alternative options.
- Significant traffic safety challenges when compared to alternative options.
- A low benefit-cost ratio when compared to alternative options.

AT concluded that overall the underpass option, although a technically feasible option, still retains significant construction risks, rail disruption, CPTED concerns and traffic safety challenges. AT did not agree with the CSRA underpass design assumptions that resulted in the substantially lower cost estimate prepared for the CSRA report.

According to AT it was considered that the Cowie Street bridge option remained a superior option to the underpass option prepared for the CSRA *(2).*

Subsequent to this the Chairman of AT, requested AECOM to undertake a high level review of all of the options previously considered by AT as well as the CSRA underpass option.

4.2 Review of AT Identified Options and Process

Table 2 summarises the options which have been previously identified. AECOM has performed an initial review to confirm whether circumstances have changed since they were identified and assessed and confirmed they should be retained for further consideration in AECOM's review. Those that are considered to be fatally flawed in terms of meeting the project objectives or feasibility have been discarded and not taken through to the MCA process. Table 2 also provides a summary of the review and the reasons for options to be retained or discarded. This review confirms that Options 1a, 2a, 2b, 3a, 3b, 4a, 4b and 4c remain as feasible options and were taken into the MCA evaluation.

Table 2: Summary of Initial Options Assessment

Option	Description	AECOM Initial Assessment
Do Minimum	**Maintain Level Crossing** This option involves the retention of the level crossing with dedicated personnel to ensure safety of rail and road users.	**Discarded** This option is not considered viable if a higher frequency timetable is introduced as retaining the crossing would remove all resiliencies from the rail network to recover from network delays and maintaining reliable passenger services.
1a	**Cowie Street to Laxon Terrace Over-Bridge** Auckland Transport SAR preferred option, which involves removal of the existing level crossing and construction of a two-lane road bridge from Cowie Street to Laxon Terrace.	**Retained subject to MCA** This is a feasible option with little effect on traffic congestion.
1b	**Sarawia Street to Laxon Terrace Over-Bridge** This option involves removal of the existing level crossing and construction of a two-lane road bridge from Sarawia Street to Laxon Terrace.	**Discarded** This option is not considered viable due to topographical and geographic constraints.

Option	Description	AECOM Initial Assessment
2a	**Furneaux Way Connection – Two Lane** This option involves replacement of the existing level crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and accommodating vehicle traffic to/from Laxon Terrace by expanding an existing walkway to a double lane road connecting to Furneaux Way, a private road.	**Retained subject to MCA** This option requires land acquisition and potential building block demolition makes this an expensive and disruptive option. However, taking due account of the Furneaux Way options is considered further as part of the MCA process.
2b	**Furneaux Way Connection – One Lane** This option involves replacement of the existing level crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and accommodating vehicle traffic to/from Laxon Terrace by expanding an existing walkway to a single lane road connecting to Furneaux Way, a private road.	**Retained subject to MCA** This is a feasible option from a construction and implementation perspective.
PF	**Additional Option from December 2012 Public Forum: Parnell Road Connections** There were three routes identified and connected the northern end of Laxon Terrace to Parnell Road which would create an intersection in close proximity to the Ayr street / Domain / Parnell Road intersection.	**Discarded** This option is not considered viable due to geotechnical issues noted in the existing reports (although no evidence provided) and high costs and traffic impact to existing intersection.
3a	**Cowie Street to Through Newmarket Park to Ayr Street** This option involves replacement of the existing level crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and construction of a two-lane road from Laxon Terrace through Newmarket Park to Ayr Street.	**Retained subject to MCA** This is a more feasible option from a construction and implementation perspective when compared to the Cowie Street to Around Newmarket Park option.
3b	**Cowie Street to Around Newmarket Park to Ayr Street** This option involves replacement of the existing level crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and construction of a two-lane road from Laxon Terrace around to the north of Newmarket Park to Ayr Street.	**Retained subject to MCA** This option has significant geotechnical issues and high costs, however, taking due account of the Newmarket Park options is considered further as part of the MCA process.
4a	**Opus Sarawia Street to Laxon Underpass (Two Options)** This option involves replacement of the existing level crossing with a two-lane underpass running from Sarawia Street to Laxon Terrace.	**Retained subject to MCA** This is a feasible option from a construction and implementation perspective.
4b	**CSRA Sarawia Street to Laxon Underpass** This option involves replacement of the existing level crossing with a two-lane underpass running from Sarawia Street to Laxon Terrace.	**Retained subject to MCA** This is a feasible option from a construction and implementation perspective.
4c	**Railway Street to Laxon Underpass** This option involves replacement of the existing level crossing with a two-lane underpass running from Railway Street to Laxon Terrace.	**Retained subject to MCA** This option has extremely complex logistics issues of entering from Railway Street. However, taking due account of the underpass options is considered further as part of the MCA process.

4.3 Advantages and Disadvantages of Identified Options

The advantages and disadvantages for each identified option based on Auckland Transport SAR and the Cowie Street Residents Association (CSRA) underpass proposal report are summarised in Appendix A.

5.0 Discussion of High Level Issues

5.1 Rail Operations and Engineering

From a rail operational perspective, the elimination of the Sarawia Street level crossing is facilitated by all the options considered, thus resulting in an elimination of the risk of a collision between a train and a vehicle or pedestrian, as well as enabling an increase in the frequency of train services between Newmarket and Britomart. Although higher train frequencies may result in some increased noise, electric trains will operate the majority of services on this section of line from mid-2015, so any increase in noise levels would be expected to be negligible. In addition the removal of the level crossing warning lights and bells will eliminate a regular source of disturbance to residents in Sarawia Street and Laxon Terrace adjacent to the crossing.

None of the options result in permanent change to the existing railway alignment, however the elimination of the level crossing should enable an existing derogation from KiwiRail traction overhead wire gradients, that currently limits the design line speed of this section to be eliminated.

All of the options provide less direct access for pedestrians between Laxon Terrace. and Sarawia Street after the level crossing is closed, with pedestrians being required to either cross the railway on either a road or foot bridge or using a subway. AECOM understands from AT that an option of retaining a pedestrian level crossing at Sarawia Street in the Opus Laxon Terrace Grade Separation Alternative Access Options Report 2012, was not acceptable to KiwiRail on safety grounds[1] and so was not progressed. The resulting additional walking distance from a grade separated pedestrian crossing may cause some pedestrians to trespass across the railway instead, and so it is recommended that fencing be provided on either side of the railway in the vicinity of the former Sarawia Street level crossing to discourage this.

Overall however, all the options would be expected to provide a positive outcome from a rail operational perspective.

Construction impacts of the options essentially fall into two categories:

- Disruption to rail services (planned and unplanned) as a result of construction works.
- Temporary or permanent relocation of rail infrastructure assets to enable the construction works to take place.

If construction works either require the removal of track and underlying formation, or cannot be undertaken safely because of risk of equipment coming into contact with passing trains or the high voltage rail traction overhead wires, then construction will either need to be undertaken at night outside of normal service hours if the work can be undertaken safely or in compliance with noise regulations, or during Blocks of Line (BOL) with services suspended for longer construction activities. Although in recent years there have been frequent weekend blocks of line across the Auckland rail network, together with extended blocks of line during the December- January and Easter Holiday periods for electrification and DART Project construction works, the availability of such BOLs in future is not yet clear, as AT wishes to limit disruptions to passenger services so as not to discourage people from using rail and to help achieve patronage growth targets. Planning timeframes for BOLs are typically 6 months for weekend BOLs 12 months beforehand for Christmas or Easter multiday BOLs in order that alternative arrangements for passenger and freight movements can be planned well in advance. Therefore, in the case of the Sarawia Street level crossing replacement options, the critical path for the construction works may well be driven by either the availability of suitable existing blocks of line or the planning timeframes for dedicated BOLs.

Although AECOM has not undertaken a detailed comparison of the over-bridge and underpass options for Sarawia Street, however, it is reasonable that the construction of either the Cowie Street over-bridge (Option 1a) or the Sarawia Street foot bridge (Options 2a/2b) should have less impact on rail services than the construction of any of the underpass options (Options 4a, 4b, 4c). Construction of the bridge abutments should be able to be largely undertaken while rail services are operating, and the bridge spans lifted in during one or more an overnight no- trains periods, with the traction overhead power isolated. For the underpass options, the requirement to excavate the railway formation to enable the new rail under track bridges to be installed will require the disconnection of signalling equipment, temporary removal of track and potentially temporary relocation of the

[1] Email from Adrian Price to Simon Wood 20 October 2014

traction overhead wires to facilitate access by construction machinery. This would suggest that the construction of an underpass option would likely incur a longer block of line than a weekend, such as at Christmas or Easter.

Permanent relocation of some rail infrastructure assets, including cable routes, may be necessary to accommodate the construction of some of the level crossing replacement options, if they cannot be avoided or protected during construction works. The main KiwiRail signals cable route, as well as AT's station CCTV fibre optic cable route runs along the Laxon Terrace side of the Railway within the rail corridor boundary. In addition there are a number of local under track cable ducts crossing the line at intervals to connect signalling equipment including the level crossing barriers and alarms at Sarawia Street, as well as third party utilities such as electricity and telecommunications cables passing under the railway at various intervals. Normal construction precautions for buried services should be sufficient to locate and avoid these cable routes for the over-bridge options, however for the underpass options, it would probably be necessary to provide a temporary cable route in the vicinity of the underpass site and then transfer the cables to a new permanent cable route after the underpass is constructed. The cut over to both temporary and final routes would need to take place in a block of line to avoid delays to train services.

KiwiRail also has a major signalling equipment building, just north of Newmarket junction on the Broadway side of the railway. Vehicle access to this building is from a maintenance track from the Sarawia Street level crossing and it is critical that access is maintained throughout and after the construction of any replacement for Sarawia Street level crossing. In addition, the route of any proposed underpass from Railway Avenue to Laxon Terrace. (Option 4c) should if at all possible avoid the need to relocate this building.

The proposed construction methodology for the Sarawia to Laxon Street underpass (Option 4c) put forward by the HFC consultants for the Cowie Street Residents Association requires the relocation of four traction overhead structures to facilitate construction of the underpass approaches. AECOM designed the Auckland traction overhead line equipment for KiwiRail, and contrary to what is suggested by HFC, the relocation of these structures is a complex matter. All four are BWA (balance weight anchor) structures and are an extremely critical aspect of the OLE design through this area. The design of the OLE through the whole Newmarket triangle area is complex, optimised and at the limits of KiwiRail's Auckland OLE design parameters due to the Newmarket triangle track layout and need to accommodate a possible future airspace property development. Therefore moving the OLE structures to accommodate an underpass, would not be a trivial exercise and could have significant knock on impacts on the configuration of the overall Newmarket traction overhead design. We have been unable within the time available for this review to assess the full impact of the proposed changes.

By contrast, any new road or pedestrian over-bridge would be required to be constructed to comply with current KiwiRail vertical clearances (5.5 metres from underside of bridge to top of rail) so it could be expected that there should only be minimal changes to the existing overhead wire height to accommodate the new bridge.

5.2 Geotechnical Engineering

The underlying geology of the area for all options is the East Coast Bays Formation (ECBF), which is overlain by weathered ECBF and localised basalt lava flows from the Domain volcanic cone nearby. The natural ground surface has been extensively reworked by cut and fill, to form building platforms and the railway embankment. The area to the east of the railway is now parkland but was formally used as a municipal tip for many years, has been landscaped in recent years and has a history of slope instability.

The existing railway line north of Newmarket is located on mainly fill and is partially retained by a large solder pile wall to the east along Laxon Terrace. The railway embankment fill whilst engineered is likely to comprise a range of materials and be classed as contaminated and will require appropriate safety measures when being worked on and will incur additional costs for disposal. The information provided does not appear to include site specific ground investigations for any of the options.

There are a number of significant geotechnical risks that should be considered when comparing options as described below.

Option 1

Removal of the Crossing and construction of a two-lane road bridge from Cowie Street to Laxon Terrace:

- Some earthworks in potentially contaminated soils.
- The structure is likely to require piling down to ECBF where fill may include boulders and obstructions.

- Construction of approach embankments is close to the crest of the slope and will need to be designed so as not to adversely affect overall slope stability.

Option 2

Replacement of the Crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and accommodating vehicle traffic to/from Laxon Terrace by expanding an existing walkway to a double (Option 2a) or single (Option 2b) lane road connecting to Furneaux Way, a private road:

- The widening of the walkway is straightforward from a geotechnical point of view.
- The pedestrian footbridge is a relatively light weight structure requiring minor approach embankments so that geotechnical issues are not a significant factor in option evaluation.

Option 3

Replacement of the Crossing with a pedestrian/cycle bridge located at Cowie or Sarawia Street and construction of a two-lane road from Laxon Terrace through Newmarket Park to Ayr Street:

- Construction through or along the western flanks of Newmarket Park will encounter filled ground and likely adversely affect existing slope instability. This is a significant disadvantage for these options and will add to their cost and impact.

Option 4

Replacement of the Crossing with a two-lane underpass running from Sarawia Street to Laxon Terrace:

- Underpass options require extensive excavation in fill, ECBF and potential volcanic materials. Lateral support of these excavations where there is insufficient space to form slopes will add to the complexity of design and costs. Greater quantities of potentially contaminated fill may be encountered.

The ground conditions will affect the options to a greater or lesser extent, however this is be reflected in the cost and programme to construct that option and is not considered to be a factor ruling out any of the options being considered.

5.3 Bridge and Structures Engineering

General findings of the review of the over-bridge and underpass structures are:

- Preliminary desktop geotechnical information has been used in the assessments with no specific site investigation.
- General outline plans, 3D pictorial sketches and some descriptive text were available to describe the options proposed in the SAR. No indicative sketches, presenting the arrangements of the structural elements was available.
- There are four overhead line equipment (OLE) structures identified in the area proposed for the CSRA underpass (Option 4b) and they are critical to the operation of the rail network. Appropriate arrangements for these elements will be required for the construction of the underpass that is likely to be substantial.
- Also key to the construction of the underpass will be the feasible block of line (BOL) available for the construction and the topographically constrained work area will limit plant operation increasing the outage period. There does not appear to have been a study undertaken to understand the implication of these various constraints.

In particular, the Cowie Street to Laxon Terrace Over-Bridge (Option 1a) and Opus' Sarawia Street to Laxon Underpass (Option 4a: two options), the construction of these bridges will be more straight forward compared to the construction of the underpass options due to the constraints imposed by the OLE structures and the topographical constraints. At least a preliminary geotechnical investigation is required to justify any structural systems.

Furthermore, the CSRA Sarawia Street to Laxon Underpass (Option 4b) option provides various sketches showing the arrangements of the proposed underpass structures. A number of issues have been identified and a number will need modifications including:

- All OLE structures be relocated outside the proposed underpass construction area, however, as noted in Section 5.1 above, this assumption has yet to be verified.

- Geotechnical conditions are sufficient for the proposed footings.
- BOL required during the construction is possible.
- Potentially large precast beams may need to be handled on site.
- The proposed geometry satisfies access requirements.

Some of the above conditions, particularly the first three, need further investigations and assessment with more appropriate solutions developed for the remaining items.

5.4 Environment Impact and Consents

5.4.1 Background

Under the Auckland Operative District Plan (Isthmus Section) the rail corridor is zoned Special Purpose 3 (Transportation Corridor) and designated for Rail Purposes. The surrounding land is zoned Residential (Sarawia Street, Cowie Street, Laxon Terrace and James Cook Terrace), Business Activity (Railway Street) and Open Space (Newmarket Park). The Proposed Auckland Unitary Plan rolls over the designations of the Operative District Plan and also applies similar zones to that of the Operative District Plan with respect to rail corridor, business and residential land and Newmarket Park.

The consents required, environmental impacts and likely mitigation measures and consenting risks for main options are summarised as follows:

5.4.1.1 Option 1a - Cowie Street Bridge (Vehicle and Pedestrian)

Relatively straightforward consents are required if the work is confined to the Transportation Corridor and existing road designations for Cowie Street and Laxon Terrace. Opposition is expected from the residents of Cowie Street as a result of the diversion of traffic and vehicle noise from Sarawia Street to Cowie Street. However Cowie Street is classified as a local road and while it is currently a cul-de sac the resulting traffic volume is commensurate with its “local road” status. The main mitigation measures are likely to be in an aesthetic design of the bridge itself, landscaping and the mitigation of construction vibration and noise. Overall the consent risk is minor with consent status likely to be restricted discretionary or a discretionary activity. The written approval of KiwiRail as the requiring authority for the railway designation should be sought prior to lodgement of the consents[2].

Consent risk will increase should work be required to be undertaken outside the Transportation Corridor or the road designation. This will require a Notice of Requirement with the consenting risk increasing to moderate.

5.4.1.2 Options 2a/2b- Furneaux Way through Roads (one or two lane) with a Pedestrian Access Bridge to Sarawia or Cowie Streets

Laxon Terrace and James Cook Terrace, both local roads are connected by Furneaux Way a privately owned access way (owned by the Broadway Park Residents Society) and a 20 m cyclist / pedestrian only access way, owned by Auckland Council. Furneaux Way and the cyclist / pedestrian access way are zoned Residential 7.

Land acquisition from multiple owners will be required. However the obtaining of consents under the Resource Management Act by way of a Notice of Requirement and / or other consents, particularly for the single lane option (which does not require the removal of buildings) is relatively straight forward. This is because the works take place across established access ways with a minimal increase in surface area and low impact structures being required (extended formation of the carriageway). Mitigation measures are likely to be in the form of landscaping, urban design and traffic calming measures. While some opposition may be forthcoming from Broadway Park Residents Society the increase in traffic volumes (i.e. 400 movements/day approximately) through Furneaux Way will be minimal (from approximately 50 residential units).

Being confined to pedestrians only, the bridge to Sarawia or Cowie Street will have less environmental impacts than the larger combined vehicle /pedestrian bridge option. However construction noise and vibration management plans will still be required to manage these effects.

[2] Pursuant to Section 176 of the RMA no person without the prior written consent of the requiring authority may do anything in relation to land subject to a designation that would prevent or hinder a public work to which the designation relates.

5.4.1.3 Options 3a/3b- Newmarket Park through Road Options

Through roads are not consistent with the Open Space zonings of the Newmarket Park. Furthermore as Newmarket Park is a closed landfill complex, consents will be required to deal with land contamination under the National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health and current Regional Plan and the Proposed Auckland Unitary Plan. Combined with the stakeholder interest within the Park and the availability of reasonable alternative routes, all routes through the park involve significant consenting risk.

5.4.1.4 Options 4a/4b/4c- Underpass Options (to Railway Street or Sarawia Street)

All these options will requiring the approval of KiwiRail as the designating authority for the rail corridor, consents for earthworks, an Outline Plan of Work (OPW) and/ or a Notice of Requirement. The main environmental effects are associated with construction effects (noise, vibration and the operation of the rail network during construction) as well as security for users, particularly pedestrians and cyclists. Visual impacts will be minimal and less than that for the bridge options. The security of users of the under pass and the ongoing resilience of the rail network, are key design and consenting challenges for all the underpass options. Consultation and the written approval of KiwiRail are vital if these options are to be pursued. Because of this, the consent risk is assessed as significant for all underpass options.

5.4.2 Earthworks and Contaminated Land

All options will result in the undertaking of earthworks within and adjacent to the existing rail corridor. There is the potential for contaminated soils to be encountered. For most options, these risks can be managed and mitigated through pre-works investigations. The exception is Options 3a/3b -Newmarket Park through Roads, which as outlined above, is a high risk for consents acquisition due to the known land contamination and ground instability issues within the park.

5.4.3 RMA Obligations to Assess Alternative Options

The RMA places an obligation on consent authorities to consider whether the requiring authority or applicant (for resource consents) has adequately considered alternatives. While the preferred option does not need to be the one with the least environmental impact, there should be a transparent reasoning for selecting the preferred option. Further, for a Notice of Requirement the consent authority has to consider whether the work / designation is reasonably necessary for achieving the objectives of the project / requiring authority (section 171(1) RMA).

While the AT September 2013 Newmarket Level Crossings Scheme Assessment Report *(1)* identifies various options it does not identify the project objectives, although as noted earlier in Section 1.1, the July 2013 AT Project Initiation Document *(7)* does include AT's objectives for the Newmarket Level Crossing project. This inconsistency makes it difficult to determine on what basis the preferred option (Cowie Street Vehicle Bridge) has been selected. There is further inconsistency in the reasons for discounting options in the AT SAR in terms of the next best option (Option 2B – Furneaux Way). On page 13 reference is made to "consents will be relatively straight forward" yet on in the Conclusions and Recommendations section on page 40 reference is made to Furneaux Way facing "significant potential legal and consenting challenges".

It is recommended that the project objectives be clearly reviewed and adopted by AT prior to lodging any Notice of Requirement, Outline Plan of Works or other consents for the project. Further the options in the SAR should be reviewed against these objectives to check whether this results in any change to the preferred option. This could be in the form of an addendum to the 2013 AT SAR *(1)*.

5.5 Transport Planning

A high level review of the information provided has been used to assess the potential impacts that would occur with each option. This assessment is based on the extent to which existing connections are maintained and/or the acceptability of new connections, the ability to service development and impacts on traffic Levels of Service (LOS).

The level crossing provides vehicle access to Parnell Road for Laxon Terrace residents but also provides access for pedestrians and cyclists from a wider catchment to key destinations of Newmarket and Newmarket Park. This is via a public walkway through Furneaux Way and walkways through Newmarket Park. In considering the impacts on pedestrians, a network view has been taken including access to key destinations.

The Laxon Terrace traffic catchment generates approximately 380 vehicle trips per day (based on AT survey data) with a maximum of 50 vehicle trips during the midday peak period. The traffic assessment information

provided with the 2013 AT SAR *(1)* details the changes in traffic volumes likely with alternative connections to the road network. Changes in traffic volumes are small in the context of the wider arterial network and are therefore unlikely to have a noticeable effect. The implications on the local roads which the options connect to are discussed below.

Option 1a provides an improved facility removing all interactions between trains, traffic and pedestrians in a similar location. This option replaces the current level crossing with a new connection to Cowie Street, this will reduce traffic volumes on Sarawia Street and increase volumes on Cowie Street. Cowie Street is a public road which provides for access to immediate properties. The connection to Laxon Terrace would not create a through route between parts of the wider network and is considered appropriate for the volume of traffic that would use it. There is unlikely to be any degradation in LOS at existing intersections as traffic volumes will not change by a significant amount. Any delays associated with the use of the level crossing will be removed for general traffic. However, pedestrian access will be affected as pedestrians will be required to walk marginally longer to access Parnell Road.

Option 2a and 2b connect to the Furneaux Way private road maintaining access for Laxon Terrace residents through a different part of the road network. To provide this connection a private access road would require to become a public road. Option 2a provides a two lane connection with footpaths, option 2b provides a single lane shared space for pedestrians, cyclists and traffic. Although the increase in traffic is numerically small it would change the character of the road and almost double the traffic using the current private access road. Traffic from Laxon Terrace travelling to the north (Parnell or the CBD) would be required to travel further to access the same location. Pedestrian access to Sarawia Street would be maintained by a pedestrian over bridge. Whilst providing a safer connection compared to the current level crossing the pedestrian over bridge would be a more remote facility with no activity alongside it. In addition the height of the overbridge will need to be a minimum 5.5 m above the rail tracks, which will result in long ramps.

Options 3a and 3c connect to Ayr Street travelling through the park to connect to the existing park access road (3a) and around the park to a new intersection on Ayr Street (3c). Both options require traffic to travel an additional distance to access the arterial road network. Whilst there is unlikely to be a significant delay in traffic accessing Ayr Street, traffic will travel through the busy intersection of Ayr Street with Parnell Road. This option also provides the greatest disbenefit to pedestrians. Unless a pedestrian overbridge were provided, this would sever the direct connection between Newmarket and Newmarket Park requiring pedestrians to walk to Ayr Street and via Parnell Road to access Newmarket, a trip which is relatively direct at present.

Options 4a to 4c provide an underpass facility removing all interactions between trains, traffic and pedestrians in a similar location. Options 4a and 4b connect directly to Sarawia Street and Option 4c connects to Railway Road. All provide improved connections to the existing road network, although the underpass provides a less attractive route for pedestrians. Option 4c would require an assessment of potential traffic impacts given the intersection of Railway Street with Parnell Road is close to an existing busy roundabout.

All options provide an adequate level of connectivity for traffic to the arterial road network and it is unlikely that any would impact on the LOS of existing intersections given the small volumes of traffic. Of particular note:

- Options 1a, 4a-4c connect in a similar location, provide the least changes in connectivity for Laxon Street residents and maintaining the current connections for pedestrians.
- Option 2a and 2b provides vehicle access from Laxon Terrace to a completely different part of the network and doubles the number of vehicles on Furneaux Way (private Road). A pedestrian over bridge maintains the current connections to Parnell Road, Newmarket and Newmarket Park.
- Options 3a and 3c provides vehicle access from Laxon Terrace to a completely different part of the network and severs the current pedestrian access and connectivity between local destinations.

5.6 Road Geometrics

A high level review of the road geometrics for the options is as follows:

- The over-bridge options (i.e. 1a and 1b) Cowie Street to Laxon Terrace appears to comply with Auckland Transport Code of Practice (ATCOP) and NZTA standard design guidelines, however, Sarawia Street to Laxon Terrace appears non-compliant due to topographical constraints.

- The Furneaux Way options (i.e. 2a and 2b) is by far the smallest footprint impact than the other options, however, the single lane option would not comply with ATCOP's cross section detail for a carriageway with a road classification of "Local Road" which would need to be addressed for this option.
- The Newmarket Park alignment options (i.e. 3a and 3b) carriageway platform would need to be sufficiently wide to accommodate dual-lanes and a footpath, which would result in extensive fill batters or alternatively high retaining walls given the relatively steep terrain making these options expensive.
- The underpass options (i.e. 4a, 4b and 4c) footpaths appear to be too narrow and curve widening is required to prevent the design vehicle (i.e. single unit truck) to traverse the carriageway without crossing the centreline and improve sight distance. In addition, the entry approaches to the underpass options need to provide adequate geometry for turning paths for the design vehicle. Longitudinal gradients are steep, however, the adjacent road network is also steep for cyclists, able bodied pedestrians and particularly mobility impaired pedestrians.

6.0 Multi Criteria Assessment (MCA)

6.1 MCA and the Process

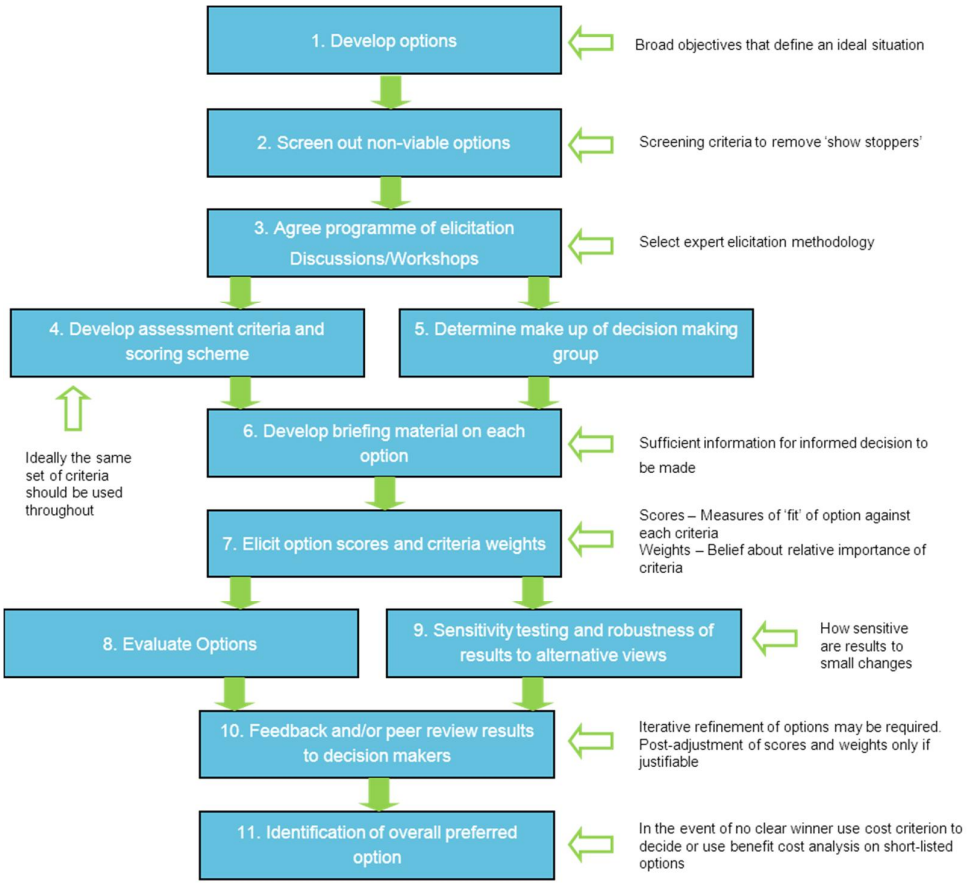
MCA is widely accepted as a formal method of assisting decision making. Decisions are guided by rating of identified options. This is achieved by assigning scores against a set of chosen criteria for each option. Criteria chosen should cover relevant attributes of the options. In New Zealand it is considered good practice to ensure that the aspects relate to the five well-beings, namely Economics, Safety, Environmental, Social and Access factors that underpin the purpose of the Local Government Act 2002.

The scores for the different criteria are combined (usually as a weighted sum) in order to rank the options. The contribution that each criterion makes to the sum of scores for an option is weighted to reflect their relative importance.

The scores may be seen as surrogates for measures of values for the criteria, allowing the effects of diverse criteria, with different measurement bases to be aggregated. The weights represent the views of those making the choice of option as to what is important in the particular situation.

The overall process used to implement the MCA methodology is illustrated in Figure 2. This evaluation of options assists the identification of the preferred option(s).

Figure 2: Multi – Criteria Assessment Decision Making Process



Source: Adapted from "Route Options for a Coroglen-Kaimarama 110kV Capable Line, Coroglen to Kaimarama", prepared for Powerco Limited, December 2008.

6.1.1 Decision Making

It is generally accepted that the best decisions are based on a consensus view, which usually involves compromise. There are two basic formal methods used in forming a consensus view promulgated in the literature. One of these, the Delphi method is to seek independent views and then later combine them in some way. The alternative is to elicit expert views through "around the table" conference discussions in order to obtain a group view of the problem solution. Both methods have their merits.

For the purpose of this review, the "conferencing" method was used due to the time available for the review and the availability of previous reports on the project options to inform the views of the specialists on the review team.

Formal decision making processes provide efficiencies in the identification of an optimal solution particularly in situations of high uncertainty or risk. These efficiencies arise because it is possible to focus rapidly on what really matters in terms of seeking an acceptable problem solution. Ineffective solutions can be quickly and easily eliminated from detailed consideration. Also, because the means by which choices have been made is open to scrutiny and undertaken in a defensible and transparent manner, it is less likely that the chosen solution would be found to be less than optimal.

Here the decision making process is used to seek a balanced overall view on the aspects to be considered. MCA is then used for scoring the various options against a defined set of criteria that represent what is favourable or unfavourable about a particular option. The option with the highest weighted sum of scores across all criteria gives an indication of the preferred solution.

The minutes from the MCA workshop are in Appendix B.

6.1.2 Criteria to Evaluate

In determining the criteria to take into account for the MCA evaluation, a range of considerations came into play. Some criteria are given more weight in terms of the Resource Management Act, such as impacts on outstanding natural features and landscapes and on habitats of indigenous flora and fauna, amenity values including visual amenity and any impacts on areas of historic and cultural significance.

In terms of reducing effects on residents and the community, it was considered appropriate to take into account existing land uses and the presence of dwellings and other significant buildings. The ability of the road network to provide adequately for service vehicles after the Sarawia Street Level Crossing was closed was also an important consideration.

Other considerations such as the ability to construct the option, how construction could be managed and the associated costs were also taken into account.

The criteria set out in **Table 5** below were considered appropriate to include in the analysis and are grouped by category. Each category had weightings applied to reflect their relative importance initially an equal weighting was applied. The sensitivity of the weightings was assessed by adjusting the category weightings to see how these influenced the priority ranking of the options.

6.1.3 Scoring of Criteria

Scores were allocated depending upon how the option being considered performed against the criteria, either relative to the 'Do-Minimum' option or in some cases relative to each other, given that the Do- Minimum Option of retaining the Sarawia Street level crossing is not considered a viable option (refer to Section 4.2). **Table 3** presents the MCA scoring system adopted.

Table 3: MCA Scoring System

Assessment	Score
Unacceptable Effect	-3
Negative effect	-2
Slight negative	-1
Neutral / No Change	0
Slight positive	1
Positive effect	2

6.2 Key Input from the Review Team

This section summarises the key factors that influenced the MCA assessment for each of the assessment categories mentioned in **Table 5**.

6.2.1 Economics Category

This category was largely driven by capital cost and benefits that could be achieved for each option. Given that the Do Minimum option is not viable, the assessment focused on the differences in cost between the options. There were a number of technical areas that primarily influenced cost. These included geotechnical, structural, land acquisition, and the terrain that was to be traversed for a design option.

6.2.2 Safety Category

This category considered safety of a new network from a road and rail user perspective such as cycling, walking, rail and general traffic.

6.2.3 Environmental Category

This category considered all environmental impacts similar to that required for an Assessment of Environmental Effects (AEE). Urban Design and Landscaping was also considered under this category.

Existing dwellings were noted and the potential impact as a result of any design option coming into close proximity.

6.2.4 Social Category

This category considered the impacts of a new post level crossing road network on an existing community, severance issues and Crime Prevention through Environmental Design (CPTED).

6.2.5 Access Category

This category considered the impacts of a new post level crossing road network on cycling and route security.

6.3 MCA Workshop

The MCA workshop was held on 17 October 2014 at AECOM's Auckland office with all members of AECOM's review team present (refer to **Table 1**) and was facilitated by Mike O'Halloran, AECOM NZ Group Director Transportation and Environment. The minutes from the MCA workshop on 17 October 2014 are included in Appendix B.

Table 4 lists the options taken into the MCA. These were the options retained after the initial assessment (refer to Section 4.2 for details).

Table 4 Options Taken into MCA

Option	Description
1a	Cowie Street to Laxon Terrace Over-Bridge
2a	Furneaux Way Connection – Two Lane
2b	Furneaux Way Connection – One Lane
3a	Cowie Street to Through Newmarket Park to Ayr Street
3c	Cowie Street to Around Newmarket Park to Ayr Street
4a	Opus Sarawia Street to Laxon Underpass (Two Options)
4b	CSRA Sarawia Street to Laxon Underpass
4c	Railway Street to Laxon Underpass

6.4 MCA Criteria

Criteria were assigned to the five categories of economic efficiency, safety, environmental, social and access and are presented in **Table 5**. The criteria were agreed with attendees and through group discussions during the workshop, each criterion was given a score that ranged between "Positive Effect" to "Unacceptable Effect". For the scoring of the criteria refer to Appendix C.

Table 5: MCA Criteria

Category	Criteria	
Economic Efficiency	- Meets project objectives - Constructability - Level of Service (General Traffic) - Public transport operation Capital costs	- Maintenance / Operations cost - Property - Climate Change - Walking Connectivity
Safety	- Cycle - Walking	- Rail - General Traffic
Environmental	- Noise - Construction impacts - Air - Vibration - Vegetation / Trees - Archaeology - Heritage - Geology	- Contaminated sites - Hydrology - Urban / Landscape design - Lighting - Stormwater - Consents/Agreements - Recreational activities
Social	- Community - CPTED	- Severance issues
Access	- Cycle - Route Security	

6.5 MCA Results and Sensitivity Tests

6.5.1 MCA Ranking Methodology

To produce a relative ranking between options it is necessary to apply weightings to the MCA scoring by both category and criteria. Where a differential weighting is applied this represents an understanding of the importance placed on any category or criteria. During the MCA it was agreed that a number of scenarios would be considered.

The following MCA assumptions were tested:

- **Equal category weightings:** An equal weighting was applied across all categories, implying all categories were of equal importance.
- **Expert assessed weightings:** An assessment of the relative weighting of the categories was undertaken and their relative importance was weighted on the following criteria:

  a) Economic efficiency 5%
  b) Safety 35%
  c) Environmental 15%
  d) Social 25%
  e) Access 20%

- **Monte Carlo simulation:** To further test the robustness of the MCA outcome, ten thousand tests were carried out consisting of random weightings applied to each of the 5 categories. This sensitivity test provides guidance on the sensitivity of the MCA outcome across the full spectrum of weightings that could be considered. The minimum allowable weighting for any category was set to 10% and the five category weights summed to 100%.

- **Specified category weightings:** A significantly higher weighting of 75% was applied to each category in turn with the remaining 25% equally spread across the other four categories. This provided an assessment of the sensitivity of the MCA outcome by the categories.
- **Equal criteria weighting:** This sensitivity test provides guidance on the sensitivity of the MCA outcome across the full spectrum of criteria considered.

6.6 MCA Results

Table 6 presents the MCA ranking for each assumption assessed.

Table 6: MCA Results and Sensitivity Weightings – Options Ranking

Weightings	Option 1a	Option 2a	Option 2b	Option 3b	Option 4a	Option 4b	Option 4c
Equal across categories	1	2	3	7	5	4	6
Expert assessed	1	2	3	7	6	4	5
Monte Carlo analysis	1	2	3	7	5	4	6
Economic = 75%	3	2	1	7	5	4	6
Safety = 75%	1	2	3	4	7	5	6
Environmental = 75%	5	2	1	7	3	4	6
Social = 75%	1	2	3	7	5	4	6
Access = 75%	1	2	3	7	5	4	6
Equal across all criteria	3	2	1	7	4	4	6

Key issues from the table are:

i) Option 1a is the clear preference in the assessment, with it ranking highest in the majority of cases. Only when economics are the dominant criteria does it decrease to the rank of 5.

ii) Option 2a is the second ranking under all assumptions.

iii) Option 2b ranks 3 for the majority of cases with it ranking 1 under the economic, environmental and equal criteria.

iv) Option 3b has the lowest rank, 7, under all conditions apart from when the safety category dominates when its rank increases to the rank of 4.

v) Option 4a ranks 5 for the majority of the assessments, decreasing to 6 under the expert assessed weightings, decreasing to 7 when the safety component dominates, increasing to 3 when the environment component dominates, and increasing to 4 when the equal criteria component dominates.

vi) Option 4b ranks 4 under all assessments apart from when the safety category dominates when its rank decreases to the rank of 5.

vii) Option 4c ranks 6 under all assessments apart from the expert assessed weightings when its rank increases to the rank of 5.

Table 7 shows the relative scores for each option for the application of each weighting test.

Table 7: MCA Results and Sensitivity Relative Scoring

Weightings	Option 1a	Option 2a	Option 2b	Option 3b	Option 4a	Option 4b	Option 4c
Equal across categories	0.59	0.59	0.54	-0.46	0.08	0.12	0.04
Expert assessed	0.94	0.89	0.74	-0.22	0.04	0.12	0.09
Monte Carlo analysis	0.59	0.59	0.544	-0.459	0.079	0.115	0.035
Economic = 75%	0.11	0.18	0.32	-0.75	0.03	0.04	-0.22
Safety = 75%	1.56	1.56	1.20	0.54	0.03	0.21	0.18
Environmental = 75%	0.00	0.14	0.17	-0.65	0.07	0.04	-0.03
Social = 75%	0.41	0.18	0.17	-1.29	-0.43	-0.42	-0.45
Access = 75%	0.87	0.87	0.86	-0.14	0.71	0.72	0.70
Equal across all criteria	0.18	0.27	0.30	-0.61	0.03	0.03	-0.09

Table 7 shows that there is a clear separation in the relative score of the Options 1a, 2a and 2b over the remaining options with a recognised margin between the two sets of data.

Table 8 shows the results of perform the Monte Carlo analysis with 10,000 trials of potential category weightings. The options are listed across the top and the table shows the percentage of tests for which an option achieved a particular rank. Option 1a ranked first 56% of the time, followed by option 2a (36%) and option 2b (8%). Option 1a, 2a, and 2b are the only options to be ranked in the top 3.

Table 8: MCA Results of 10,000 trials with random category weightings

Rank	Option 1a	Option 2a	Option 2b	Option 3b	Option 4a	Option 4b	Option 4c
1	56%	36%	8%				
2	31%	59%	10%				
3	13%	5%	82%				
4						100%	
5					95%		5%
6					5%		95%
7				100%			

It is concluded that Options 1a, 2a, and 2b are the highest ranked options with a clear separation from the other options which can therefore be discarded.

7.0 Summary of Findings

The expert's review of existing information has considered the benefits and issues of all options and is the basis of the approach to the MCA assessment. The review of the options and the MCA process completed by AECOM has adopted and been guided by the project objectives to ensure alignment.

A number of options were discarded through an initial screening process as a result of geotechnical, geometric and topographical issues. It is acknowledged that the retention of the existing level crossing would not allow the delivery of a high frequency, reliable and resilient rail passenger service for Auckland as the crossing was on the critical link to the Britomart Station.

An MCA process was used to score each option based on a range of criteria. Findings of the MCA were:

- Options 1a Cowie Street Over Bridge, 2a Furneaux Way – Two Lane and 2b Furneaux Way – One Lane were clearly preferable to the remaining options. The remaining options were therefore discarded.
- The rankings from the MCA process for the three preferred options were close with Option 1a, Cowie Street Over Bridge, ranked the highest in most of the assessments. Second ranking was Option 2a Furneaux Way – Two Lane with third rank Option 2b Furneaux Way – One Lane.

Through the MCA process seven options were ranked and the top three were shown to have scored well ahead of the others. The top three ranked options are 1a, 2a and 2b and the key advantages and disadvantages of each are:

- **Option 1a:** The key advantage is the little change for Laxon residents where there is small reduction in the level of service for the Laxon Terrace and Young Lane residents with the exit onto Parnell Road remaining. The key disadvantages with this option is land required on one or possibly both sides of the rail corridor which affects one property at the end of Cowie Street along with the increase in traffic movements for the Cowie Street residents and longer pedestrian connectivity.
- **Option 2a:** The key advantage with this option is maintaining dual lane access expected for a local road. The key disadvantage with this option is the land acquisition and potential dwelling procurement makes this an expensive and disruptive option. In addition, the Local Government or Public Works Act may need to be used to change the status of the road from private to public road and the additional and the Laxon Terrance and Young Lane residents have a reduced level of service with potentially increased distance to access Parnell Road.
- **Option 2b:** The key advantage with this option is that no land acquisition is required and constructed in a relatively short period of time with minimal disruption to nearby residents. The key disadvantage with this option is Local Government or Public Works Act may need to be used to change the status of the road from private to public road. In addition, the Laxon Terrance and Young Lane residents have a further reduction in the level of service.

The MCA process is a tool to guide decision making and has been used by the expert's to assist them in their decision making. The outcome of the MCA identified Option 1a as the preferred option and was reinforced through sensitivity testing.

In considering the advantages and disadvantages of each option, the preference for Option 1a is further reinforced. Option 1a will provide a slightly reduced level of connectivity for residents of Laxon Terrace and pedestrians. Cowie Street will have an increase in traffic that will impact residents, however, the traffic volume is relatively small and in keeping with a local road designation.

In comparison Option 2a and 2b diminish current connectivity for Laxon Terrace residents and increase traffic for Furneaux Way residents (a private road). Furthermore, Option 2a would require the purchase of existing dwellings and will increase the level of disruption for all residents.

8.0 Conclusion

The Expert Review Panel have concluded that on the basis of the presented information, Option 1a Cowie Street to Laxon Terrace Over-Bridge provides the best mix of benefits weighed against potential impacts.

The confirmation of Option 1a is based on the consideration of maintaining current connectivity and access for Laxon Street residents by all modes.

9.0 AT Document List

AECOM based their review on the publicly available reports listed as follows:

1) Newmarket Level Crossing Scheme Assessment Report, September 2013 by Auckland Transport
2) Report on CSRA Sarawia Street Underpass Proposal, September 2014 by Auckland Transport
3) The Solution for the Newmarket Level Crossing Closure, Sarawia Street Underpass, April 2014 by Cowie Street Residents Association
4) The Solution for the Newmarket Level Crossing Closure, Sarawia Street Underpass, August 2014 by Cowie Street Residents Association
5) Newmarket Level Crossing Removal Meeting Minutes, 18 July 2014 by Xigo
6) Business Case for Design to Proceed from Investigation to Design, Newmarket Level Crossing, December 2013 by Auckland Transport
7) Project Initiation Document (PID), Newmarket Level Crossing, July 2013 by Auckland Transport
8) Laxon Terrace Grade Separation Options Report, April 2012 by Opus International Consultants Ltd
9) Justification Report for the Closure of Sarawia Street Level Crossing and Replacement with a New Over Bridge at Cowie Street, April 2011 by KiwiRail
10) Cowie Street Grade Separation Options Report, October 2010 by Opus International Consultants Ltd and Fulton Hogan Ltd
11) Scheme Assessment Report, Realignment of Sarawia Street – Newmarket, September 2007 by URS New Zealand Ltd
12) Railway Level Crossings Study, Contract No.331/120006A, August 2004 by Opus International Consultants Ltd

Appendix A

Advantages and Disadvantages of Identified Options

Appendix A Advantages and Disadvantages of Identified Options

The table below summarises the advantages and disadvantages identified in the Auckland Transport SAR and the Cowie Street Residents Association (CSRA) underpass proposal report.

No.	Advantages	Disadvantages
Do-Minimum		
	No advantages reported.	Do-minimum involves the retention of the level crossing with dedicated personnel to ensure safety of rail and road users.
		KiwiRail advised that when rail service frequencies increase through the crossing the current half-arm barriers would be unacceptable from a safety perspective, requiring additional measures such as longer barrier arms and the presence of dedicated personnel to monitor the crossing.
		This option is not considered viable if a higher frequency timetable is introduced as retaining the crossing would remove all resiliencies from the rail network to recover from network delays and maintaining reliable passenger services would become increasingly difficult
Option 1a: Cowie Street to Laxon Terrace Over-Bridge		
	BCR of 1.8 Physical Works Cost is $6.9M	Security concern: Concealment for offenders or vagrants taking up shelter close to all amenities
	RMA approvals expected to be relatively straight forward. RMA consents and approvals will be covered by an OPW and necessary resource consents or through a Notice of Requirements (NoR) process.	Elevated lighting impacting on residents
	This option involves little change for Laxon residents where there is little or no effect on the current traffic congestion of the wider area as vehicles from Laxon Terrace and Young Lane are still exiting onto Parnell Road as they are currently.	Land required on one or possibly both sides of the rail corridor which affects one property at the end of Cowie Street.
	The bridge will complement the Greenway cycle and walking link supported by the Waitemata Local Board.	The site is within close proximity to residential properties, therefore requiring mitigation measures such as landscaping, screening, urban design enhancement.
Option 1b: Sarawia Street to Laxon Terrace Over-Bridge		
	BCR was not provided Physical Works Cost was not provided	This option was discounted as non-viable due to topographical and geographic constraints associated with the rail clearance, road gradient and property access issues and Cowie Street offers a more viable solution.

No.	Advantages	Disadvantages
		

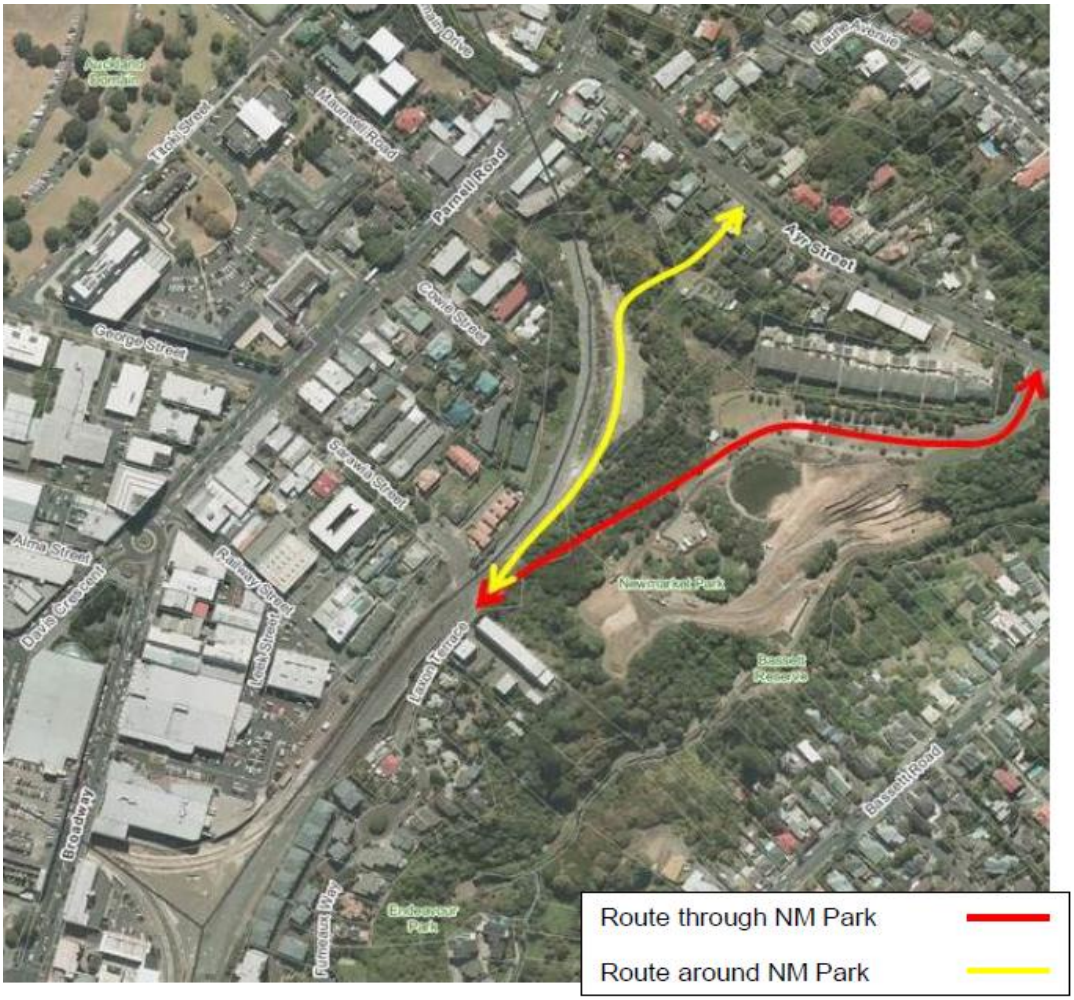
No.	Advantages	Disadvantages
Option 2a: Furneaux Way Connection – Two Lane		
	BCR of 1.3 Physical Works Cost is $10.9M	High cost option and an expected low BCR. Through further investigation the most efficient and least disruptive option is the single lane shared zone road.
	20m long pedestrian access way connecting Furneaux Way and Laxon terrace controlled by AT. Dual lane with pedestrian footpaths.	Is a feasible option from a construction and implementation perspective, however the land acquisition and potential building block demolition makes this an expensive and disruptive option.
	RMA approvals expected to be relatively straight forward. RMA consents and approvals will be undertaken across established access ways.	Extent of land acquisition and the legal right for use of Furneaux Way, a private road differs from one report to another
	Due to established access way the environmental effects are likely to be limited to access, circulation, noise and urban design.	Land ownership complexities for vehicular use of the pedestrian access way. Key constraint is property acquisition.
	Maintaining dual access and level of service expected for a local road.	Given proximity of the site to residential properties, affected party approval from adjacent residents would assist in expediting consent process.
		This connection would have an effect on the Furneaux residents due to increased traffic
		Local Government or Public Works Act may need to be used to change the status of the road from private to public.
		This option will also require a pedestrian bridge either at Sarawia Street or at Cowie Street.
Option 2b: Furneaux Way Connection – One Lane		
	BCR of 3.2 Physical Works Cost is $4.1M	The legal right for use of Furneaux Way, a private road differs from one report to another
	20m long pedestrian access way connecting Furneaux Way and Laxon terrace controlled by AT. Single lane with shared space with pedestrians	Concerns regarding shared zone were mainly around the identification of the connection as a shared zone and ensuring that the public were aware of the hierarchy of vehicles and pedestrians within the zone. Both of which are able to be dealt with through signage and road markings. The lane would be wide enough for emergency and other large vehicles.
	This is a feasible option from a construction and implementation perspective.	This connection would have an effect on the Furneaux residents due to increased traffic
	This option does not require land acquisition and constructed in a relatively short period of time with minimal disruption to nearby residents.	Local Government or Public Works Act may need to be used to change the status of the road from private to public road.
		A single lane shared space would provide a lesser level amenity compared to the two-lane options being considered for Cowie Street Bridge or Newmarket Park.
		This option will also require a pedestrian bridge either at Sarawia Street or Cowie Street.

No.	Advantages	Disadvantages
		

No.	Advantages	Disadvantages
Additional Option from Public Forum: Parnell Road Connections		
	BCR was not provided Physical Works Cost was not provided	There were three routes identified and were all discounted due to the geotechnical issues, inflated costs due to extended road geometry and structural requirements over the rail corridor and traffic constraints of adding another intersection close to the Ayr street / Domain / Parnell Road intersection.

No.	Advantages	Disadvantages
Option 3a: Cowie Street to Through Newmarket Park to Ayr Street		
	BCR of 3.0 Physical Works Cost is $4.4M	Security concern: Connecting thoroughfare through Newmarket Park to Ayr Street may provide for criminal activity. Currently the access on Ayr Street is gated and locked at night to prevent loitering, however, if this Option is used this gate will need to remain open at all times.
	The through road option was considered more viable than the around road option due to less area of road being located over unstable land, no requirement for land acquisition and a possibility to tie-in with an existing access point on Ayr Street rather than creating another access intersection in an already congested area.	A range of geotechnical issues largely connected to the historic use of Newmarket Park as a landfill site which creates geotechnical and engineering challenges.
		Residents, Auckland Council (AC) Parks and Local Board feedback have been negative with regard to this option.
		Newmarket Park is managed on behalf of Auckland Council by Parks, Sport and Recreation Department would be required to provide approval for any proposed works. In addition the Local Board has delegated authority as landowner of parks and reserves.
		A portion of the Newmarket Park within the footprint of the works is a closed landfill and is managed by AC Land and Coastal Remediation Group, which would be required to provide approval for any proposed works.
		Extensive earthworks for rehabilitation, stability and re-vegetation has been undertaken and further works is likely to be unfavourable by local residents and potentially challenging for some AC departments
		There will be a number of RMA and approvals required relating to vegetation clearance and earthworks that are not consistent with the existing zoning and therefore gaining the necessary approvals are likely to be complex.
		The site has significant public and stakeholder profile, and likely requires mitigation measures such as landscaping, screening, urban design enhancement.
		Significant risk requiring extensive structural and geotechnical work, road geometry, land acquisition and consenting
		This option will also require a pedestrian bridge, either at Sarawia Street or Cowie Street.

No.	Advantages	Disadvantages
Option 3b: Cowie Street to Around Newmarket Park to Ayr Street		
	BCR was not provided Physical Works Cost was not provided	Significant risk requiring extensive structural and geotechnical work, road geometry, land acquisition and consenting
		This option was discounted due to numerous unknown factors regarding ground stability, steep gradients and additional land acquisition requirements.
		This option will also require a pedestrian bridge, either at Sarawia Street or Cowie Street.



No.	Advantages	Disadvantages
Option 4a: Opus Sarawia Street to Laxon Underpass (Two Options)		
	Alignment 1: BCR of 1.3 Alignment 1: Physical Works Cost is $7.5M Alignment 2: BCR not provided Alignment 2: Physical Works Cost is $9.0M	Opus investigated three options and two were identified being potential alternative access routes.
		There are still geotechnical and KiwiRail access issues to Newmarket Triangle that have not been dealt with to date.
		Traffic safety concerns identified are around large vehicle tracking, visibility, footpath formation and connection with the existing roads
Option 4b: CSRA Sarawia Street to Laxon Underpass		
	BCR was not provided CSRA total cost estimate is $5m (Aug 2014)	CSRA estimate seems low and the Opus assessment of over $8M is perhaps closer to the mark.
	Replaces the level crossing with the existing traffic patterns unchanged.	Design vehicle 8m single unit truck could be too small if a large fire truck was required.
	Existing turning movements at Sarawia and Cowie with Broadway would be unchanged thus no change to traffic delays/safety and amenity for local residents.	Tracking and sight distance issues requiring convex mirror to a new structure, but can be resolved with chamfering of the northern approach. Increases cost due to the additional widening required and will need to change from the vertical walls to sloping walls and moving the footpath to accommodate better sight distances.
	No increase in traffic in and travel times/distances.	Elevated lighting impacting on residents
	Require an efficiency or safety issue to justify a change	Footpath on one side of the road corridor and is 1.3m wide. Auckland Transport ATCOP standard is 1.8m
	No foreseeable security issues beyond what would be considered normal for this location.	Increased width between columns is required to accommodate the minimum footpath width. This will increase construction time and cost of the bridge.
	Gradient/tracking/visibility/sight distance/pedestrian connectivity - OK	Limited structural detail
	Dual carriageway with 2.95m to face of kerb and therefore effective lane width is 2.65m. ATCOP standard is 2.70m (min) to face of kerb for local roads.	Limited geotechnical information
		Resource and Building consents will most likely be notified, affecting programme and costs
		KiwiRail works required to relocate OLE tension masts, signal boxes etc., is likely to increase costs more than has been assumed in the estimates provided.
		Construction access will be limited to Block on Line and evenings which will incur increase costs compared to normal working hours
		KiwiRail owned land will need to be acquired and is not covered in the cost estimates provided.

No.	Advantages	Disadvantages
Option 4c: Railway Street to Laxon Underpass		
	BCR was not provided Physical Works Cost was not provided	This route would be easier to achieve than the underpass from Sarawia Street to Laxon Terrace due to much lower grade entry point at Laxon Terrace. However, the logistics of entering from Railway Street are still extremely complex and expensive, removing this as a feasible option.

Appendix B

MCA Minutes

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Minutes of Meeting

Newmarket Level Crossing at Sarawia Street

Subject	Multi Criteria Assessment	Page	1 of 6
Venue	AECOM Auckland	Time	10.00am
Participants	Lloyd Barton, Emma Trembath, Graham Brooke-Smith, Yadav Khwaounjoo, John Cooper, Simon Wood, Mike O'Halloran, Sid Scull, Andrew Foy		
Apologies	Chris Ballantyne		
File/Ref No.		Date	17-Oct-2014
Distribution	As above		

No	Item	Action	Date
1	Introductions and Background		
	Simon Wood, Project Manager commenced the workshop stating background on the request for assistance from Auckland Transport Board. The AECOM Offer of Service was reiterated as below: 1) Review all current documentation to understand the project and assessment of options and determine if this meets the LTMA (Land Transport Management Act) and RMA requirements. 2) Identify any issues with regard to design and construction given the available blocks of line for each option. 3) Meet with AT to confirm the project objectives in order to achieve a robust MCA process. This will also confirm a criteria list for the MCA process. 4) Provide a half day workshop to undertake a MCA analysis enabling assessment of all the developed options across a range of criteria (i.e. environment effects, land acquisition, social impacts, constructability, cost etc). 5) Prepare a report documenting the above process including a high level executive summary. Participants were confirmed as follows: • Mike O'Halloran - Facilitator • Lloyd Barton – RMA Planning • Emma Trembath – Environment and Contamination • Graham Brooke-Smith – Civil Engineering • Yadav Khwaounjoo – Structures/Bridge Engineering • John Cooper – Geotechnical Engineering • Simon Wood – Rail Engineering and Strategic Advisory • Sid Scull – Transportation Planning and MCA Documentation		

No	Item	Action	Date
	• Andrew Foy – Transportation Planning/Traffic Engineering and Strategic Advisory		
2	Agenda		
	Mike O'Halloran outlined the MCA workshop agenda as follows: • Confirm Background Reports and Information examined • Team to confirm Project Objectives • Team to confirm MCA Categories and Criteria and Weightings • Team to agree options to be assessed and undertake rating for each option • Undertake sensitivity analysis subject to time to challenge the first result outcome.		
3	Background Reports		
	The participants confirmed all had viewed and examined background reports as follows: • Auckland Transport Newmarket Level Crossing Scheme Assessment Report 2013. • Sarawia Street Underpass; fully compliant design – Cowie Street Residents Association.		
4	Project Objectives		
	Graham Brooke-Smith advised some initial project objectives developed specifically for the site. It was noted that the objectives did not reference strategic transport policies. However, it was considered appropriate to focus on specific issues for this site. The participants agreed that the project objectives for this MCA workshop is as follows: • To improve the operation of the railway crossing by removing the potential safety issue with trains and the rail level crossing. • Provide alternative vehicle access to/from Laxon Terrace and Youngs Lane by March 2015, otherwise cut off from the surrounding area if the crossing is removed. • Retain pedestrian and cycle connectivity between Parnell Road and the Newmarket Park area. • Manage these solutions to take into account the interests and preferences of stakeholders, including the Local Board, community groups, park users and local residents. • Has a compatible urban design that is safe and is environmentally sensitive. All categories and criteria analysed were benchmarked against the project objectives and then against each option.		
5	MCA Categories and Criteria and Weightings		
	The developed spreadsheet for Categories and Criteria was reviewed by all participants and confirmed as follows:		

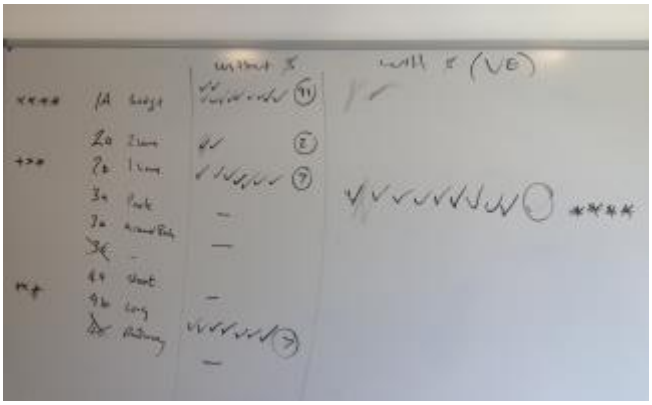
No	Item	Action	Date
	Economic Efficiency (20%) • Meets project objectives (2.22%) • Constructability (2.22%) • Level of Service (General Traffic) (2.22%) • Public transport operation (2.22%) • Capital costs Maintenance / Operations cost (2.22%) • Property (2.22%) • Climate Change (2.22%) • Walking Connectivity (2.22%) **Safety (20%)** • Cycle (5%) • Walking (5%) • Rail (5%) • General Traffic (5%) **Environmental (20%)** • Noise (1.33%) • Construction Impacts (1.33%) • Air (1.33%) • Vibration (1.33%) • Vegetation / Tree (1.33%) • Archaeology (1.33%) • Heritage (1.33%) • Geology (1.33%) • Contaminated sites (1.33%) • Hydrology (1.33%) • Urban / Landscape design (1.33%) • Lighting (1.33%) • Stormwater (1.33%) • Consents/Agreements (1.33%) • Recreational activities (1.33%) **Social (20%)** • Community (6.67%) • CPTED (Refer to Report) (6.67%) • Severance issues (6.67%) **Access (20%)** • Cycle (10%) • Route Security (10%) Rating scoring was confirmed as follows: **Scoring** Unacceptable effect: -3 Negative effect: -2 Slight negative: -1 Neutral / No Change: 0 Slight positive: 1 Positive effect: 2		
6	**Options Assessed for MCA**		
	Participants discussed various aspects of each option developed and		

No	Item	Action	Date
	referenced the document developed by Graham Brooke-Smith summarising all options. It was confirmed that 11 options have been developed. Graham stated advantages and disadvantages with each to assist participants in understanding the specific issues and opportunities. The team debated the merits of each and determined that 8 options should be considered for a MCA process. That is, 3 options were discounted on the basis that they did not warrant further assessment based upon issues and constraints identified by the participants as being problematic to take forward for consideration. The options considered for MCA were: 1. Option 1a: Cowie Street to Laxon Terrace Over-Bridge 2. Option 2a: Furneaux Way Connection – Two Lane 3. Option 2b: Furneaux Way Connection – One Lane 4. Option 3a: Cowie Street to Through Newmarket Park to Ayr Street 5. Option 3b: Cowie Street to Around Newmarket Park to Ayr Street 6. Option 4a: Opus Sarawia Street to Laxon Underpass (Two Options) 7. Option 4b: CSRA Sarawia Street to Laxon Underpass 8. Option 4c: CSRA Railway Street to Laxon Underpass		
7	**Specific comments on each option assessed.**		
	Each option was rated according to the 1. Option 1a: Cowie Street to Laxon Terrace Over-Bridge **Economic Efficiency** - – no comment **Safety** – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – CPTED issues highlighted in report and bridge most positive. **Access** – no comment 2. Option 2a: Furneaux Way Connection – Two Lane **Economic Efficiency** -– no comment **Safety** – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Cycle Bridge could be a feature despite over rail alignment. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment 3. Option 2b: Furneaux Way Connection – One Lane **Economic Efficiency** - – no comment		

No	Item	Action	Date
	Safety – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Cycle Bridge could be a feature despite over rail alignment. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment 4. Option 3a: Cowie Street to Through Newmarket Park to Ayr Street **Economic Efficiency** - Hydrology same as other options – neutral rating. From a Property perspective it was deemed unacceptable by participants to construct an option through the park. The analysis was stopped on this option based upon normal protocols of an MCA assessment. **Safety** – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Consents considered neutral as some negative impacts balanced by positive benefits. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment 5. Option 3b: Cowie Street to Around Newmarket Park to Ayr Street **Economic Efficiency** - – no comment **Safety** – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. Noted that Kiwirail property used for access. **Social** – no comment **Access** – no comment 6. Option 4a: Opus Sarawia Street to Laxon Underpass (Two Options) **Economic Efficiency** – no comment **Safety** – can achieve safety requirements through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment 7. Option 4b: CSRA Sarawia Street to Laxon Underpass **Economic Efficiency** – no comment **Safety** – can achieve safety requirements through detailed design		

No	Item	Action	Date
	Environmental – noise assessment same as other options as signal bells removed. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment 8. Option 4c: CSRA Railway Street to Laxon Underpass **Economic Efficiency** – constructability constraints assessed. Topography checked to establish if underpass can be constructed. This determined that the gradients were too steep**.** Alternative for longer alignment but still constrained by topography. **Safety** – can achieve safety requirements for general traffic through detailed design **Environmental** – noise assessment same as other options as signal bells removed. Hydrology same as other options – neutral rating. Construction impacts took into account all environmental impacts. **Social** – no comment **Access** – no comment		
8	**Sensitivity Analysis**		
	Sensitivity Analysis was not undertaken as part of the workshop. However, post workshop sensitivity was undertaken by changing the weightings of each Category. The outcome of that analysis will be contained in the report produced. As an additional exercise, the group was asked to confirm which option was preferred if cost was not important and then if it was. Three votes were permitted for no cost as a factor whilst one vote was permitted if cost was a factor. The reason for more votes permitted if cost was a factor was to differentiate a preferred option due to the complexities of all criteria being analysed against options. The participants confirmed the following.		

Option	Cost not considered	Cost considered
Option 1a	✔✔✔✔✔✔✔✔✔✔✔	
Option 2a	✔✔	
Option 2b	✔✔✔✔✔✔✔	✔✔✔✔✔✔✔✔✔✔
Option 3a:		
Option 3b		
Option 4a		
Option 4b	✔✔✔✔✔✔✔	
Option 4c		

No	Item	Action	Date
	The conclusion here was that the single lane option at Furneaux was preferred if cost was a major factor – this was considered value for money. However, in the context of cost not being a significant factor, participants opted for a more strategic solution in a bridge option, closely followed by the single lane option at Furneaux and the Sarawia Street to Laxon Underpass. The board photo is shown as Figure 1.  **Figure 1: Board Photo of Options selected by participants.**		

MCA Workshop finished at 3pm.

Minutes Prepared by Mike O'Halloran.

Date 18 October 2014.

Appendix C

MCA Scoring of Criteria

MCA Scoring of Criteria

Catergory Weighting (Equal)	Criteria Weighting	Sensitivity	Evaluation Matrix for Feasibility Op Sarawia Street Level Crossing Closure Category	Options: Criteria	1a Overbridge 6.9m	2a 2 lane + cycle bridge 11m	2b 1 lane + cycle bridge 4.1m	3a Through Park 4.4m	3b Around Park	4a Short Underpass 9m	4b Long Underpass 8.2m	4c Railway St underpass 10m+
20.00%			**Economic Efficiency**									
	2.22%			Meets project objectives	Slight positive	Slight positive	Slight positive	Slight positive	Neutral / No Change	Slight positive	Slight positive	Slight positive
	2.22%			Constructability	Slight negative	Positive effect	Positive effect	Slight negative	Slight negative	Negative effect	Negative effect	Negative effect
	2.22%			Level of Service (General Traffic)	Positive effect	Slight negative	Slight negative	Negative effect	Negative effect	Positive effect	Positive effect	Positive effect
	2.22%			Public transport operation	Positive effect	Positive effect	Positive effect	Positive effect	Positive effect	Positive effect	Positive effect	Positive effect
	2.22%			Capital costs	Negative effect	Negative effect	Slight negative	Slight negative	Negative effect	Negative effect	Negative effect	Negative effect
	2.22%			Maintenance / Operations cost	Negative effect	Slight negative	Slight negative	Negative effect	Negative effect	Negative effect	Negative effect	Negative effect
	2.22%			Property	Slight negative	Negative effect	Slight negative	Unacceptable effect	Negative effect	Neutral / No Change	Neutral / No Change	Negative effect
	2.22%			Climate Change	Slight positive	Slight positive	Slight positive	Neutral / No Change	Slight positive	Slight positive	Slight positive	Slight positive
	2.22%			Walking Connectivity	Slight negative	Neutral / No Change	Neutral / No Change	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Slight negative
20.00%			**Safety**									
	5.00%			Cycle	Positive effect	Positive effect	Slight positive	Neutral / No Change	Neutral / No Change	Slight negative	Slight negative	Slight negative
	5.00%			Walking	Positive effect	Positive effect	Slight positive	Neutral / No Change	Neutral / No Change	Slight negative	Slight negative	Slight negative
	5.00%			Rail	Positive effect	Positive effect	Positive effect	Neutral / No Change	Positive effect	Positive effect	Positive effect	Positive effect
	5.00%			General Traffic	Positive effect	Positive effect	Positive effect	Neutral / No Change	Positive effect	Neutral / No Change	Slight positive	Slight positive
20.00%			**Environmental**									
	1.33%			Noise	Positive effect	Positive effect	Positive effect	Neutral / No Change	Slight negative	Positive effect	Positive effect	Positive effect
	1.33%			Construction Impacts	Negative effect	Slight negative	Slight negative		Slight negative	Negative effect	Negative effect	Negative effect
	1.33%			Air	Slight positive	Slight positive	Slight positive	Neutral / No Change	Slight positive	Slight positive	Slight positive	Slight positive
	1.33%			Vibration	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Vegetation / Trees	Slight negative	Slight negative	Slight negative	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Archaeology	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Heritage	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Geology	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Contaminated sites	Slight negative	Neutral / No Change	Neutral / No Change	Neutral / No Change	Negative effect	Slight negative	Slight negative	Slight negative
	1.33%			Hydrology	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Urban / Landscape design	Negative effect	Slight negative	Slight negative	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Lighting	Slight negative	Slight negative	Slight negative	Neutral / No Change	Slight negative	Slight negative	Slight negative	Slight negative
	1.33%			Stormwater	Slight negative	Neutral / No Change	Neutral / No Change	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
	1.33%			Consents/Agreements	Negative effect	Negative effect	Slight negative	Neutral / No Change	Negative effect	Slight positive	Neutral / No Change	Slight negative
	1.33%			Recreational activities	Slight positive	Slight positive	Slight positive	Neutral / No Change	Slight positive	Slight positive	Slight positive	Slight positive
20.00%			**Social**									
	6.67%			Community	Slight negative	Slight negative	Slight negative	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
	6.67%			CPTED (Refer to Report)	Positive effect	Slight positive	Slight positive	Neutral / No Change	Slight negative	Negative effect	Negative effect	Negative effect
	6.67%			Severance issues	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
20.00%			**Access**									
	10.00%			Cycle	Neutral / No Change	Neutral / No Change	Neutral / No Change	Neutral / No Change	Negative effect	Neutral / No Change	Neutral / No Change	Neutral / No Change
	10.00%			Route Security	Positive effect	Positive effect	Positive effect	Neutral / No Change	Positive effect	Positive effect	Positive effect	Positive effect

Scoring	
Unacceptable effect	-3
Negative effect	-2
Slight negative	-1
Neutral / No Change	0
Slight positive	1
Positive effect	2