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Options development and selection process

South Metro Connect (SMC), December 2010. *Options Development and Selection Process*. Unpublished report prepared for Main Roads, Perth, WA.

Appendix C

Options development and selection process

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Roe Highway Extension

Options Development and Selection Process

Technical Report

60100953-313G-CS-REP-0013

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Options Development and Selection Process Technical Report

Project Brief

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South Metro Connect is an integrated project team comprised of personnel from Main Roads Western Australia and AECOM. The team was created for the development of Roe Highway Extension project. Its primary objective is to work collaboratively with specialty consultants, stakeholders, and regulatory authorities to develop an environmentally, socially and economically acceptable project design that ultimately receives statutory approval.

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Report Objective

This report provides a chronology of the options development and selection process for the development phase of the proposed Roe Highway Extension. The chronology begins with the project objectives identified in July 2009 and the minimum requirements identified for the project in November 2009. It then details the way in which these objectives were turned into design options through an iterative and collaborative process of design engineering, environmental management, heritage consultation, stakeholder and community engagement and specialist input. The report describes how this process resulted in the identification of the preferred option for the project and concludes with a summary of the preferred option.

Executive Summary

An iterative and collaborative process was followed for the development and selection of design options for the proposed Roe Highway Extension. Environmental, social and economic impacts were identified by environmental consultants, stakeholders and community to develop and select the most sustainable design options, while still meeting the objectives of the proposed project.

Objectives

The objectives of the options development and selection process were to:

- Identify the most sustainable alignment for the proposed project according to triple bottom line criteria;
- Collaborate with community and stakeholders to identify the evaluation criteria (based on sustainability principles) and preferred design options;
- Identify preferred options through an iterative process of development, analysis and selection according to the criteria;
- Satisfy the regulatory requirements; and
- Meet the project objectives.

Key Events

The key events for the options development and selection process began in July 2009 with the early environmental surveys and project objectives workshop. The environmental surveys identified significant values and potential impacts. Design engineers generated innovative and sustainable road designs to avoid or minimise these impacts by collaborating with environmental scientists and community and stakeholders. The initial key community and stakeholder engagement events began with an Environmental Scoping Document focus group workshop on 24 September 2009, a community information day on 24 October 2009 and a Multi Criteria Analysis (MCA) workshop (criteria identification workshop) on 19 February 2010. Some of the design options were developed following community and stakeholder suggestions made at a series of design workshops and an options selection workshop held during the period March to June 2010.

Outcomes

Design options for the proposed project were selected based on avoidance and minimisation of impacts. The environmental, social and economic constraints were identified during the engagement process and environmental studies and design options were developed to:

- Maximise use of existing cleared areas and areas of degraded vegetation to avoid impacts on high and medium quality vegetation;
- Optimise the alignment to avoid potential Carnaby's Black-Cockatoo nesting sites, wherever practicable;
- Relocation of the original Bibra Drive interchange to a new location (Murdoch Drive Extension interchange) in cleared government-owned land to the east. This is to minimise impact on conservation category wetlands (including Roe Swamp) and high quality vegetation and fauna habitat;
- Replace embankments and batters with retaining walls to minimise footprint in high environmental and heritage value locations;
- Use of a minimum width highway median to minimise the clearing footprint;
- Alignment of the proposed project along the western section of Hope Road, between Bibra and North lakes, and along the existing high tension power line corridor to minimise the clearing footprint;
- Inclusion of bridges over a portion of Roe Swamp and south-east of Horse Paddock Swamp to minimise interruption to surface and potential subsurface flows. This will also maintain ecological linkages for fauna species and long-term genetic transference of flora species;
- Use top-down construction methods to build a conventional multi-span bridge over Roe Swamp and surrounding wetlands. This construction method will reduce the clearing footprint of the proposed project by

removing the need for ground level access by machinery and vehicles, and will also require no clearing under the bridge, which is especially important in this high-value ecosystem.

- Reconfiguration of the Kwinana Freeway Interchange to retain areas previously set aside as environmental offsets for Roe Highway Stage 7.
- Provide southern access to and from the Murdoch Activity Centre (MAC), to and from Roe Highway and the Kwinana Freeway, with minimal social impacts on the Spanish Club of WA, Murdoch Pines Golf and Recreation Centre and Lakeside Recreation Centre; and
- Provide a Principal Shared Pathway (PSP) along the entire alignment that links with existing pedestrian and cyclist networks.

1.0 Introduction

The proposed project will extend the Roe Highway westward from its current southern end point at Kwinana Freeway in Jandakot to Stock Road in Coolbellup, using the Primary Regional Road Reserve set aside in the MRS. The proposed project is required to:

- meet the needs of the growing population;
- meet the increased transport needs;
- provide efficient transport to and from the Fremantle Inner Harbour;
- provide a link between the Fremantle Inner Harbour and proposed Outer Harbour; and
- remove heavy vehicles from local streets.

South Metro Connect (SMC) is an alliance between Main Roads Western Australia (MRWA) and industry partner AECOM Australia Pty Ltd. The SMC alliance was formed in 2009 to develop the Roe Highway Extension project.

The design options development and selection process was used during the development phase of the proposed project to systematically and collaboratively account for the environmental, social and economic impacts identified by the project team, stakeholders and community. The aim of the process was to select the most sustainable design options and still meet the objectives of the proposed project.

1.1 Approach

The iterative process of options development and selection was based on the sustainable decision making framework developed for the proposed project (Figure 1). The framework was designed to consider all options, ideas, opportunities and innovations, and to help identify an appropriate road transport solution that balances project objectives and environmental, social and economic factors.

Figure 1: SMC Sustainable Decision Making Framework

To manage the process of options development and selection, the team divided the project area into three sections:

1) Eastern Section: Kwinana Freeway to Bibra Drive;

2) Western Section: Stock Road to North Lake Road; and

3) Central Section: North Lake Road to Bibra Drive.

The eastern section focused on the Roe Highway/Kwinana Freeway interchange and access to the MAC. The western section focused on the strategic link with Stock Road and the central section focused on Beeliar Regional Park and associated wetlands.

To implement the sustainable decision making framework in a collaborative way, triple bottom line criteria were developed in conjunction with community and stakeholders and used during key events to analyse design options for the proposed project (see Section 5.3.8). Multiple viable options for the central section of the project were analysed during the Options Selection Workshops using Multi Criteria Analysis.

1.2 Key Events: Community Engagement and Studies

Environmental surveys, project team meetings and workshops, community and stakeholder engagement and Aboriginal heritage consultation were used to identify potential impacts and generate ideas to minimise these impacts. These key events are displayed chronologically in Figure 2.

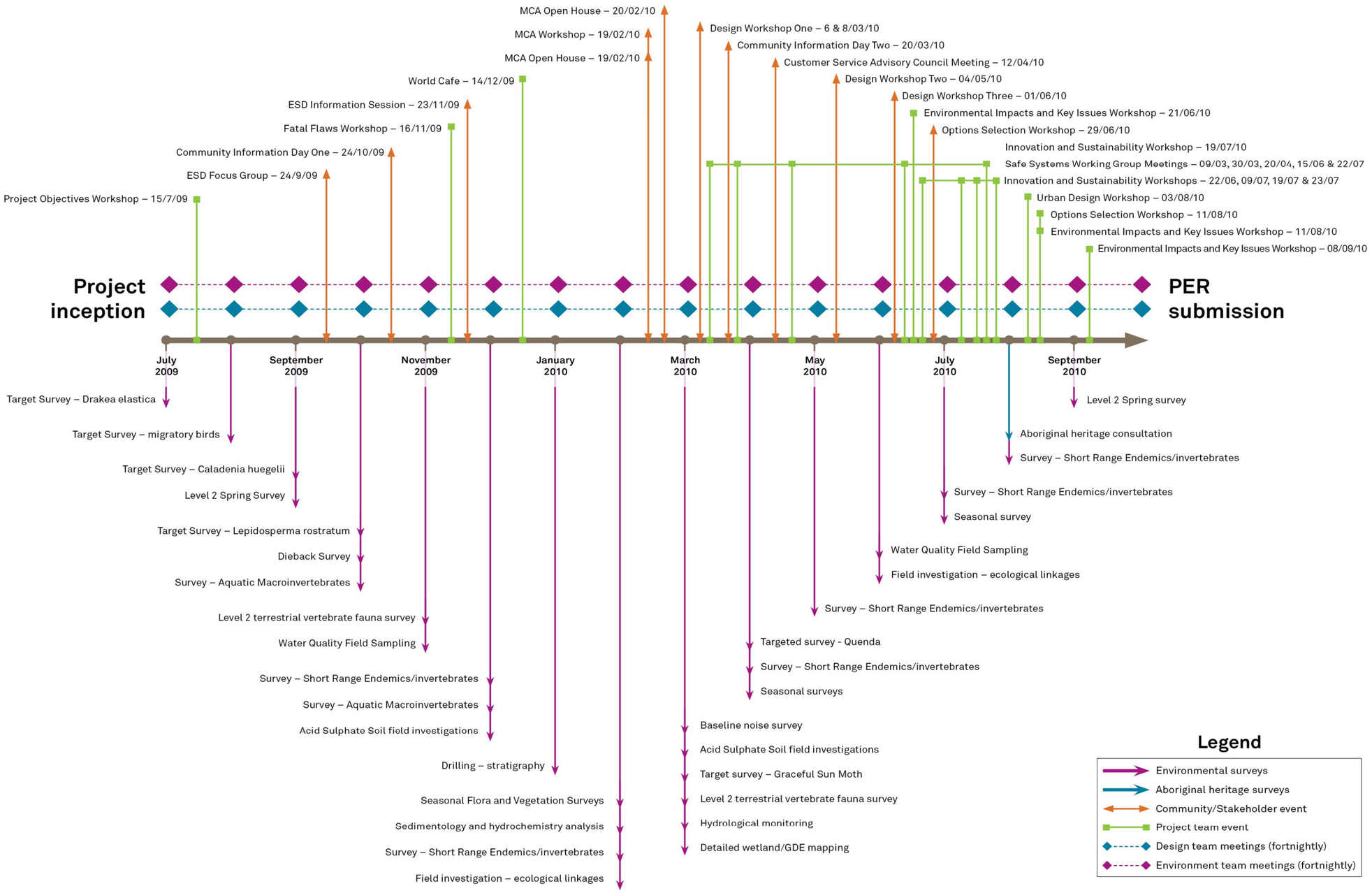

Figure 2: Roe Highway Extension Key Events Timeline

2.0 Project Objectives

The concept design options for the proposed project were developed with reference to the project objectives that were established in line with MRWA's 2012 Strategic Plan (Main Roads Western Australia, 2010). The project objectives are listed in Table 1.

Table 1: Roe Highway Extension Project Objectives

Key Result Area	Project Objectives
Environmental	Minimal impact on the environment
	Net environmental gain
	Outstanding solutions to road design in environmentally sensitive areas
Social	Lasting positive legacies and relationships
	Operational road safety – towards the state government's 'Vision zero' (zero deaths and serious injuries on WA roads)
	Exceed expectations of community, stakeholders and Main Roads WA
Economic	Value for money
	Transport efficiency
Governance	Safe, positive and fulfilling team experience
	Construction to commence in 2012
	Shared gained knowledge and development of capabilities (between team and stakeholders/community)
	New benchmarks for collaboration, innovation and sustainability in project development

3.0 Minimum Requirements

A project team workshop was held on 16 November 2010 to gain a clear and common understanding of the project objectives and produce a list of undesirable outcomes or impediments to these objectives. To ensure that these undesirable outcomes were avoided, the team developed a list of minimum requirements. The minimum requirements are listed in Table 2.

Table 2: Roe Highway Extension Minimum Requirements

Key Result Area	Minimum Requirements
Environmental	The design must be environmentally acceptable
Social	The design must not depart significantly from the defined corridor for the project
	The design must be acceptable in terms of road safety standards
	The design must not require significant acquisition of private property
	The design must facilitate a direct connection to Murdoch Activity Centre from the south
	The design must have a high probability of obtaining Aboriginal Heritage approvals
	After mitigation, the design must have no significant impacts on residential and

Key Result Area	Minimum Requirements
	recreational amenity
Economic	The cost of construction must be sustainable
	The design must have no traffic signals on Roe Highway (except at the Stock Road intersection)
	The design must allow a posted speed of preferably at least 80kmh on Roe Highway
	The design must typically have four lanes but must not preclude upgrading to six lanes at some point into the future
	The design must provide an adequate level of service (for traffic congestion) against defined standards

4.0 General Design Guidelines

General guidelines were formed to assist in the achievement of the project objectives and minimum requirements for the proposed project. These guidelines were formed from the:

- Project objectives;
- Minimum requirements;
- Regulatory context;
- Environmental constraints;
- Aboriginal heritage considerations;
- Road safety requirements; and
- Innovation and sustainability framework.

4.1 Regulatory and Environmental Constraints

The project team took into account the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (The EPBC Act) and the *Environmental Protection Act 1986* (The EP Act) and conducted extensive surveys to identify the environmental constraints and guide the design team in creating the most sustainable road design solution for the proposed project.

The general design guidelines adopted for environmental constraints were:

- Minimised footprint;
- Maximised use of existing cleared areas;
- Reduced median strip to reduce footprint;
- Road water runoff treatment; and
- Avoidance of potential Black Cockatoo nesting trees.

4.2 Aboriginal Heritage Considerations

During August 2010, sub-consultant Australian Cultural Heritage Management Pty Ltd (ACHM) was contracted to consult with Aboriginal groups regarding the impact of the proposed project on Department of Indigenous Affairs (DIA) registered sites. During this time, ACHM consulted with 54 members of Noongar families. The recommendations made by ACHM as a result of this consultation process are now under consideration with the aim of seeking approval for the proposed project under section 18 of the *Aboriginal Heritage Act 1972* (AH Act).

For more information on the consultation process, see Australian Cultural Heritage Management Pty Ltd, 2010 in the references

4.3 Road Safety Requirements

The MRWA Safe Systems Working Group (SSWG) was consulted to monitor safety aspects and implement the policies of the state government's Towards Zero Framework (TZF) for the proposed project. The TZF contains specific design criteria for significantly reducing crash severity and road trauma.

Five workshops were held with the SSWG beginning on 09 March 2010 to incorporate the TZF into the concept designs for the proposed project. These workshops resulted in the incorporation of additional safety barriers, innovative intersection treatments, forgiving road and roadside design features, appropriate signage and intelligent transport systems that aid the driver.

For more details on the TZF, see Main Roads Western Australia, 2010.

4.4 Innovation and Sustainability

The sustainable decision making framework (Figure 1) was implemented for the proposed project through the use of the following:

- an innovation and sustainability register for recording all design ideas/suggestions;
- a Sustainability Measurement Assessment and Reporting Tool (SMART) for assessing innovative ideas;
- an innovation and sustainability seminar; and
- a series of workshops for facilitating innovative thinking about sustainable road solutions.

4.4.1 Innovation Workshops

One of the five innovation and sustainability workshops was held on 23 July 2010 to analyse general treatments for the proposed project. The workshop resulted in an agreed approach of applying design principles to the concept design to minimise potential impacts. The agreed approaches were to:

- Retain a 20 metre minimum vegetation corridor, as much as practicable, to maintain fauna connectivity in the western section;
- Use one in three batters on average, steeper where possible, with up to one in two-and-a-half batters as a maximum, with benching where required to reduce the footprint;
- Use retaining walls where it is not possible to retain the vegetation corridor with batters, recognising some pinch points were present where the 20 metre corridor was not possible; and
- Consider hybrid options, including a combination of batters and walls.

5.0 Preferred Design Options

The design options for the three sections of the proposed project were developed and selected in the following order:

1) Eastern Section: Kwinana Freeway to Bibra Drive;
2) Western Section: Stock Road to North Lake Road; and
3) Central Section: North Lake Road to Bibra Drive.

5.1 Eastern Section: Kwinana Freeway to Bibra Drive

5.1.1 Environmental Surveys

5.1.1.1 Flora and Vegetation

Seasonal flora and vegetation surveys identified the following values within the eastern section:

- Pre European – Bassendean Complex;
- Remnant native vegetation;
- High, medium and low value vegetation; and
- High, medium and low Carnaby's Black and Red Tailed Cockatoo foraging habitat.

For more details, see AECOM, 2010a.

5.1.1.2 Fauna

Fauna surveys recorded sightings of the following conservation significant species within the eastern section:

- Southern Brown Bandicoot or Quenda;
- Endangered Carnaby's Black Cockatoo;
- Vulnerable Forest Red-tailed Black Cockatoo; and
- Priority Three species Perth Lined Lerista.

Taking into account the unmitigated impacts on the fauna and fauna listed above, a number of alterations were made to the eastern section, including:

- Road runoff water treatment; and
- Removal of the median strip to allow for narrower formation.

For more details on the fauna surveys see Phoenix Environmental Sciences, 2010.

5.1.1.3 Acid Sulphate Soils

Acid Sulphate Soil (ASS) field investigations conducted for the project identified Class One and Two ASS in the eastern section of the project area. An ASS Management Plan will be prepared in accordance with appropriate guidance prior to final design and construction.

For more details on the ASS investigations conducted for the proposed project, see AECOM, 2010b.

5.1.2 Concept Design

In addition to the measures listed above, the concept design (Figure 3) for the eastern section contained potential changes to the proposed Kwinana Freeway/Roe Highway interchange and the proposed new southern connection to the MAC (including the Fiona Stanley Hospital, expected to open in 2014).

The design for the Roe Highway southern access to the MAC showed a connection of Roe Highway with Bibra Drive north of Hope Road, with a north easterly realignment of Bibra Drive. This would connect it with the existing Farrington Road/Murdoch Drive/Allendale Entrance roundabout. Following preliminary consultation indicating concerns with the Metropolitan Region Scheme (MRS) alignment over Roe Swamp, this design moved the connection with Bibra Drive to the area immediately east of Roe Swamp, and therefore slightly outside of the MRS, to avoid impacts on the swamp and associated vegetation.

This alignment was created based on an understanding that the associated impact on Murdoch University land was undesirable.

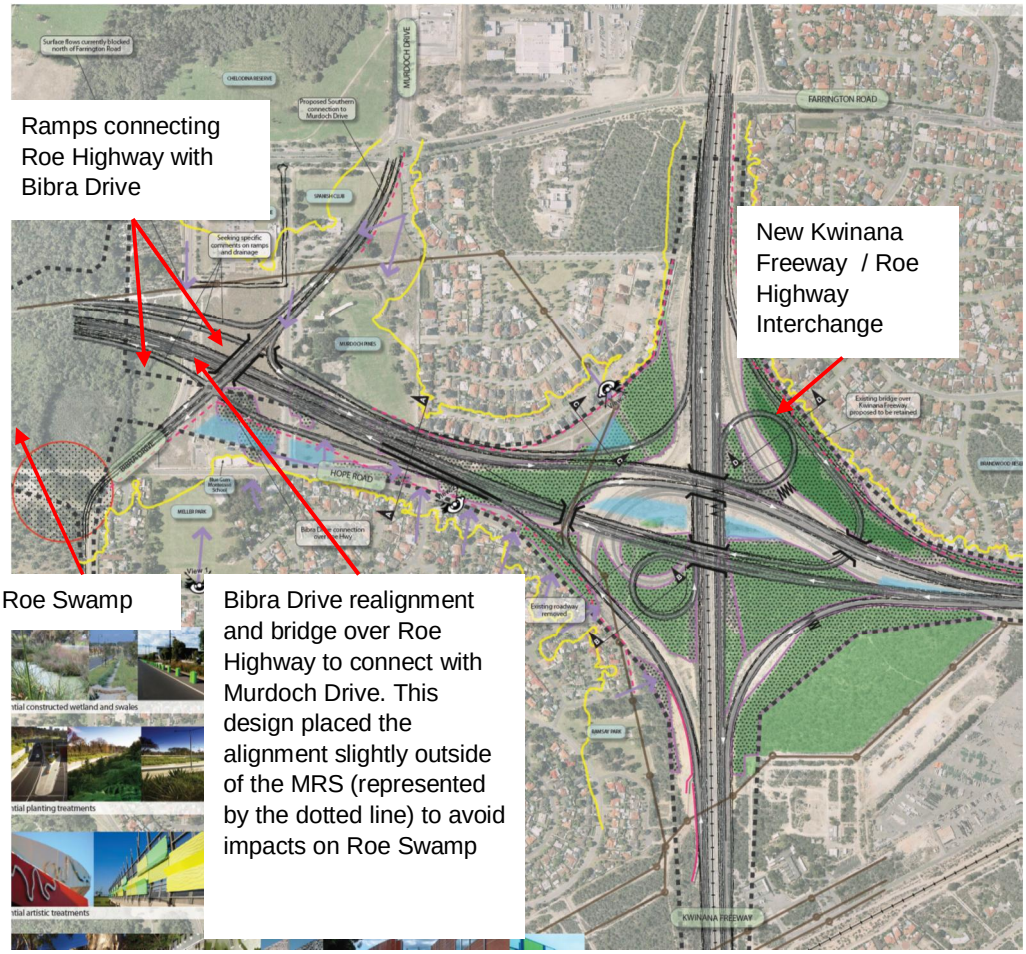

Figure 3: Roe Highway Extension Design Discussion Drawing, Eastern Section[1]

5.1.3 Community Engagement

The first design workshop held on 6 and 8 March 2010 resulted in a number of comments on the concept design for the eastern section including:

- Concerns that Bibra Drive would be used as a short cut, therefore increasing traffic;
- A majority preference that there should not be a connection between Roe Highway and Bibra Drive;
- Concerns that the alignment would have significant negative impact on land used for recreational activities;
- Concerns that Allendale Entrance, which connects to the Farrington Road / Murdoch Drive roundabout, is the only entrance to the Murdoch Chase subdivision - and increased traffic would create safety concerns for residents; and
- Concerns that pedestrians, particularly children, would have difficulty safely crossing Farrington Road.

All comments relevant to this section were reviewed, and although some indicated a preference for a connection between Bibra Drive and Roe Highway, the majority of comments received did not. Based on this, and the issues raised about the Farrington Road/Murdoch Drive/Allendale Entrance roundabout, further work was undertaken to develop a more appropriate solution.

[1] The design discussion drawings for all three sections of the proposed project were developed and used as 'discussion starters only' during the design workshops with community and stakeholders.

For more information on the community and stakeholder engagement process, including a summary of the comments received (over 1300) at each of the three design workshops, see South Metro Connect, 2010a.

5.1.4 Stakeholder Engagement

In addition to community feedback, the project team considered the potential impacts on, and issues raised by, directly affected stakeholders in the area including:

- Murdoch University;
- Fiona Stanley Hospital;
- Lakeside Recreation Centre;
- Murdoch Pines Golf and Recreation Centre;
- The Spanish Club of WA; and
- Murdoch Chase residents.

The Spanish Club and Murdoch Pines Golf and Recreation Centre expressed concerns with the concept design plans to realign Bibra Drive to meet Murdoch Drive for the southern access to the Murdoch Activity Centre. The alteration to lease boundaries required to make this realignment possible would make their operations economically unviable.

A number of Murdoch Chase residents expressed concerns with the concept design plans to realign Bibra Drive to the existing Allendale Entrance/Farrington Road alignment. The close proximity of this realignment to the houses on Allendale Entrance would make access to and from Farrington Road difficult.

5.1.5 Preferred Design Options

An alternative concept design was created to address the potential impacts raised by the environmental surveys, community and stakeholders to the maximum extent possible.

The new preferred design (Figures 4 and 5) replaces the connection between Roe Highway and Bibra Drive with a Bibra Drive bridge over Roe Highway. Instead of providing access to the MAC from Roe Highway via Bibra Drive, the new design connects Roe Highway to a southern extension of Murdoch Drive. This removes the connection to the Farrington Road/Murdoch Drive/Allendale Entrance roundabout. However, this design does have an impact on Murdoch University land.

This design has the following features:

- The existing Farrington Road/Murdoch Drive/Allendale Entrance roundabout is retained, but the northern (Murdoch Drive) leg has been restricted to local access only. The configuration for this junction provides the best level of service for traffic movements and requires only minor physical alterations to the north, allowing for the existing landscaping on the roundabout and other approaches to be retained;
- Bibra Drive continues as a local road with no connection to Roe Highway, helping to prevent short cuts, and the existing signalised junction with Farrington Road is maintained;
- All traffic movements to and from the Murdoch Activity Centre via the Roe Highway are accommodated, without additional traffic on Bibra Drive. These movements are controlled at the proposed Murdoch Drive Extension/Farrington Road by a new signalised intersection;
- The impacts on the Spanish Club and Murdoch Pines Golf and Recreation Centre are reduced;
- The existing east bound on ramp from Kwinana Freeway to the existing Roe Highway will be retained to minimise any impacts on the existing Roe Highway (stage 7) Offset Area E, and maintain separation from existing residences; and
- The existing Roe Highway (stage 7) Offset Area D has been mostly preserved by designing the existing south bound on ramp to Kwinana Freeway from the Roe Highway (Stage 7) to minimise its encroachment into this area. A retaining wall will be constructed for this ramp to reduce the width of the formation and minimise any clearing of Offset Area D.

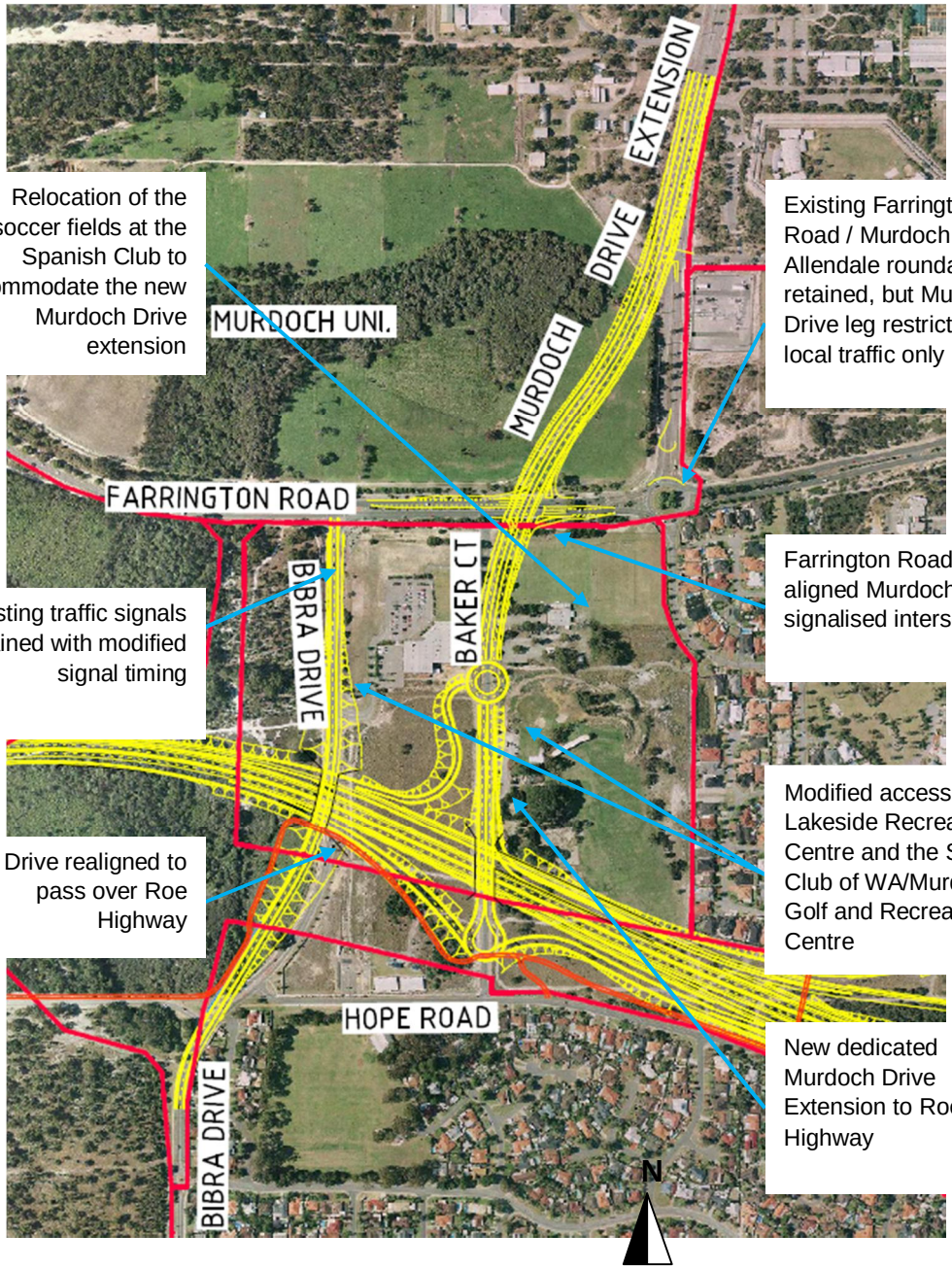

Figure 4: Roe Highway Extension Preferred Option, Murdoch Activity Centre Southern Access

Figure 5: Roe Highway Extension Preferred Option, Free Flowing Kwinana Freeway/Roe Highway Interchange

5.2 Western Section: Stock Road to North Lake Road

5.2.1 Environmental Surveys

5.2.1.1 Flora and Vegetation

Seasonal flora and vegetation surveys identified the following values within the western section:

- Pre European – Bassendean & Rockingham complex;
- Remnant native vegetation; and
- Some high value vegetation.

For more details see AECOM, 2010a.

5.2.1.2 Fauna

Fauna surveys recorded sightings of the following conservation significant species within the western section:

- Southern Brown Bandicoot or Quenda;
- Endangered Carnaby's Black Cockatoo;
- Vulnerable Forest Red-tailed Black Cockatoo; and
- Priority Three species Perth Lined Lerista.

Fauna surveys carried out during project development identified Graceful Sun-moth (GSM) habitat (*Lomandra hermaphrodita*) at the northwest quadrant of the road reserve. Impacts on this habitat were unavoidable if the project objectives of a free flowing interchange at Stock Road were to be achieved. Accordingly, an investigation is underway to determine appropriate strategies to offset these impacts.

Fauna surveys also identified:

- Potential black cockatoo nesting habitat; and
- High to moderate black cockatoo foraging habitat.

Taking into account the unmitigated impacts on the fauna and fauna habitat listed above, a number of alterations were made to the concept designs, including:

- Road runoff water treatment;
- Minimised clearing of Black Cockatoo foraging habitat;
- Removal of the median strip to allow for narrower formation; and
- Alignment of the proposed highway through the centre of the road reserve as much as practicable to maximise the width of vegetation between the road and adjacent properties, and to provide maximum potential habitat on either side.

For more details see Phoenix Environmental Sciences, 2010.

5.2.1.3 Acid Sulphate Soils

Acid Sulphate Soils (ASS) field investigations were conducted for the project, which resulted in the identification of Class Three ASS in the western section of the project area. Due to the buffering potential of the alkaline soils in this section, ASS is not considered a design constraint.

For more details on the ASS investigations see AECOM, 2010b.

5.2.2 Concept Design

In addition to the measures listed above, the concept design for the western section of the proposed project (Figure 6) contained a partially grade separated interchange connecting the proposed Roe Highway Extension with Stock Road. The design contained a realignment of Coolbellup Avenue and Sudlow Road from existing locations to a new alignment and bridge over the proposed Roe Highway. The design also contained a T-junction located at a new western terminus of Forrest Road at Sudlow Road, effectively removing Forrest Road between Sudlow Road and Purvis Street. In the east, the design contained an interchange at North Lake Road.

To meet the safety and serviceability requirements associated with the traffic increase on Stock Road, two existing local road movements were removed in the concept design - left into Ralston Street from Stock Road and right out of Ralston Street onto Stock Road. This limited access to a left turn onto Stock Road from Ralston Street and a right turn onto Ralston Street from Stock Road.

In the concept design, most of the Roe Highway profile between Stock Road and North Lake Road was lower than the surrounding ground level, which would require embankments or retaining walls. The section of the road adjacent to Malvolio Road was at or just above the existing ground level.

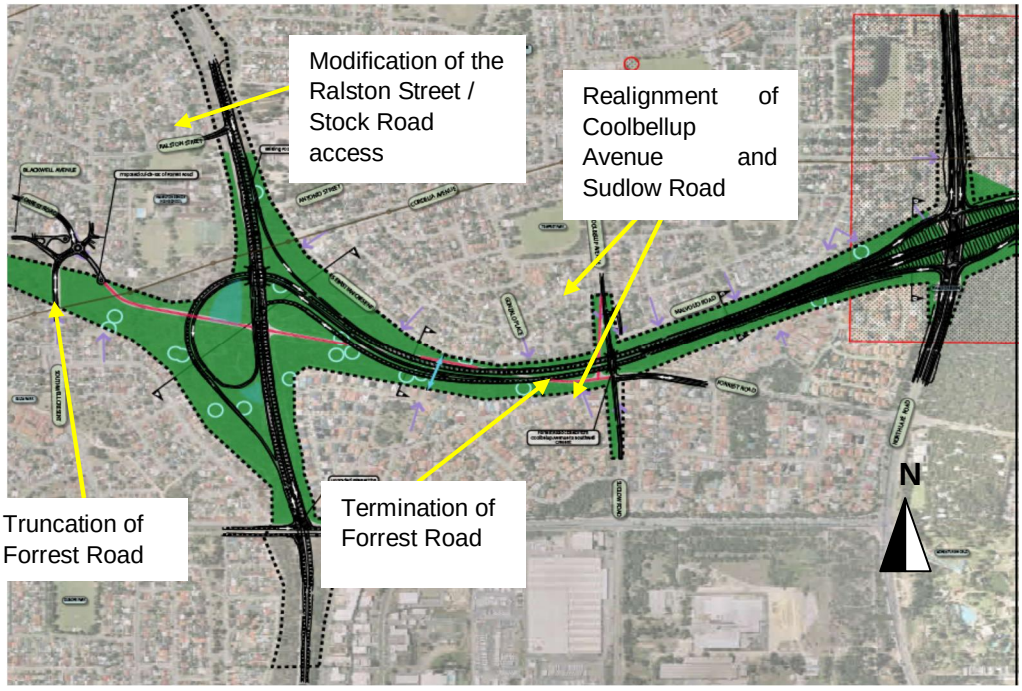

Figure 6: Roe Highway Extension Design Discussion Drawing, Western Section

5.2.3 Community Engagement

The second design workshop held on 4 May 2010 resulted in a number of comments on the concept design for the western section including:

- Provision of a free-flowing Interchange at the connection with Stock Road;
- Management of potential impacts on the Graceful Sun Moth habitat;
- Retention of remnant vegetation;
- Provision of local area access, east and west, inclusive of Hamilton Senior High School;
- Provision of pedestrian and cyclist access and connectivity;
- Use of existing Forrest Road alignment to minimise footprint, especially for the southbound connection to Stock Road;
- Testing for noise impacts; and
- Input as to whether there should be a connection from Roe Highway to Forrest Road to the west of Stock Road.

For more information on the community and stakeholder engagement process, including a summary of the comments received (over 1300) at each of the three design workshops, see South Metro Connect, 2010a.

5.2.4 Stakeholder Engagement

The following stakeholders were engaged for the western section of the proposed project:

- The City of Cockburn;
- The Department of Planning;
- The Department of Transport;
- Main Roads WA;
- The Department of Environment and Conservation;

- Hamilton Senior High School; and
- Residents of Malvolio Road.

This engagement process identified the following:

- Hamilton Senior High School identified potential access issues that may arise from the closure of the Stock Road/Forrest Road connection and the restriction of access to Ralston Street;
- MRWA noted future planning requirements for the upgrade of Stock Road to a highway standard six lane road; and
- Malvolio Road residents noted that they wished to have the highway aligned as far away from their properties as possible.

5.2.5 Preferred Design Options

The community and stakeholder engagement led to a concept design for the western section (Figure 7) that includes the replacement of the normal T-junction interchange with a roundabout at the intersection of Forrest Road and Sudlow Road/Coolbellup Avenue. It also includes the modification of the Ralston Street connection to Stock Road to improve access by enabling three traffic movements between Stock Road and Ralston Street and ultimately to and from Hamilton Senior High School. For safety reasons, vehicles travelling on Ralston Street will be unable to turn right onto Stock Road.

The northbound Roe Highway on-ramp from Stock Road has been moved slightly to the north, resulting in the requirement for land resumption from the Department of Education and Training (DET). DET was consulted along with Hamilton Senior High School, and appropriate measures will be negotiated to mitigate or compensate associated impacts.

The new preferred design (Figure 7) contains the following specific environmental impact avoidance and mitigation measures:

- Optimisation for Main Roads WA's future planning requirement to upgrade Stock Road to a highway standard six lane road;
- Construction of a retaining wall along the north side of the alignment immediately east of the Sudlow Road/Coolbellup Avenue flyover to maintain a 20m buffer of vegetation between the highway and houses along Sebastion Crescent, where possible. The retaining wall will be up to 11m in height;
- The highway is aligned through the centre of the road reserve as much as practicable to provide maximum width of vegetation on either side as an ecological corridor for fauna and to buffer nearby residences; and
- The Principal Shared Path (PSP) is diverted away from the highway edge to Malvolio Road at the Coolbellup flyover to reduce the width of the clearing footprint. It rejoins the highway alignment where the east bound off ramp to North Lake Road commences.

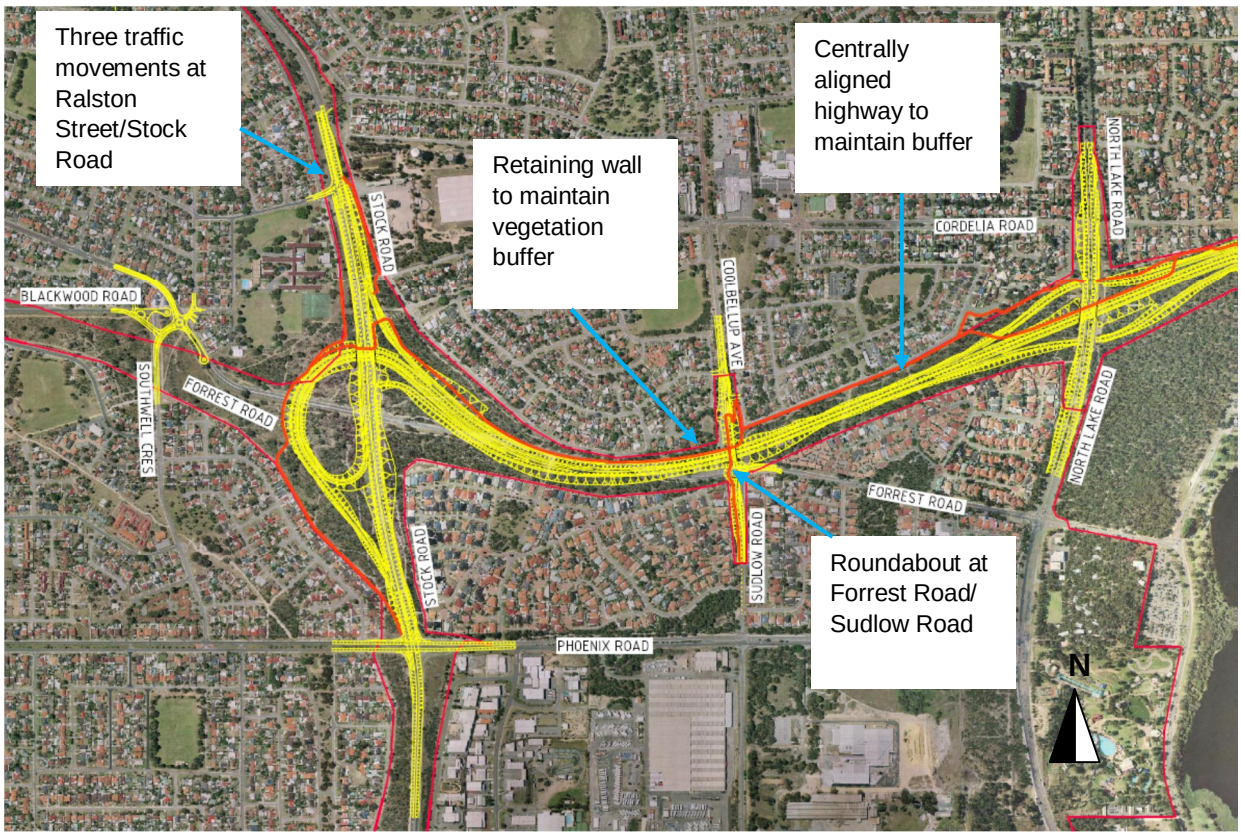

Figure 7: Roe Highway Extension Preferred option, Western Section

5.3 Central Section: North Lake Road to Bibra Drive

5.3.1 Environmental Surveys

5.3.1.1 Conservation Category and Environmental Protection Policy Wetlands

The central section of the proposed project passes through Conservation Category Wetlands (CCW) and Environmental Protection Policy (EPP) Wetlands. The detailed wetland mapping conducted during project development identified the following potential impacts on these wetlands:

- Crossing and encroachment of the boundary of the CCW and EPP Wetlands and wetland buffers; and
- Alteration to the surface and subsurface hydrological function of the wetlands.

Taking into account these unmitigated impacts, the following changes were made to the concept designs:

- Inclusion of bridges to minimise interruption to surface flows and connectivity;
- Inclusion of bridges to minimise the impact on subsurface hydrological functionality;
- Relocation of Bibra Drive MRS interchange to already cleared Western Australian Planning Commission land; and
- Alignment of Roe Highway along existing high tension power lines to minimise the clearing footprint.

For more details on the wetlands studies see Syrinx Environmental PL and V&C Semeniuk Research Group, 2010.

5.3.1.2 Flora and Vegetation

Seasonal flora and vegetation surveys identified the following values within the central section:

- Bush Forever Site;

- Pre European – Bassendean Complex;
- Remnant native vegetation; and
- High, medium and low value vegetation.

These constraints were considered during the development of the concept design for the central section of the proposed project and the alignment was moved to the north near the existing power line corridor to avoid the highest quality vegetation.

For more detail on the flora and vegetation surveys see AECOM, 2010a.

5.3.1.3 Fauna

Fauna surveys recorded sightings of the following conservation significant species within the central section:

- Southern Brown Bandicoot or Quenda;
- Endangered Carnaby's Black Cockatoo;
- Vulnerable Forest Red-tailed Black Cockatoo; and
- Priority Three species Perth Lined Lerista.

The fauna surveys conducted during project development identified bird strike, loss of migratory bird habitat, decline in water quality and displacement of fauna by noise levels as potential unmitigated impacts associated with the proposed project.

Particular species and values of fauna habitat identified during fauna surveys includes:

- *Lomandra hermaphrodita;*
- Black Cockatoo foraging habitat, including good, moderate and poor quality vegetation; and
- Potential Black Cockatoo nesting trees and potential significant habitat trees.

Taking into account the unmitigated impacts on the fauna and fauna habitat listed above, a number of alterations were made to the concept designs, including:

- Road runoff water treatment;
- Minimised clearing of Black Cockatoo foraging habitat;
- Removal of the median strip to allow for narrower formation;
- Realignment of the proposed highway to avoid potential nesting trees; and
- Realignment along the power line corridor to minimise the extent of impact on the foraging habitat.

For more detail on the fauna surveys, see Phoenix Environmental Sciences, 2010.

5.3.1.4 Acid Sulphate Soils

Acid Sulphate Soils (ASS) field investigations conducted for the project identified Class One and Two ASS in the central section of the project area.

For more detail on ASS investigations see AECOM, 2010b.

5.3.2 Aboriginal Heritage Constraints

The central section of the proposed project intersects with two permanent and one interim status Aboriginal site (Brad Goode and Associates, 2010).

For more information on the consultation process, see Australian Cultural Heritage Management Pty Ltd, 2010.

5.3.3 Innovation and Sustainability Workshops

The innovation and sustainability workshop held on 22 June 2010 identified two innovations that have been incorporated into the preferred design:

- *Multi-span arches*

The workshop identified multi-span arches as a preferred option that is constructed offsite (precast) and installed by crane. When used with piles they reduce the impact and construction footprint, provide for variable geometry and allow for underpasses. They also provide an opportunity for landscaped batters and can be used for public and/or Aboriginal art. They are built from pervious material to allow movement or a replicate of soil structure and light weight polystyrene to reduce compaction impact.

- *Conventional multi-span bridge for Roe Swamp with Top Down Construction*

  The workshop identified a conventional multi-span using a top down construction method.

5.3.4 Concept Design

In addition to the measures listed above, the surveys and identified potential impacts led to a concept design for the central section (Figure 8) that contained:

- a bridge over Progress Drive;
- interchanges connecting the proposed highway to North Lake Road; and
- an alignment that utilised the existing section of Hope Road between Bibra and North lakes to minimise the footprint by making use of existing cleared areas.

To utilise existing cleared areas and minimise the potential impact on Aboriginal sites, the connection between Hope Road and Progress Drive was removed, creating a Hope Road cul-de-sac to the east of Horse Paddock Swamp. The concept design maintained access to the Cockburn Wetlands Education Centre and the Native Animal Rehabilitation Centre from Bibra Drive.

This solution ensures minimal group disturbance between the bridge supports and enables the maintenance of ecological connectivity under the bridge.

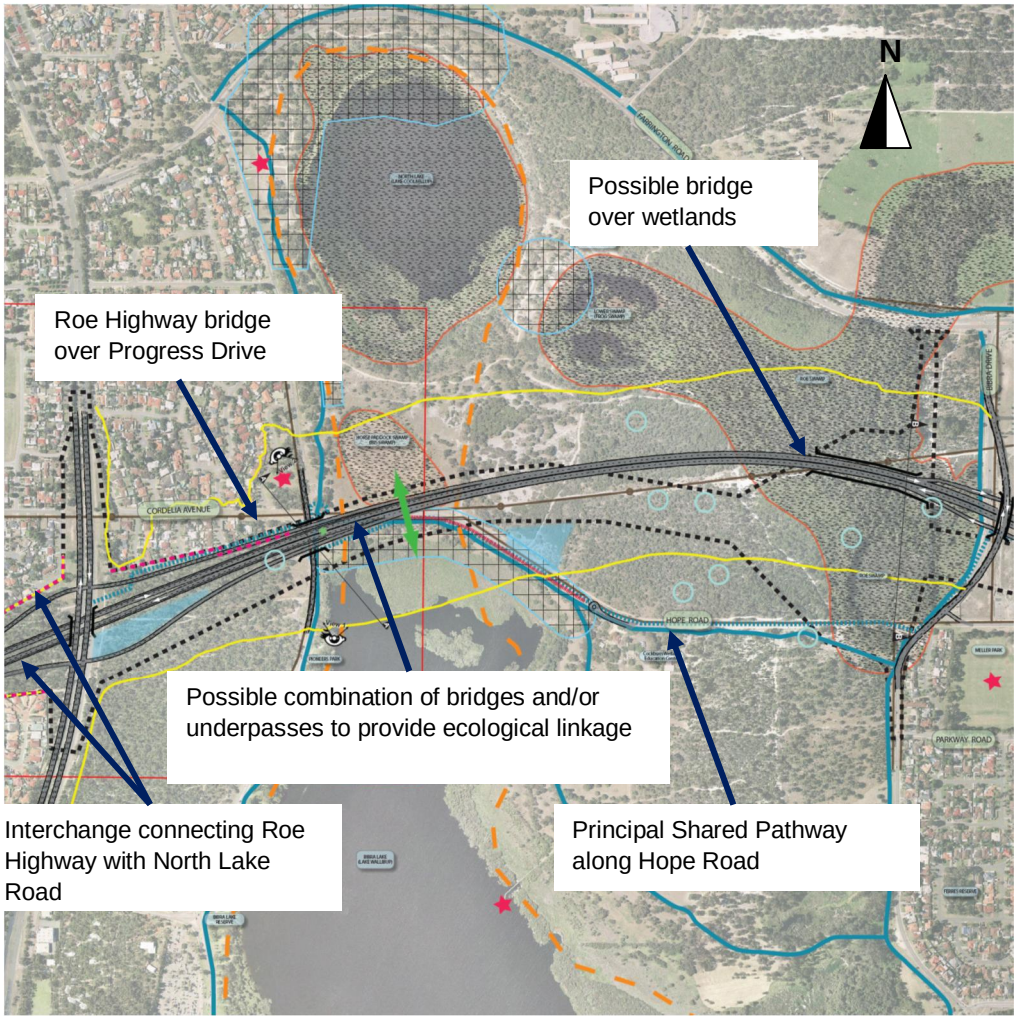

Figure 8: Roe Highway Extension Design Discussion Drawing, Central Section

5.3.5 Community Engagement

The third design workshop, held on 1 June 2010, identified a number of key considerations for the central section of the proposed project including:

- Inclusion of innovative structures over the wetlands;
- Construction of a tunnel under the wetlands;
- Provision or maintenance of ecological linkages;
- Minimisation of the associated project footprint;
- Alignment along Hope Road as a possible design option;
- Closure of Progress Drive at the proposed Roe Highway bridge; and
- Assessment of the impacts on local access.

For more information on the community and stakeholder engagement process, including a summary of the comments received (over 1300) at each of the three design workshops, see South Metro Connect, 2010a.

5.3.6 Stakeholder Engagement

The following stakeholders were engaged for the central section of the proposed project:

- The City of Cockburn;

- The Department of Environment and Conservation (DEC); and
- The Department of Environment, Water, Heritage and the Arts (DEWHA) (Now Department of Sustainability, Environment, Population and Communities).

5.3.7 Interim Design Developments

The feedback received at the third design workshop contained general acceptance for the bridge over Progress Drive and the interchange connecting the proposed Highway with North Lake Road, so these concept design options were retained.

The severing of Progress Drive and the provision of cul-de-sacs either side of the proposed highway would not result in any reduction of the amount or size of embankments through this section. Additionally, Progress Drive in its current configuration provides one of only two exit routes for the residents of North Lake to access both Bibra Drive and Farrington Road.

Two options to tunnel under the wetlands and minimise environmental impacts were analysed by the team and subsequently not included in the design. These options were not included as they would not meet the minimum requirements for the project. Cut-and-cover and bored tunnels were not included in the design because they would:

- Restrict movements at two critical interchanges, with only western connections possible at the North Lake Road interchange and eastern connections at the MAC;
- Restrict operating speeds within the road tunnels to 80 km/h;
- Restrict freight access to the proposed highway, resulting in use of an alternative route for placarded vehicles;
- Result in unquantifiable impacts on the environment, even with a bored tunnel option;
- Require 24-hour ventilation, lighting and monitoring, and high power consumption;
- Require significant ongoing operational cost; and
- Require significant cost impact in terms of cost/m2, in the vicinity of 155% to 280% of the cost of an above-ground option.

Although tunnel options were not included in the design, a concerted effort was made to reduce the footprint through this section by developing a number of different viable design options.

5.3.8 Multi Criteria Analysis

In an effort to minimise the footprint for the central section of the proposed project, two viable design options were created to utilise as much as possible of the existing Hope Road alignment and sections of degraded vegetation between Bibra Lake and Horse Paddock swamp. Different, but seemingly equal, levels of constraints were identified for both options. It was difficult for the SMC team to decide between the two options without assessing them using a formal Multi Criteria Analysis (MCA) process. The MCA process for the central section was run in collaboration with community and stakeholders.

5.3.8.1 MCA Process

MCA is a technical term for the decision making process that people use in their day-to-day lives. The MCA process systematically identifies and prioritises criteria for choosing between different options.

The MCA process was combined with the project's sustainability framework and its principle of community and stakeholder engagement to develop a robust, systematic and collaborative approach to the identification of sustainable design options. This MCA process was applied whenever multiple viable design options were identified for a particular section of the proposed project. Multiple viable options were identified for the central section only, so an MCA workshop was held only for that section.

5.3.8.2 Process for establishing Criteria and Weightings

The MCA triple bottom line criteria (Table 3) were developed in line with the project's policies of collaboration and sustainability. The criteria were established in collaboration with the community and stakeholders during the first

MCA workshop on 19 February 2010. The workshop provided community members and stakeholders with a forum to discuss, record and prioritise social, environmental and economic criteria. The highest ranking criteria from this workshop were used for the MCA during the Options Selection workshop on 29 June 2010 (see South Metro Connect, 2010b), which assessed options for the central section alignment and structures. The criteria were also used for the MCA during the internal Options Selection workshop on 11 August 2010, which assessed options for the power line alignment through the central section.

For the MCA, the environmental, social and economic categories of criteria were evenly weighted at 33.3% per category. Within each category, the criteria were weighted according to the votes provided by the community and stakeholders at the MCA workshop on 19 February 2010.

Table 3: Roe Highway Extension Community and Stakeholder Triple Bottom Line Criteria

Triple Bottom Line Category	Criteria
Environmental	Impacts on the wider area
	Impacts on fauna
	Potential for contamination
	Size of the project footprint
	Impacts on the wetlands
Social	Planning to enhance the social environment
	Noise impacts
	Impact on Aboriginal heritage[2]
	Provision of pedestrian access and connectivity
	Visual impacts
	Impacts on traffic flow
	Impacts on local amenity and quality of life
Economic	Cost of construction
	Maintaining and improving accessibility
	Providing efficient freight and vehicle movement
	Reducing future costs
	Maintaining land value
	Reducing traffic congestion

5.3.8.3 Options Selection Workshop 29 June 2010 (MCA Workshop)

An MCA Workshop was held on 29 June 2010 with a representative community and stakeholder group to select the preferred alignment for the central section of the proposed project.

The MCA Group was initially presented with one northern and one southern alignment option at the workshop:

- **Option 1** - Southern alignment (Figure 9); and
- **Option 2** - Northern alignment (Figure 10).

[2] While not identified as a priority during the workshop on 19 February, Aboriginal heritage was a critical consideration in determining the preferred design option and was included by South Metro Connect as a criterion for the options analysis.

During the workshop proceedings, the group identified a third and a fourth option, which were then included in the MCA assessment, presenting a total of four options as follows:

- **Option 1** - Southern alignment (Figure 9);
- **Option 2** - Northern alignment (Figure 10);
- **Option 3** - Northern power line alignment; and
- **Option 4** - Bridge spanning the entire length of the wetlands.

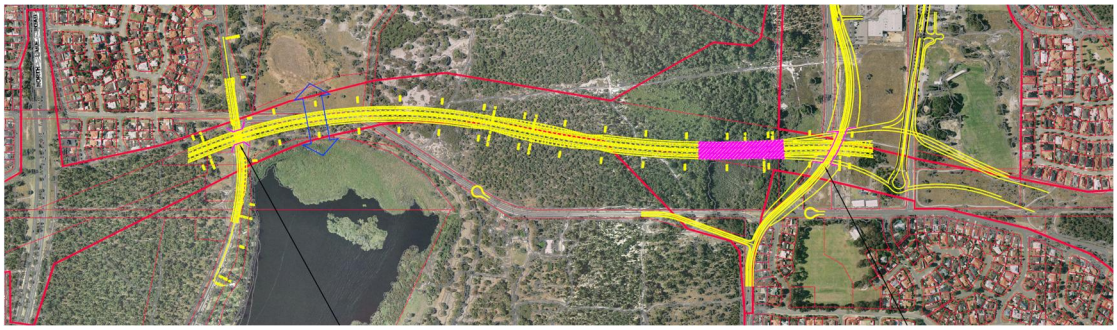

Figure 9: Roe Highway Extension Option 1, Southern alignment

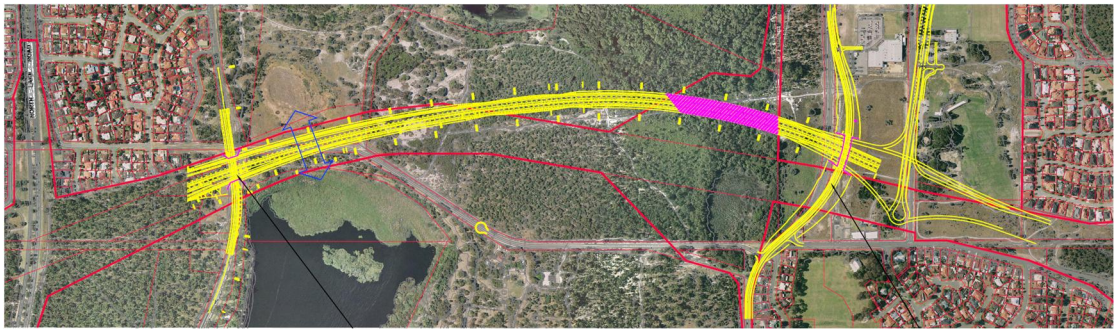

Figure 10: Roe Highway Extension Option 2, Northern alignment

The group considered the two options and agreed the following benefits for each option:

- Option 1:
  - Shorter length through the CCW
  - Avoids better condition vegetation immediately north of Roe Swamp
  - Has a shorter and therefore lower cost bridge
  - Avoids the expense of relocating the high tension power lines
- Option 2:
  - Avoids crossing the open water of Roe Swamp and therefore any associated impacts on water birds
  - Reduces noise levels at nearby recreational nodes, such as Cockburn Wetlands Education Centre and Meller Park
  - Reduces visibility from Hope Road and Cockburn Wetlands Education Centre
  - Requires less clearing of Black Cockatoo foraging and potential nesting habitat
- **Option 3** (northern power line alignment)Includes the benefits of Option 2, but also:
  - Uses the existing transmission line access track so as to minimise clearing of good condition wetland vegetation and black cockatoo habitat

- Avoids more of the good condition vegetation north of Roe Swamp

- **Option 4** (bridge spanning the entire length of the wetlands)
  - Minimises the extent of the project's permanent clearing footprint significantly
  - Reduces the extent of habitat severance
  - Avoids the potential for hydrological impacts

The group discussed all four alignment options and considered each option's performance against each of the 18 criteria.

The group acknowledged that **Option 3** would create a smaller footprint and have less potential impacts on the wider environment i.e. regional water movements (surface and ground), the Jandakot groundwater mound and groundwater source and species survival than **Options 1, 2**, and **4**.

Option 4 rated low due to its high construction costs and negative impact on future costs. **Option 1** rated the second highest. It was agreed, however, that **Option 3**, the northern power line alignment, is the most sustainable option in terms of all of the environmental, social and economic criteria.

5.3.8.3.1 Final Scores

Following the discussion and assessment, the MCA participants scored each of the four options (Figure 11) against each of the triple bottom line criteria. The combined scores gave **Option 3** the highest rating.

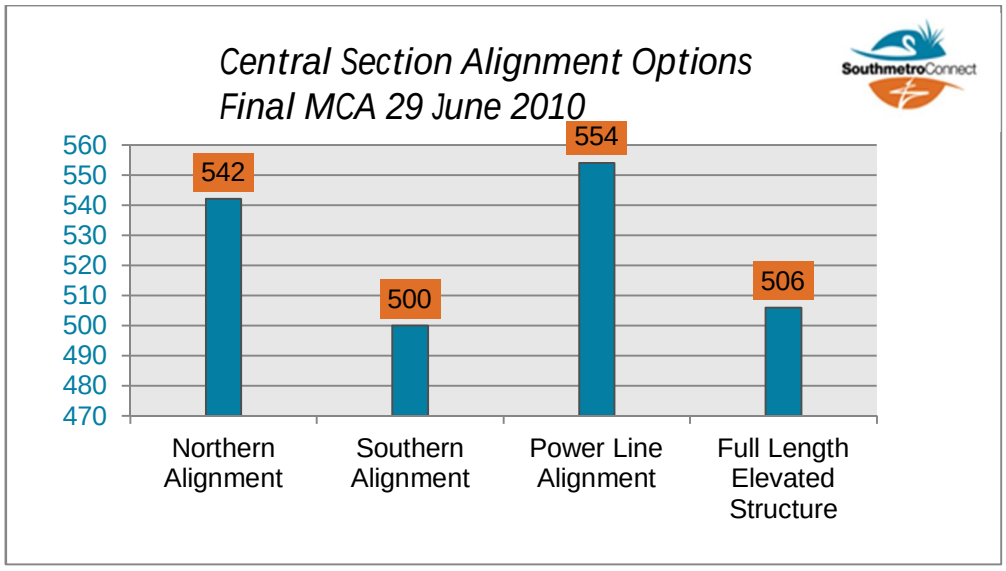

Figure 11: Roe Highway Extension MCA Results, Central Section

The participants discussed and reviewed the scores at the close of the workshop and agreed that **Option 3** is the preferred option for the central section of the proposed project.

For more detail on the workshop, refer to Appendix A.

5.3.8.4 Internal Options Selection Workshop 11 August 2010

The Options Selection workshop held on 29 June 2010 identified the northern power line alignment as the most sustainable option. Consequently, an internal options selection workshop was held on 11 August 2010 to assess options for moving the existing power line to accommodate the northern power line alignment.

Three options were assessed for the placement of power lines in the central section of the proposed Roe Highway Extension. The options were assessed against the community- and stakeholder-based criteria established at the MCA Workshop on 19 February 2010. Specialists from the design, environment, heritage, community and project management teams were on hand to explain the impacts of each option against each criterion.

The group assessed the following three options for the vertical and horizontal power line alignment between Bibra Drive and Progress Drive:

- **Option A** - Overhead power line along the preferred northern power line alignment (identified at the Options Selection Workshop on 29 June 2010), without access points;
- **Option B** - Buried power line in the shoulder along the preferred northern power line alignment; and
- **Option C** - Overhead power line along the existing Hope Road alignment.

5.3.8.4.1 Final Scores

The individual scoring indicated a preference for **Option C**: overhead power line along the existing Hope Road alignment (Figure 12). Further examination is required to determine the feasibility and sustainability of all options.

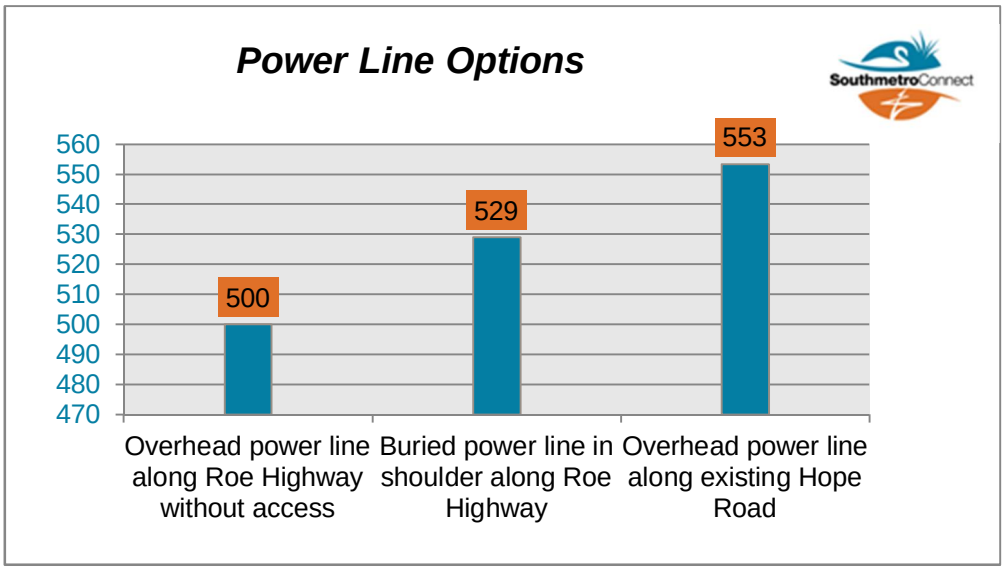

Figure 12: Roe Highway Extension MCA Results, Central Section Power Line Location

5.3.9 Preferred Design Options

As a result of the environmental constraints, community input and MCA process, SMC selected the northern power line option presented in Figure 13.

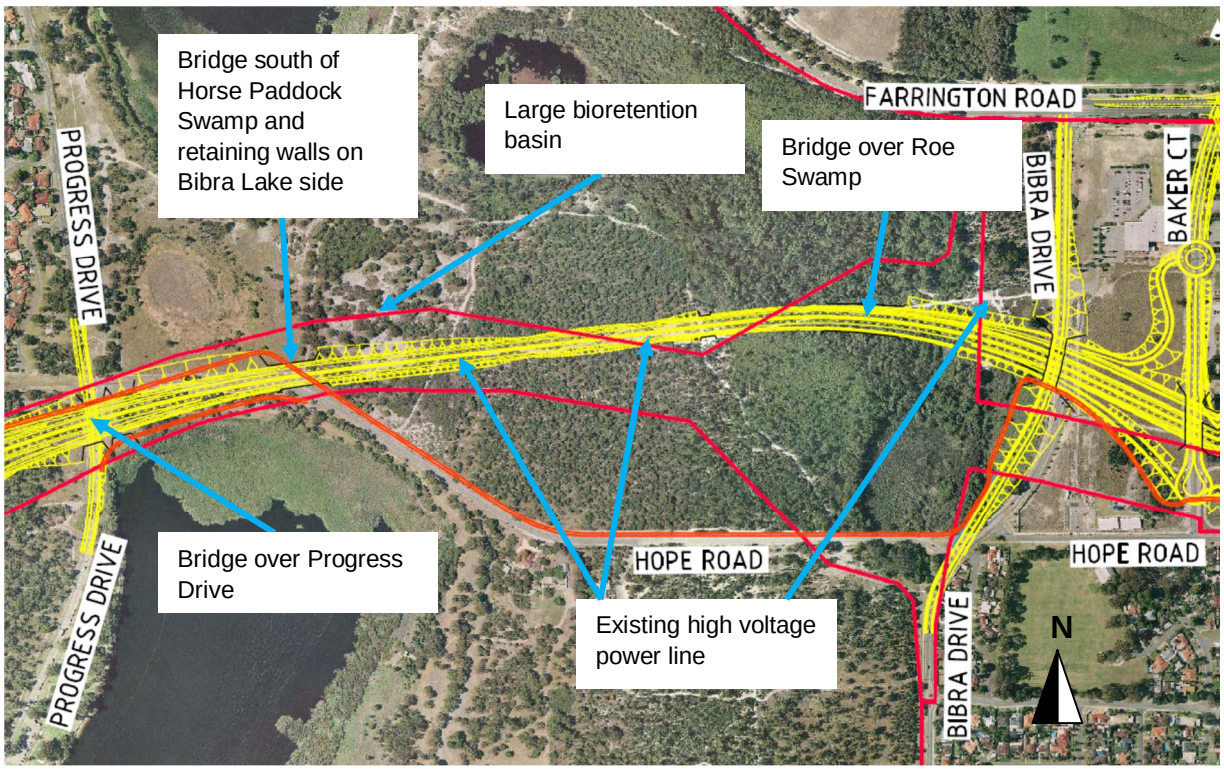

Figure 13: Roe Highway Extension Preferred Option, Central Section (Northern Power Line Alignment)

The surveys, community workshops, stakeholder engagement and MCA led to a design that contains the following specific impact avoidance and mitigation measures:

- A retaining wall (ranging between 6.7m and 8.1m in height) will be constructed along the south side of the formation between the proposed highway extension and Bibra Lake to minimise encroachment of the formation into Bibra Lake;
- A two-span bridge over Hope Road, south of Horse Paddock Swamp, to allow for pedestrian and fauna movements between either side of the proposed highway extension;
- A large bioretention basin on the north side of the alignment, immediately east of Horse Paddock Swamp, to treat road runoff and provide recharge to local wetlands via groundwater recharge. The basin was designed such that existing trees will be retained and already cleared, open space will be excavated for the basins, which will be rehabilitated to develop a reconstructed wetland environment;
- A half height retaining wall will be constructed on the south side of the alignment, east of the retention basin, to minimise the width of the formation and reduce the extent of clearing required. It will include culverts to facilitate surface water movement and accommodate seasonal flooding within this area;
- An underpass will be provided at the eastern end of the bridge between Bibra Lake and North Lake to facilitate pedestrian and fauna movement between either side of the proposed highway extension;
- A full height retaining wall will be constructed on both sides of the alignment, to the west of the Roe Swamp Bridge, to reduce the width of the formation and minimise the extent of clearing of high quality vegetation;
- A bridge over Roe Swamp, consisting of six spans. The bridge will be constructed using a top down method, ensuring that ground access, and hence clearing, is not required under the bridge for machinery to access the site for construction purposes;
- The existing transmission lines and towers will be replaced with poles. Where possible, poles will be located within the proposed road embankment;
- A full height retaining wall will be constructed on the south side of the alignment, to minimise clearing of high quality vegetation and minimise filling of the Roe Swamp Conservation Category Wetland (CCW);
- A half height retaining wall will be constructed on the south side of the alignment to minimise filling of the Roe Swamp CCW;
- The PSP will be diverted from the north side of the highway to the existing Hope Road to reduce the width of the formation and minimise the extent of clearing of high value Carnaby's Black-Cockatoo foraging habitat, high quality vegetation and Roe Swamp CCW; and
- Hope Road will be downgraded and its connection to Progress Drive will be removed. Subject to City of Cockburn agreement, it will be gated at night. Consideration will be given to a parking area near the cul-de-sac of Hope Road. The section of Hope Road west of the cul-du-sac will be removed and rehabilitated, except for where the PSP will be constructed.

6.0 The Preferred Option

Presented in a sequence from west (i.e. Stock Road) to east (i.e. Kwinana Freeway), the proposed project has the following key characteristics. The numbers for these characteristics correspond with the labels on Figure 14.

1) Signal controlled intersection for west bound traffic on Roe Highway turning south onto Stock Road;
2) No access west of Stock Road for traffic on Roe Highway;
3) Free flowing movements for other directions on and off Stock Road and Roe Highway;
4) Minor realignment of Coolbellup Avenue and Sudlow Road;
5) Grade separation (no access) between Roe Highway and Sudlow Road/Coolbellup Avenue, with Roe Highway passing beneath;

6) Termination of Forrest Road via roundabout at Sudlow Road near Forrest Road;

7) Grade-separated interchange at North Lake Road allowing for all movements;

8) Bridge over Progress Drive;

9) Elevated structure between North and Bibra lakes with full height retaining walls on southern side;

10) Removal and rehabilitation of Hope Road to the west of the Native Animal Rehabilitation Centre (ARC) driveway;

11) Downgrade Hope Road, with access to Cockburn Wetlands Education Centre, Native ARC and recreational car park only;

12) Bioretention basin on the north side of the alignment located east of Horse Paddock Swamp to treat road runoff and provide recharge to local wetlands via groundwater recharge. Basin design will ensure that existing trees are retained. Retention basins will be rehabilitated with local wetland species to increase wetland habitat within the project area. For ease of reference, the basin has been named Hope Road bioretention basin;

13) Pedestrian and fauna underpasses in the wetland areas;

14) Grade-separated Principal Shared Path (PSP) along full length of the proposed project for the use of cyclists and pedestrians;

15) Realignment of Murdoch Drain;

16) Bridge at Roe Swamp, using a construction methodology that avoids the need for continuous clearing under the structure (for example, top down construction);

17) Realignment and grade separation of Bibra Drive over Roe Highway;

18) Grade-separated interchange between Roe Highway and a southern extension of Murdoch Drive allowing for all movements;

19) Signal controlled intersection between realigned Murdoch Drive and Farrington Road; and

20) Freeway to freeway interchange of Kwinana Freeway/Roe Highway with full movements in all directions, including seven new bridges and pedestrian and cycle underpasses.

The design also includes a grade separated Principal Shared Path (PSP) along the full length of the Roe Highway Extension (marked in blue).

In addition to the above works, there will be several accommodating upgrades on the adjacent road network including:

- Widening of Roe Highway Stage 7 east to Karel Avenue;
- Upgrade of on/off-ramps at Karel Avenue;
- Reconfiguration of Forrest Road with Southwell Crescent, Blackwood Avenue and O'Connell Street, Hamilton Hill;
- Reconfiguration of Ralston Street/Stock Road intersection, Hamilton Hill;
- Upgrade of Stock Road from Ralston Street to south of Phoenix Road, including upgrade of the Phoenix Road intersection; and
- Replacement of existing high tension powerline between Bibra Drive and Progress Drive.

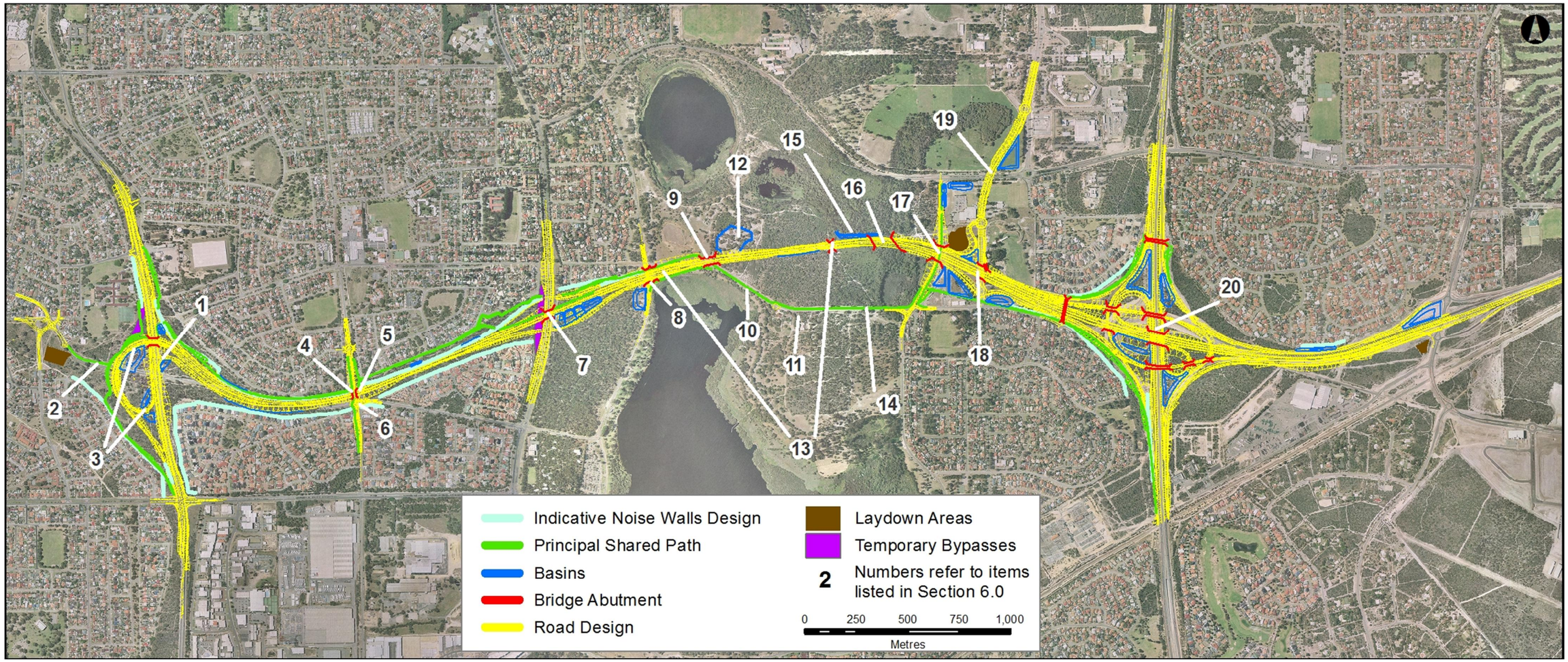

Figure 14: The Roe Highway Extension Preferred Alignment, 03 December 2010

Conclusion

The iterative and collaborative process of options development and selection for the proposed project helped to identify the most sustainable and acceptable solution for the extension of Roe Highway between its current southern end point at Kwinana Freeway in the east and Stock Road in the west. The process brought together environmental survey knowledge and specialist impact avoidance and mitigation measures, with community and stakeholder input, to identify a preferred alignment that meets the growing regional needs of transport in the Perth metropolitan area's south-west corridor.

The preferred alignment option, identified through the options development and selection process for the proposed project, will be submitted to the Office of the Environmental Protection Authority for assessment and will form the basis of a 12-week Public Environmental Review in mid- 2011. Pending the outcomes of this assessment and review, and state and commonwealth funding, this option will be refined during a detailed design phase before construction.

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Appendix A

Multi Criteria Analysis Workshop Report

SouthmetroConnect

Roe Highway Extension

Bibra Drive to North Lake Road
Multi Criteria Analysis Workshop Report
Tuesday 29 June 2010

60100953-313C-CS-REP-0001

GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

AECOM

Seeking **collaborative solutions** for extending Roe Highway

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PO Box 5026, South Lake, 6164
Phone: 1800 132 572
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Bibra Drive to North Lake Road
Multi Criteria Analysis Workshop Report
Tuesday 29 June 2010

Project Brief

Job Number	60100953
Client	Main Roads WA
Date	06 December 2010
Prepared by	Linton Pike and Liam Stone
Reviewed by	Terry Pearce

Document Status

Rev	Date	Description	By	Signed
A	06-07-10	First Draft	LP	
B	13-10-10	Review	TP	
C	02-11-10	Redraft	LS	
0	06-12-10	Issued for Final Use	TP	

Table of Contents

Executive Summary

South Metro Connect (SMC) held its second Multi Criteria Analysis (MCA) Workshop on Tuesday 29 June 2010 in collaboration with a community and stakeholder MCA Group. The scope of the workshop was to select the most sustainable design option for the central section of the proposed Roe Highway Extension between Bibra Drive and North Lake Road.

The MCA Group discussed and scored four viable options for the central section of the proposed project:

- **Option 1** - a northern alignment option.
- **Option 2** - a southern alignment option.
- **Option 3** - a northern option derivative running along the Western Power line route, and
- **Option 4** - a full length bridge structure probably running along the northern alignment to allow for the penetration of light, fauna crossing opportunities and unconstrained surface water flow.

The options were assessed in accordance with SMC's triple bottom line sustainability framework. The participants scored each of the four options against environmental, social and economic criteria established and weighted by the community and stakeholders during the first MCA Workshop on 19 February 2010. The final scores for each option were calculated by applying the criteria weightings to the median individual scores. A normalisation factor was then used to convert the scores to a figure out of 1000.

Workshop participants discussed and reviewed the assessment and agreed that a northern alignment that mostly follows the Western Power corridor is preferred. It was noted that geometrically it is not possible to follow the entire length of the power line corridor between Bibra Drive and Progress Drive, but the alignment can follow the majority of the corridor and still comply with relevant design standards.

At the conclusion of the workshop the group proposed that the SMC team give consideration to:

- Further developing a northern alignment option that follows the existing Western Power corridor to the greatest extent possible.
- Extending the lower speed zone (currently proposed from Karel Avenue to Bibra Drive) slightly further west to tighten the geometry further.
- Maximising use of the existing power line corridor with SMC working through the detail and advantages.
- Setting a governing goal to maximise the cleared Western Power footprint whilst ensuring that the melaleuca woodland is not affected. This should be done by challenging the design standards to follow the power line as much as possible.
- Running the existing power lines underground between Bibra Drive and Progress Drive.
- Extending the length of the Roe Swamp structure to the greatest extent possible and at least 30m longer than that shown in the SMC northern option to minimise the impact on the Conservation Category wetland and reflect the topography.
- Separating the Horse Paddock Swamp structure from the Progress Drive structure to reflect human and fauna requirements and to add aesthetic appeal. It is noted that there are likely to be more social issues than environmental issues in this area.
- Revegetating and rehabilitating Horse Paddock Swamp with appropriate (two or three) fauna links that are suitably vegetated.
- Including a number of culverts (two or three) as fauna crossing opportunities at relevant locations.
- Adopting a speed zoning of no greater than 80km/h for the full length of this section.
- Opening up connectivity around Progress Drive as much as possible.
- Realigning Hope Road west of Bibra Drive to connect with Bibra Drive at the existing

Parkway Road intersection, and

- Rehabilitating the area south of Hope Road with renewal and regeneration of the Hope road alignment following the change above.

Feedback forms were distributed at the close of the workshop to provide the participants with an opportunity to rate various aspects of the workshop and MCA process. The analysis of these forms indicates that 91% of the participants were satisfied with the proceedings of the workshop.

1.0 Introduction

The scope of the MCA Workshop was to discuss and identify a preferred design option for the central section of Roe Highway Extension between Bibra Drive and North Lake Road (Figure 1).

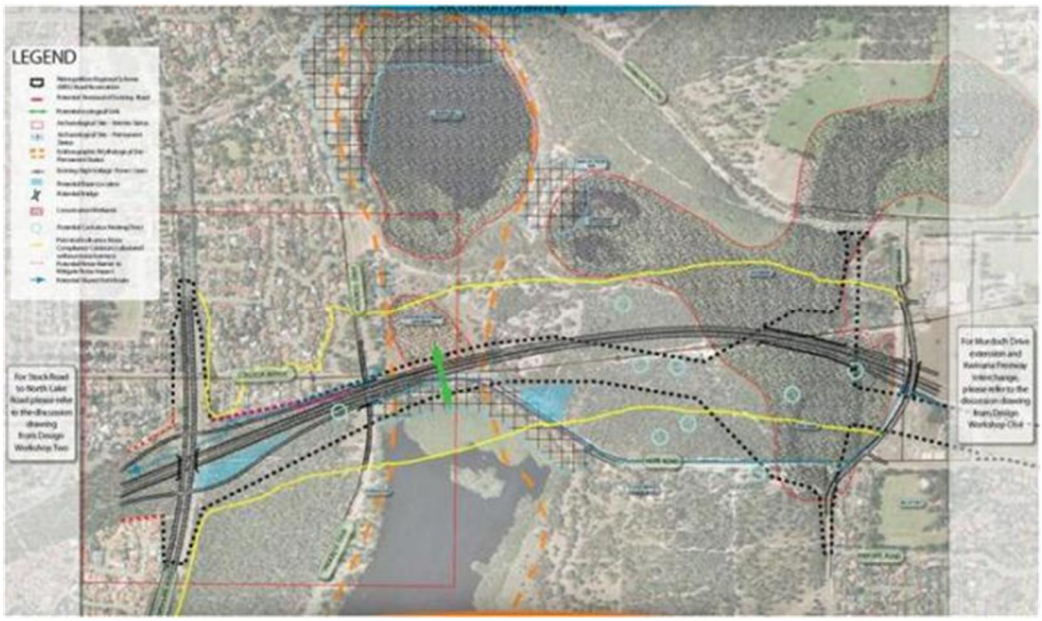


Figure 1-1: Roe Highway Extension Concept Design – Central Section[1]

The aims of the workshop were to:

- Complete an MCA of multiple viable options for the central section of the Roe Highway Extension project.
- Identify agreed preferences for the central section, and
- Identify and agree appropriate follow up actions.

[1] For a higher resolution version of the design discussion drawing from Design Workshop Three, please visit www.southmetroconnect.com.au

2.0 Background

The MCA Workshop was designed to identify the most sustainable design options for the proposed Roe Highway Extension from options developed during the design process and community events.

2.1 Overall Options Selection Process

The MCA process and workshop forms part of the overall options selection process (Figure 2) that SMC has adopted for the Roe Highway Extension project. All design options, including those presented at the MCA Workshop, were assessed against:

- minimum **Requirements.**
- government **Regulations**, and
- specialist **Recommendations**.

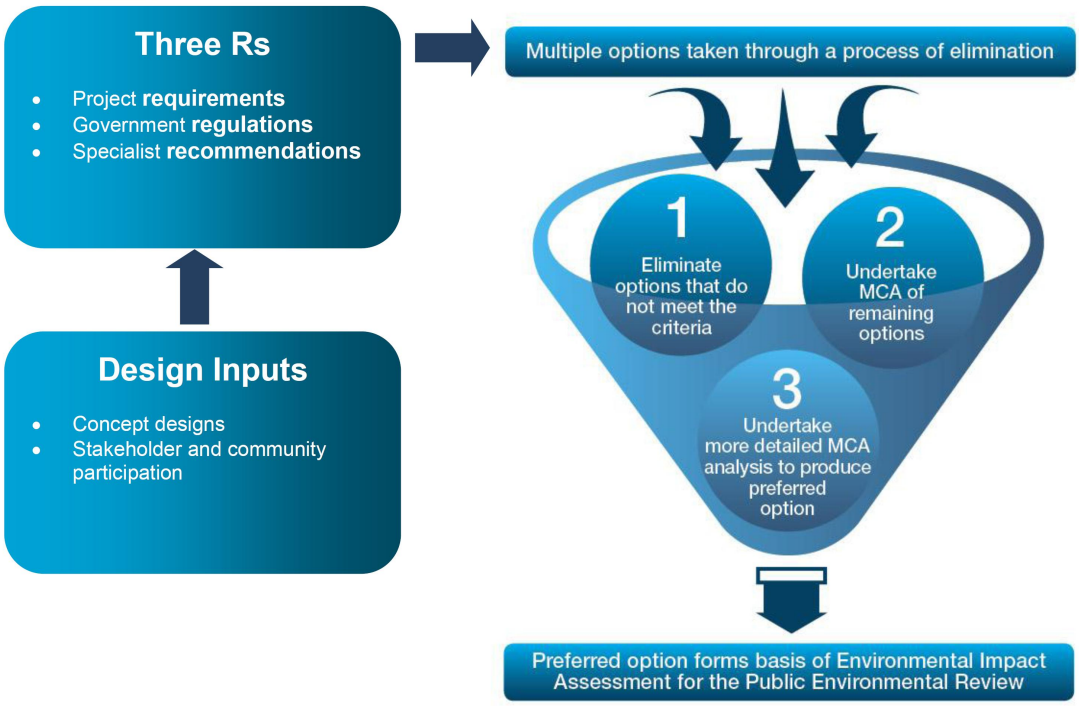


Figure 2-1: Options Selection Process

2.2 Sustainable Decision Making Framework

The overall options selection process including the MCA process is based on the sustainable decision making framework developed for the proposed project (Figure 3). The framework was designed to consider all options, ideas, opportunities and innovations, and to help identify an appropriate road transport solution that balances project objectives and environmental, social and economic factors.

Figure 2-2: Sustainable Decision Making Framework

2.3 Design Workshops

The options analysed during the MCA Workshop were identified previously during a series of design workshops. The design workshops were held for the following sections of Roe Highway:

- Kwinana Freeway to Bibra Drive.
- North Lake Road to Stock Road, and
- Bibra Drive to North Lake Road.

The suggestions made by the community and stakeholders at the design workshops were developed by SMC into design options for MCA analysis.

Design workshop three on the central section from Bibra Drive to North Lake Road identified a number of key considerations including:

- The inclusion of innovative structures over wetlands.
- Maintenance of ecological linkages.
- The need to minimise the project footprint.
- Hope Road alignment as a possible design option, and
- Impacts for local access.

3.0 Method

3.1 Process

The MCA process began with a deliberative assessment of options. The group was given the opportunity to discuss the options and, where possible, to select a preferred option based on unanimous agreement before proceeding with a formal MCA process.

The full MCA process consisted of six discrete steps:

1. Strategic analysis to check that the options are sufficiently different to allow meaningful assessment.
2. Detailed presentation by SMC specialists and a group discussion of the performance of each option against each of the 18 triple bottom line criteria.
3. Individual scoring of each option against each criterion (all group members will score all criteria for all options).
4. Computer modelling and presentation of results.
5. Sensitivity analysis of the resultant outcome, and
6. Group review to ensure that the best outcome for the community and stakeholders has been achieved with refinement of the preferred solution if necessary.

3.2 Criteria

The criteria and weightings (Table 1) used in the assessment were developed by the community and stakeholders at the first MCA workshop on 19 February 2010.[2]

Table 1: Criteria and Weightings

HEADING	NUMBER	DESCRIPTION	Percen-tage	Heading Weighting
ENVIRON-MENTAL	Env1	Impacts on the wetlands	6%	33%
	Env2	Impacts on fauna	7%	
	Env3	Potential for contamination	7%	
	Env4	Size of the project footprint	6%	
	Env5	Impacts on the wider area	8%	
SOCIAL	Soc1	Noise impacts	6%	33%
	Soc2	Impacts on Aboriginal Heritage[3]	5%	
	Soc3	Provision of pedestrian access and connectivity	4%	
	Soc4	Visual impacts	4%	
	Soc5	Impacts on traffic flow	4%	
	Soc6	Impacts on local amenity and quality of life	4%	
	Soc7	Planning to enhance the social environment	8%	

[2] For more information on the first MCA Workshop, please visit www.southmetroconnect.com.au

[3] While not identified as a priority during the workshop, Aboriginal Heritage is a critical consideration in determining the preferred design option and was included by the South Metro Connect team as a criterion for the final MCA process.

HEADING	NUMBER	DESCRIPTION	Percen-tage	Heading Weighting
ECONOMIC	Ec1	Cost of construction	8%	33%
	Ec2	Maintaining and improving accessibility	7%	
	Ec3	Providing efficient freight and vehicle movement	5%	
	Ec4	Reducing future costs	5%	
	Ec5	Maintaining land value	4%	
	Ec6	Reducing traffic congestion	4%	

The 18 criteria were established from a system of priority voting. The community and stakeholder participants used a dot voting system to allocate preferences to criteria, which were tallied to identify the top 18 criteria and weightings for use during the second MCA Workshop.

The three categories of criteria were weighted evenly at 33.3% each to place equal import on each of the triple bottom line areas of sustainability. The criteria were weighted differently within each category according to the priority votes allocated by community members and stakeholders during the first MCA Workshop on 19 February 2010.

3.3 Scoring

The southern option was used as a baseline option with an assumed score of 5 for each criterion. The southern option was adopted as the baseline option as it most closely reflects the existing road reserve. The other options were then scored relative to the southern option as being either better or worse than the southern option for the criterion under consideration.

The rating scale used is shown below in figure 4:

Score	Relative Assessment - Description
9	MUCH BETTER THAN THE SOUTHERN OPTION
	⇕
5	NO DIFFERENT TO THE SOUTHERN OPTION
	⇕
1	MUCH WORSE THAN THE SOUTHERN OPTION

Figure 3-1: Ratings Scale

3.4 Final Scores

The MCA Group used the ratings scale to score each of the four options against each of the 18 criteria. The participants provided both group and individual scores and the final scores for each option were calculated from the individual scores provided by the non-SMC team participants. The median individual score was identified and applied to the weightings of the criteria and a normalisation factor was then used to convert the scores to a score out of 1000.

4.0 Design Options

Two options were developed for the workshop by the SMC team (depicted in Figure 4 and Figure 5 below). The workshop participants identified two additional options during their discussion and these additional options were then included in the assessment process. The four options assessed were:

- **Option 1** - a northern alignment option.
- **Option 2** - a southern alignment option.
- **Option 3** - a northern option derivative running along the Western Power line route, and
- **Option 4** - a full length bridge structure probably running along the northern alignment to allow for the penetration of light, fauna crossing opportunities and unconstrained surface water flow.

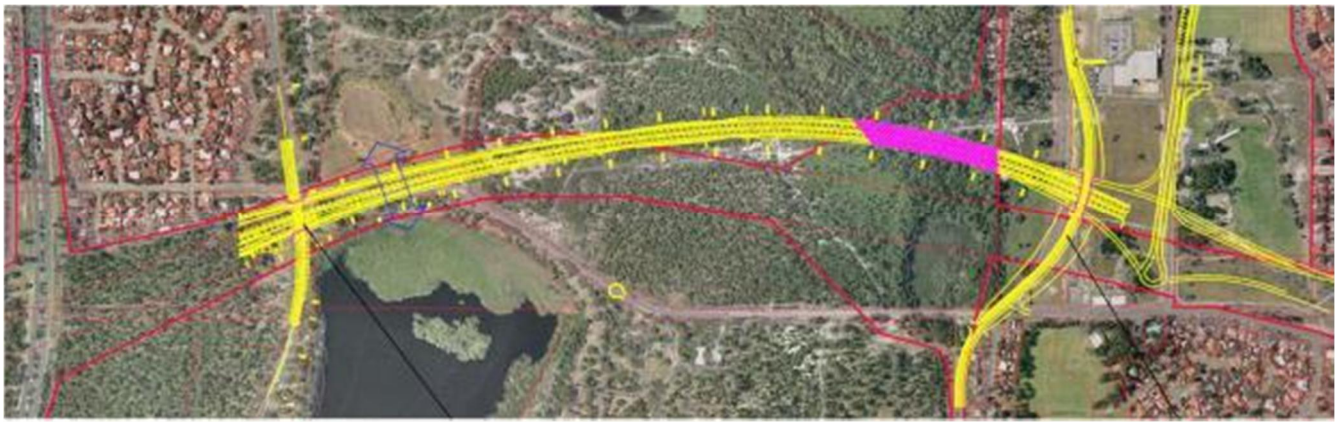


Figure 4-1: Option 1 - Northern Alignment

Figure 4-2: Option 2 - Southern Alignment

5.0 The Workshop

5.1 Deliberative Assessment

Participants completed a deliberative assessment of the options and the following discussion arose:

- These options appear a start point for discussion but other options including a northern option that more closely follows the power lines to minimise the associated footprint and a long bridge structure with separation and appropriate elevation to allow for greater light penetration should also be considered. SMC advised that these options have been considered along with tunnel structures and other possible solutions but were eliminated due to associated technical or other considerations as being lesser options than those presented.
- Greater flexibility and creativity in the vertical geometry is needed for any prospective option to more closely follow the natural ground line and minimise the associated footprint. For example, design the structures as long and low as possible to allow for good fauna access in the north south direction with minimal height at Progress Drive and Bibra Drive and with the absolute minimum footprint size.
- Ensure the resultant grade lines are able to accommodate light rail in the future.
- Minimise the footprint with no central median and separation via a crash barrier. Both offer the same potential and similar footprints and can be assumed for either the northern or southern option.
- Realign Hope Road to align with Parkway Road at Bibra Drive to enable the rehabilitation of the existing Hope Road or alternatively use the existing Hope Road as a pedestrian/cycle path in both options.
- Provide direct access from Bibra Drive and for residents of Bibra Lake to Roe Highway westbound to improve emergency access and egress from the Bibra Lakes area.
- Modify the height and length of the bridge structures over the wetlands to reduce or eliminate embankments to promote the best possible environmental outcomes, minimise impacts on flight paths of birds and minimise impacts on the movement of ground fauna. This potentially allows opportunities to minimise the revegetation needs, footprints, aesthetics, etc. e.g. Lawrence Hargrave Drive near Woolongong. The possibility of including a structure of substantial length over the wetland should be considered for each option.
- Aboriginal heritage will be assessed as a criterion with significant potential issues at, or around Progress Drive with associated impacts for at least two registered sites. The current understanding is that the impacts are similar if not the same for both options (subject to heritage survey and input from Aboriginal stakeholders who have to date chosen to not participate or engage in consultation on the project).
- Is the existing Western Power power line corridor a suitable alignment? It is possible with associated cost in an already partially cleared area. It is likely that the eastern end would be somewhat problematic due to road geometry requirements but it is possible as part of a refined northern alignment.
- After further discussion and direction by the Project Director it was agreed that this workshop will assess:
    - The two core options developed by SMC (northern and southern alignments).
    - Time permitting, the sub-options or derivatives identified by this MCA group, specifically:
        - The modified northern alignment along the existing power lines.
        - A bridge across the whole of the wetlands area (nominally from Bibra Drive to Progress Drive).

- Discussion identified that the northern alignment has some obvious benefits however the southern option has benefits of its own and both options should be assessed. The obvious benefits of the northern option identified include:
  - Further from houses with reduced noise impacts.
  - Impacts largely upon disturbed ground.
  - Further away from wetland area, and
  - Is better suited to the natural topography.
- The group agreed that a full assessment was required to identify the preferred option.

5.2 Formal Assessment

5.2.1 Social Assessment of Northern & Southern Options

The following points were recorded during the formal assessment of each option against each social criterion:

SOC 1 - Noise Impacts

- Road operations will have an impact.
- Statutory requirements must be met with appropriate mitigation to residential areas if required (not commercial).
- There is no statutory requirement for noise impacts on fauna.
- Southern option moves the alignment closer to houses near Bibra Drive and is likely to impact more on Bibra Lake residents.
- Mitigation measures can be intrusive with various standards adopted around the metropolitan area.
- Recreational areas at the northern end of Bibra Lake are marginally less impacted by the northern option but this option is closer to existing houses near Progress Drive.
- Noise impacts on people are likely to be marginal, and
- The southern alignment is likely to require mitigation with associated visual impacts (high walls) close to residences near the corner of Hope Road and Bibra Drive.

SOC 2 - Aboriginal Heritage

- Can't differentiate between the options with both impacting upon registered sites.

SOC 3 – Provision of pedestrian access and connectivity

- Both options will provide a Principal Shared Path for the full length to the same standard as Roe 7 and Kwinana Freeway.
- The Principal Shared Path will link to existing and planned Local Government Authority and State Government paths at agreed points.
- Roe Highway Extension will improve east-west pedestrian and cycling access, but may sever some existing paths.
- There is no major differentiation between the options.
- The annual Christmas walk for Murdoch Branch of the WA Wildflower Society is most impacted by the southern alignment and the northern alignment has less impact.
- May be able to divert existing tracks to minimise impacts and maintain access through informal pathways and dirt tracks.
- Greater benefits for Environment Centre (Cockburn Wetlands Education Centre) with northern option causing less disruption, and
- More work is needed to differentiate between the options.

SOC 4 - Visual impacts

- Both options have similar grade lines.

- The areas around the lakes are likely to be similar.
- Southern option closer to people and facilities generally.
- Southern option has the greatest associated visual impacts around Bibra Drive (at around 3m high at Hope Road with associated noise mitigation in the form of some additional noise mitigation structures), and
- The northern alignment is slightly better.

SOC 5 - Impacts on traffic flow

- Both options offer similar traffic and connectivity outcomes.
- The southern option requires the closure of Hope Road east of Bibra Drive as shown with access/egress limitations.
- Bibra Drive configuration is slightly better for the northern option.
- Montessori School preference is a minimum left in/left out access from Hope Road to Bibra Drive (achievable with the northern option). For the southern option Hope Road one way (eastbound) with access from the school to Bibra Drive via Parkway Road appears the only solution, and
- Bibra Lake community is generally satisfied with the concept as shown for local access to Roe Highway.

SOC 6 – Impacts on Local amenity and quality of life

- Factors above combine to influence this criterion.
- Construction implications are another consideration.
- Temporary detours, noise, dust during vibration, etc. are considerations, and
- The north-west corner of Bibra Lake is a concern because it is most affected by retaining walls and bridges. The concerns include proximity, associated visual impacts, resultant access limitations and noise resulting from an elevated roadway.

SOC 7 – Planning to enhance the social environment

- What other planning and local changes will result from or be impacted by this or other future initiatives?
- Lake access, recreation, local access and future community amenity are important.
- Land available as a result of local road reserve changes on Hope Road or the Roe Highway reserve could be used to provide improved social outcomes, and
- Limited difference between the options at North Lake but needs to be considered.

5.2.2 Environmental Assessment of Northern and Southern Options

The following points were recorded during the formal assessment of each option against each environmental criterion:

ENV 1 – Impacts on the wetlands

- Wetland is more than simply the water bodies.
- Roe Swamp and Horse Paddock Swamp are Conservation Category Wetlands.
- Possible implications to be considered include:
  - Interruptions to surface water.
  - Declining functionality – soil compaction, ground water movement, hydrostatic pressure changes.
  - Impacts for the free flow of ground water, and
  - Encroachment on and impact for Conservation Category Wetland boundaries.
- Southern alignment goes over “permanent” water but passes through the narrowest portion of the Conservation Category Wetland.
- The eastern wetland extends across Farrington Road into Murdoch University. The

Murdoch University section has some contamination resulting from equine uses with wetland linkages to the south blocked and diverted at Farrington Road.

- Nutrient stripping and recharge of the eastern wetland drain is a possible improvement to maintain continuous water flow potential under both options as an offset.
- Will Horse Paddock swamp renewal be funded or is it hypothetical only? The PER will outline various management interventions including an offset package potentially including tenure arrangements for sensitive areas such as good quality bushland and improvement initiatives. Any commitments must be pursued and delivered. This could be a positive initiative with impacts for Aboriginal heritage and Beeliar Regional Park.
- The southern option seems to impact less upon the wetlands particularly at the Roe swamp end. Horse Paddock Swamp is less sensitive.
- There is minimal surface flow under normal conditions. Ground water flows are more complex.
- The bridges shown are not proposed to provide for surface water flows (culverts could do this) they are for fauna movement.
- Species need adjacent upland areas too, and
- It is for these and other reasons that the Conservation Council opposes any option through here.

ENV 2 – Impacts on Fauna

- Mapped data shows northern option limits potential Cockatoo habitat impacts.
- Migratory birds are prevalent throughout.
- Rainbow bee-eaters nest along the power lines in clean sandy areas as preferred habitat.
- Quenda exist throughout the area in covered continuous low understorey.
- Reptiles exist through the area in limited numbers.
- There is limited information about Amphibians in the area of the alignment.
- Tortoises exist in the area and nest on the southern banks of the lakes to get the northern sun.
- Avifauna movements are being considered at the moment.
- The northern option is better because of:
  - Reduced Cockatoo habitat impacts.
  - Edge effects, and
  - The resultant reduced island effect of Hope Road and Roe Highway.
- Cockatoo and other offsets will be proposed in appropriate locations. Federal government requirements will focus on Cockatoo habitat amongst other things.
- Offsets seem to go across projects and areas. Links with uplands areas for habitat provide similar results for both options.
- Tortoise movement is prevalent around Horse Paddock swamp and in Aboriginal heritage area.
- Elevated structures may help in overcoming some of these things and including avifauna.
- It is possible that there is little movement between the lakes for birdlife but considerable movement to or from any of the wetland areas, and
- It is for these and other reasons that the Conservation Council opposes any option through here.

ENV 3 - Potential for Contamination

- The possible highest risk of impact is where options pass directly over a body of water. If an incident occurred there is probably better containment potential for the northern option.
- The road design must allow for full containment capacity in a one hundred year event.

- A crash involving chemical, diesel or other contaminants must be managed.
- Two stage basins with appropriate capacity are required and will be provided to meet criteria set by the Department of Water.
- The Vision Zero crash policy will result in crash barriers.
- Open retention basins are most likely however if land availability is limited underground storage may be pursued. The drainage solution will be developed to ensure good outcomes to reflect the preferred design option.
- The treatments to manage contamination or spills include Gross Pollutant Traps and other biological filters or other pollutant stripping mechanisms.
- Water Sensitive Policy will apply.
- Northern alignment intuitively seems more suitable but we need to understand if a purpose built road such as this would have an extreme high risk event frequency with destructive outcomes. Vision Zero is to create a safe driving environment and appropriate design measures will be included. The concept design will include Intelligent Transport System facilities to assist in event management and response. Lane configuration and lane metering are useful tools to manage incidents and associated impacts.
- Acid Sulphate Soils (ASS) have no real distinction between the two options and are likely to be present but equally manageable.
- There are some scattered contaminated sites through the area but not of major significance.
- What about construction and/or maintenance (resealing, reconditioning, etc)? There is no sensitivity between the options with no significant difference, and
- Some realignment of artificial drains may be required.

ENV 4 – Size of the project footprint

- Areas of direct and indirect impact include the effects of shadowing from associated structures.
- Two key considerations:
  - Area of footprint – influenced by the design (retaining walls, etc), and
  - Spatial location – determined by alignment.
- Comparable footprints for either option.
- The best value vegetation under the footprint is generally skirted by the northern alignment.
- Vegetation in the southern alignment over Roe Swamp would be generally more degraded. The northern alignment with structures would cause less degradation.
- The Principal Shared Path is another clearing impact that will be managed using the former Hope Road alignment, subject to acceptability.
- The northern alignment if along the power line would have less impact it seems.
- Undergrounding of the power line close to the road is a possibility.
- A construction footprint would be required to provide access to build the bridge over the swamp, which would have some impacts.
- Limited geotechnical assessment suggests a piled solution would be adopted.
- Lighting would be provided.
- Both options are similar in footprint impacts.
- The options are similar in impact for 4 or 6 lane options on a like for like comparison basis and would be part of a further assessment, and
- The Melaleuca woodland is likely to be more impacted by the northern option and the alignment could be moved further north.

ENV 5 - Wider environmental impacts

- Jandakot mound exists in the area and is unlikely to be impacted.

- Air pollution is a consideration but difficult to differentiate between options.
- The viability of the remaining land parcels and fragmentation is another consideration. The southern option performs best in this regard and maintains the northern remnant area linking back to Farrington Road, and
- An elevated northern option would address some of these concerns especially if it made the most of the Western Power alignment.

5.2.3 Economic Assessment of Northern and Southern Options

The following points were recorded during the formal assessment of each option against each economic criterion:

EC 1 - Cost of construction

- Need to include cost of land acquisition, environmental offsets and other associated costs.
- The northern alignment has a slightly longer structure (30m) but its cost would be relatively minimal at approximately $24.5M.
- The southern alignment would cost approximately $21M. There would be additional costs for associated retaining walls required at Bibra Drive.
- The northern alignment would require power line relocation but this would be minimal.
- Both alignments impact upon existing Progress Drive power lines with associated costs.
- Services and utilities around Bibra Drive may be impacted but these are not yet identified.
- Possibly $10M of access provisions around Progress Drive for the structure at this location.
- Similar offset costs are assumed for either option.
- Total indicative costs:
  - Either option around $50-$80M, and
  - A full length bridge (Bibra Drive to Progress Drive) would be a six to ten fold increase with a length of around 1,500m and a cost of around $500M, plus similar on-costs.

EC 2 - Maintaining and improving accessibility

- Based upon existing desired lines and current destinations in an economic context – journey time, etc.
- Accessibility for people moving from home to school/work, etc.
- Freight movements along the route.
- Similar travel implications with little difference, and
- Closure of Hope Road will add some travel time with minimal affected traffic.

EC 3 – Providing efficient freight and vehicle movement

- No difference in freight and vehicle movement between these options, and
- Northern alignment is geometrically simpler but both comply with relevant design standards.

EC 4 - Reducing future costs

- Maintenance and renewal costs reflect initial construction cost.
- There is no difference between the options.
- User costs are major commitments but there is no difference between these options:
  - Road life 40 years, and
  - Structure life 100 years.

EC 5 - Impacts for land values

- Uncertainty for people and potential for some associated negative impact in some areas.
- Direct impacts during construction in the short term – noise, dust, vibration.
- The success and implications of mitigation measures will be relevant from an outlook and sense of place perspective with associated impacts.
- Murdoch Activity Centre will benefit from improved access as will other locations.
- Hope Road closures will have some negative impacts. Minimal difference between options in area west of Progress Drive with less direct impacts than Bibra Lake, and
- The final design geometry will possibly allow for the Metropolitan Region Scheme road reserve to reduce between Bibra Drive and Progress Drive with the associated release of land into the Beeliar Regional Park. Some potential for land value increases as a result of improved road access.

EC 6 - Reducing traffic congestion

- Reduced congestion on other routes will be similar for either option.
- Both will produce the same benefits with similar vehicle attraction, given they are the same from a design, standards, route and connectivity perspective.
- Northern alignment provides slightly better outcomes for Bibra Drive, and
- Southern alignment may improve traffic flows with suggested improvements.

5.2.4 Additional Options

The group collectively discussed and identified the relative merits of:

- The northern and southern options (as developed by SMC).
- A northern option modified slightly to run along the Western Power line route (as identified by the group during the workshop). The group discussed this option with acknowledgement that it would be subject to further proofing to test the associated alignment impacts and implications for the relocation of the existing power lines, and
- A full length bridge structure (as identified by the group during the workshop and probably along the northern alignment). The group discussed this option assuming that the structure would be as long as possible and extending the full length of the alignment if possible to allow for the penetration of light, fauna crossing opportunities and unconstrained surface water flow.

5.3 Results

5.3.1 Group Scores

The group discussed and agreed on a group score for each criterion to reflect the overall assessment and group view for options one and two (see Figure 7 below). A group score was not established for options three and four.

Figure 7 below shows the agreed group scores arising from workshop discussion.

Option No.	OPTION	GROUP SCORES																
		Env1	Env2	Env3	Env4	Env5	Soc1	Soc2	Soc3	Soc4	Soc5	Soc6	Soc7	Ec1	Ec2	Ec3	Ec4	Ec5	Ec6
1	**Northern Alignment with bridge structure north of Roe Swamp***	3	6	5	5	4	6	5	7	6	7	7	7	5	5	5	5	6	5
2	**Southern Alignment with bridge structure over Roe Swamp***	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	**Northern Alignment slightly south to follow power line corridor***	4	7	5	7	5	6	5	7	7	7	8	7	3	5	5	5	6	5
4	**Full length elevated (3-5m high) structure along either alignment*** Refer also comment at 7.4 above.	7	7	4	8	6	4	5	8	5	7	6	6	1	5	5	3	7	5

Figure 5-1: Group Scores

* Each option assumes structures will be provided at Horse Paddock Swamp and Progress Drive.

5.3.2 Final Scores

The final scores used to identify the preferred option for the central section of the proposed Roe Highway Extension are shown graphically below in Figure 8. The scores were calculated from individual scores provided by non-SMC workshop participants only. The assessments completed by SMC team members were not included in the final scores.

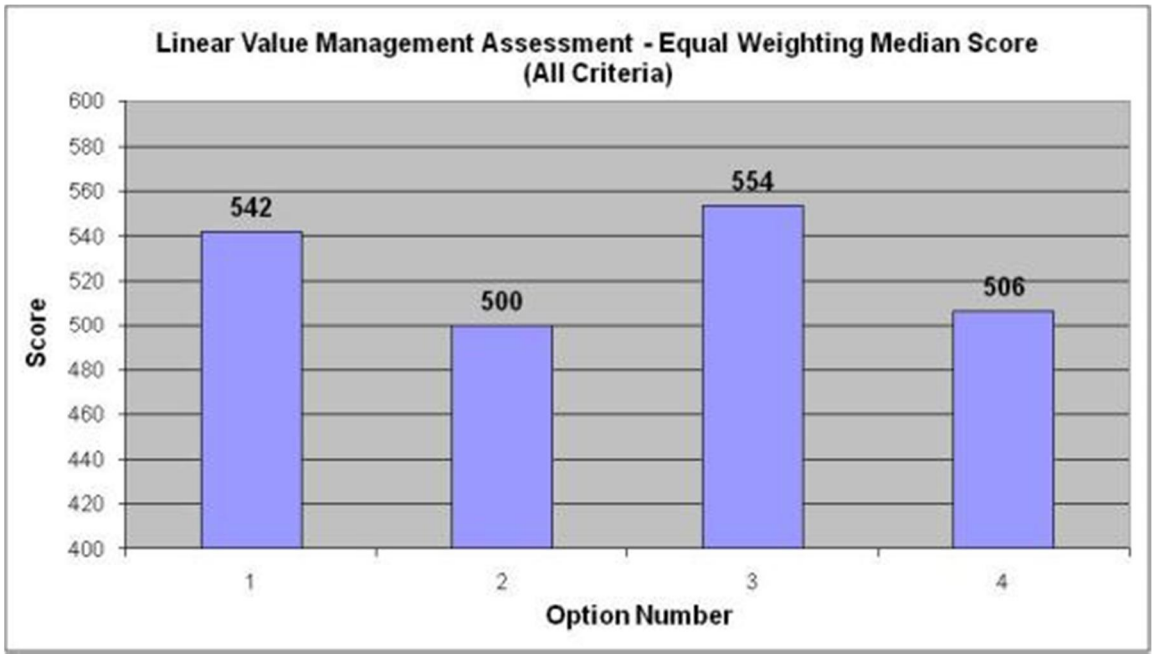


Figure 5-2: Final Scores

The final scores for the individual assessments completed by the SMC team are shown below in Figure 9 and are included for comparison purposes only.

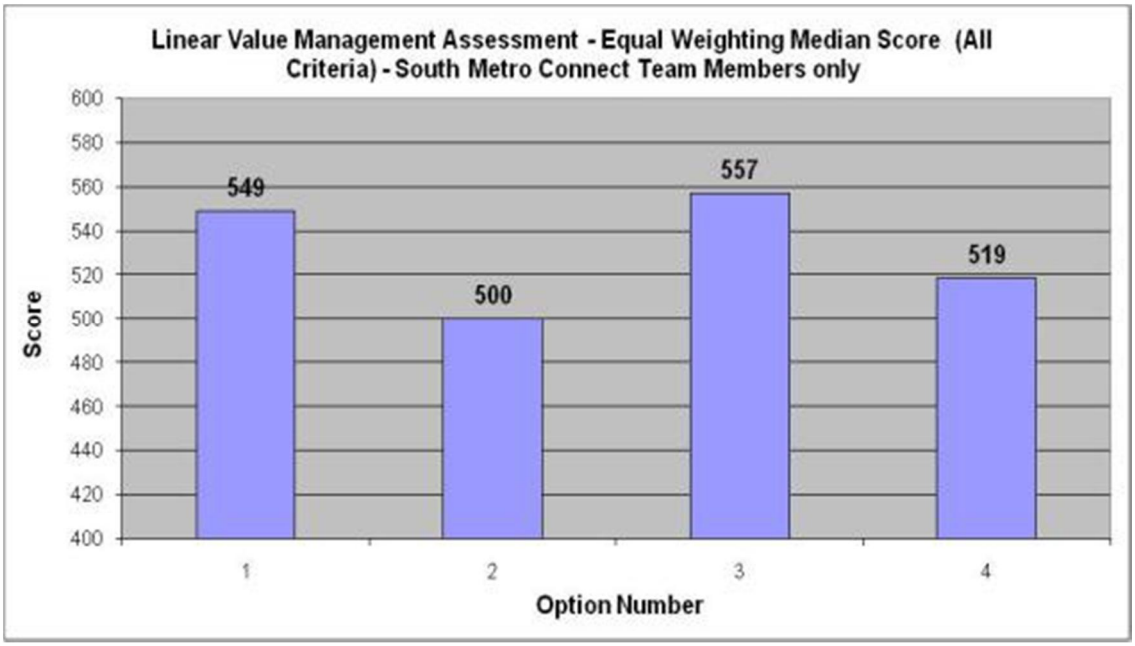


Figure 5-3: Final SMC Scores

5.4 Sensitivity Assessment

A sensitivity assessment of each of the three Triple Bottom Line determinants was conducted using non-SMC workshop participant ratings only.

Using only the social criteria, the rating order remained the same:

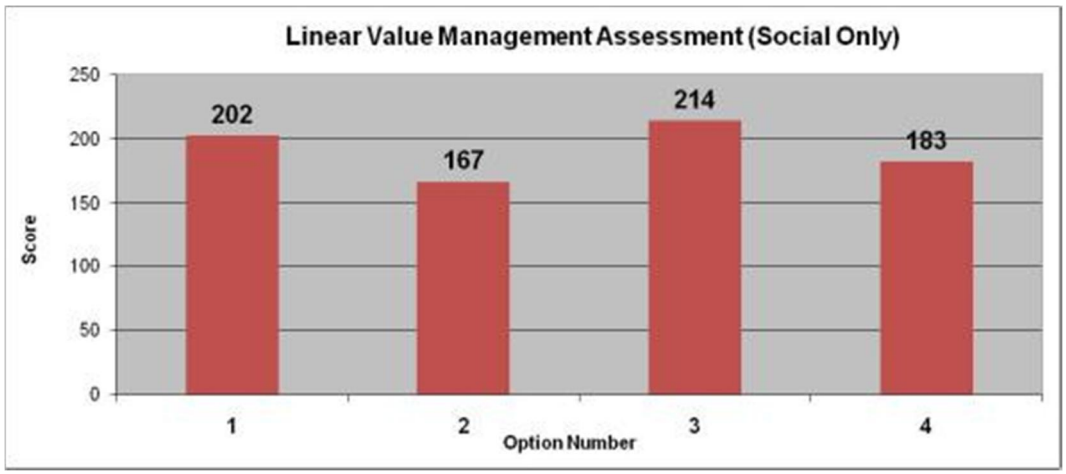


Figure 5-4: Social Rating

Using only the environmental criteria, Option 4 took preference over Option 3:

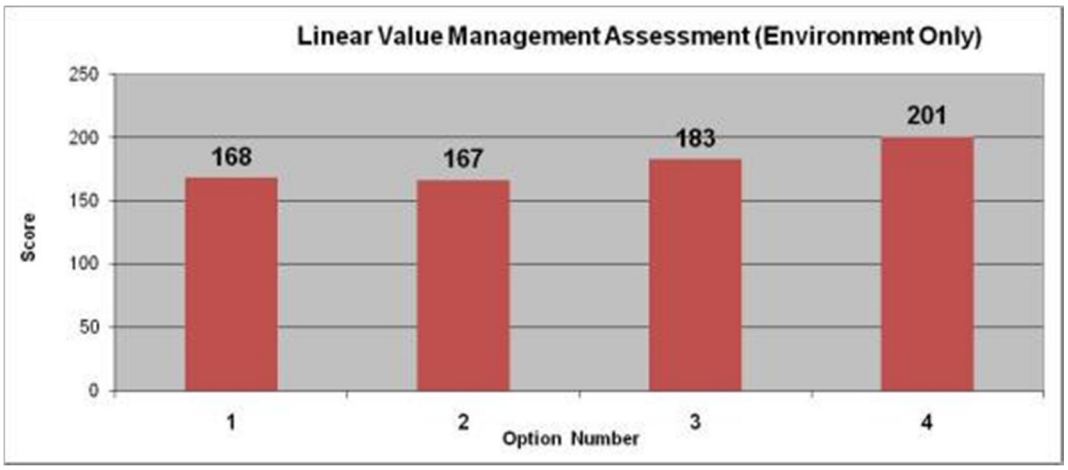


Figure 5-5: Environmental Rating

Using the economic criteria only, Option 1 became the preferred option ahead of Options 3 and 4:

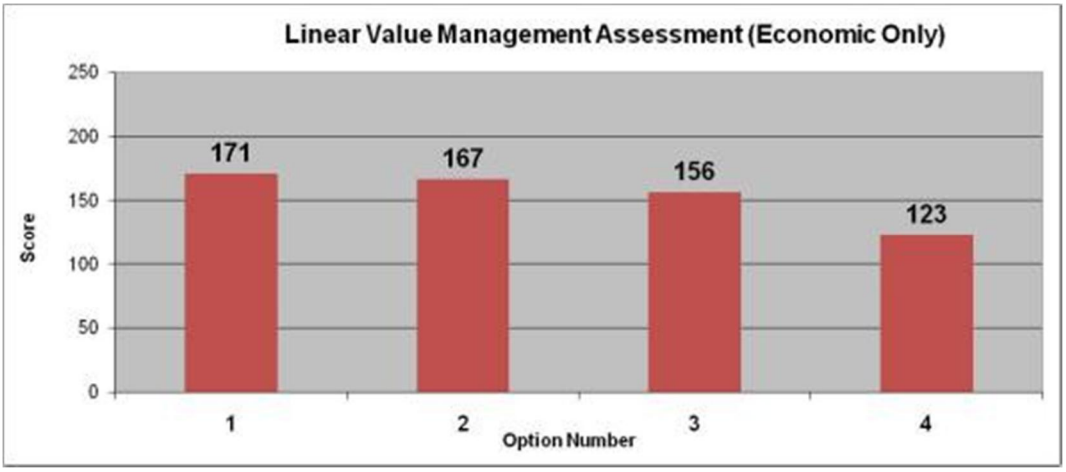


Figure 5-6: Economic Rating

5.5 Final Discussion and Agreement of Preferred Option

Workshop participants discussed and reviewed the assessment and agreed that a northern alignment that mostly closely follows the western power corridor is preferred (shown as Option 3 in the scores tables above). It was noted that geometrically it is not possible to follow the entire length of the power line corridor between Bibra Drive and Progress Drive, but the alignment can follow the majority of the corridor and still comply with relevant design standards.

At the conclusion of the workshop the group proposed that the SMC team give consideration to:

- Further developing a northern alignment option that follows the existing Western Power corridor to the greatest extent possible.
- Extending the lower speed zone (currently proposed from Karel Avenue to Bibra Drive) slightly further west to tighten the geometry further.
- Maximising use of the existing power line corridor with SMC working through the detail and advantages.
- Setting a governing goal to maximise the cleared Western Power footprint whilst ensuring that the melaleuca woodland is not affected. This should be done by challenging the design standards to follow the power line as much as possible.
- Running the existing power lines underground between Bibra Drive and Progress Drive.
- Extending the length of the Roe Swamp structure to the greatest extent possible and at least 30m longer than that shown in the SMC northern option to minimise the impact on the Conservation Category wetland and reflect the topography.
- Separating the Horse Paddock Swamp structure from the Progress Drive structure to reflect human and fauna requirements and to add aesthetic appeal. It is noted that there are likely to be more social issues than environmental issues in this area.
- Revegetating and rehabilitating Horse Paddock Swamp with appropriate (two or three) fauna links that are suitably vegetated.
- Including a number of culverts (two or three) as fauna crossing opportunities at relevant locations.
- Adopting a speed zoning of no greater than 80km/h for the full length of this section.
- Opening up connectivity around Progress Drive as much as possible.
- Realigning Hope Road west of Bibra Drive to connect with Bibra Drive at the existing Parkway Road intersection, and
- Rehabilitating the area south of Hope Road with renewal and regeneration of the Hope road alignment following the change above.

5.6 Final Comments

The following comments were provided by individual members of the MCA Group:

Rob Grieve

- Nothing to add to the comments recorded above.

Don Watson

- Nothing to add to the comments recorded above.

Deo Balraj

- Some alignment modifications may be required between Bibra Drive and Kwinana Freeway to ensure safe and legible linkages to Hope Road remain, and
- Support was expressed for the closure of Hope Road west of Bibra Drive with an enabling realignment slightly to the south using the existing cleared area or via a major realignment link to Bibra Drive at the Parkway Road intersection.

John Tedesco

- Still lots of information gaps with work happening over an extended period (in particular the shared pathway design details which were not available for this workshop).
- This makes it difficult to comment at this time, and
- More information and subsequent community input to these decisions is needed.

Brett Pye

- Nothing to add to the comments recorded above.

Neville Campbell

- Principles discussed with regard to Aboriginal engagement will be a major influence for power lines and other considerations, and
- Need to see community input when these issues have been further progressed.

Eddy Wayon

- The environmental constraints mean that a road in this area is not appropriate.
- If it is to go through we need to pursue an elevated structure that must be canvassed more widely, and
- Other options – double decker road, western power line corridor, etc should not be lost along with other opportunities.

Trish Phelan

- Impressed with the way things have come together.
- Mixed feelings but more for the road than against it, and
- Need to consider the form of the bridge/structure to keep it low key and unobtrusive.

Tony Weeks

- Similar view to John Tedesco.
- Far too many things that information was lacking for, resulting in clustering of scores (around 5).
- There should have been some sort of absolute scoring not relative at least for some criteria (where the key options both very good or both very bad), and
- The process was very good today and seems to have come to a reasonable conclusion but I am opposed to a highway through this area because it is just not needed and does not solve the prevailing port and local traffic needs.

Bob Hannan

- I have lived here for 50 years and thought that this road link might happen one day.
- This area between the lakes is very important and has not been given enough importance.
- Aboriginal input is needed.
- The decline in water over time and the fight for survival by the creatures that live here need our support. Let's do more for them, and
- Additional fauna access ways may be needed.

Colin Medlycot

- The raised road option is worthy with other precedent projects in existence in similar circumstances with constrained sites of high ecological value.

Jim Reddyhough

- Action in the form of construction commencement is needed as soon as possible preferably in the controversial part as a commitment for the future.

The following comments were provided by Project Director Mark Hazebroek:

Mark Hazebroek

- Lots of good feedback in a rigorous process.
- Good topic to commence the assessment process.
- Looking for a hybrid solution with Western Power involvement.
- We will adopt the suggestions and comments and make them work wherever possible to guide our design team.
- 3 MCA workshops are scheduled.
- Other topics may include:
  - Access to Murdoch Drive/Bibra Drive configuration.
  - Connection to Forrest Road.
  - Shared Path Network, and
  - Topics to be further developed and confirmed.

5.7 Workshop Feedback

Feedback forms were distributed at the close of the workshop to provide the participants with an opportunity to rate various aspects of the workshop and MCA process. The analysis of these forms indicates that 91% of the participants were satisfied with the proceedings of the workshop. See Appendix F for a detailed analysis.

6.0 Conclusion

SMC held its second MCA Workshop with a community and stakeholder MCA Group on 29 June 2010 to assess a number of viable design options for the central section of the proposed Roe Highway Extension between Bibra Drive and North Lake Road. The group had the task of selecting the preferred design option for the central section of the proposed highway by assessing each option against the triple bottom line criteria established at the original MCA Workshop on 19 February 2010.

The group assessed four viable options during the MCA workshop:

- **Option 1** - a northern alignment option.
- **Option 2** - a southern alignment option.
- **Option 3** - a northern option derivative running along the Western Power line route, and
- **Option 4** - a full length bridge structure probably running along the northern alignment to allow for the penetration of light, fauna crossing opportunities and unconstrained surface water flow.

The MCA Group discussed and reviewed the four options and agreed that **Option 3** – a northern alignment option derivative running along the Western Power line route, is the preferred option.

Option 3 has since been reviewed by SMC and incorporated into the overall design of the proposed Roe Highway Extension. The preferred design will be submitted to the Environmental Protection Authority for assessment and Public Environmental Review.

Appendix A - Agenda

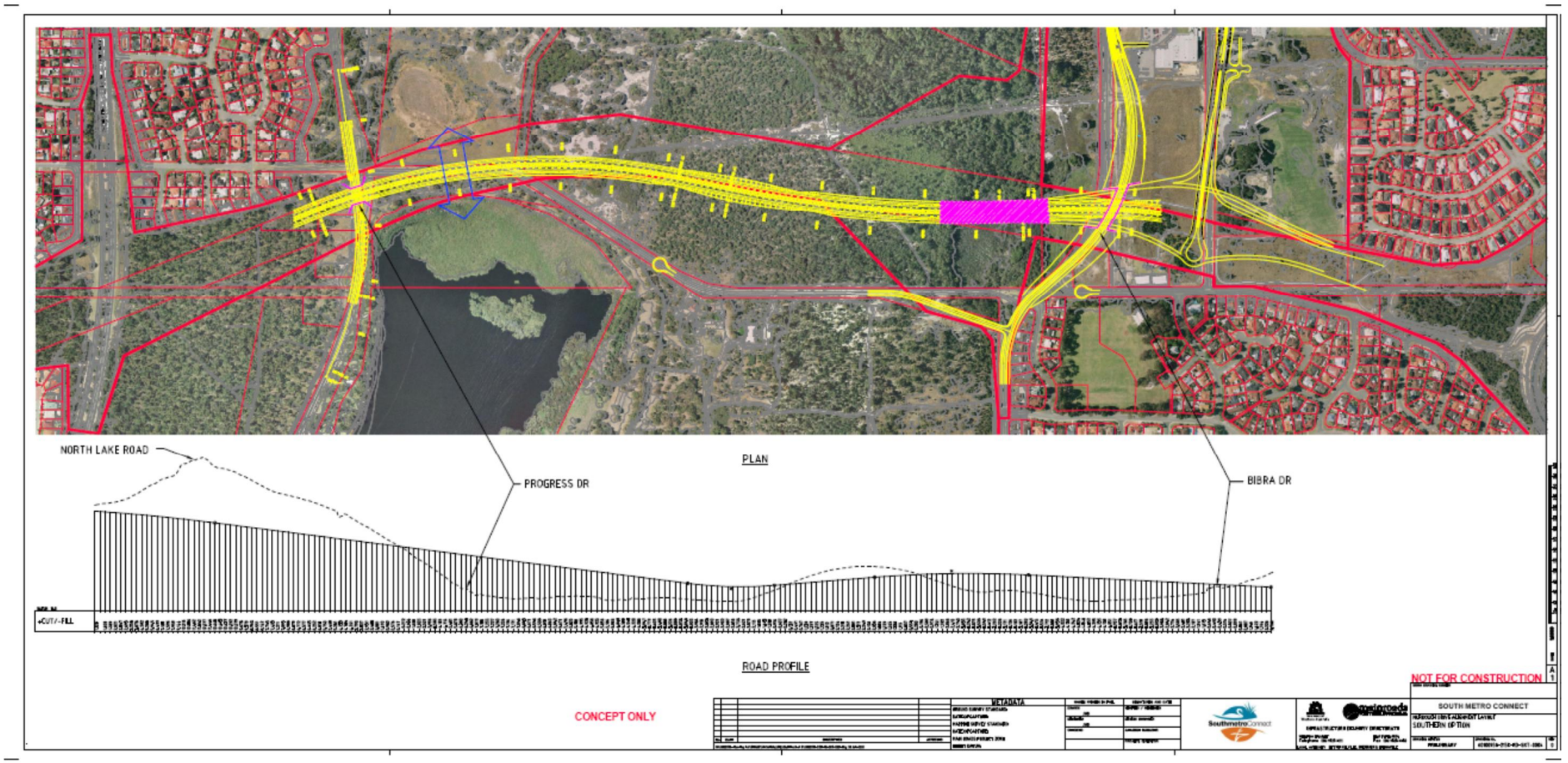
Time	Item	By
8:15	**Arrival – tea and coffee provided**	
8:30	Welcome, housekeeping and introductions	Facilitator
8:40	Explain MCA workshop scope and format	Facilitator
8:50	Project overview and context for the day's design options: • Why these options? • Relationship to the PER.	Project Director
9:15	Present options to be assessed for northern and southern alignments and structures	Design team
10:00	Strategic assessment of options and confirm assessment differences exist	All
10:15	**Morning Tea break**	
10:30	Present criteria and weightings resulting from earlier workshops	Facilitator
11:00	Session One: Social assessment of all (6) options	All
12:00	**Lunch**	
12:30	Session Two: Environmental assessment of all (6) options	All
13:30	Session Three: Economic assessment of all (6) options	All
14:30	**Afternoon tea**	
14:45	Present and discuss resultant scores for all options	All
15:15	Session Four: Sensitivity assessment	All
16:00	Session Five: Agree preferred option and further development tasks	All
16:30	Session Six – Individual comment on each option	All
16:50	Next steps and close	Project Director
17:00	**Close**	

Appendix B - Participants

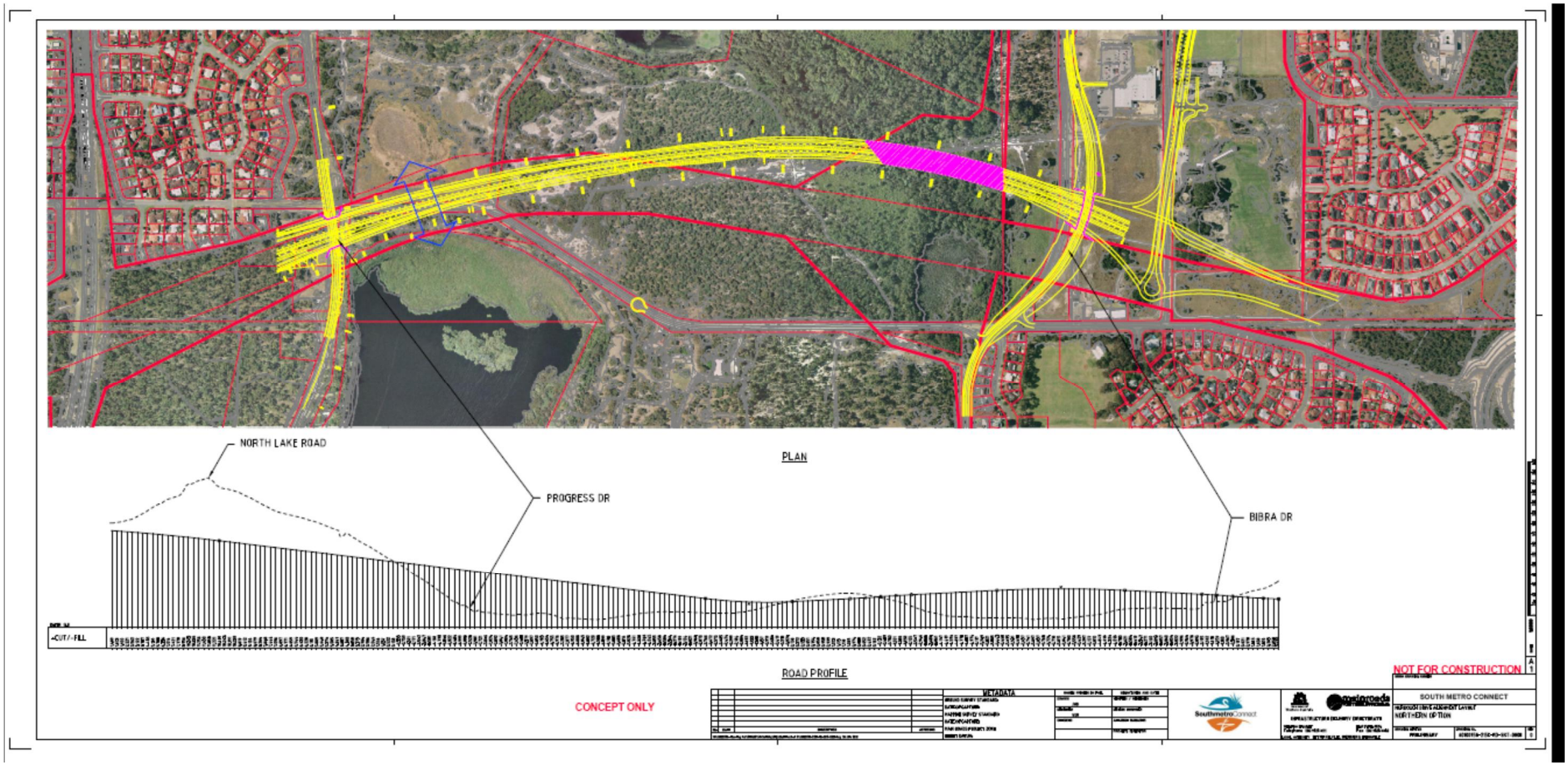
1	Rob Grieve	Stakeholders
2	Don Watson	
3	Chris Fitzhardinge	
4	Julie Harrison	
5	Deo Balraj	
6	Matthew Posa	
7	John Tedesco	
8	John Cameron	
9	Brett Pye	
10	Neville Campbell	
11	Eddy Wajon	
12	Trish Phelan	
13	Tony Weeks	
14	Chris Beaton	
15	Robert Hannan	
16	Colin Medlycott	
17	Jim Reddyhough	
18	Tony Louden	Project Team
19	Terry Pearce	
20	Jamie Shaw	
21	Abra DeKlerk	
22	Neil Westmacott	
23	Gaye Gelok	
24	Kellie Honczar	
25	Mark Hazebroek	
26	Mahes Rajakaruna	
27	Liam Stone	
28	Linton Pike (Workshop Facilitator)	

Appendix C – Options 1 & 2

SOUTHERN OPTION



NORTHERN OPTION



Appendix D – Assessment Sheets

Name: . . . . . .

SOCIAL						
NUMBER	DESCRIPTION	SCORE (1 - 9)				COMMENT
		Southern alignment	Northern alignment			
Soc1	Noise impacts	5				
Soc2	Impacts on Aboriginal Heritage	5				
Soc3	Provision of pedestrian access and connectivity	5				
Soc4	Visual impacts	5				
Soc5	Impacts on traffic flow	5				
Soc6	Impacts on local amenity and quality of life	5				
Soc7	Planning to enhance the social environment	5				

Other comments

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ENVIRONMENTAL						
NUMBER	DESCRIPTION	SCORE (1 - 9)				COMMENT
		Southern alignment	Northern alignment			
Env1	Impacts on the wetlands	5				
Env2	Impacts on fauna	5				
Env3	Potential for contamination	5				
Env4	Size of the project footprint	5				
Env5	Impacts on the wider area	5				

Other comments

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Name: . . . . . .

ECONOMIC						
NUMBER	DESCRIPTION	SCORE (1 - 9)				COMMENT
		Southern alignment	Northern alignment			
Ec1	Cost of construction	5				
Ec2	Maintaining and improving accessibility	5				
Ec3	Providing efficient freight and vehicle movement	5				
Ec4	Reducing future costs	5				
Ec5	Maintaining land value	5				
Ec6	Reducing traffic congestion	5				

Other comments

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Appendix E - Project Team Summary of Criteria

MCA Criteria Summary - Social Criteria

Criteria	Summary
1. Noise impact	There are certain legislative requirements for mitigating noise impacts. These requirements state that once a noise level or threshold is reached a minimum level of mitigation is required. These requirements will apply equally to all alignments for the proposed Roe Highway Extension. However, there may be a difference between the locations affected below the legislated levels giving some difference in impact. However, noise impacts may occur below the threshold. It is important to consider these impacts in particular when considering this criterion.
2. Impact on Aboriginal Heritage	The project will impact on registered archaeological and ethnographic (spiritual) heritage sites in the vicinity of Bibra and North Lakes. A planned heritage survey may identify additional areas of heritage significance. Opportunities to manage and/or offset impacts include: • Selection of an option which avoids individual sites • Protection of sites • Minimisation of impact on sites • Reduction of human access to sacred sites • Relocation of sites material, and • Rehabilitation of degraded sites.
3. Provision of pedestrian access and connectivity	Any new road will have potential to both sever and improve existing accessibility for pedestrians. The Roe Hwy will have a Principal Shared Path PSP along its length, which provides the highest standard of access. Access across the highway will be via road crossings connecting existing shared paths into the PSP. All alignments across the wetlands will have a PSP. Impacts will depend on the PSP alignment, the frequency of road crossings, and connectivity to local networks.
4. Visual impacts	The road may or may not be visible from recreational nodes, walking trails, and houses. The height of the road and the distance from the observer will have a bearing on visual impacts.

5. Impacts on traffic flow	The road will have an impact on traffic flows on existing roads by either drawing traffic off of those roads or placing additional traffic on those roads. Overall the intent is to locate traffic on the most appropriate road for its purpose (regional traffic on regional roads and local traffic on local roads). The impacts can be gauged by forecasting traffic.
6. Impact on local amenity and quality of life	This is a broad overview of potential impacts that may affect the local community and therefore quality of life, and those using local amenities. The impacts may include: • Road operational issues – noise, vibration, visual amenity, availability and location of shared paths and generally changing the existing environment, and • Short term impacts of road construction – noise, dust, vibration, temporary detours etc.
7. Planning to enhance the social environment	When assessing the options it is important to consider the bigger picture issues: • Size of buffer between road and neighbouring properties • What happens further west of Stock Road • Impacts on wider road network with associated safety issues, and • Sustainability – consider the future.

MCA Criteria Summary - Environmental Criteria

Criteria	Summary
1. Impact on the wetlands	The road options have the potential to directly impact on wetland values. These negative impacts may be related to: Interruptions to surface water flows Decline in wetland function due to loss of groundwater connectivity, and Encroachment on Conservation Category Wetland boundaries.
2. Impact on fauna	The options may have negative impacts on the movement of fauna between habitat areas and on fauna habitat. Fauna includes invertebrates (insects), birds, mammals (such as Quenda), reptiles and other aquatic species such as tortoises and frogs. Other factors to consider include: • Quenda movements • Quality of vegetation remnants • Size of vegetation remnants, and • Cockatoo habitat. It is likely that both options will have sufficient fauna underpasses to facilitate fauna movement in a north to south direction.
3. Potential for Contamination	All roads have the potential to suffer hazardous materials spillage. Spillage on one option for the Roe Highway Extension may be less containable than spillage on another, even where that option has been designed to reduce the risk of an incident as much as possible.
4. Size of the project footprint	The physical extent of the options (ie, the width of the road and embankments) and also the knock on effects of the road, such as edge effects and the reduced size of remnant vegetation, will determine the size of the footprint. The condition of the vegetation that the road passes through is also an important factor.
5. Impact on the wider area	The road options have the potential to impact negatively on regional water movements (surface and ground), the Jandakot groundwater mound and groundwater source, and species survival. For instance, road closure can cause increased road kill by diverting traffic onto other roads.

MCA Criteria Summary - Economic Criteria

Criteria	Summary
1. Cost of construction	The cost of construction includes the cost of service relocations, land acquisition, preconstruction activities, and any art works or environmental offsets for land impacted.
2. Maintaining and improving accessibility	The road alignment and connection options may either help or hinder people and goods in arriving at their destinations, which includes jobs, homes, and recreational and social destinations. The construction of a highway will usually provide significant regional traffic accessibility benefits, but may increase local trip distances to areas around the highway. It is important to consider the balance of these.
3. Providing efficient freight and vehicle movement	To operate efficiently and safely, freight vehicles need roads with lower grades (inclines) and less stopping and starting than lighter vehicles. Large articulated trucks (27.5m long) will be using the proposed Roe Highway Extension. The more direct, free flowing and flatter the alignment is, the better it will fair under this criterion
4. Reducing future costs	Future costs can be thought of as either infrastructure costs (maintenance, repair, replacement) or user costs (vehicle operating costs, road user time). Usually, although they are indirect, user costs are by far the greater cost. Road design life is usually 40 years and structure life is usually 100 years, so during this time there will be millions of user hours and kilometres passed. The shortest distance with the highest speed and no stopping and starting reduces these costs. Infrastructure costs will depend on the length and nature of construction. Generally, shorter roads cost less.

5. Maintaining land value	Project impacts on land value maybe positive or negative and may vary through the project development, construction and operating phases. Development Phase • Uncertainty about the project scope, in particular the effectiveness of impact mitigation measures, may affect the value of residential properties close to the proposed road reserve. Potential increases to the value of commercial and residential properties in the region as a result of improved access may not be realised during this period. Construction Phase • Construction impacts, including noise, dust and access disruption may have a temporary impact on property values. Construction activities will be managed to prevent damage to nearby buildings. Measures will include condition surveys, communication, monitoring and repairs if justified. Operating Phase • Improved access may increase the value of properties in the region. • The effectiveness of impacts mitigation measures (including time for vegetation growth) may affect the value of properties immediately adjacent to the road.
6. Reducing traffic congestion	Traffic congestion is measured by a level of service that is related to the number of vehicles using a road versus its capacity. It is important to consider the impact on existing (other) roads as well as the impact on the new road. Traffic forecasts are used for this. If the alignments are similar then they are likely to have similar impacts on traffic congestion.

Appendix F – Workshop Participant Feedback

Feedback forms were distributed at the close of the workshop to provide the participants with an opportunity to rate various aspects of the workshop and MCA process.

In general, workshop participants were satisfied with the proceedings of the workshop – 64% were satisfied and 27% were highly satisfied (see Figure 6). 100% of the participants agreed that the principles of MCA were made clear and 90% agreed that the design options were adequately explained. 100% of participants agreed that the process of discussion and voting was fair and unbiased, and 91% were satisfied with the general approach of the facilitator and the approach of the specialists in explaining the design options and their impacts.

18% were uncertain whether the MCA process would contribute to the identification of a preferred design.

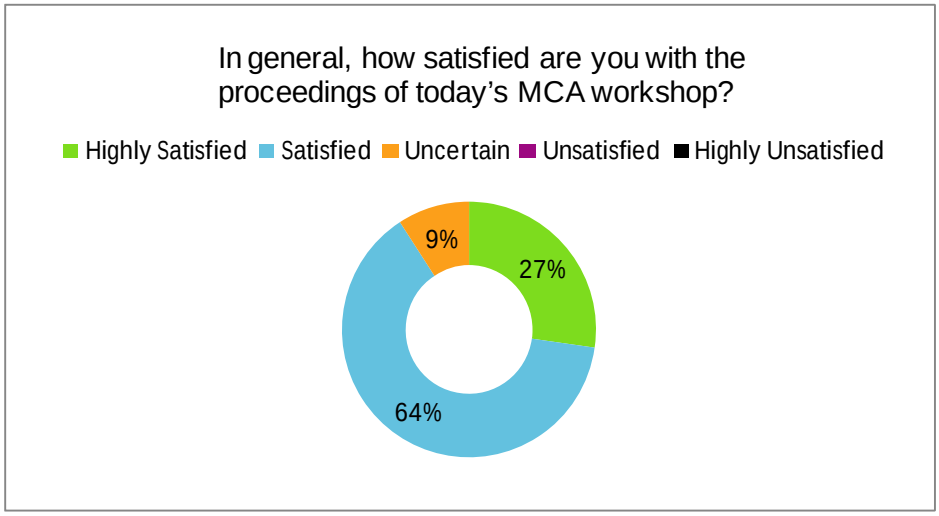

Figure 6-1: Workshop Participant Satisfaction