SouthmetroConnect

Visual impact assessment

AECOM, December 2010. *Roe Highway Extension Visual Impact Assessment*. Unpublished report prepared for South Metro Connect, Perth, WA.

AECOM, April 2011. *Roe Highway Extension: Landscape and Urban Design Framework*. Unpublished report prepared for South Metro Connect, Perth, WA.

Appendix X

Visual impact assessment

AECOM

Main Roads
23 March 2011

Roe Highway Extension

Visual Impact Assessment

Roe Highway Extension

Visual Impact Assessment

Prepared for

Main Roads

Prepared by

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Quality Information

Document Roe Highway Extension

Date 23 March 2011

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Revision History

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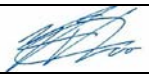
D	23 Mar 2011	Final	Walter Van Der Loo	

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Glossary of Terms

AILA	Australian Institute of Landscape Architecture
CoC	City of Cockburn
CPTED	Crime Prevention through Environmental Design
D&C	Design and Construct
DTM	Digital Terrain Model
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
ESD	Environmental Scoping Document
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPS	Global Positional System
LCU	Landscape Character Unit
LIDAR	Light Detection and Ranging
LRUD	Landscape Revegetation and Urban Design
LUDF	Landscape and Urban Design Framework
MAC	Murdoch Activity Centre
MCA	Multi Criteria Assessment
MRS	Metropolitan Region Scheme
NSW	New South Wales
PER	Public Environmental Review
PSP	Principal Shared Path
RTA	Roads and Traffic Authority
SMC	South Metro Connect
SMS	Scenic Management System
VEM	Visual Envelope Map
VIA	Visual Impact Assessment
WA	Western Australia
WAPC	Western Australia Planning Commission
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

1.0 Visual Impact Assessment Terms of Reference

The following terms of reference are taken from the Environmental Scoping Document, June 2010.

Terms of Reference
Recreational values of the project area have been highlighted as a significant factor by the Environmental Protection Authority. Recreational values of the area are associated with the area's visual amenity. Accordingly, SMC proposes to undertake a visual impact assessment of the proposed project. Studies proposed to be included for the visual assessment include: 1) Identification of a project area which will contain all of the likely significant impacts of the proposal on the visual resource, also known as a Zone of Theoretical Visibility, to provide the location of representative viewpoints. 2) Field survey work to inform the visual baseline against which potential impacts can be assessed and to confirm the location of representative viewpoints. 3) A strategic character assessment of the proposed road corridor, to inform the visual baseline (involving definition of broad visual 'character units'). 4) Identify mitigation or management measures to reduce the potential effects of light spill on nearby residential communities. 5) Analysis of the sensitivity of each representative viewpoint, followed by an assessment of the likely scale of change in the view resulting from the proposal, as well as the degree of contrast or integration of new features with existing features. 6) Preparation of visualisations to illustrate the likely impacts of the proposal to stakeholders. If required, these would be photo-realistic images produced using a combination of computerised modelling techniques or hand drawing to convey the character and key aspects of the proposal. The project team will use the WAPC document *Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design, 2007* while assessing and managing potential visual impacts of the proposed project.

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2.0 Introduction and Methodology

2.1 Report background and process

Main Roads Western Australia is proposing an extension to the Roe Highway from the Kwinana Freeway and Roe Highway interchange in Jandakot to Stock Road located in Coolbellup. The extent of project on which this assessment is based, is approximately 8.5km of highway road and includes tie-in areas to existing roads.

The requirements for the assessment of impacts on visual amenity, to be hereinafter referred to as visual impact assessment, are from the following documents:

- Main Roads WA Corporate Procedure, Environmental Guidelines, "Guideline for Visual Screens in the Road Reserve" – Document No. 6707/02/13003; and
- Main Roads WA Corporate Procedure, Environmental Guidelines, "Guideline for Visual Impact" – Document No. 6707/020.

This technical report is structured in the following way:

1) The visual amenity impact assessment approach and methodology;
2) Understanding of the existing baseline conditions pertaining to Visual Amenity;
3) Impact assessment of the proposed project on Visual Amenity;
4) Specific management measures to minimise impacts on Visual Amenity; and
5) A residual impact assessment, used to assess the effectiveness of the proposed mitigation measures and identify remaining significant impacts that may require further consideration in the future phases of the design and construction.

2.2 Limitations and assumptions

A number of limitations and assumptions have been made about the project.

2.2.1 Limitations

Limitations associated with this assessment are:

- The assessment is based on a concept engineering design which would be further developed during future design stages. The final design may vary from that described within.
- The assessment is based upon publicly accessible views as it is considered that more people would obtain views from these locations, as opposed to views from private land. However, given the nature of this project, consideration has also been made of the views achieved from private property. The site work did not include access to private property and, therefore, the conclusions drawn are based upon assumptions and inferences made from the publicly accessible locations.
- The photo simulations are based on concept engineering design. The end built form may differ from that portrayed in the images and, therefore, these images are purely indicative at this stage.
- No detailed night time assessment has been undertaken. However, impacts associated with the likely lighting requirements have been considered and a commentary provided.
- The digital terrain model (DTM) developed for topographic mapping was based on 1m cells derived from LIDAR data (Light Detection and Ranging) provided by the City of Cockburn.
- The viewshed analysis or Zone of Theoretical Visibility (ZTV) for the entire design was based on a 2.5m cell (derived from original LIDAR data) DTM, resolution degraded to reduce processing time and data storage requirements.
- At the time of assessment the construction timeframe was unknown.

It is important to consider the conclusions of this assessment in the context of these limitations however; it is not considered that any of these limitations would have a significant effect on the assessment of impact.

2.2.2 Assumptions

Assumptions have been made at this stage regarding the lighting associated with the proposed project. The actual detailed design of the lighting is yet to take place. This chapter considers only the visual issues associated with the potential light spill.

2.3 Methodology

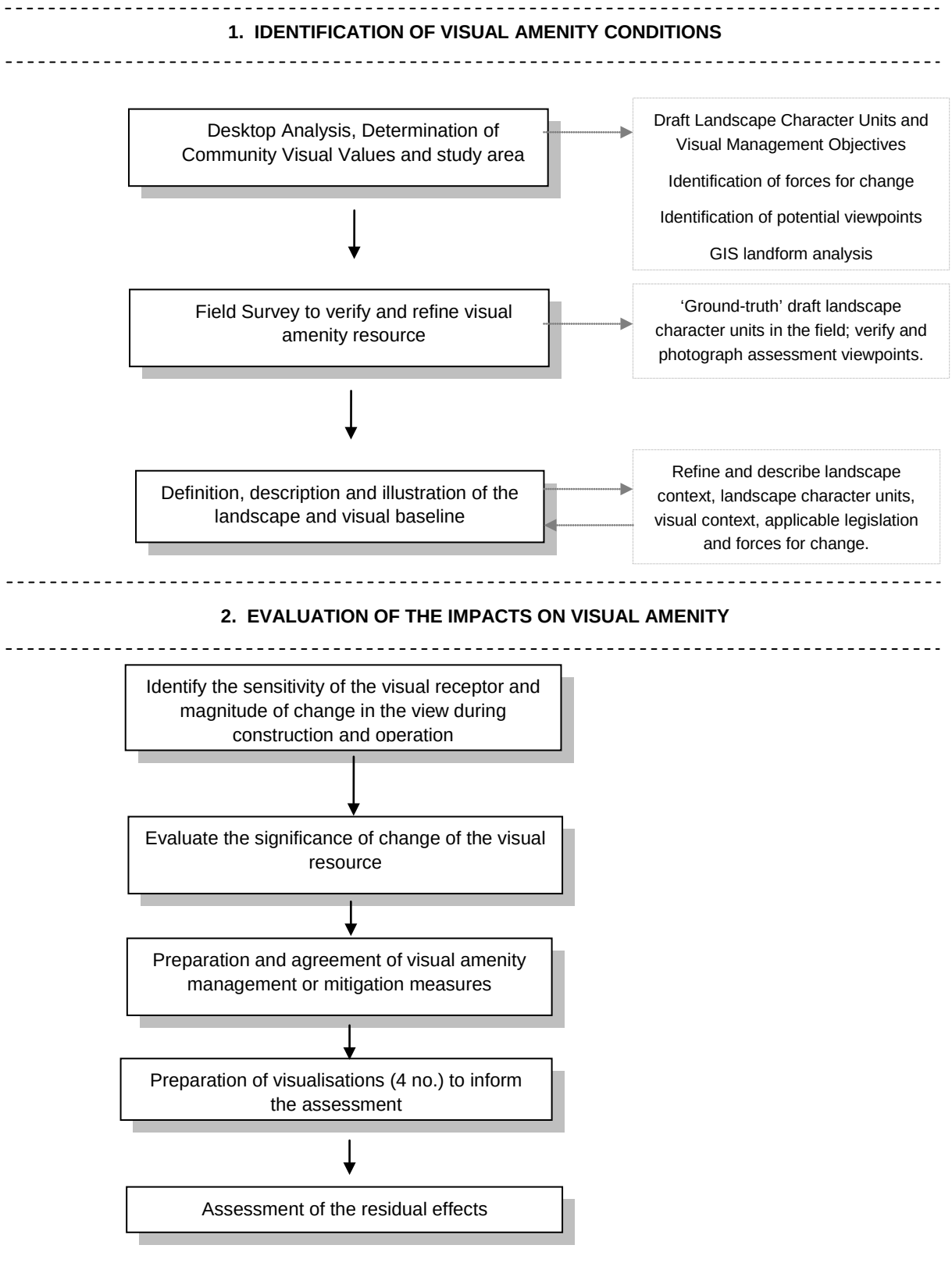
The approach to the visual amenity impact assessment has been developed based on the following two key guidance documents:

- *Visual Landscape Planning in Western Australia; a manual for evaluation, assessment, siting and design* (2007) Western Australian Planning Commission. http://www.planning.wa.gov.au ; and
- *Guidelines for Landscape and Visual Impact Assessment* (GLVIA) produced jointly by the Landscape Institute and the Institute of Environmental Management and Assessment, (2002) Second Edition.

In addition other relevant guidance notes and documentation used, includes:

- *Road Landscape Manual* (1997) Queensland Government Department of Main Roads;
- *Environmental Guidance for Planning and Development* (chapter D3: Visual Amenity) (2008) Environmental Protection Authority (EPA);
- *The US Forestry Service, Scenic Management System* (SMS) as described in the publication 'Landscape Aesthetics: A Handbook of Scenery Management', US Forestry Service, 1996; and
- *Landscape Character Assessment Guidance for England and Scotland* (Countryside Agency and Scottish Natural Heritage, 2002).

Key Steps of the Visual Amenity Impact Assessment



These steps are described in more detail below.

2.3.1 Identification of existing visual amenity conditions

This included a desktop survey, site survey and review of applicable legislation and policy.

2.3.1.1 Desktop survey, assessment of community values and definition of the study area

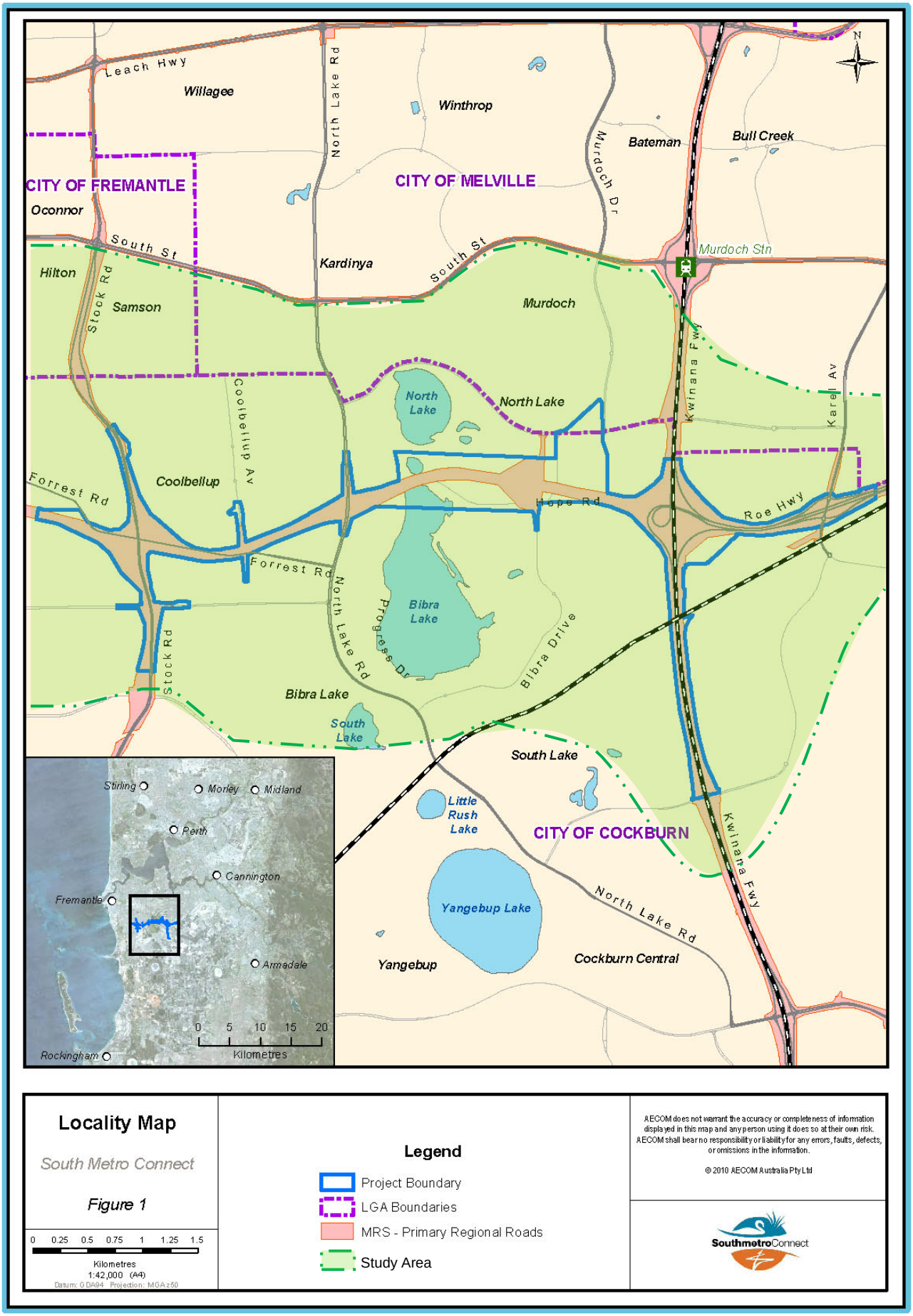
Assimilation of background information: The first task of the desktop survey was to assimilate information within and adjacent to the study area.

This included obtaining and reviewing the following sources of information:

- Planning schemes from relevant local government authorities;
- Digital aerial photography;
- Digital Terrain Model (DTM);
- Cadastral data (showing roads and all major features, built areas etc);
- Hydrology;
- Land use;
- Vegetation;
- Existing infrastructure e.g. transmission lines; and
- Important cultural heritage features.

Study area determination: To gain an accurate picture of the project area and enable a robust impact assessment, the study area boundary extends past that of the project area. This allows a full understanding of the context within which the proposed project is located. By reviewing a wider area at a high level and avoiding an evaluation of an isolated location, a greater insight may be obtained regarding the study area's character and what influences this (both culturally and naturally), the landscape assets, and how rare or abundant they are and the study areas visual context, i.e. how it is viewed from areas outside the study area, as well as how it is viewed from within.

The boundary of the study area was determined through the desk top assessment and by conducting a preliminary zone of theoretical visibility (ZTV) to determine the theoretical extent to which the preliminary proposed project would be visible. The resultant project area extends in the north to South Street and to the east it extends past Kwinana Freeway to include the residential suburb of Leeming. To the south, it extends into the residential suburbs and industrial areas of South Lake and Bibra Lake, whilst to the west, it extends into residential areas of Hamilton Hill and Beaconsfield. The project area and north and south limits to the study area are illustrated in the Locality Map (**Figure 1**).



Locality Map

South Metro Connect

Figure 1

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Kilometres

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Datum: GDA94 Projection: MGA z50

Legend

- Project Boundary
- LGA Boundaries
- MRS - Primary Regional Roads
- Study Area

SouthmetroConnect

Date Modified: 25/11/2010

Author: CBB J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\WPER\Misc\Rachael Piper\Location Map\Location_Map.mxd

Assessment of Community Values: In accordance with the WAPC guidelines: *Visual Landscape Planning in Western Australia; a manual for evaluation, assessment, siting and design* (2007), an assessment of community preferences, experiences and values was undertaken, to ascertain what the community values about the existing landscape.

Extensive community consultation has been conducted as part of the proposed Roe Highway project design, for over 12 months. Four workshops have been held, the first to generate a list of community values (of which values pertaining to visual amenity were considered) for criteria development for use in a multi criteria analysis (MCA) process. This workshop was followed by three design workshops, which again considered visual amenity issues. Key questions were asked such as, *how should it* (the proposed project) *look?* The participants were also requested to comment on visual impact, landscape works and public art.

Each design workshop had a morning session and an evening session. An online forum preceded each of these workshops to generate greater participation and each was widely promoted using various methods including newspaper advertising, a project update published in community newspapers, website, direct mail and direct invitation to stakeholders.

Also widely promoted were two information days, one at the beginning of the project to promote the development phase and the existence of South Metro Connect and one after the MCA and first design workshop to show what had been happening up until that time.

At the time of compiling the VIA, the development and distribution of feedback brochures was being undertaken and distributed by direct mail to neighbouring residents and stakeholders.

Analysis of background information and community values: Following on from the above tasks, a preliminary desk-based analysis of the visual amenity resource was analysed and used to inform the baseline assessment. This included analysis of the underlying landscape (e.g. geology, soils, topography), land cover (e.g. vegetation, land use, settlement pattern), landscape value (e.g. reflected in scenic routes/trails and landscape designations including national parks and conservation reserves), and desk-based site analysis (e.g., identification of recognised panoramas and views and key landmarks).

Five key outcomes of this desktop analysis were:

1) The preliminary identification of landscape character units (LCUs) within the project area. This broad ***landscape character assessment*** is a tool for identifying what makes one place different from another or provides a locality with its 'sense of place' that distinguishes it from neighbouring areas. This assessment identifies what makes a place distinctive, without assigning a value to it, but determines the sensitivity to change associated with the proposed project. The landscape character assessment method was based on guidelines within WAPC (2007). In summary, the baseline landscape character assessment involved mapping and describing the six (6) discrete landscape character units of the project corridor. Based on the character assessment and our understanding of community visual values associated with the study area, a set of visual management objectives pertaining to each LCU were created.

2) Identification of factors that have influenced landscape change in the past and those that are likely to do so in the future e.g. recreational demands, development pressures associated with provision of other infrastructure, residential and commercial. These are referred to as “forces for change”.

3) A Geographic Information Systems (GIS) analysis (where appropriate) to assist the assessment e.g. landform analysis.

4) Selection of a provisional list of representative viewpoints to be used in the visual amenity impact assessment.

5) A review of the following applicable legislation was conducted to identify policy pertaining to visual amenity:

- The Planning and Development Act 2005;
- Environmental Protection Act 1986;
- Directions 2031 Draft Spatial Framework for Perth and Peel, June 2009, Western Australian Planning Commission;
- Perth Metropolitan Region Scheme (MRS), updated November 2007; and
- The City of Cockburn Local Planning Scheme.

2.3.1.2 Site survey

Field visits were carried out in December 2009 and August 2010 by two landscape planners / architects, both with Australian Institute of Landscape Architecture (AILA) accreditation, experienced in landscape and visual impact assessment to ground truth the findings of the desk top assessment and take photographs to (a) portray landscape character; (b) refine the viewpoint assessment and selection of viewpoints; and, (c) provide data for the production of photographic simulations and visualisations. The field visits focused on those aspects of the landscape with potential to be of the greatest sensitivity to the proposed project proposals, and on gaining an appreciation of those aspects of the proposals most likely to affect visual values.

Records were made in the form of GPS point data, field notes and photographs.

2.3.1.3 Definition, description and illustration of Visual Amenity Baseline

The final phase of identifying existing visual amenity conditions was consolidation of the findings into a report. All information assimilated through the desk top and site surveys, was divided into the following five sections:

- Landscape context of the study area;
- The landscape and visual character of the project area i.e. the identification of landscape character units;
- Visual context of the study area i.e. identification of the key areas of visual sensitivity in the study area;
- Understanding of key community values;
- Applicable legislation; and
- Identification of anticipated changes in the study area that may impact on visual amenity values.

This understanding provides the setting and baseline upon which the visual impact assessment in **Section 5** of this report is based.

2.3.2 Evaluation of impacts on visual amenity

The evaluation of impacts on visual amenity utilises a representative viewpoint assessment. For each viewpoint the impact of the proposed project on visual amenity has been primarily evaluated on the basis of a combination of two main factors, to generate a judgement regarding the significance of impact:

- Visual sensitivity; and
- Magnitude of visual change.

2.3.2.1 Visual Sensitivity

This step involved classification of the sensitivity of the viewers (sensitive receptors) to the development.

For the purposes of this assessment, the sensitivity of a viewer (or visual receptor) is dependent upon:

- the importance of the view i.e. the scenic qualities of the view, including the presence of other existing manmade elements in the view; and
- the visual receptor (type and volume of viewers); for example, residents and visitors to important/valued landscapes are considered to have a higher sensitivity to their visual environment than, say, visitors to non-designated areas or motorists passing through the landscape.

In this assessment, sensitivity is described as *negligible, low*, *medium* or *high* as defined and illustrated in **Table 1**.

2.3.2.2 Magnitude of visual change

This step involved prediction of the magnitude or level of change in the view. The preliminary assessment only considered the change associated with the engineered alignment of the PER concept design. It did not consider the effectiveness of the visual mitigation or management measures (in **Section 5.3**) and the works prescribed in the Roe Highway Extension Landscape and Urban Design Framework (LUDF), AECOM (2011).

The magnitude of change affecting a visual receptor depends on the nature, scale and duration of the particular change that is expected to occur. In a landscape, the magnitude of change will depend on the loss, change or addition of any feature, or any change in the backdrop to, or outlook from, a landscape that affects its character. The effect on a view will depend on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the development.

Magnitude of change is described as being imperceptible, noticeable, considerable or dominant as defined and illustrated in **Table 1**.

2.3.2.3 Assessment of Impact Significance

This step involved evaluation of the significance of visual impacts depending on the sensitivity of the viewer to change and the predicted magnitude of change.

No established, measurable technical thresholds of significance exist for landscape and visual impacts (see paragraph 7.42, page 94 in GLVIA). Significance is, therefore, determined by considering the sensitivity of the visual receptor and the magnitude of change expected as a result of the development. Professional judgement and experience are applied on a case by case basis in order to identify broad levels of significance for each receptor. Each case is assessed on its own merits as factors unique to each circumstance need to be considered.

Following these, the level of significance of impact is described as being *negligible, minor, minor to moderate, moderate, moderate to major or major*. There is often a gradual or blurred transition between levels of significance; and where impacts lie on the borderline they may be described, for example as minor to moderate.

Impacts which are graded as being *moderate to major* or *major* are those which the visual amenity team considers should be given greatest weight, relative to other levels of visual impact, in decision making. They are usually close views seen by sensitive viewers. Moderate levels of impact are of progressively reducing importance. Impacts graded as minor also constitute effects which warrant being brought to the attention of the decision maker, but should individually carry only little weight in the decision.

Type of Impact: Impacts are described as being adverse (negative), beneficial (positive) or neutral. They can be direct (i.e. directly or physical affecting a landscape resource) or indirect (i.e. physical changes elsewhere which affect the landscape character or views within adjacent or more distant areas). Impacts can be short term (i.e. those occurring during construction of a development) or long term (i.e. those lasting for the life time of the project). In addition, they can be wide-spread or localised.

Table 1 Levels of Significance of Visual Amenity Impacts

			Magnitude of change in view caused by proposed project			
			Dominant change	**Considerable change**	**Noticeable change**	**Imperceptible Change**
			Major changes in view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view.	Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a wider-ranging, less concentrated change across a wider area.	Minor changes in views, at long distances or visible for a short duration, and/or are expected to blend in with the existing view to a moderate extent.	Change which is barely visible, at a very long distance, or visible for a very short duration, and/or are expected to blend with the existing view.
Sensitivity of viewpoint to proposed project	**High**	Larger numbers of viewers or those with proprietary interest in landscape appreciation and prolonged viewing opportunities such as residents and users of attractive and/ or well-used recreational facilities. Includes views from regionally important locations whose interest is specifically focussed on the landscape e.g. Cockburn Wetlands Education Centre.	**Major**	**Moderate to major**	**Moderate**	**Minor to moderate**
	Medium	Medium numbers of residents and moderate numbers of visitors with some interest in their environment e.g. trail or push bike riders.	**Moderate to major**	**Moderate**	**Moderate**	**Minor to moderate**
	Low	Small numbers of visitors with a passing interest in their surroundings e.g. those travelling along roads. The viewers whose interest is not specifically focussed on the landscape.	**Moderate**	**Moderate**	**Minor to moderate**	**Minor**
	Negligible	Very occasional numbers of viewers with a passing interest in their surroundings e.g. those travelling along minor street connector roads.	**Minor to moderate**	**Minor to moderate**	**Minor**	**Negligible**

Table 1 is a guide only. The descriptions of magnitude and sensitivity are illustrative only. Each case is assessed on its own merits using professional judgement and experience, and there is no defined boundary between levels of impacts. A large number of viewers in a category that would otherwise be of low or moderate sensitivity may increase the sensitivity of the receptor.

2.3.3 Visual amenity management (or mitigation) measures

Potential “high level” additional visual amenity management (or mitigation) measures that could reduce the adverse impacts on visual amenity have been identified. These have been supported and incorporated in the LUDF (AECOM, 2011a), which considers the broader landscape and urban design requirements associated with the proposed project.

2.3.4 Residual impact assessment

The residual impact assessment is an assessment of the PER concept design proposal combined with proposed mitigation measures that are to be developed further and adopted by the proposed project as part of the next stage of design. The aim of the residual impact assessment is to assess the effectiveness of the mitigation measures upon identified impacts on visual amenity as well as to provide an indication of the residual risk associated with the proposed project.

This residual impact assessment is a shorter assessment, utilising the same receptors and method of assessment as the main assessment i.e. it identifies the sensitivity of the receptor (this will remain the same in residual impact assessment) and the magnitude of change (which may have been modified by the proposed mitigation measures) to determine a significance level of impact.

2.3.5 Key digital communication tools utilised in the assessment

2.3.5.1 Geographic information system (GIS) analysis

A key visualization tool used in the existing condition and impact assessment on Visual Amenity is the production of “zones of theoretical visibility” (ZTV). This is a 2D graphic that illustrates which parts of the surrounding area could potentially view some part of the proposed project. Note: ZTV is also termed as Viewshed, Zone of Visual Influence (ZVI) and Visual Envelope Map (VEM). It is used as a tool to, firstly, define the study area and, secondly, to assist in the selection of representative viewpoints for the impact assessment.

A number of ZTV of the project have been generated. The first was of a preliminary concept in December 2009, to assist with the study area boundary determination and provisional selection of representative viewpoints. This ZTV was effectively rendered redundant when the preferred PER concept design alignment was fixed December 2010 and, therefore, has not been included in this assessment.

The following two additional ZTVs were generated in January 2011, after the preferred PER concept design alignment was fixed:

- A ZTV of the alignment (see **Figure 8**); and
- A ZTV of the alignment and noise walls (see **Figure 9**).

For all ZTVs produced, a GIS data distribution type was based on a standard method known as “natural break”. The class breaks are based on “natural groupings” which are grouped by similar values or where there is a relatively large difference in data value. A number of target points along the centre line of the proposed project, plus 1.6 metres for a typical vehicle height, approximately every 200 metres were selected and ratings prescribed.

ESRI ArcGIS software has been used to model the ZTVs of the proposed project. The ZTV covers a radius of approximately 5km from the project boundary.

Note: The ZTVs presented in this report are a ‘worst case scenario’, as they are based on the ground surface elevation only, and do not take account of intervening vegetation, buildings or minor changes in topography. Where such features intervene between the viewer and the proposed project, then this local visual screening will reduce the visibility of the proposed project.

2.3.5.2 Visualisation Production: Photomontages

Five photomontages have been compiled to enable appreciation of the potential visual impact of the presence of the road from five key representative viewpoints. These have been created using the PER concept design alignment 3D and 2D AutoCAD drawings in combination with Google SketchUp 7 and Adobe Photoshop CS3 for rendering. Two scenarios have been produced and are illustrated in **Section 5.2,** viewpoints 6, 10, 11, 12 and 15:

- Scenario 1: unmitigated scheme, where none of the proposed landscape and urban design mitigation treatments have been included. This scenario, therefore, illustrates the "worst case scenario". These were used in the main impact assessment **(Section 5.0).**
- Scenario 2: mitigated scheme, where the agreed proposed landscape and urban design and mitigation treatments have been included. These were used in the residual impact assessment **(Section 6.0)**.

When interpreting the visualisations, it is important to consider the limitations described in **Section 2.2**.

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3.0 Existing Visual Amenity Conditions and Baseline

The following Section describes the existing visual conditions and values in terms of the:

- Landscape context of the study area;
- The landscape and visual character of the project area i.e. the identification of landscape character units;
- Visual context of the study area i.e. identification of the key areas of visual sensitivity in the study area;
- Key Community Visual Values;
- Applicable legislation; and
- Anticipated changes in the study area that may impact on visual amenity values.

This understanding provides the setting and baseline upon which the visual amenity impact assessment in **Section 5** and **Section 6** of this report is based.

3.1 Landscape context of the study area

The proposed road is located south of Perth in the City of Cockburn 6km south east of Fremantle. The proposed project traverses principally two types of land use:

- Low density residential suburbs; and
- Beeliar Regional Park.

These two land uses and other key landscape and visually prominent features and elements are illustrated in the Landscape Context map (**Figure 2**).

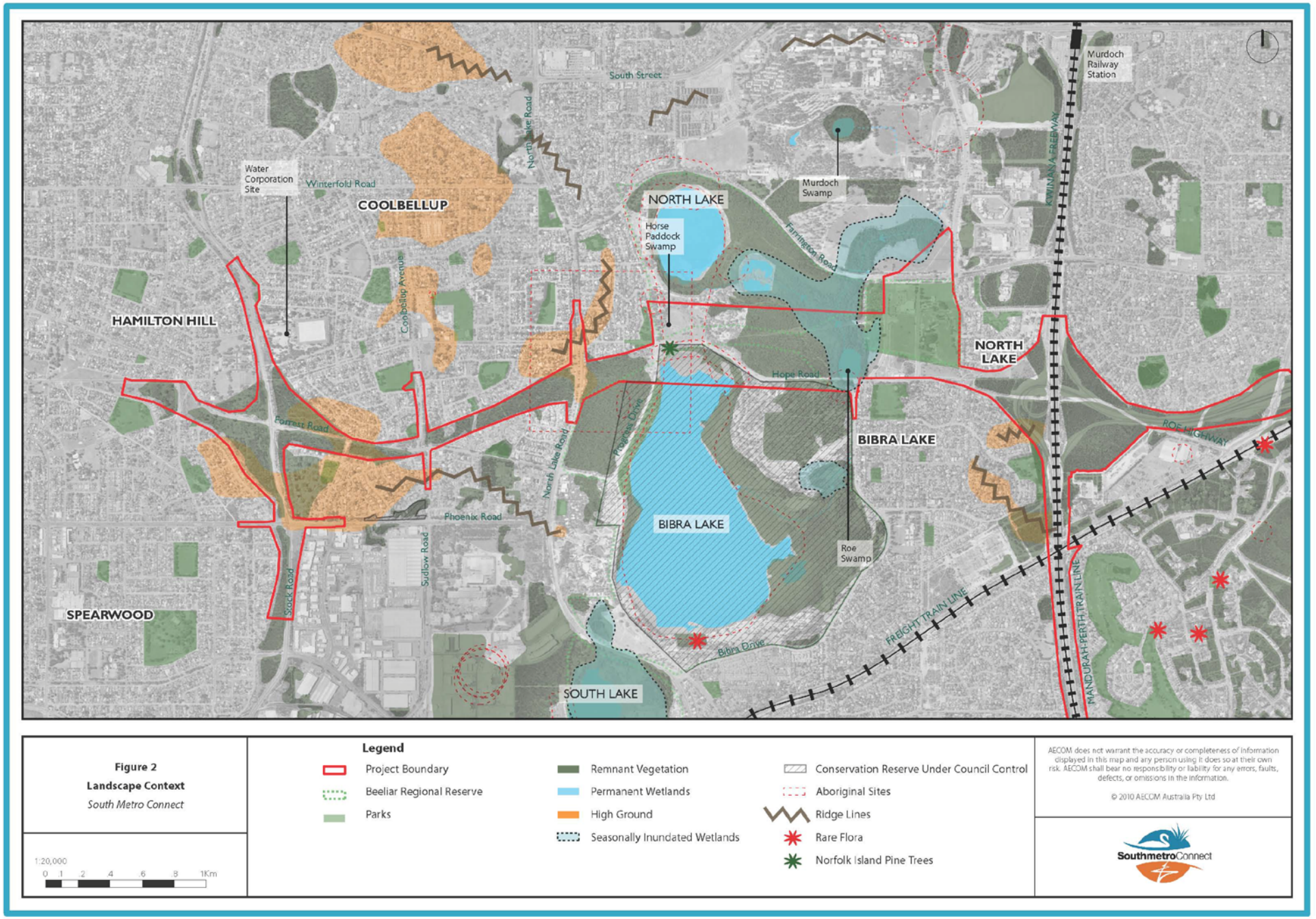
The study area landform is illustrated on the Topography: Landform map (**Figure 3**) and the Topography: Slope Analysis map (**Figure 4**) and essentially comprises the eastern part of what is locally known as the Spearwood Valley.

The low density residential suburbs of Hamilton Hill, Coolbellup, North Lake and Bibra Lake are typically uniform in character and are composed of 1970's and 80's detached one-storey properties constructed of red brick or rendered concrete, and clay tile roof, with limited remnant vegetation within garden spaces. However, larger new, two-storey residential properties are found contrasting with the typical development type, for example the new development at Peterborough Circle (Murdoch Chase).

The proposed project is located in the eastern portion of the Spearwood Valley which contains Beeliar Regional Park with its associated chain of wetlands, including Bibra Lake and North Lake. These wetlands are known as the Eastern Beeliar Wetland Chain. Of note, just west of the study area, running parallel to the coast is a distinctive limestone ridge and dunal system, and the western portion of the Spearwood Valley system, which contains the western chain of the Beeliar Wetlands.

The Eastern Beeliar Wetland Chain is separated from a western chain of wetlands by a ridge, around the Hamilton Hill and Samson suburbs. This is illustrated on the Landscape Context and Topography figures (**Figures 2- 4**). This ridge system runs parallel to the coast on a north to south direction and provides visual and physical separation between the coast and inland area. It also provides potential for some elevated views over Cockburn, to the Darling Ranges escarpment, as well as glimpses of Perth CBD.

The eastern wetland chain is slightly deeper than those in the western Beeliar chain and tends to be more permanent and contain fresh water year around. These wetlands provide an area of high recreation value and thus contribute an important metropolitan open space system.


Water Corporation Site
Winterfold Road
COOLBELLUP
North Lake Road
South Street
Murdoch Railway Station
KWINANA FREEWAY
Murdoch Swamp
NORTH LAKE
Horse Paddock Swamp
Farrington Road
HAMILTON HILL
Coolbellup Avenue
NORTH LAKE
Hope Road
Forrest Road
Progress Drive
ROE HIGHWAY
BIBRA LAKE
North Lake Road
Phoenix Road
BIBRA LAKE
Roe Swamp
Sudlow Road
Stock Road
SPEARWOOD
FREIGHT TRAIN LINE
Bibra Drive
MANDURAH-PERTH TRAIN LINE
SOUTH LAKE
Figure 2
Landscape Context
South Metro Connect
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0 .1 .2 .4 .6 .8 1Km
Legend
Project Boundary
Beeliar Regional Reserve
Parks
Remnant Vegetation
Permanent Wetlands
High Ground
Seasonally Inundated Wetlands
Conservation Reserve Under Council Control
Aboriginal Sites
Ridge Lines
Rare Flora
Norfolk Island Pine Trees
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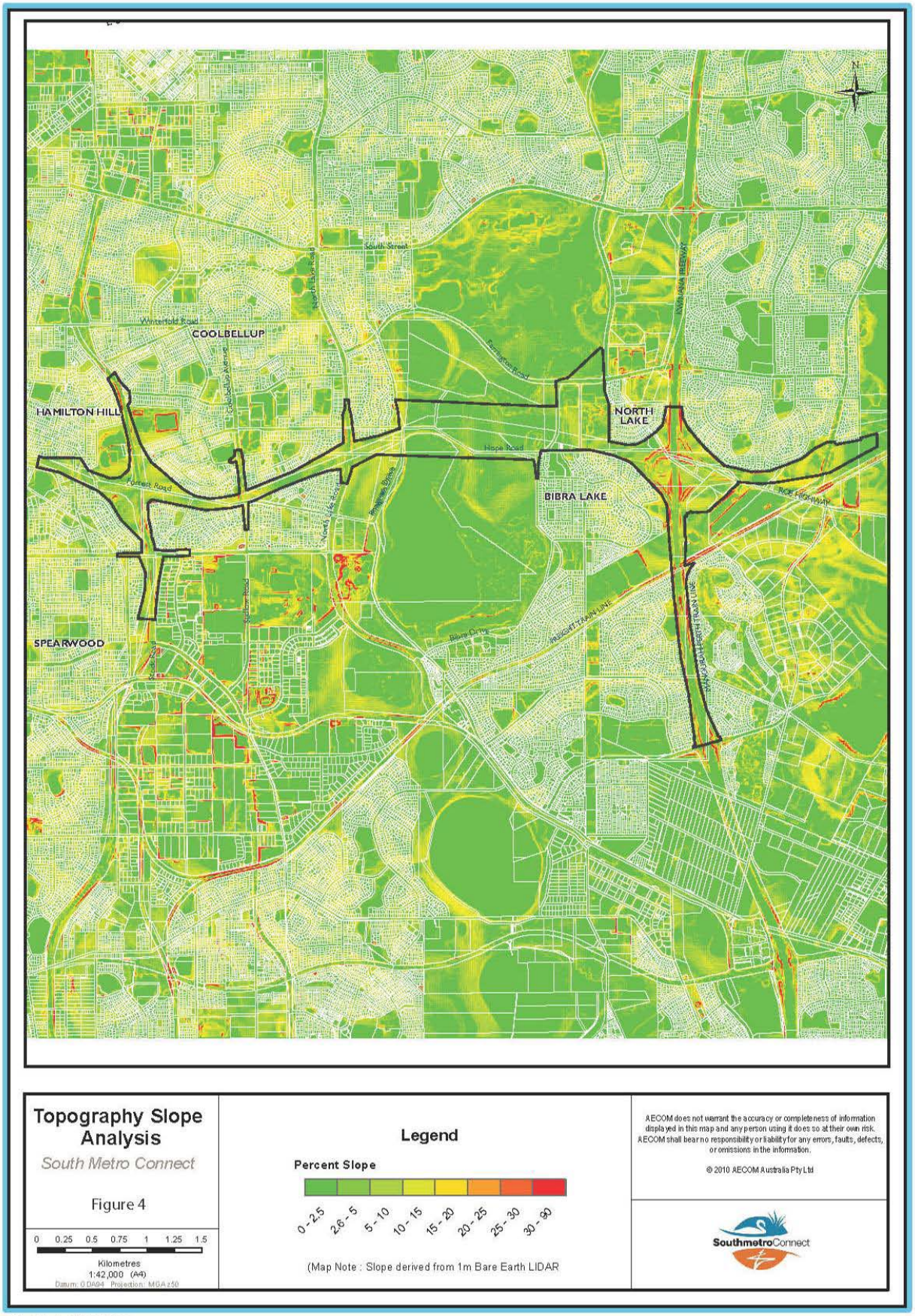

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The Beeliar Regional Park is considered to contain high biodiversity and fauna and avi-fauna habitat values and is extensively used by terrestrial including the threatened Carnaby's Cockatoo (listed as 'Endangered' by the Commonwealth and 'Schedule 1, Endangered' by the State Government) and water birds. The wetlands are surrounded by fringe vegetation of fresh and salt water paperbark trees and extensive areas of remnant vegetation and provide "one of the most significant set of wetlands in the metropolitan region" (The City of Cockburn Local Planning Scheme). Furthermore the Local Planning Scheme states that the remaining vegetation (some of which is within the project site itself) is extremely important from a local landscape perspective. Some areas of remnant vegetation have been nominated as regionally significant under the Bushplan and Regional Reservations System. These are illustrated on the Landscape Context map (**Figure 2**).

Some of the lake systems, such as Bibra Lake, are degraded as a result of eutrophication, pollution, loss of fringing vegetation and changes to their hydrological regime. This project provides an opportunity to improve ecological health of these water bodies, wetland systems and surrounding open space areas. This project could act as a catalyst of renewal and restoration of the Eastern Beeliar Wetland Chain, commencing with Bibra Lake. The existing and increasing value of this open space system is recognised through the production and implementation of the Beeliar Regional Park Management Plan and Bibra Lake Management Plan, which both outline a vision and structure for the parks' future development.

To the east of the study area is the flat, low laying sandy plains of *Banksia* woodlands, which overlay the Jandakot groundwater mound. Jandakot Airport is a key nearby municipal facility.

3.2 Landscape Character of the Project Area

The proposed project site has been divided into six landscape character units (LCU), which are illustrated in the Landscape Character Units map **(Figure 5)**.

3.2.1 Landscape Character Unit 1: Stock Road to North Lake Road Bushland

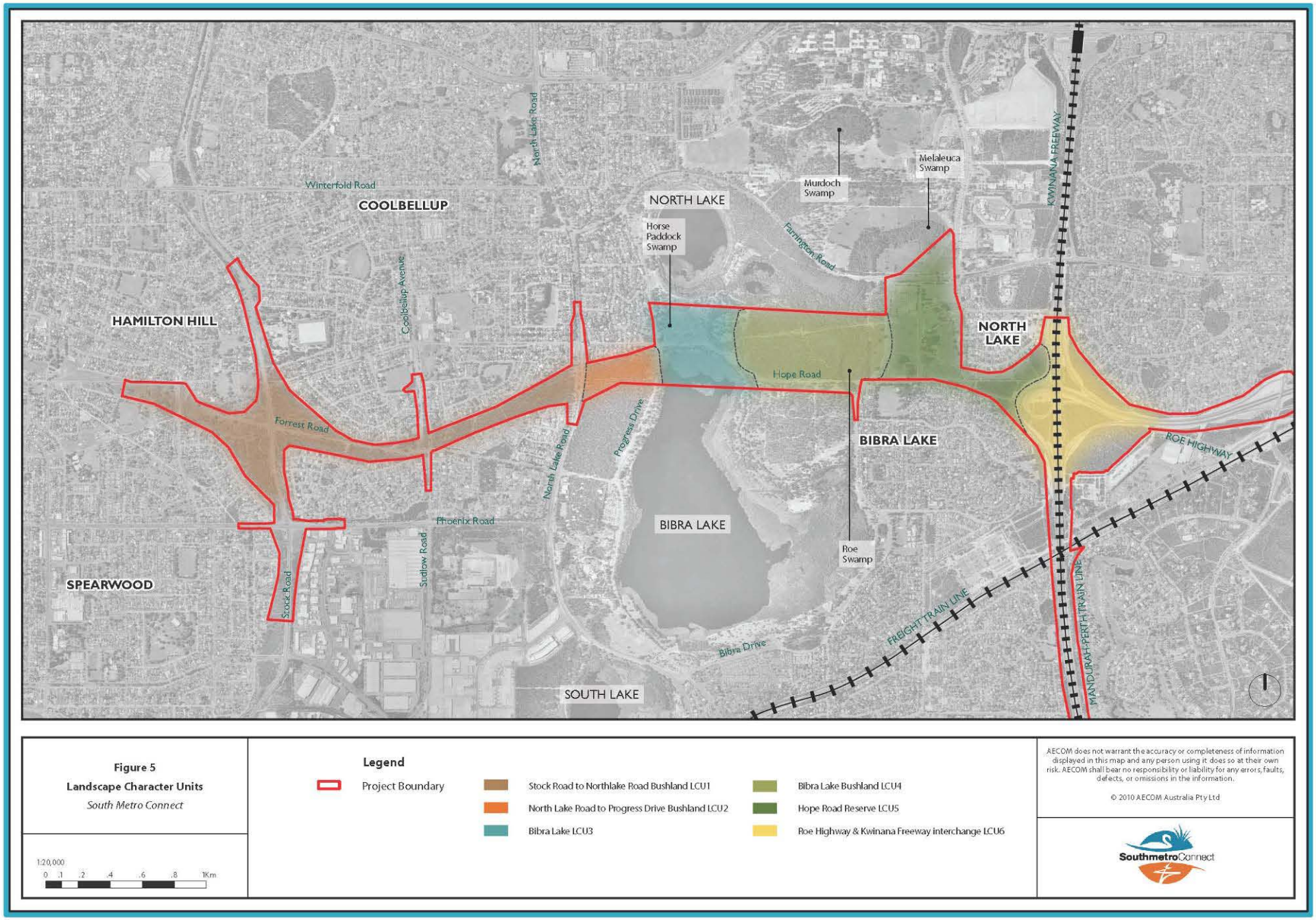
Sensitive landscape receptors: Remnant vegetation (refer to AECOM 2011b for more detail).

Sensitive visual receptors:

- Residential communities in Coolbellup and Bibra Lake i.e. Sebastian Crescent, Forillion Avenue, Provincial Mews;
- Hamilton Senior High; and
- Users of local parks such as Matilda Birkett Reserve.

Existing description

This narrow, predominantly bushland covered LCU covers the project area from Stock Road to North Lake Road. It varies in width between a minimum of 100m (at the western end) and up to 300m at the Stock Road intersection. It is surrounded by low density residential communities and is perceived by these communities, as well as other users (such as recreational walkers or cyclists), as a local informal bushland parkland with high aesthetic and visual amenity values. It visually connects with open space immediately adjacent, such as Matilda Birkett Reserve by Coolbellup Avenue (refer to **Figure 6** for location). It contains numerous, largely informal pedestrian and cycle pathways that form linkages along and across the space. It has an enclosed character which is provided by the semi-mature remnant native bushland. This vegetation generally precludes views across the reserve to the adjacent suburbs and thus it also provides a visual buffer of high aesthetic and visual amenity value between the residential suburbs.


Winterfold Road
COOLBELLUP
North Lake Road
NORTH LAKE
Murdoch Swamp
Melaleuca Swamp
KWINANA FREEWAY
Horse Paddock Swamp
Farrington Road
HAMILTON HILL
Coolbellup Avenue
NORTH LAKE
Hope Road
Forrest Road
Progress Drive
North Lake Road
BIBRA LAKE
ROE HIGHWAY
Phoenix Road
BIBRA LAKE
Roe Swamp
Sudlow Road
Stock Road
SPEARWOOD
FREIGHT TRAIN LINE
Bibra Drive
MANDURAH-PERTH TRAIN LINE
SOUTH LAKE
Figure 5
Landscape Character Units
South Metro Connect
1:20,000
0 .1 .2 .4 .6 .8 1Km
Legend
Project Boundary
Stock Road to Northlake Road Bushland LCU1
North Lake Road to Progress Drive Bushland LCU2
Bibra Lake LCU3
Bibra Lake Bushland LCU4
Hope Road Reserve LCU5
Roe Highway & Kwinana Freeway interchange LCU6
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The LCU can be further divided into the following three sub - units:

1) the western portion at Forrest Road reserve is the narrowest section of the project reserve at approximately 100m width;

2) the middle section at Stock Road intersection is a much broader bushland reserve (up to 300m) in width; and

3) the eastern end near North Lake Road is up to 190m in width.

The visual amenity is generally higher at the middle and eastern locations due to the larger width of the reserve vegetation, as opposed to the Coolbellup Avenue / Sudlow Road and Forrest Road intersections where the narrower width results in less tree cover and more intervisibility between the adjacent residential uses.

The vegetation structure and ecological communities are typical of the Swan Coastal Plain and the Spearwood System. Specifically, the western portion of the LCU is Karrakatta Soils. The vegetation is known as Karrakatta woodland of Jarrah with Marri or Tuart with an understorey of *Banksia* and Sheoak. This is a similar vegetation structure as Kings Park.

Prior to European settlement the woodland would have been dominated by tall Tuart *(Eucalyptus gomphocephala),* Jarrah (*Eucalyptus marginata)* and Marri (*Corymbia callophylla)* with *Banksia* species and *Allocasuarina fraseriana* sub-dominating. Currently the bushland cover of LCU1 is increasingly dominated by *Banksia* species and *Allocasuarina fraseriana.*

The visual quality of this woodland is defined as “ecosystems that contain widely spaced trees with their crowns not touching”. By definition and as reflected on site, LCU1 provides a relatively high level of visual permeability. This means a 50 metre intact woodland buffer typically provides a 100% visual buffer. Given that most of the current project reserve is over 100 metres wide a full visual buffer is effectively provided between the two suburban residential homes on either side of the reserve i.e. the two residential communities cannot view each other.

In most parts of this LCU the undergrowth is intact. However, parkland, verges and some clearings of undergrowth have increased visual permeability; for example where Sebastian Crescent and Forrest Road closely align. Additionally from this area through to Sudlow Road, the poor vegetation cover and reduced project corridor width allows views from both the road and north side residents through existing woodland to rear fence lines on the south of Forrest Road. Except for one group of houses just west of Coolbellup Road, the majority of residents are provided with a visual buffer of high visual amenity. The area south of Malvolio Road in the eastern portion of Unit 1 is a good example of this.

3.2.1.1 LCU1 Visual amenity management objectives

- To maintain Matilda Birkett Reserve by Coolbellup Avenue;
- To maintain the sense of a vegetative “visual buffer” between the residential suburbs; and
- To ensure that the lack of intervisibility between the residential suburbs on either side of the road corridor is maintained i.e. from one side of the road corridor ensures no roofs are seen on the other side of the road corridor.

To facilitate the last two objectives, the following three sub objectives have been created:

- Maintaining and further enhancing the existing remnant vegetation cover on the edge of the road, to its greatest extent possible without compromising the functionality and safety of the proposed project;
- To provide endemic landscape design treatments along the road that reflect the existing remnant vegetation communities within the reserve; and
- To provide road infrastructure that is cognisant of not only the road users but also the adjacent static residents. For example, apply appropriate and sensitive urban and landscape treatments to infrastructure sited immediately adjacent to private residential boundaries, such as noise walls and cut or fill treatments. Refer to the mitigation section **(Section 5.3)**.

3.2.2 Landscape Character Unit 2: North Lake Road to Progress Drive Bushland

Sensitive landscape receptors: Remnant vegetation (refer to AECOM 2011b for more detail)

Sensitive visual receptors:

- Residential communities in North Lake i.e. Madeleine Court, Lygon Court, and Samual Court;
- Users of Adventure World Amusement Park; and
- Users of local parks such as Bassett Reserve.

Existing description

This small LCU covers the area from North Lake Road to Progress Drive and includes Bassett Reserve by Progress Drive (refer **Figure 6** for location). It is largely covered in existing native semi mature bushland which has the same visual quality as the bushland outlined in LCU1 above i.e. Karrakatta Woodland with high visual amenity. One point of visual distinction between LCU1 and LCU2 is that the topography is orientated in an easterly direction down towards Bibra Lake. Given vegetation cover is intact; views from North Lake Road in an easterly direction towards Bibra Lake are generally not afforded.

To the north, the suburban residential area of North Lake, i.e. Madeleine Court, Lygon Court, and Samual Court provide a defined visual edge to the LCU.

3.2.2.1 LCU2 Visual amenity management objectives

- To minimise the direct impacts on Bassett Park Reserve by Progress Drive; and
- To seek to maintain the sense of a vegetative "visual buffer" between the residential properties and the proposed project north of the study site to the greatest extent possible i.e. Madeleine Court, Lygon Court, and Samual Court.

To facilitate the second objective, the following three sub objectives have been created:

- Maintaining and further enhancing the existing remnant vegetation cover on the edge of the road, to its greatest extent possible without compromising the functionality and safety of the proposed project;
- To provide endemic landscape design treatments along the road that reflect the existing remnant vegetation communities within the reserve; and
- To provide road infrastructure that is cognisant of not only the road users but also the adjacent static residents. For example, apply appropriate and sensitive urban and landscape treatments to infrastructure sited immediately adjacent to private residential boundaries, such as noise walls and cut or fill treatments. Refer to the mitigation section (**Section 5.3)**.

3.2.3 Landscape Character Unit 3: Bibra Lake

Sensitive landscape receptors: remnant vegetation and wetland ecosystems (refer to AECOM 2011b, Syrinx 2011 (in prep) for more detail), the two Norfolk Island Pines (*Araucaria heterophylla*), Horse Paddock Swamp and Bibra Lake. The location of these receptors are illustrated in **Figure 2**.

Sensitive visual receptors:

- North Lake, Horse Paddock Swamp and Bibra Lake Recreational Users.

Existing description

LCU3 is the Bibra Lake area. Bibra Lake to the south is an open expanse of water, whilst to the north the lake is surrounded by a combination of low macrophytic (sedge) communities and a narrow strip of open *Melaleuca* and other Karrakatta woodland tree species, that is as little as 20 m wide in places. The occasional exotic trees such as Norfolk Island Pines provide distinct features in this landscape. To the south and east sides of Bibra Lake are the existing wetland communities which have been less impacted upon by human activities and provide an attractive vegetated backdrop, whilst the western part of this LCU is Bibra Lake Reserve formal parklands with recreational facilities, such as BBQ facilities and a bike path which provides a circular trail around the entire lake.

The portion of this LCU north of Hope Road includes Horse Paddock Swamp and contains a variety of vegetation types, in varying conditions. Infrastructure such as high voltage power lines, local power/telegraph lines, roads, paths, fence lines, bollards and signage clutter this area. This has resulted in large areas of vegetation clearance which in turn has reduced the visual amenity of the area and has allowed greater visual permeability. Vegetation clearance associated with the high voltage power lines creates a barren exotic grassland character that contrasts with the typical vegetation communities associated with the Beeliar Wetlands land system (refer to AECOM 2011b, for detailed descriptions of vegetation communities). Due to the largely open visual character, attractive views are afforded across the lake where public access is achieved. To the south and west sides of Bibra Lake the waterside parklands associated with Progress Drive and Bibra Drive e.g. Eliza Cave Reserve, provide classically beautiful landscapes, with large established trees in open grass immediately adjacent to the lake. This area has high recreational value.

3.2.3.1 LCU3 Visual amenity management objectives

- Minimise locating any road infrastructure within Bibra Lake or Horse Paddock Swamp;
- Use the implementation of Roe Highway Extension as a catalyst for restoration of Bibra Lake and Horse Paddock Swamp, including:
    - Improving the ecological health of the lake and surrounds e.g. by maintaining and further enhancing the existing remnant wetland and dry vegetation cover.
    - By providing endemic landscape design treatments along the road that reflect the existing vegetation within the reserve.
    - By upgrading the recreational facilities in the vicinity of the proposed project e.g. upgrading pedestrian and cycle paths, new bird hides.
- Minimise the level of visual intrusion that the proposed structures may have on views across Bibra and North lakes. Recognising the fact that the road infrastructure may be highly visible through this LCU, and that the community values views of the lake, this part of the road should be cognisant of the surrounding landscape values.
- Achieving a good aesthetic form for the propose structures should be balanced with achieving the desired ecological objectives (the reason for which the bridge structures are being proposed). In this setting it is suggested that the proposed structures should be simple, of low visual mass, evenly proportioned, unified, uninterrupted, of rational order and rhythm (not necessarily symmetrical), slender and light weight. Best practice design and engineering needs to be applied to help ensure "*A bridge is a whole not an assemblage of parts."(*Bridge Aesthetics: RTA - NSW)

3.2.4 Landscape Character Unit 4: Bibra Lake Bushland

Sensitive landscape receptors: remnant vegetation and wetland ecosystems (refer AECOM, 2011b) and Roe Swamp.

Sensitive visual receptors

- North Lake and Bibra Lake Recreational Users including users of the Cockburn Wetlands Education Centre.

Existing description

This LCU is principally covered by existing native bushland and wetland. The bushland is open Jarrah *Banksia* woodland which contrasts dramatically with the closed vegetation of Roe Swamp. The visual amenity of each vegetation type is similar; however subtle differences in the topography (in the order of 1 to 2 metres height) are the means that provide the vegetation variety and thus the visual interest in LCU4. The exposed soil surfaces, within LCU4 are grey to white coloured sands of the Bassendean System. These contrast with the green vegetation and the exposed areas of green and brown hues of the natural bushland ground. This LCU contains

the highly valued Wetlands Education Centre. Visual detractors in the area include the high voltage lines and the Hope Road corridor.

3.2.4.1 LCU4 Visual amenity management objectives

- Minimise the impact of road infrastructure within Roe Swamp;
- Minimise extent of vegetation clearance; and
- Use the implementation of Roe Highway as a catalyst for restoration in this part of the park, including:
    - Improving the ecological health of existing habitats.
    - By providing endemic landscape design treatments along the road that reflect the existing vegetation within the reserve.
    - By upgrading the recreational facilities in the vicinity of the proposed project e.g. upgrading pedestrian and cycle paths, new bird hides.

3.2.5 Landscape Character Unit 5: Hope Road Reserve

Sensitive landscape receptors: remnant vegetation (refer AECOM, 2011b).

Sensitive visual receptors:

- Residential communities in Bibra Lake; Peterborough Circle, Hope Road;
- Blue Gum Montessori School off Hope Road;
- Spanish Club
- Lakeside Recreation Centre
- Murdoch Pines Golf Club users: and
- Recreation users of local public parks such as Meller Park Reserve.

Existing description

This LCU is from Bibra Drive to the western edge of the Kwinana Freeway and Roe Highway interchange. Except for the most eastern portion of LCU5 the majority of the existing native vegetation has been cleared, and replaced with open parkland i.e. open grassland and the occasional trees or groups of trees. These trees are remnants of open Jarrah *Banksia* woodland and also include large grass trees. There are a number of visual detractors in the area such as the local power poles and high voltage lines.

The eastern end of Hope Road is an elevated, open location that provides clear views over this LCU.

The Murdoch Pines golf driving range, to the north of the proposed project, provides a manicured, open turf setting that contrasts with the surrounding native landscape. Like the majority of LCU5, its overall aesthetic quality is considered low. This is due in part to removal of indigenous vegetation which has allowed weed and other exotic plants to colonise and some areas of erosion exposing white/grey sandy soils. The removal of the native vegetation has also allowed views from the project area to adjacent residential areas.

As in LCU1 the adjacent residential areas at Peterborough Circle are orientated north away from the proposed project presenting a rear fence to the project site. Residents south along Hope Road are, however, orientated north and in effect their front gardens directly overlook the project site.

To the far east of LCU5 is a slightly sunken (below Hope Road levels) yet high quality stand of existing woodland. The vegetation community has fewer dominant tree species than LCU1; however it provides a rich ground cover, shrub and small tree diversity providing a very high level of visual amenity. The stand is not large (approximately 200m by an average of 80m wide) and does not provide a full visual screen between adjacent suburban residential areas.

3.2.5.1 LCU5 Visual amenity management objectives

- To provide vegetative “visual buffers” between the residential suburbs on either side of the proposed project corridor, that respond to the fence setting on the northern side of the road corridor and the local service road on the south side of the proposed project corridor; and
- To reduce the intervisibility between the adjacent residential suburbs and the proposed project with appropriate endemic vegetative treatments.

To facilitate the above two objectives, the following 2 sub objectives have been created:

- To maintain and further enhance the existing remnant vegetation cover on the edge of the road; and
- To provide endemic landscape design treatments along the road that reflects the existing remnant vegetation communities within the reserve.

3.2.6 Landscape Character Unit 6: Roe Highway and Kwinana Freeway intersection

Sensitive landscape receptors: existing infrastructure art work at the intersection i.e. the yellow lighting columns and bridge abutments and significant existing vegetation to the south east of the interchange.

Sensitive visual receptors:

- Residential communities in Leeming, North Lake and Bibra Lake such as those off Casserly Drive, Timber Ridge Retreat), Evergreen Court, Peterborough Circle;
- Kwinana Freeway and existing Roe Highway users; and
- Travellers on the Perth - Mandurah railway.

Existing description

This LCU is the Kwinana Freeway and Roe Highway interchange. The character unit is dominated by large scale road and rail infrastructure, with a large overpass crossing Kwinana Freeway and the Perth - Mandurah railway. The landform varies considerably in this LCU with infrastructure, including an elevated bridge structure over the Kwinana Freeway, lower than surrounding land forms. It is considered to be of lower landscape and visual amenity value, which is further decreased by the presence of over head power lines. However, the presence of the yellow sculptured light poles provides a distinctive road corridor landscape feature.

Some large stands of the native open Eucalypt bushland remain in and around the existing interchange. Some areas have been cleared around the interchange to allow for the existing interchange cuttings and embankments. However, the revegetation works are starting to establish. Some of the vegetation clearance allows views from adjacent residential areas of the interchange, particularly residential areas of North Lake. In addition the vegetative land cover between the interchange and the residential area of North Lake (around Peterborough Circle) is ineffective at screening views of the interchange and the light poles are prominent features where visible. Furthermore the revegetation approach means that areas of exposed white/grey sandy soils remain. However, to the east of the interchange, both to the north and south, the retention of the remnant bushland provides a vegetative and visual buffer between the interchange and adjacent land uses i.e. residents in Leeming, and the electricity works and to the south west.

3.2.6.1 LCU6 Visual amenity management objectives

- To provide full vegetative “visual buffers” between the residential suburbs of North Lake, Bibra Lake and Leeming between the proposed project and existing interchange;
- Provide additional connections to the cycle link along Kwinana Freeway; and
- Provide urban design treatments to infrastructure such as noise walls, lighting columns, bridge treatments that compliment those existing on Roe Highway.

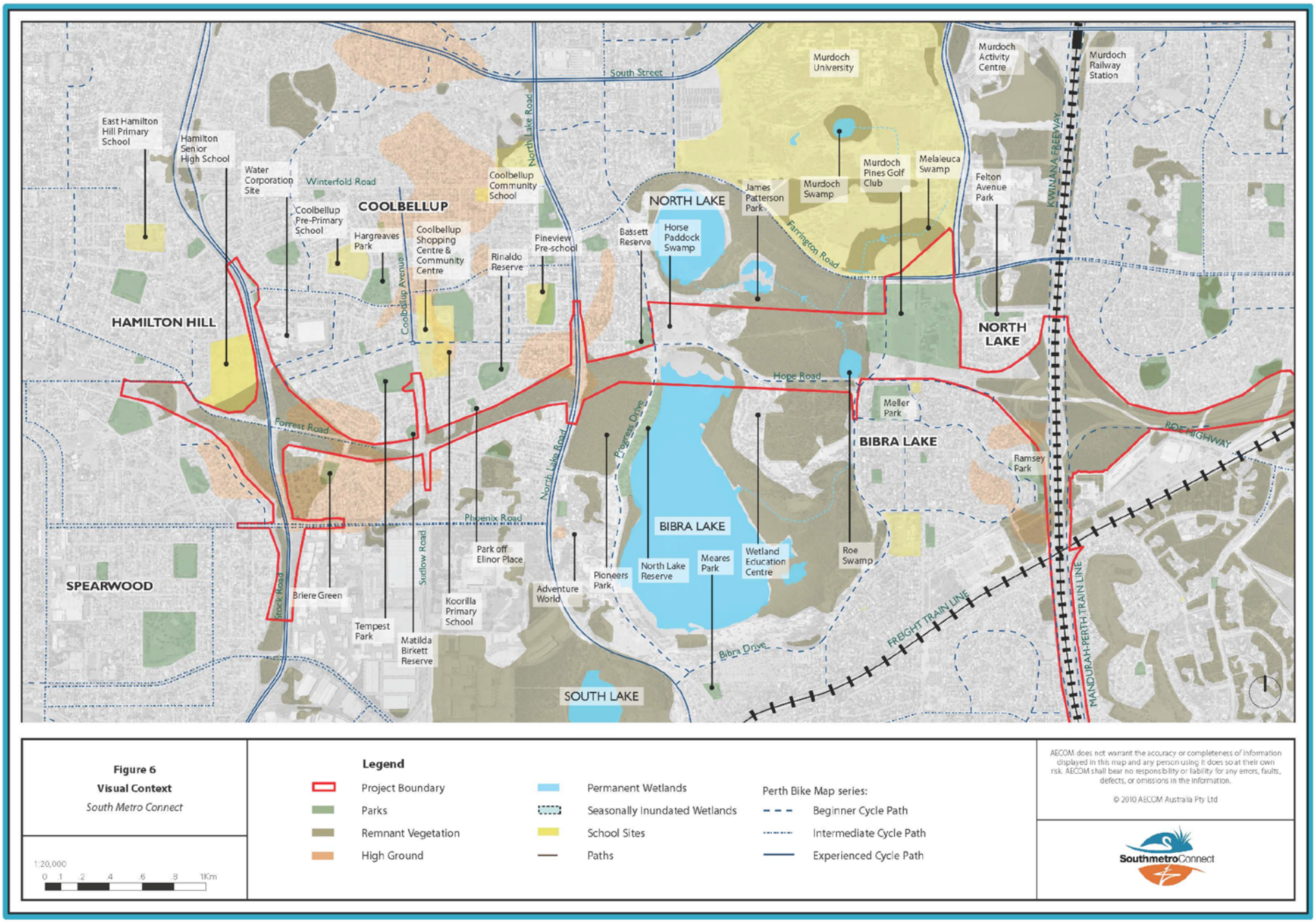
3.3 Visual context of the study area

Key community facilities and services that attract users who are cognisant of the surrounding landscape and may be in the locality for landscape appreciation i.e. localities where the landscape and visual context is important include:

- Beeliar Regional Park: including the Cockburn Wetlands Education Centre and extensive network of bikeways and footpaths;
- Murdoch Pines Golf Club;
- Spanish Club;
- Lakeside Recreation Centre;
- Adventure World;

- Local schools such as Blue Gum Montessori School (off Hope Road), Hamilton Senior High School; and
- Local parks within the suburbs: Meller Park, Matilda Birkett Reserve, Tempest Park.

Other key community facilities where landscape appreciation is less important to users, but are still considered key visual receptors include users of the Kwinana Freeway and Perth - Mandurah railway line to the east of the study area, Murdoch Activity Centre to the north west of the study area and Coolbellup shopping and community centre to the north of the study area. These facilities are illustrated on the Visual Context Plan, **Figure 6.**


East Hamilton Hill Primary School
Hamilton Senior High School
Water Corporation Site
Winterfold Road
Coolbellup Pre-Primary School
COOLBELLUP
Hargreaves Park
Coolbellup Shopping Centre & Community Centre
Coolbellup Community School
North Lake Road
Pineview Pre-school
Rinaldo Reserve
Coolbellup Avenue
HAMILTON HILL
South Street
Murdoch University
Murdoch Activity Centre
Murdoch Railway Station
KWINANA FREEWAY
Murdoch Pines Golf Club
Melaleuca Swamp
Murdoch Swamp
James Patterson Park
NORTH LAKE
Bassett Reserve
Horse Paddock Swamp
Farrington Road
Felton Avenue Park
NORTH LAKE
Hope Road
Meller Park
BIBRA LAKE
ROE HIGHWAY
Ramsey Park
Forrest Road
Progress Drive
North Lake Road
Phoenix Road
BIBRA LAKE
Park off Elinor Place
Sudlow Road
Stock Road
Briere Green
SPEARWOOD
Tempest Park
Matilda Birkett Reserve
Koorilla Primary School
Adventure World
Pioneers Park
North Lake Reserve
Meares Park
Wetland Education Centre
Roe Swamp
Bibra Drive
FREIGHT TRAIN LINE
MANDURAH-PERTH TRAIN LINE
SOUTH LAKE
1:20,000
0 .1 .2 .4 .6 .8 1Km
Figure 6
Visual Context
South Metro Connect
Legend
Project Boundary
Parks
Remnant Vegetation
High Ground
Permanent Wetlands
Seasonally Inundated Wetlands
School Sites
Paths
Perth Bike Map series:
Beginner Cycle Path
Intermediate Cycle Path
Experienced Cycle Path
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3.4 Key Community Visual Values

A review of available literature was undertaken to obtain an understanding of the general perception of visual values for the study area. The references reviewed included: the *Beeliar Regional Park Management Plan*, *The City of Cockburn Bibra Lake Management Plan* and EPA Bulletin 1088.

Following an extensive and well-publicised community engagement process, the visual elements identified as most highly-valued by the community are summarised below:

- The natural landscape of the area is a valuable educational resource as expressed physically by the Cockburn Wetlands Education Centre;
- The recreational value of the area including the visual experience of walking along trails and the visual connectivity between North Lake and Bibra Lake;
- The value of the visual expression of the existing vegetation, particularly as it relates to fauna habitat, for example, the Carnaby's Cockatoo habitat;
- Tranquillity around lakes;
- "Garden" views;
- Green landscaping (trees); and
- Sweeping views across Bibra Lake with limited intrusion of built infrastructure.

Through the three design workshops attended by members of the community, a number of issues and requests pertaining to the maintenance of the Visual Amenity of the area were identified. These are summarised below:

- Ensure that embankments are properly landscaped;
- Provide landscaping between noise barriers and properties;
- As well as using landscaping and vegetation to screen noise walls, many suggestions included the use of local art work to soften the infrastructure, inspired by youth art, street art, or local vegetation;
- Acknowledge Aboriginal Heritage in artwork - input into parks and design;
- Redevelopment of open space;
- Provide plenty of bicycle paths with shade;
- Provide visually appealing signage;
- Providing for an increased awareness of heritage sites (educational);
- Provide landscaping;
- Facilitate education;
- Consider the aesthetics (visual appearance) of Noise wall;
- Maintaining / improving recreational aspects of the lakes; and
- Blending into environment.

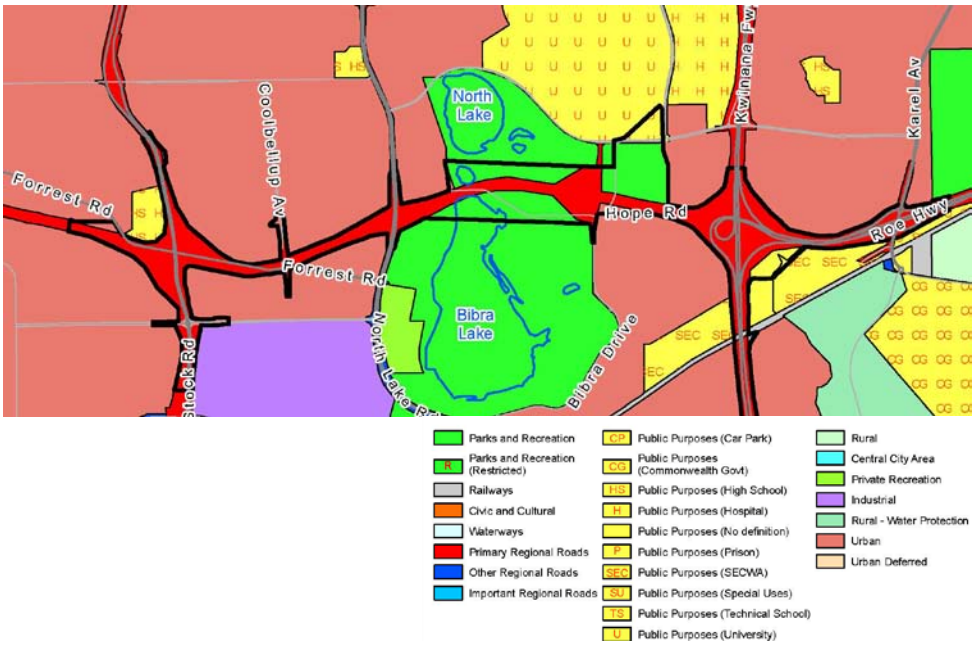
3.5 Applicable Legislation

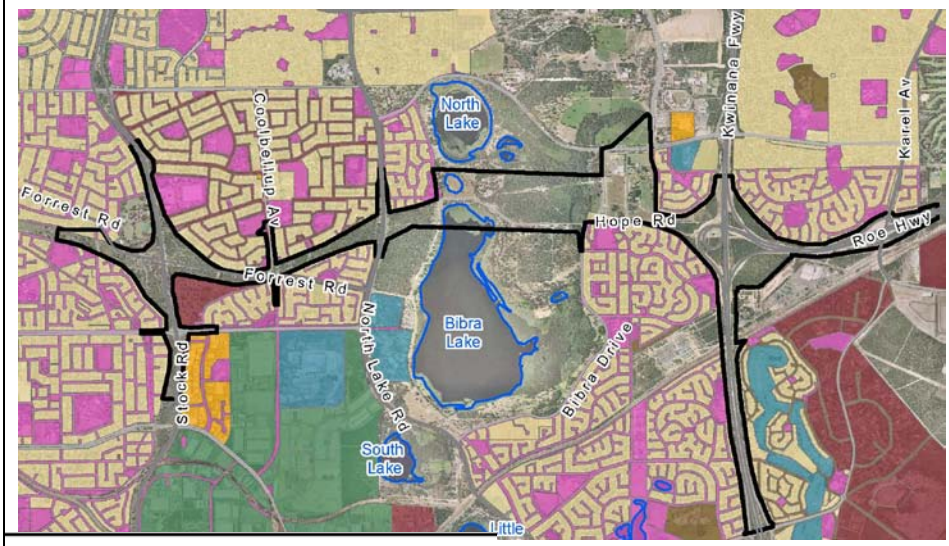
3.5.1 Strategic and Local Planning Framework

There is little relevant legislation which directly influences the assessment and implementation of the project with regard to visual amenity considerations. The following table **(table 2)** provides a brief overview of relevant legislative policies and standards.

Where it is felt that the proposed project may conflict with the local planning schemes, recommendations in the form of management (or mitigation) measures have been provided to avoid, reduce, remediate and compensate the impacts.

Table 2: Strategic and Local Planning Framework Table

Strategic Planning Framework	
Legislation / Policy Document	**Response / Relevance**
The Planning and Development Act 2005	Nothing specifically relating to the outcomes of the assessment. This document guides the development of local governments or planning authorities' statutory planning instruments.
Environmental Protection Act 1986	Nothing specifically relating to the outcomes of the assessment.
Directions 2031 Draft Spatial Framework for Perth and Peel, June 2009	Directions 2031 is a high level strategic plan that establishes a vision for future growth of the Perth and Peel region. The proposed project is located within the south-west sub-region. The document makes specific reference to the Beeliar Regional Park Network, of which Bibra Lake is part of this network, and that it is an environmentally significant feature worthy of protection. The document describes the park as *"the most significant environmental feature in the sub-region.....which contains significant vegetation complexes and protects a series of important wetlands*." The document states that "*continued urban growth must protect and appropriately manage areas that have a high conservation value, are important natural resources, and contribute to the natural amenity of the area."*
Perth Metropolitan Region Scheme (MRS)	This scheme covers the Perth Metropolitan area from Singleton in the south to Two Rocks in the north and east to The Lakes. The MRS defines the future use of land, dividing it into broad zones and reservations. An extract of the MRS, pertaining to the study area, is illustrated below.  It requires local government town planning schemes to produce detailed plans for their part of the region. The MRS Zoning advocates that "*.....all land reserved for Parks and Recreation shall be managed to protect the integrity, function and environmental values of the bushland and landforms to the requirement of the Western Australian Planning Commission on the advice of the Environmental Protection Authority and shall only be used for conservation, landscape and complementary purposes*." The proposed project is located almost wholly within the "*Primary Regional Road*" designation, which is "*the most important of the roads of regional significance in the planned road network, and are currently or proposed to be declared under the Main Roads Act 1930*."

Local Planning Framework	
Legislation / Policy Document	**Response / Relevance**
Cockburn Council Town Planning Scheme No. 3 and Local Planning Strategy	The City of Cockburn Town Planning Scheme No. 3 in combination with the Local Planning Scheme sets out the long-term planning directions for the municipality of Cockburn. It provides the rationale for the zones and other provisions of the scheme. ***Zoning:*** The proposed development is set aside in the "Primary Regional Road" zone, as illustrated in the extract of the Cockburn Zoning Plan whilst the surrounding study area immediately abutting the project area is zoned: - Regional Parks and Recreation Reserve: Bibra Lake is a regional park and recreation reserve; - Local Parks and Recreation Reserve: Matilda Birkett is a local park and recreation reserve; and - Residential Zone: "*To provide for residential development at a range of densities with a variety of housing to meet the needs of different household types*". An extract of Cockburn Zoning Plan is below and a detailed figure  **Legend** Industrial Zones Institutional/Public Uses Local Authority Reserves No Zone Residential Retail/Business Rural Special Zones Unknown ***Corporate Objectives:*** The City of Cockburn Council Planning Scheme also included corporate planning and environmental objectives and provisions with respect to visual amenity. These include: - "*To ensure that development will enhance the levels of amenity currently enjoyed by the community;* - *To conserve the quality, extent and uniqueness of the natural environment that exists within the district;* - *To conserve the character and historic value of the human and built environment; and* - *To ensure that the development of the district is undertaken in such a way that the balance between the natural and human environment is maintained*." ***A key profile and issue*** of the City of Cockburn Council Planning Scheme relevant to existing visual amenity relates to Beeliar Regional Park. The majority of the City's open space is encompassed in the extensive linear Beeliar Regional Park running on a north- south axis through the middle of Cockburn's jurisdiction. The suite of wetlands includes North Lake and Bibra Lake through which the proposed

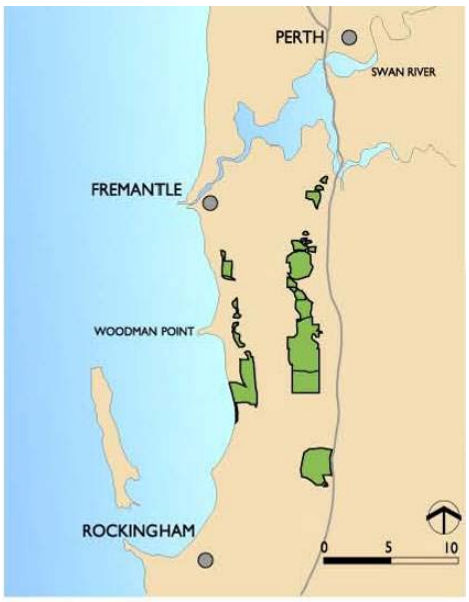
project transects.

Land Use and Management Guidelines are provided for this open space network in the local planning strategy and further reference is made to other management plans for the entire Beeliar Regional Park and specific areas within it i.e. the City of Cockburn Bibra Lake Management Plan and North Lake Management Plan.

Strategies and Actions: The following key strategies relevant to existing visual amenity include:

Strategy	***Action***
2.1 State Planning Strategy: Prevent further loss in biodiversity.	• Retaining and managing urban bushland in the planning process and making provision for a representative reserve system in strategic plans.
6.9 Open Space Strategy: Protect landscape, open space and public access.	• Consider landscape values when assessing proposed developments near national parks and other scenic areas. • Enhance the passive recreational values of Regional Open Space by the progressive implementation of management plans, including the provision of passive recreation facilities such as cycleways and seating.
6.13 Heritage Strategy: Enhance local identity and character by preserving buildings and places with historic, architectural, scientific or scenic value.	• Have due regard for buildings and places in Council's Municipal Heritage Inventory when considering applications for subdivision, rezoning and Planning approval.

Beeliar Regional Park Management Plan (2006)



This Management Plan was prepared on behalf of the Conservation Commission of Western Australia in accordance with the Conservation and Land Management Act 1984. The location of the park is illustrated on the image opposite. Roe Highway Extension is in the northern part of the Eastern Chain of the wetland system.

The Plan acts as an "umbrella" document, coordinating existing plans for specific areas of the Park.

A number of management zones were created for protecting the Park and guiding uses and management activities which are appropriate in certain Park areas. The management zones relevant to the study area are 8 – 15.

The key objectives relevant to this VIA are:

- To protect and conserve the lakes and wetlands of the Park.
- To protect, conserve and rehabilitate local flora species and vegetation communities in the Park.
- To minimise the impact of environmental weeds on the local plant species and communities in the Park.
- To restore degraded areas of the Park to a condition resembling the natural environment.
- To maintain and enhance the natural and cultural landscape qualities of the Park.
- To provide safe, convenient and structured access to, and within, the Park that is consistent with the Park's values.
- To minimise the impact of public utilities in the Park and provide cost effective, efficient and safe park services.

	• To facilitate community involvement in the management of the Park.
Bibra Lake Management Plan (2009)	The City of Cockburn has formally endorsed the strategies contained within the Beeliar Regional Park Management Plan and has created the Bibra Lake Management Plan. The plan's vision for Bibra Lake is key: *"To protect, enhance and promote the natural and cultural values of Bibra Lake; enabling sustainable community use of the lake and surrounds through the provision of a range of conservation, recreation and environmental education opportunities"* A number of key plan management objectives and actions specifically related to this assessment are outlined below. Management Objectives 1. Protect, enhance and foster the natural environmental values of Bibra Lake. 2. Protect and enhance the cultural and heritage values of Bibra Lake. 3. Create a distinctive identity for Bibra Lake as a community destination and place of connection to the natural environment. 4. Provide and maintain a network of access around Bibra Lake; enabling the values of the lake and surrounds to be explored and appreciated by the wider community while still protecting the natural environment. Management Actions (for the conservation zone) 1. Revegetate degraded areas in accordance with a staged implementation plan using local native species. 2. Control weeds to minimise fuel loads (and hence fire risk) and maintain, and where possible, improve the condition of native vegetation. 3. Upgrade existing pathways within the Conservation Zone; through the addition of strategically located boardwalks, seating and viewing nodes. 4. Establish new pathways within the Conservation Zone, in accordance with the Master Plan.
North Lake Management Plan (1986)	The 24 year old Murdoch University plan has a strong emphasis on Aboriginal and archaeological importance of North Lake. However a couple of key recommendations (section 3) may be considered of relevance to this VIA: • That the natural flora and fauna of the Coolbellup (North Lake) and Walliabup (Bibra Lake) wetlands area be preserved and rehabilitated. • Areas of mythological significance, site of occupation or other Aboriginal sites be protected and respected in future planning. Note: recommendation number 10 is that Roe Highway is not built through this landscape because of it's impact on "mythological and spiritual significance" and "natural environmental context." This recommendation did not specifically reference visual amenity. In addition this 24 year old document is superseded by the Beeliar Regional Park Management Plan (2006).

3.6 Anticipated forces for change that may impact on visual amenity

Some of the study area's landscape is anticipated to undergo a number of major changes in the next 20 years, whilst other areas are predicted to undergo very minor, incremental changes.

Predicted future changes that may impact on the existing character of the area include:

- Jandakot development: new residential community and industrial area to the south east of the proposed project;
- Murdoch Activity Centre: estimated to provide 30,000 jobs at Fiona Stanley Hospital, Saint John of God Hospital, Challenger TAFE, and the police and other organisations, immediately north east of the proposed project; Identified as a "strategic specialised centre" in the Directions 2031 Draft Spatial Framework for Perth and Peel (June 2009);
- O'Conner Industrial Area to the north west of the proposed project;
- Increasing the urban density of the area;

- The provision of Cockburn Coast, a significant urban regeneration project located south of Fremantle and overlooking the Indian Ocean. The project will involve the remediation and redevelopment of approximately 120 hectares of former industrial land, as a new oceanside community with an estimated population of 10,800; and
- Continued urban growth in the south-west subregion is anticipated within the *Directions 2031 Draft Spatial Framework for Perth and Peel, June 2009* document.

The gradual trend for urban intensification is anticipated throughout the study area which may result in further urban encroachment and land take of public and private open spaces. However with the exception of those key developments described above, for the remainder of the wider study area these gradual urban intensification changes are considered to be minor.

4.0 Description of the proposed project

4.1 Introduction

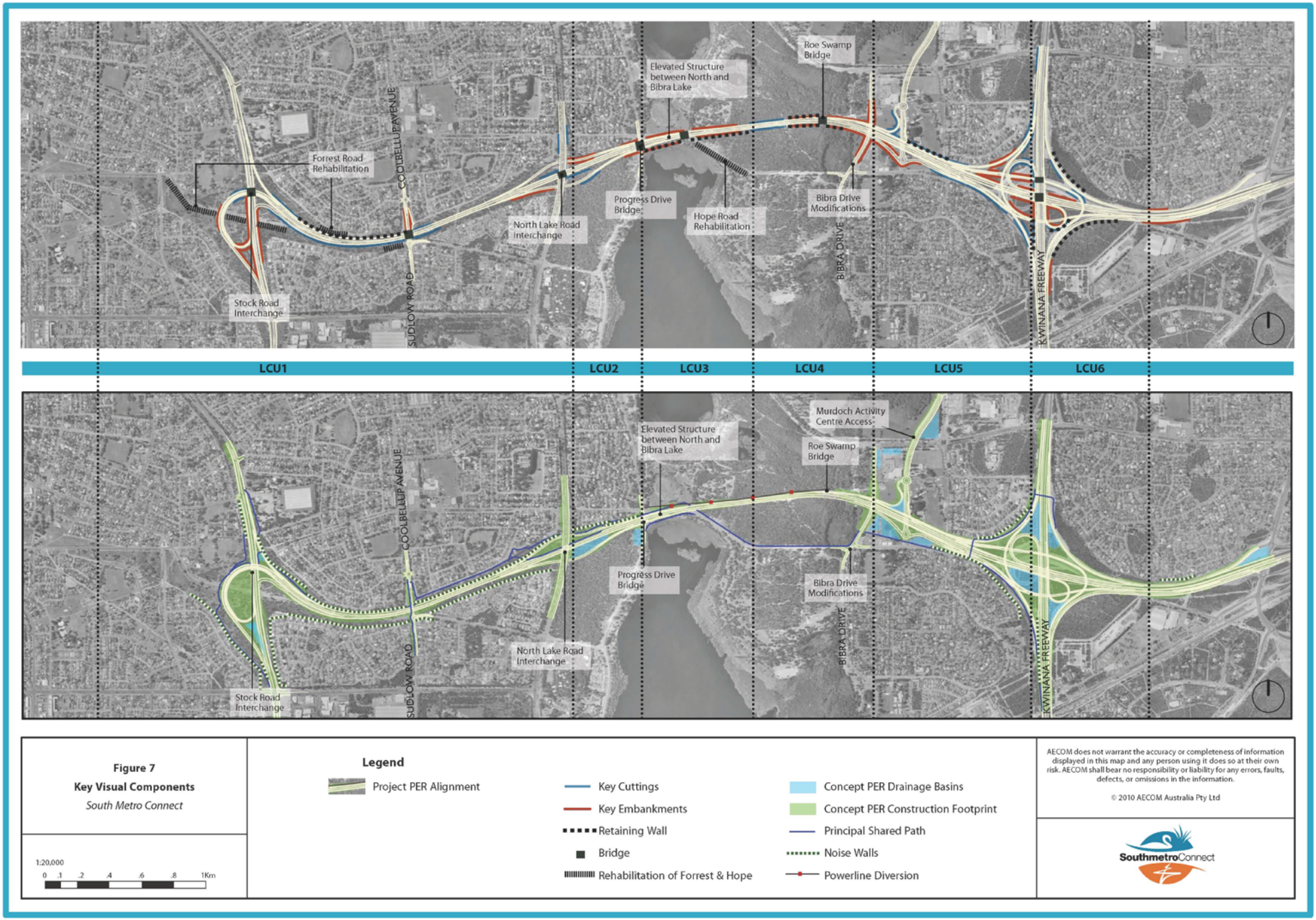
For detailed descriptions of the proposed project refer to:

- Roe Highway Extension Landscape and Urban Design Framework Report (LUDF), AECOM, 2011a.

This section provides a description of the proposed project as it relates to visual amenity. It draws out the features and elements of the work that have the potential to affect the visual amenity and landscape values identified in study area baseline conditions (**Section 3.0**).

The LUDF (AECOM, 2011a) has been developed in parallel with the engineering design and the visual impact assessment (VIA). The simultaneous development of the VIA and the LUDF (AECOM, 2011a), allows the visual management objectives and the visual impacts to be addressed more effectively through a collaborative design and assessment process.

To easily understand the key visual changes associated with the proposed project, the description of the engineering proposal has been divided into six parts; using the six discrete landscape character units described in the visual amenity conditions and baseline **Section 3.2**. In addition, a Key Visual Components of the proposed are depicted in **Figure 7**.


Forrest Road Rehabilitation
COOLBELLUP AVENUE
Elevated Structure between North and Bibra Lake
Roe Swamp Bridge
Progress Drive Bridge
Hope Road Rehabilitation
Bibra Drive Modifications
North Lake Road Interchange
Stock Road Interchange
SUDLOW ROAD
BIBRA DRIVE
KWINANA FREEWAY
LCU1
LCU2
LCU3
LCU4
LCU5
LCU6
Murdoch Activity Centre Access
Figure 7
Key Visual Components
South Metro Connect
1:20,000
0 .1 .2 .4 .6 .8 1Km
Legend
Project PER Alignment
Key Cuttings
Key Embankments
Retaining Wall
Bridge
Rehabilitation of Forrest & Hope
Concept PER Drainage Basins
Concept PER Construction Footprint
Principal Shared Path
Noise Walls
Powerline Diversion
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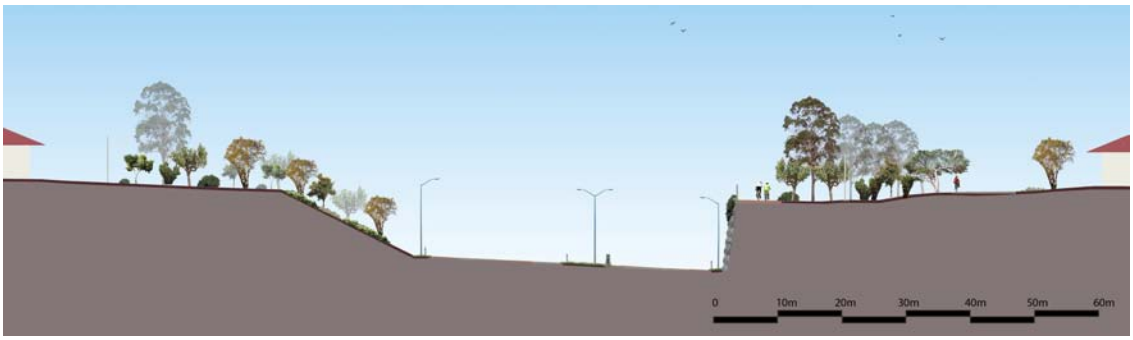
4.2 Key visual changes associated with the proposed project

4.2.1 Landscape Character Unit 1: Stock Road to North Lake Road Bushland

- This LCU contains the following key elements of the proposed project:
  - Stock Road interchange;
  - Coolbellup Avenue and Sudlow Road overpass (including a roundabout at Forrest Road / Sudlow Road intersection); and
  - North Lake Road interchange. The Roe Highway extension would go under north/south roads at all three locations.
- Removal of Jarrah Marri woodland or Tuart cover to the extent of the construction footprint, as illustrated in the Key Visual Components (**Figure 7**). Note the construction footprint extends west of Stock Road interchange by Hamilton Hill Senior High School and on the west side of North Lake Road.
- The main carriageway of the proposed project is sunken in a cutting from Stock Road (approximate chainage 6950) to Coolbellup Avenue and Sudlow Road (chainage 8430). The deepest part of the cutting could be up to 11metres between chainage 7350 and 7450. On the northern side of the road the PER concept design provides a retaining wall from chainage 7450 to 8100 The sunken nature of the proposed project is illustrated in the cross section below:

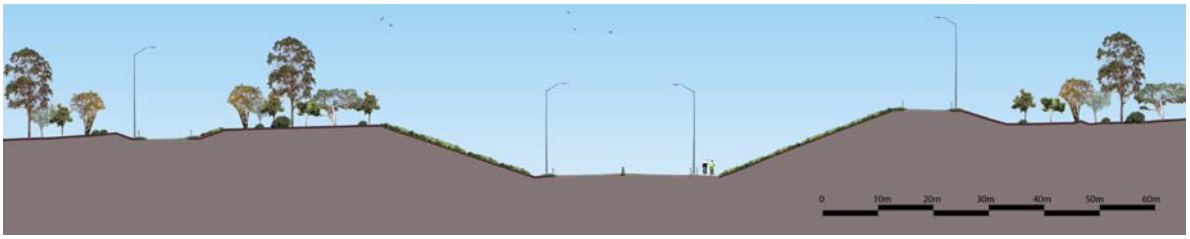


- From chainages 8430-9010 the main carriageway is slightly elevated onto an embankment, to potentially 3.3 metres above the existing ground level.
- Two small cleared basins, and three large basins which will not be cleared are located in and around the Stock Road/Roe Highway interchange.
- Part of the width of Forrest Road from Sudlow Road to O'Connell Street is to be rehabilitated and part is to be used for the westward extension of the Principal Shared Path.
- A principal shared path is to be accommodated on the western side of Stock Road interchange and along the northern flank of main carriageway through this LCU.
- A vegetative "visual buffer" on either side of the main carriageway is being provided through this LCU by maintaining existing vegetation (i.e. minimising the construction footprint) and revegetation works on road verges. This approach has been informed by the two key visual management objectives of LCU1 (described in section 3.2.1).
- Noise walls, estimated to be approximately 1.8 to 3.6 metres high are to be added on both the northern and southern side of the proposed project through this LCU. The tallest sections of noise wall (over 3.0 metre high) are on the northern side of the proposed project from approximate chainage 8600 to 9100 (North Lake Road).

4.2.2 Landscape Character Unit 2: North Lake Road to Progress Drive Bushland

- The key element of the proposed project located in this LCU is North Lake Road bridge at chainage 9180.
- Removal of Karrakatta woodland cover to the extent of the construction footprint, as illustrated in the Key Visual Components (**Figure 7**).

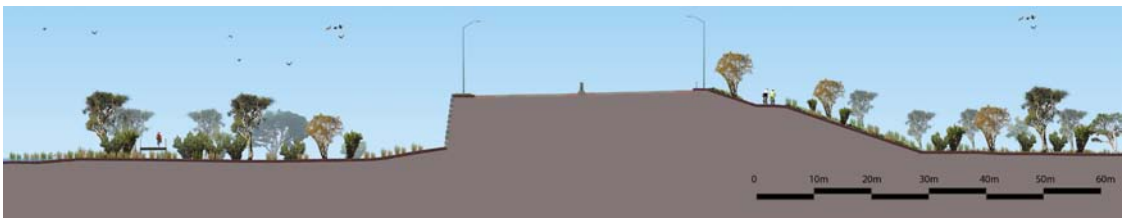
- To navigate the elevated landform of this LCU, the main carriageway is sunken in a cutting through the majority of this LCU. Potentially the cutting could be up to10.5 metres at chainage 9200, to accommodate the main carriageway going under North Lake Road. The sunken nature of the proposed project is illustrated in the cross section below.



- A principal shared path is to be accommodated along the northern flank of main carriageway through this LCU and is illustrated in the cross section above.
- Two cleared retention basins are to be located on the south side of the alignment, east of North Lake Road and west and Progress Drive.
- The construction footprint has been minimised through this LCU.
- Two noise walls between 2.4 and 3 metres high are proposed on the northern side of the proposed project.

4.2.3 Landscape Character Unit 3: Bibra Lake

- This LCU contains the elevated embankment and retaining wall formation between North Lake and Bibra Lake, which would be visually prominent.
- Removal of open *Melaleuca* and other Karrakatta woodland tree cover to the extent of the construction footprint, as illustrated in Key Visual Components (**Figure 7**). No additional construction footprint is required in this LCU.
- The main carriageway is to be elevated onto a visually prominent structure.



- To the north the structure will be embankment at 1:3 grade, whilst on the south side of the structure, a full height wall will be provided between chainages 9470 and 9970. This minimises direct impacts on Bibra Lake wetland communities and this aligns with one of the visual management objectives described in section 3.2.3. This is illustrated on the cross section above. It is anticipated the highest part of the raised formation could be around 8.6 metres high above the existing ground level (at chainage 9730). This elevated structure will contain three bridge structures, varying in span from approximately 18 to 35 metres wide. Two bridges would be provided at Progress Drive; a vehicle underpass and a separate pedestrian underpass. Whilst a third bridge (Dixon Road Bridge) would be provided at the approximate point where the existing Hope Road intersects the proposed project (eastern edge of the LCU).
- East of Dixon Road Bridge, the elevated structure would reduce in height from approximately 5.5 metres above the existing ground level to virtually at grade at the eastern end of the LCU at chainage 10350. To the north will be embankment at 1 in 3 grade, whilst on the south side a partial retaining wall with a 2m high embankment at 1:3 grade on the top, will be provided between chainages 10040 to 10300.
- Hope Road will be rehabilitated through this LCU.
- This LCU will contain one bio-retention basin (the Dixon Road Bio Retention Basin) to the north and east of Hope Road at approximately chainage 10160. This basin will not be cleared of existing vegetation.

- This LCU includes a section of the diverted 132 KV power line between Progress Drive and Roe Swamp. This section is anticipated to contain 2 power poles assumed to be 22 metres high on the northern side of the main carriageway. The power line is illustrated in the Key Visual Components (**Figure 7**).
- A principal shared path is to be accommodated along the northern carriageway through part of this LCU. At Hope Road the principal shared path will go under the main carriageway and continue along Hope Road.
- To minimise the level of visual intrusion through this LCU, no noise walls are proposed.

4.2.4 Landscape Character Unit 4: Bibra Lake Bushland

- This LCU contains the elevated bridge structure over Roe Swamp avoiding directly impacting the sensitive landscape receptor. This is in line with the visual management objectives in **Section 3.2.4**.
- Removal of predominantly open Jarrah *Banksia* woodland to the extent of the construction footprint. This is illustrated in the Key Visual Components (**Figure 7**). To minimise the extent of vegetation clearance, the alignment has utilised the existing power line easement where possible and this is in line with the visual management objectives in **Section 3.2.4**. No additional construction footprint is required in this LCU.
- The western part of the proposed project traversing this LCU has to navigate some elevated ground between chainage 10 350 and 10550 (up to 21 metres AHD). As a result a minor cutting may be required up to 1.7 metres at around chainage 10440. Through the mid section of this LCU at around chainage 10580 the natural landform drops off significantly into the Roe Swamp and a large elevated embankment of up to 5.8 metres (at chainage 10840) above the existing ground level, combined with a 120m long multi span bridge structure (which at the time of the assessment is approximately 36 metres wide), is required to navigate the swamp.
- This LCU contains a section of the diverted power line between Roe Swamp and Bibra Drive. This section is anticipated to contain 2 power poles assumed to be (for the purpose of this assessment) 22 metres high on the northern side of the main carriageway. The power line is illustrated in the Key Visual Components (**Figure 7**).
- The principal shared path does not traverse this LCU. It is to be accommodated along Hope Road to Bibra Drive Intersection and incorporated into Bibra Drive bridge, southern approach embankment.

4.2.5 Landscape Character Unit 5: Hope Road Reserve

- The proposed project is significantly wider and of a greater scale through this LCU and contains the following two key large scale elements of the proposed project:
  - Murdoch Activity Centre (MAC) Access; and
  - Bibra Drive Modifications.
- Removal of remnant open Eucalypt woodland to the extent of the construction footprint. No additional construction footprint is required in this LCU.
- To accommodate the rising landform of this LCU, a significant cut up to 7.2 metres deep, is required between chainages 11210-11840. From chainage 11840 until the edge of the LCU at approximately chainage 12040 the proposed project will be slightly elevated onto an embankment up to 3.6 metres high to navigate a dip in the natural landform.
- This LCU will contain a number of small, fully cleared retention basins to the south side of Bibra Drive and the MAC access and to the north near Farrington Road and Murdoch Drive at approximately chainage 11100.
- A principal shared path is to be accommodated along the southern flanks of main carriageway from chainages 11160 to 11850. After approximately chainage 11815, an elevated bridge crossing is provided to link the PSP to the Kwinana Freeway PSP to the north and the Roe PSP to the east.
- Lengths of noise wall estimated to be in the region of 1.8 and 2.4 metres high are proposed on either side of the proposed project at the eastern end of this LCU (approximately between chainages 11600 and 12200).

4.2.6 Landscape Character Unit 6: Roe Highway and Kwinana Freeway interchange

- This LCU contains the Kwinana Freeway interchange. The proposed project will greatly increase the size and scale of this interchange resulting in ten (10) new bridge structures with two new elevated bridge crossings over Kwinana Freeway, two underpasses of the Roe Highway, and some ramp over/under passes. These underpasses and bridges will require large scale earthworks. There will also be extensive retaining wall structures required on some ramps to minimise impacts on existing bush.
- Removal of remnant open Jarrah *Banksia* woodland to the extent of the construction footprint.
- The current interchange has one elevated bridge. The Roe Highway over Kwinana Freeway will be the second elevated crossing. This crossing will be double the size of the existing crossing and be a bridge structure up to 9.7 metres high.
- This LCU will contain the greatest length of principal shared path in line with visual management objectives in **Section 3.2.6**. Of particular note, the path will go over the Roe Highway with the northbound access to Kwinana Freeway, over the Kwinana Freeway and is only accommodated along the northern flanks of the Roe Highway to the east of the intersection. The paths are illustrated in the Key Visual Components (**Figure 7**).
- Two sections of noise wall anticipated being between 2.2 and 2.4 metres high are to be accommodated in this LCU, The first is adjacent to the northbound carriageway of Kwinana Freeway, whilst the second is along the east bound carriageway of the Roe Highway adjacent to Greenlea Rise, Briar Court and Tana Court. Refer to Key Visual Components (**Figure 7**).

5.0 Visual Impact Assessment

The visual impact assessment of the proposed project is divided up into the following sections:

- Visual influence of the proposed project;
- Assessment of representative viewpoints;
- Visual amenity management measure opportunities;
- Residual visual amenity effects assessment; and
- Opportunities for additional visual amenity mitigation.

5.1 Visual influence of the proposed project

Two Zones of Theoretical Visibility (ZTV#) (**Figure 8 and 9)** were prepared to inform this assessment:

- A ZTV of the preferred alignment; and
- A ZTV of the noise walls.

A3 figures are contained in **Appendix 1.** Note: areas in brown beige are “not visible”.

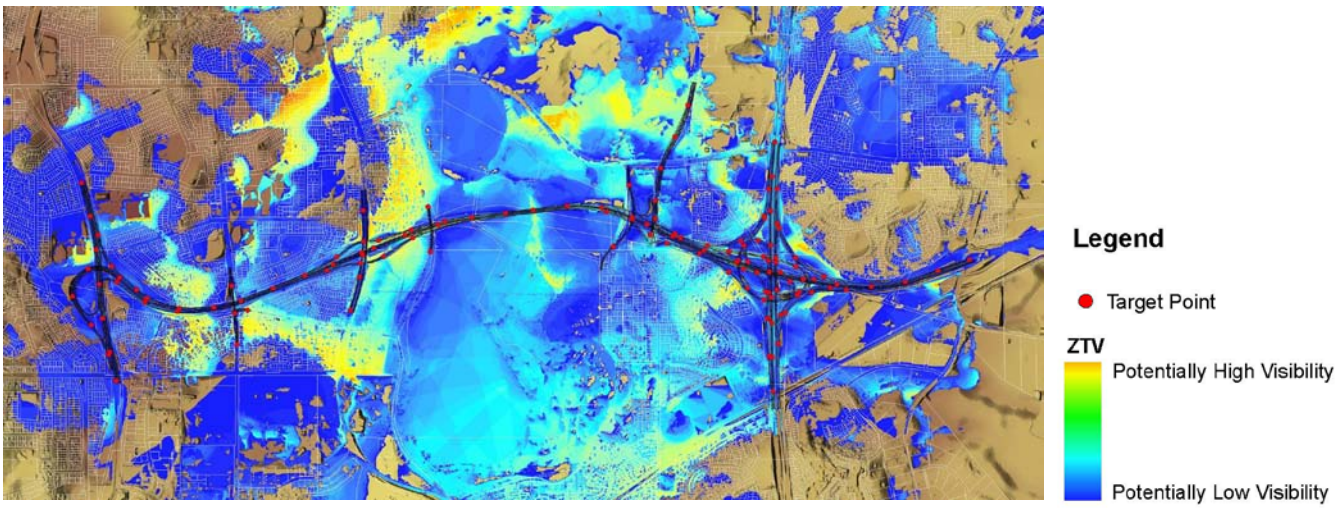


Figure 8: ZTV of the preferred alignment

The ZTV modelling only factors in landform data to determine the visibility. It does not analyse the screening influence of intervening land cover (i.e. vegetation and built form). Field investigations determined that many of the areas identified as theoretically “visible” in the ZTVs were in reality “not visible” due to the effect of intervening land cover.

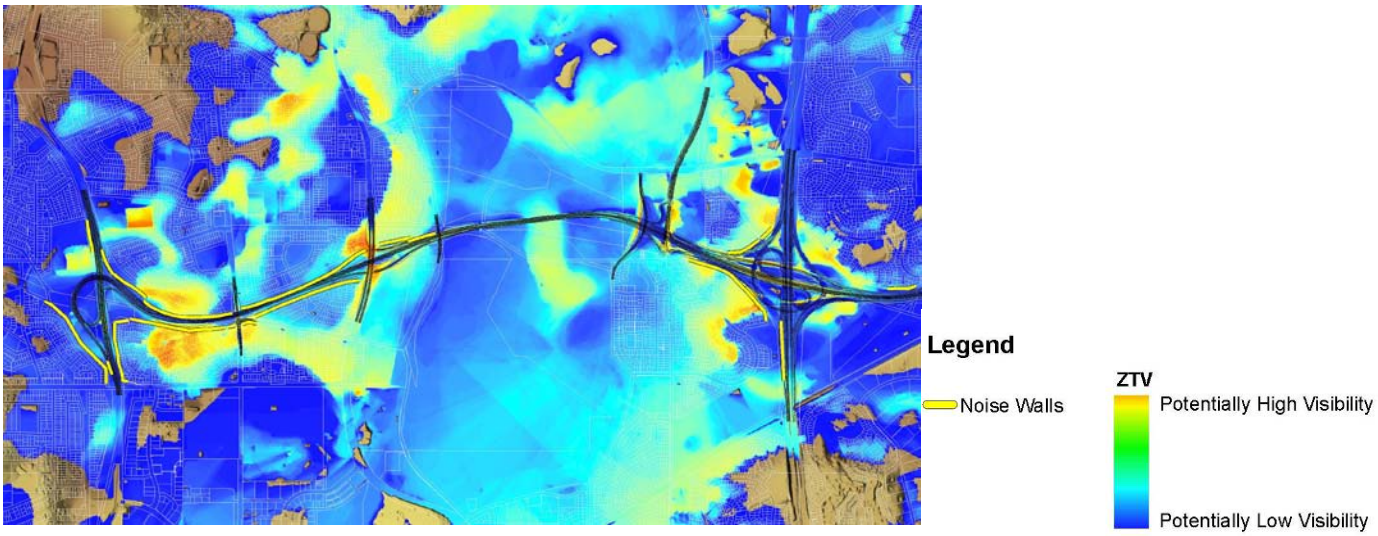


Figure 9: ZTV of the noise walls

5.1.1 The ZTV findings

Despite the mildly undulating topography of the study area, the ZTV of the PER concept design alignment (**Figure 8**) illustrates a relatively contained potential zone of visibility. In particular, a narrow band of visibility is illustrated from Stock Road to North Lake Road and from the Kwinana Freeway interchange to the east. For the remainder of the project area, particularly through LCU3 and 4 the level of visibility increases up to a maximum of 2 kilometres from the proposed project. This is because of greater potential visibility across the open, lowland waterscape of Bibra Lake and North Lake and the flatter, low lying topography of the Bibra Lake and North Lake residential areas. The highest areas of potential visibility are:

- around Sebastian Crescent (viewpoint 5 is sited in this location);
- around Provincial Mews (viewpoint 3 is sited in this location);
- east of Sudlow Road; and
- between North Lake Road and Progress Drive (viewpoint 10 is sited in this location).

It is noted that the model illustrates a low level of visibility at Bibra Lake. This is because at Bibra Lake, only about five percent of the full alignment can be viewed from close up to the alignment.

The ZTV of the proposed noise walls and alignment (**Figure 9**) illustrates that the potential visibility is more extensive than the preferred alignment on its own. This is to be expected as the noise walls are higher than the alignment. The noise walls are theoretically the most visible at the following locations:

- around Sebastian Crescent, viewpoint 5 (**Figure 10**) is sited in this location;
- around Provincial Mews, viewpoint 3(**Figure 10**) is sited in this location);
- around North Lake Road and Tait Place, north of the alignment;
- around Peterborough Circle, viewpoint 19 (**Figure 10**) is sited in this location; and
- around Stone Court / Currie Place south west of the Kwinana Freeway.

The field work revealed that the only longer distance views of the proposed project were those around Bibra Lake (viewpoints 12 and 13).

5.2 Assessment of representative viewpoints

5.2.1 Representative viewpoints selection

Based on the ZTV studies, subsequent field work and collaboration with the community consultation team, 18 representative viewpoints have been selected on the basis of providing potential views to the proposed project from publicly accessible locations. The field work showed that the actual ZTVs would be far less than that illustrated in the GIS visual constraints model. This is because the visual constraints model only works with landform and does not include land cover elements such as vegetation and built form.

The viewpoints represent the range of publicly accessible views where visual impact arising from the proposed project could be expected. No viewpoints were taken from any private property but through this assessment the impact on private views has been considered. The visual impact for each representative viewpoint is assessed based on the assessment criteria listed in **Section 2.3.2** and **Table 1**.

Photo simulations illustrating the proposed project have been produced for five viewpoints: 6, 10, 11, 12 and 15. These are anticipated to represent the most sensitive public viewing locations where the project corridor is anticipated to be highly visible. A list of the 18 viewpoints selected is provided below and are shown on the Representative Viewpoint Locations map **(Figure 10).**

1) View south from Hamilton Senior High School pedestrian footbridge
2) View north from unnamed public open space by Forillion Avenue and Briere Green
3) View north west from Provincial Mews
4) View north along Sudlow Road
5) View south east from Sebastian Crescent near the junction with Juno Place
6) View south across Matilda Birkett reserve (off Ceres Place)
7) View south from unnamed public open space by Elinor Place and Malvolio Road
8) View north from Paddington Court
9) View from trail looking south east across North Lake
10) View from Bassett Reserve, by Rossetti Court
11) View north east from jetty off Bibra Lake Reserve
12) View north east from footpath by Bibra Lake Reserve
13) View from bench in Eliza Cave Reserve
14) View from Hope Road by the Cockburn Wetlands Education Centre
15) View north from Hope Road by Blue Gum Montessori School
16) View north from junction of Hope Road and Gilchrist Avenue
17) View south and west from Allendale Entrance, over Granton Garden
18) View south east at the junction of Peterborough Circle and Tulkara Way

Enlarged views of each viewpoint can be found in Appendix 1 **(Figures 11 to 21)**.

5.2.2 Representative viewpoints assessment

The assessment of representative viewpoints considers the visual impacts arising from the proposed project upon the 18 representative viewpoints. It evaluates the significance of the level of visual impact anticipated for each of these viewpoints.

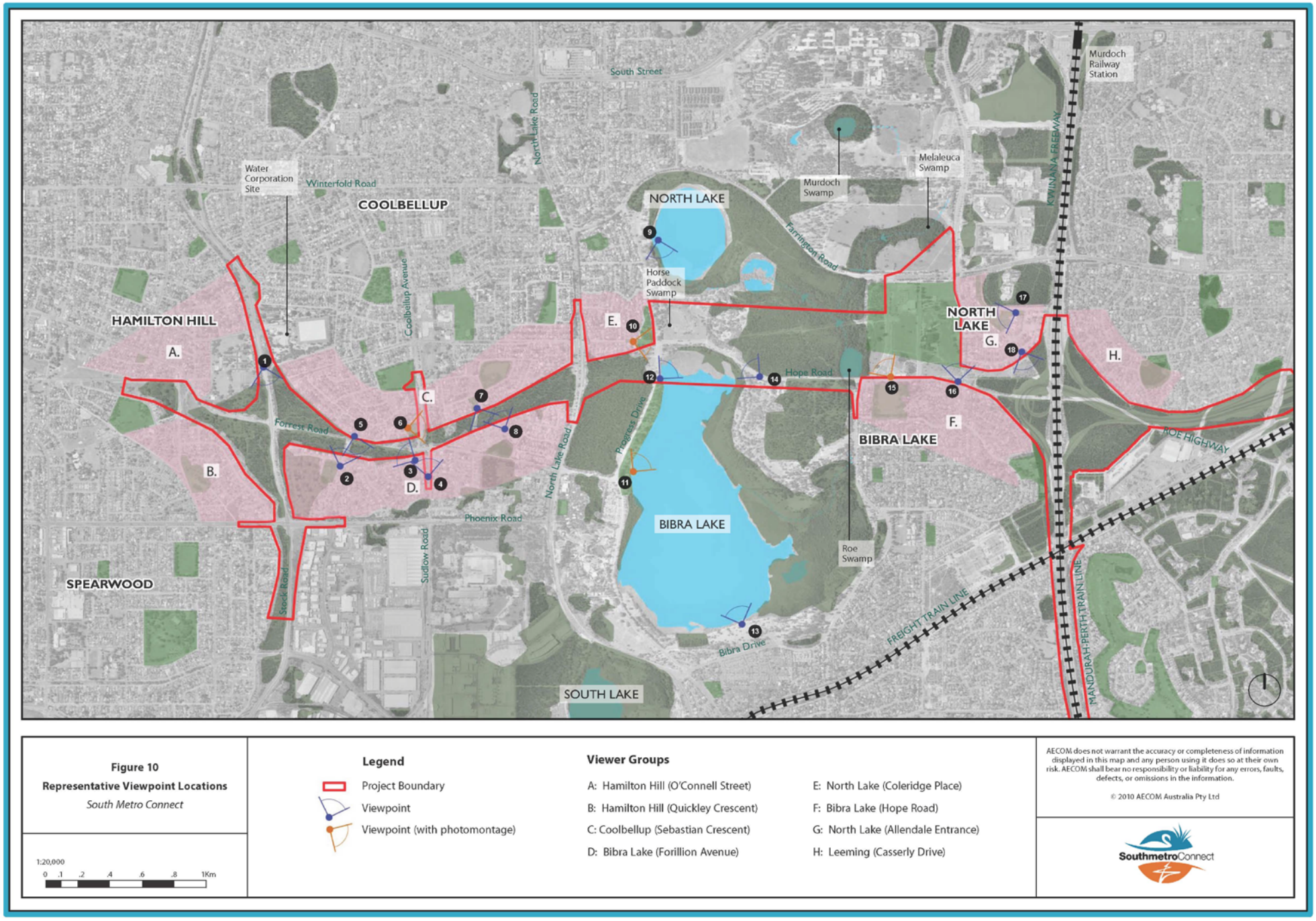


Figure 10
Representative Viewpoint Locations
South Metro Connect

1:20,000
0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Viewpoint
- Viewpoint (with photomontage)

Viewer Groups

A: Hamilton Hill (O'Connell Street)
B: Hamilton Hill (Quickley Crescent)
C: Coolbellup (Sebastian Crescent)
D: Bibra Lake (Forillion Avenue)
E: North Lake (Coleridge Place)
F: Bibra Lake (Hope Road)
G: North Lake (Allendale Entrance)
H: Leeming (Casserly Drive)

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Viewpoint 1: View south from Hamilton Senior High School pedestrian footbridge

Viewing situation

The viewpoint is taken looking south bound along Stock Road (a regional road), from the existing pedestrian bridge to Hamilton Senior High School. The bridge crosses where some of the works are proposed close to Stock Road. The view is typical for road users going southbound along Stock Road and represents the "worst case" view for the users of Hamilton Senior High School.

The view is currently framed by the bushland along road embankments and illustrates the dense bushland character of Landscape Character Unit 1: Stock Road to North Lake Road Bushland.

Visual sensitivity

This view is considered to be of a **medium to low** visual sensitivity. The view is not particularly scenic or in a locality where the viewer's principal interest would be to appreciate landscape, a road is already precedent in the view and it is anticipated to have a moderate number of viewers. The school children are not anticipated to focus their attention on landscape appreciation. In addition the view is considered to be representative of large numbers of viewers using Stock Road, who are transient and considered to be of lower visual sensitivity.

Magnitude of visual change and viewpoint viewshed analysis

A significant portion of Stock Road interchange would be visible from this viewpoint.
The construction activities anticipated to be visible include levelling of the vertical alignment at the interchange, particularly associated with the introduction of large embankments for the elevation of Stock Road over the on ramp to the Roe Highway. In addition clearing of Tuart / Jarrah bushland on either side of Stock Road would be visible as well as part of the temporary traffic diversion on the west side of Stock Road and the principal shared path (PSP) on either side of Stock Road.

Once operating, the main direct change is anticipated to be generated by the elevated Stock Road over the Roe Highway on ramp in the middle ground of the view, bringing large scale road infrastructure in close proximity to the pedestrian crossing.

Existing elevated road lighting already exists in the view and, therefore, the introduction of additional lighting to the intersection is anticipated to represent an incremental increase in the light levels compared to the current situation.

Given there is a precedence of road infrastructure within the view, this part of LCU1 has some capacity to absorb change associated with the proposed project. This partially lowers the anticipated magnitude of change, given the change represents an intensification of existing road infrastructure in the view rather than new elements. However, given the change would be clearly visible at a close distance and change a large portion of the view, the magnitude of change for both the construction and operational phase is judged to be **considerable.**

The intensification of the road infrastructure and grade separation is considered to generate an **adverse** change.

Visual impact

The combination of a low to medium visual sensitivity to change and a considerable adverse level of visual change are predicted to generate a **moderate** adverse significance

Existing view south from Hamilton Senior High School pedestrian footbridge

Viewpoint 2: View north from the junction of Forillion Avenue and Briere Green

Viewing situation

This viewpoint is situated less than 40 metres from the proposed road infrastructure in the quiet suburban residential area of Bibra Lake. It is considered to be representative of viewer group D in Bibra Lake. It is located at the junction of Forillion Avenue and Briere Green, on a quiet cul de sac road, directly adjacent and north of a well maintained pocket park.

The view affords a clear, uninterrupted, yet narrow field and ground level view, in a north-north east direction. The view is currently framed by suburban residential housing fence lines.

Visual sensitivity

This is a view of **high** sensitivity, even though it is anticipated to be viewed by a small number of viewers. In addition the view is an attractive viewing situation within a residential area. This is because the view is representative of static receptors living in this area of Bibra Lake, who are considered to be highly sensitive to change associated with the introduction of unprecedented road infrastructure into their views. Currently from this viewing location, views of Forrest Road are perceptible, but the majority of the existing road is screened by vegetation on the southern flank of the road corridor.

Magnitude of visual change and viewpoint viewshed analysis

The main carriageway and principal shared path (PSP) would not be visible (even without the noise wall) and therefore it is predicted that during the construction phase the visible activities would be of:

- a noise wall anticipated to be 2.4 metres high directly in front of the view at the end of the easement;

- removal of some of the Tuart / Jarrah tree canopy; and

- elevated construction activities associated with the road cuttings and lighting.

Once operating, the main direct change is anticipated to be generated by the introduction of the noise wall in the middle ground of the view. This wall would be higher than the existing garden fences (estimated to be 1.5 to 1.8 metre high). However it would serve to largely block views of the road infrastructure, with the exception of elevated road lighting (should it be used). There is no lighting along this section of Forrest Road however; there may be sky glow from other street lighting and properties in the area. The introduction of elevated lighting into an unlit area would result in considerable increase in the light levels compared to the current situation at night.

During daylight hours, the main visual change would be generated by the noise wall. This wall would block views to the main carriageway. The wall could be designed to either blend in with the existing view or be an attractive feature in the view. Given the noise wall would partially blend in with the surrounding area it is anticipated to be **adverse** and **noticeable**.

However at night, the visual change associated with the introduction of elevated road lighting may generate a **considerable** long lasting adverse change given there is limited precedence of road lighting in the view.

Visual impact

During the day time, the combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance

During the night time, the combination of high visual sensitivity to change and considerable adverse level of change are predicted to generate a **moderate / major** adverse significance.

Existing view north from the junction of Forillion Avenue and Briere Green

Viewpoint 3: View north west from Provincial Mews

Viewing situation

This very close distance view is located on the boundary of the existing highway reserve and is anticipated to be approximately 50 metres from the proposed road infrastructure.

The ground level view is directed in a north west orientation from a suburban street in a location where the road corridor is at its most narrow. The view is from a footpath looking through vegetation to Forrest Road. In this locality the view illustrates how the narrow existing bushland buffer is ineffective at fully screening Forrest Road from the residential area.

The view is representative of worst case scenario viewers for viewer group D in Bibra Lake. However this situation is somewhat unique for this viewer group, as the residential properties "front" the corridor, instead of the typical situation where the back garden fences of the residential properties front the corridor.

The viewing situation clearly illustrates the very close proximity of the proposed road to a suburban street and the bushland character of Landscape Character Unit 1: Stock Road to North Lake Road Bushland

Visual sensitivity

The visual sensitivity of this vantage point is considered to be **medium**. Even though the view is representative of more sensitive, static residential receptors in viewer group D: the Bibra Lake suburbs, their sensitivity to change associated with the upgrade of Forrest Road to a highway is lowered as an existing road is already visible in the view. This is different to representative viewpoint situation 2 discussed in the previous section.

Magnitude of visual change and viewpoint viewshed analysis

The most visible construction activities are those associated with the construction of the noise wall anticipated to be in the region of 2.4 metres high directly in front of the view.

Until the noise wall is constructed, the following activities may be glimpsed through the breaks in the vegetation retained in the foreground of the view:

- removal of Tuart / Jarrah dominated vegetation;
- the excavation of the cuttings;
- introduction of the road lighting;
- construction of the principal shared path (PSP) on the north side of the main carriageway; and
- the revegetation activities of Forrest Road.

Once operating, the main direct change is anticipated to be generated by the introduction of the noise wall directly in front of the view. Unlike viewpoint 2 assessed, there is no precedence of garden fences in the view, however, it would principally block views of the remaining road infrastructure, with the possible exception of elevated road lighting. There is no lighting along Forrest Road in this locality but, there may be sky glow from other street lighting and properties in the area. The introduction of elevated road lighting into a principally unlit area would result in considerable increase in the light levels compared to the current situation at night.

The introduction of the noise wall and lighting in very close proximity to this view would generate a long-lasting, major change in the view. A substantial part of the view would be affected by the foreground obstruction to views to vegetation. In addition, the potential visual change associated with the introduction of elevated road lighting may generate a considerable long lasting change. The changes during both daylight and night time hours would represent a **dominant** level of change.

The introduction of a noise wall, foreshortening views in the day and lighting at night are anticipated to generate an **adverse** change.

Visual impact

The medium visual sensitivity to change and a dominant adverse level of visual change are predicted to generate a **moderate - major** adverse significance

Existing view north west from Provincial Mews

Viewpoint 4: View north along Sudlow Road

Viewing situation

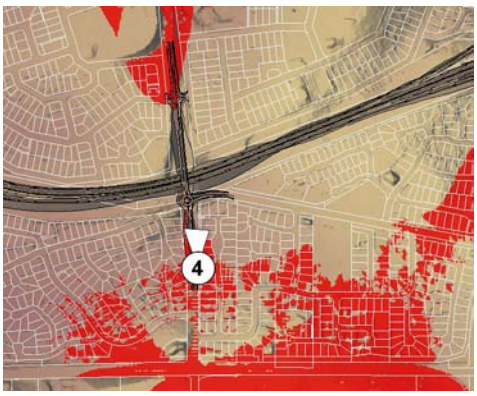
This is a very close distance view, in a location directly impacted by the proposed project. The view is of Sudlow Road / Coolbellup Avenue and Forrest Road intersection and is illustrative of views from connecting local roads to the future project.

The existing view is a clear, uninterrupted view from a car, directed immediately north along Sudlow Road. The view is enclosed on the east by the brick walls of the residential properties, whilst to the west it opens up into an undesignated open space. In the backdrop of the view some roofs of the existing properties on higher ground in the North Lake viewer group (E) can be seen breaking the canopies of the existing tree cover.

Visual sensitivity

This view is considered to be of a **low** visual sensitivity. The view is not particularly scenic or in a locality where the viewer's principal interest would be of landscape appreciation. Furthermore a road is already precedent in the view and unlike the situation represented in viewpoint 1, it is anticipated to have a relatively low number of transient viewers.

Magnitude of visual change and viewpoint viewshed analysis



The most visible construction activities would be those associated with the construction of the grade separation of Sudlow Road / Coolbellup Avenue and the main carriageway, including a roundabout to access Forrest Road, and a portion of the principal shared path (PSP). This would include substantial earthworks associated with embankments of Sudlow Road / Coolbellup Avenue bridge crossing and creation of cuttings associated with the sinking of Roe Highway under the bridge. In addition the removal of Tuart dominated tree cover in the road verge in the foreground of the view and a large portion of the vegetation in the middle to background of the view associated with relocating Coolbellup Avenue east of its current alignment. Coolbellup Avenue is currently not visible in this view.

The introduction of the noise walls are anticipated to be screened by the properties on either side of Sudlow Road.

Once operating, the main direct change would be the introduction of Sudlow Road / Coolbellup Avenue bridge and Forrest Road roundabout in the middle ground of the view. This would include associated infrastructure such as road lighting and the PSP.

The introduction of elevated road lighting into a principally unlit area would result in considerable increase in the light levels compared to the current situation at night.

Even though local road infrastructure (including some street lighting on Sudlow Road) is present in the existing view, the introduction of the roundabout, bridge and embankments in very close proximity to this view would generate a long lasting, large scale and major change in the view. A substantial part of the view would be affected. The replacement of a wooded suburban landscape in the backdrop of the view with large scale road infrastructure in the fore and middle ground of the view would result in an **adverse** and **considerable** level of change during both day and night time hours.

Visual impact

The low visual sensitivity to change and a considerable adverse level of visual change are predicted to generate a **moderate** adverse significance

Existing view north along Sudlow Road

Viewpoint 5: View south east from Sebastian Crescent near the junction with Juno Place

Viewing situation

This viewpoint is located approximately 15 metres from the proposed infrastructure. The view is from Sebastian Crescent and is directed south east toward and across Forrest Road. The view is representative of viewer group C – Coolbellup, particularly where a local residential property "fronts" the corridor instead of the typical situation where the back garden fences of the residential properties front the corridor such as the residential static viewers along Sebastian Crescent.

The view illustrates the existing nature strip (or bushland buffer) between Forrest and Sebastian Roads. This buffer visually separates the adjacent residential areas from the existing road.

The view illustrates the bushland character of Landscape Character Unit 1: Stock Road to North Lake Road Bushland.

Visual sensitivity

The visual sensitivity from this viewpoint is considered to be **medium**. Even though the view is representative of more sensitive static, residential, receptors in viewer group C: Coolbellup suburb, their sensitivity to change associated with the upgrade of Forrest Road to a highway is lowered as an existing road is already visible in the view. This is different to representative viewpoint situations 2 and 3 discussed in the previous section.

Magnitude of visual change and viewpoint viewshed analysis

Views south would be relatively extensive, but would not include the sunken carriageway itself. As illustrated in the photograph, the screening effect of land cover, principally vegetation, precludes views south of Forrest Road.

The most visible construction activities would be those associated with the construction of the noise wall, PSP and the revegetation of Forrest Road at the top of the main carriageways cutting. In addition the removal of the Tuart dominated vegetation in the middle to background of the view would be highly evident as well as any elevated construction activities (e.g. cranes) associated with the main carriageways cuttings and lighting. However the views would be glimpsed through breaks in the retained Tuart dominated vegetation directly in front of the view.

Once operating, the main direct change is anticipated to be generated by the introduction of the noise wall and PSP in the middle ground of the view. The PSP and the noise wall would largely block views of the remaining road infrastructure, with the exception of road lighting. There is no lighting along Forrest Road in this locality; however, there may be sky glow from street and properties in the area. Therefore, the introduction of lighting would be principally into an unlit area and could result in considerable increase in the light levels compared to the current situation at night.

During the day time, the PSP and noise wall would be the new key element introduced in the view. Even though this change is in close proximity to the view, it would result in an incremental change and therefore is considered to be a **noticeable** magnitude of change. As there may be vegetation removal the change would be **adverse.**

However at night, the visual change associated with the introduction of elevated road lighting may generate a considerable long lasting change into a landscape where there is no precedence of road lighting. The level of change would be **considerable** and **adverse** in nature.

Visual impact

During the day time, the combination of medium visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate an impact of **moderate** adverse significance

During the night time, the combination of medium visual sensitivity to change and considerable adverse level of change are predicted to generate an impact of **moderate** adverse significance.

Existing view south east from Sebastian Crescent near the junction with Juno Place

Viewpoint 6: View south across Matilda Birkett reserve (off Ceres Place)

Viewing situation

This close distance view at approximately 40m from the closest part of the proposed infrastructure is from a footpath along Whitmore Place (a residential street) across Matilda Birkett reserve, north of the proposed project. The view is orientated in a south east direction and incorporates Coolbellup Avenue.

The view illustrates a typical view for close distance residential receptors in representative viewer group C (Coolbellup). It is also considered to be indicative of views from Matilda Birkett reserve. Currently the tree cover in the parkland precludes views of Forrest Road.

Visual sensitivity

This is a view of **high** visual sensitivity as it is a popular local recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the area for potentially prolonged periods of time. Furthermore the sensitivity of the receptors is elevated as the existing road infrastructure is barely perceptible in the view.

Magnitude of visual change and viewpoint viewshed analysis

Visibility into the wider landscape from this viewpoint is low. However, it is predicted that both the construction and eventual operation of Coolbellup Avenue would be visible in the middle to backdrop of this view. The view of Coolbellup Avenue is, and would continue to be, filtered by vegetation retained within the pocket park.

The key construction activities would include removal of Tuart dominated vegetation in the backdrop of the view and earthworks associated with raising Coolbellup Avenue onto an embankment, to facilitate it crossing the main carriageway. Once operating, the main change in the view would be a road further in the background of the viewpoint, raised onto a gently sloping embankment. This is illustrated in the photomontage below.

Views of the bridge crossing over the main carriageway, noise walls and the principal shared path during both the construction and operation phase, would be screened by the vegetation retained in the pocket park and are not predicted to be visible from this viewpoint.

As Coolbellup Avenue is currently visible in the view there is precedence for road infrastructure. Coolbellup Avenue would be moved some distance from the viewpoint and the pocket park, which could (with appropriate mitigation measures) improve the visual amenity and setting of the park. The impact of the unmitigated scheme has been determined as adverse as the elevation of Coolbellup Avenue would make it more prominent in the view. During the day even though the change is in close proximity to the view and would be long lasting, the existing vegetation partially visually assimilates the elevated road into the view. The magnitude of visual change would therefore be minor, **adverse** and **noticeable**.

Should elevated road lighting be used its introduction into a principally unlit landscape would result in a **considerable** change at night.

Visual impact

During daytime the combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance

During the night time, the combination of high visual sensitivity to change and considerable adverse level of change are predicted to generate a **moderate / major** adverse significance.

Existing View south across Matilda Birkett reserve

Scenario 1: Photo simulation illustrating "unmitigated" proposed project

Scenario 2: Photo simulation illustrating a "mitigated" proposed project

Viewpoint 7: View south east from unnamed public open space by Elinor Place and Malvolio Road

Viewing situation

This very close viewpoint is located where the principal shared path is proposed. The view is from a footpath, directed south east from the corner of Elinor Place and Malvolio Road, by an unnamed public open space and illustrates a typical existing view from Malvolio Road.

The view is representative of viewer group C (Coolbellup) and is used to illustrate a very close visual impact where a local residential access road “fronts” the corridor.

The view is of the bushland character of Landscape Character Unit 1: Stock Road to North Lake Road Bushland and the residential suburbs on the other side of the bushland cannot be viewed.

Visual sensitivity

This is a view of **high** visual sensitivity as the unnamed local park caters for a relatively large number of locals, who can frequent the area for a potentially prolonged period of time. Furthermore the sensitivity of the receptors is elevated as the existing road infrastructure is not precedent in this area and is, therefore, uncharacteristic in the view.

Magnitude of visual change and viewpoint viewshed analysis

Visibility into the proposed project area would be relatively contained.

To minimise the impact of the proposed project the concept construction footprint has been kept to a minimum. This is illustrated in **Figure 7, Key Visual Components**. In situations such as this viewpoint assessment, the effect on visual amenity of this action is clearly evident. Minimising the footprint means that a landscape buffer of approximately 40 metres wide would be retained which would partially screen both the construction and eventual operation of the main carriageway and the noise walls.

The most visible construction activities would be those associated with the installation of the principal shared path (PSP) along Malvolio Road, with some potential Tuart dominated vegetation removal. In the middle to background of the view, it is possible that the noise walls construction, vegetation removal, earthworks and installation of the lighting would be glimpsed through the retained vegetation.

Once operating, the main direct change is anticipated to be generated by the PSP along Malvolio Road. It is envisaged that the 3 metre wide red tarmac path (with 0.5 metre offset on either side) would be accommodated to the southern side of Malvolio Road. It is anticipated this facility would be lit. The introduction of this path in a substantial part of the view would increase the scale of transport infrastructure in very close proximity to the view. Furthermore, the introduction of a lit piece of infrastructure into principally an unlit area would result in a considerable increase in the light levels compared to the current situation at night. It is recommended that as part of the mitigation measures the introduction of low level lighting is introduced along the PSP to reduce the visual impact of lighting. It is not recommended the lighting is removed from the PSP to reduce the visual impact of light at night, for CPTED (Crime Prevention through Environmental Design) reasons.

Unlike Viewpoints 1 - 5, there is no precedence of a road in the middle to backdrop the view. However, through the retention (and potential further enhancement) of the landscape buffer, views of the road could be screened from view and, therefore, the visual change and subsequent impact would be substantially reduced. The only possible exception would be the introduction of lighting. There is no lighting in the road reserve currently and the introduction of road lighting into a principally unlit area would result in a considerable increase in the light levels compared to the current situation at night.

Considering the above, it is anticipated that the level of visual change would be greater during the night, as the lighting would be perceived in a substantial part of the view along both the main carriageway and the principal shared path, in a landscape that is principally unlit. The level of change at night would be **considerable** and **adverse** in nature**.**

During the day time, the PSP would be the new key element introduced in the view, but at ground level. Even though this change is in close proximity to the view, it would result in an incremental change and therefore is considered to be a **noticeable** magnitude of change. As there may be vegetation removal the change would be **adverse.**

Visual impact

During the day time, the combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance.

During the night time, the combination of high visual sensitivity to change and considerable adverse level of change are predicted to generate a **moderate / major** adverse significance.

Existing view east from unnamed public open space by Elinor Place and Malvolio Road

Existing view west from unnamed public open space by Elinor Place and Malvolio Road

Viewpoint 8: View north from Paddington Court

Viewing situation

This is a close distance view at approximately 70 metres viewing distance. The view is directly north by the entrance to no. 14 Paddington Court. This view is representative of viewer group D (Bibra Lake) and illustrates a typical residential view from locations where the residential properties back on to the road corridor.

Currently the view illustrates how a dense bushland backdrop is provided to the properties as the upper elements of the bushland canopy can be clearly seen. This bushland backdrop is what residents currently view from their properties.

Visual sensitivity

This viewpoint is located at the end of a quiet residential street and is not accessed by many public views. However the residents (which the viewpoint is representative of) who may experience visual changes in the view from this location are anticipated to be highly sensitive to adverse visual changes and the permanency in the viewing situation. This is because the sensitivity of the receptors is elevated as existing road infrastructure is not precedent and is therefore, uncharacteristic in the view. This is a view of **high** sensitivity.

Magnitude of visual change and viewpoint viewshed analysis

Even though the main carriageway is to be elevated by approximately 1 metre in this location, the only key construction activity that would be visible is the removal of some of the Tuart tree cover and elevated construction activities required to install the noise wall in the middle to background of the view. This change would be permanent. It is possible that if cranes or tall construction equipment were used (e.g. to install the road lighting), that these activities would also be temporarily viewed.

Once operating the only visual change anticipated during the day would be less Tuart tree cover and glimpses of upper elements of the noise wall in the backdrop of the view, whilst at night the change may be greater with direct views of elevated road lighting at night. Given existing light is not precedent within the proposed project area, the level of change is considered greater. Furthermore, as the new light source is in close proximity to the viewpoint and sensitive residents, light trespass and spill may be an issue.

Considering the above, the change during the day would be minor or **noticeable** in the backdrop of the view. However at night, the visual change associated with the introduction of road lighting may generate a **considerable** and permanent change.

The removal of vegetation and introduction of road infrastructure is considered to generate an **adverse** change.

Visual impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance during the daytime. At night, it is predicted that the change would be considerable and therefore **moderate / major** adverse significance.

Existing view north from Paddington Court

Viewpoint 9: View from trail looking south east across North Lake

Viewing situation

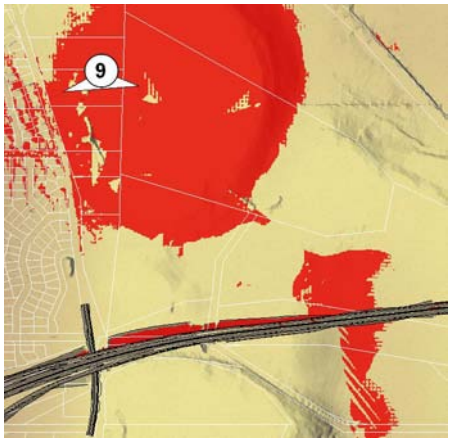
This medium to long distance viewpoint at approximately 670 metres viewing distance has been taken from the edge of North Lake. The foreground of this vantage point is dominated by the existing lake and parkland landscape, which has a generally open and natural character.

The view is orientated south east toward Hope Road and the proposed project and has been used to illustrate the worst case view for recreational users of North Lake, where they would obtain clear, uninterrupted views.

Visual sensitivity

This is a view of **high** visual sensitivity as it is a popular regional recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the area for a potentially prolonged period of time. Furthermore, the sensitivity of the receptors is elevated as existing road infrastructure is not precedent and therefore uncharacteristic in the view.

Magnitude of visual change and viewpoint viewshed analysis



Even though the embankment / retaining structure (over 8 metres high) between Bibra Lake and North Lake would be visible, it is anticipated that the vegetation between North Lake and Horse Paddock Swamp would screen views of most of the construction activities and the operating proposed project.

The key components of the proposed project that may be visible during the construction may include elevated construction equipment such as cranes or other tall plant. During the operational phase, it is predicted that the power line poles would be visible above the tree canopies as well as possible glimpsed views of moving vehicles (particularly larger trucks) through breaks in the canopy of the tree cover between North Lake and Horse Paddock Swamp as well as elevated lighting columns (if they are used).

No noise walls are proposed on the structure or would be visible. The greatest magnitude of change could be during the night, should tall lighting be added to the elevated structure. This is because existing lighting is not precedent in the view. In addition when considering the visual impact of light at night, it is predicted few viewers would be at this viewpoint at night.

Even though this landscape has no precedence of road infrastructure and therefore an inherently lower capacity to absorb change, the change during the day and night would be glimpsed, minor and at some distance in the backdrop of the view resulting in a **noticeable** change**.** The introduction of large scale road infrastructure, into a wetland landscape is considered to generate an **adverse** change.

Visual impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance.

Existing view from trail looking south east across North Lake

Existing view from trail looking south east across North Lake zoomed in to illustrate the project area in the backdrop of the view.

Viewpoint 10: View from Bassett Reserve by Rossetti Court

Viewing situation

This viewing situation is similar to that presented in viewpoint 6. However, in this instance the view is from the middle of Bassett Reserve and not from the perimeter road (Rossetti Court in this case). It is only a couple of metres distance from the closest component of the road infrastructure (proposed edge of Progress Drive) and is orientated in a south east direction.

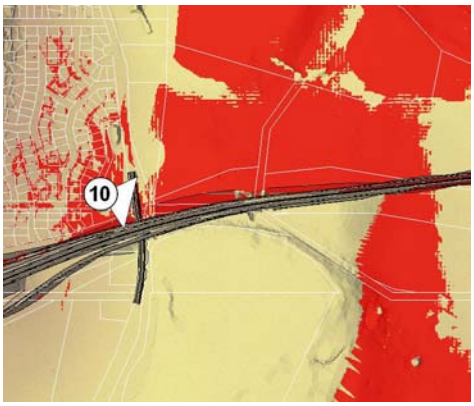
The view illustrates a typical view for close distance residential receptors in representative viewer group E (North Lake). It is also considered to be indicative of views from Bassett Reserve. The view from the middle of Bassett Reserve is currently a filtered view through the perimeter parkland tree cover of Horse Paddock Swamp, Progress Road, Hope Road, the existing power lines and Bibra Lake. This tree cover currently mostly precludes views of Bibra Lake.

Visual sensitivity

This is a view of **high** visual sensitivity as it is a popular local recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the areas for potentially prolonged periods of time. Furthermore, the sensitivity of the receptors is elevated as the existing road infrastructure is barely perceptible in the view.

Magnitude of visual change and viewpoint viewshed analysis

Both the construction and eventual operational activities associated with the following key proposed project elements are anticipated to be highly visible, in close proximity to this viewpoint:



- embankment structure between Bibra Lake and North Lake;
- Progress Drive bridges and Progress Drive upgrade;
- Horse Paddock Swamp (or Hope Road) bridge;
- The large detention basin to the north and east of Hope Road at approximately chainage 10160, when it is inundated. Given this basin would not be cleared of vegetation it's presence at other dry times would not be perceptible;
- Relocation of the power line; and
- The principal shared path (PSP).

Contrary to the theoretical visibility shown on the viewshed analysis and as illustrated in the photomontage, views further east of the proposed project over Roe Swamp are unlikely to be visible.

During the construction phase, the following key activities may be visible:

- removal of the two Norfolk Island Pine trees, other parkland trees and the dry vegetation communities on the northern edge of Bibra Lake; and
- construction equipment, such as earthmoving equipment and possible elevated structures such as cranes, used to install elevated road lighting and the power line.

Once operating, the Progress Drive bridges and the 1:3 embankment dividing Bibra and North lakes (up to 8.6 metres high) would be the most visible elements in the view.

In the background of the view, through breaks in existing vegetation to be retained, the Dixon Road bridge and Bio-retention basin may be visible, though these should not break the horizon in the view. In addition the relocated power line and power poles (already visible) would be visible in the middle to background of the view, the lower components of which would be partially screened by existing vegetation. No noise walls are proposed on the structure.

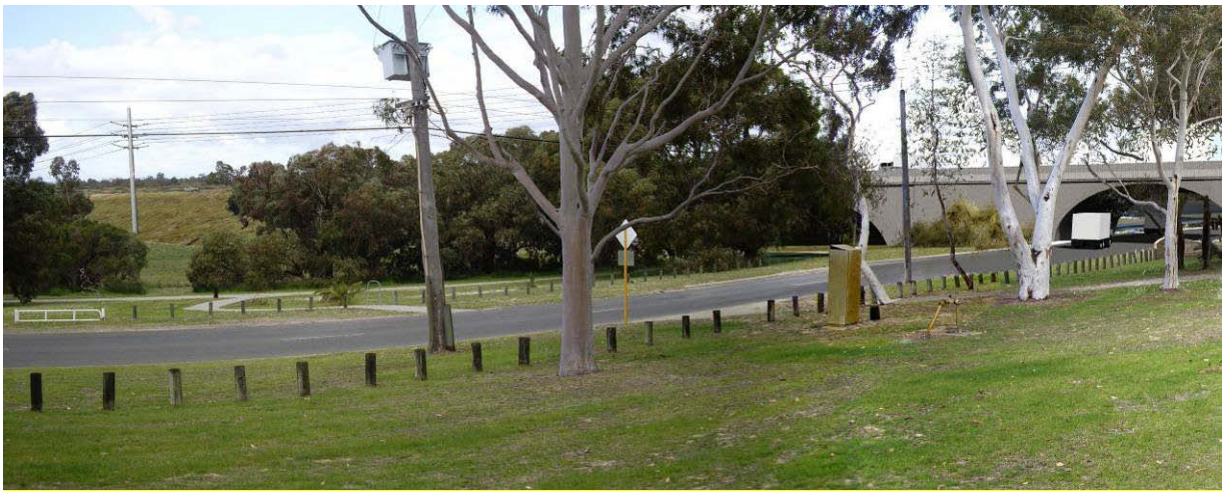
Should elevated lighting columns be used on the top of Progress Drive bridges and along Bibra Lake and North Lake structure, the impacts at night would be highly perceptible and very prominent given existing street lighting is not precedent in the view.

Considering the above, the level of change is considered to be **dominant,** as a substantial portion of the view would be changed in very close proximity to the view point. Furthermore this wetland landscape has an inherently lower capacity to absorb change of this nature, as there is limited precedence for large scale, elevated road infrastructure in the existing view. This change is anticipated to be **adverse**.

Visual impact

The combination of a high visual sensitivity to change and a dominant adverse level of visual change are predicted to generate a **major** adverse significance

Existing view from Bassett Reserve by Rossetti Court



Scenario 1: Photo simulation illustrating "unmitigated" proposed project

Scenario 2: Photo simulation illustrating a "mitigated" proposed project

Viewpoint 11: View north east from jetty off Bibra Lake Reserve

Viewing situation

This medium to long distance viewpoint at approximately 800 metres viewing distance has been taken from the jetty in Bibra Lake. The foreground of this viewpoint is dominated by the open lake, with the formal parkland landscape framing the view to the west, where some marginal water edge rehabilitation works are occurring. It has been selected to illustrate Landscape Character Unit 3: Bibra Lake, where the existing public open space fronts the lake.

The viewing situation provides a clear, uninterrupted view north from the jetty, across Bibra Lake to the project site.

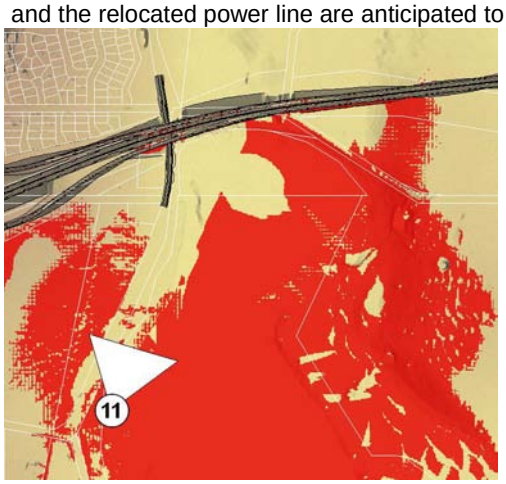
The viewpoint is close to the Waldorf School for Rudolf Steiner Education and Adventure World. It is predicted that views from these two potentially sensitive viewer groups are not anticipated and that this view is illustrative of the worst case scenario view from the western edge of Bibra Lake in the open parkland.

Visual sensitivity

This is a key viewing location of **high** visual sensitivity as it is a popular local and regional recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the area for potentially prolonged periods of time. There is also, no precedence for large scale road infrastructure in the view.

Magnitude of visual change and viewpoint viewshed analysis

Both the construction and eventual operational activities associated with the proposed embankment / retaining structure between Bibra Lake and Horse Paddock Swamp, the Horse Paddock Swamp (or Hope Road) bridge, and the relocated power line are anticipated to be visible in this view. All other activities associated with proposed project, including those associated the PSP in front of the retaining structure and with Progress Drive, are either not predicted to be visible or barely perceptible at this distance. This is illustrated in the viewpoint analysis.



During the construction phase, the following key activities are predicted to be visible, from the viewpoint:

- removal of the dry bush land communities (*Melaleuca* and other Karrakatta woodland trees); and

- construction equipment, such as earthmoving equipment and possible elevated structures such as cranes, used to install elevated road lighting and the power line.

Once operating, some stands of the taller dryland vegetation between the structure and Bibra Lake would be permanently removed and a full height retaining wall (up to 8 metres high) is predicted to be perceptible in the backdrop of the view (as illustrated in the photomontage). In addition, the upper components of the power lines and poles are predicted to be just perceptible, as is the case in the existing view and illustrated in the photomontage. Most of the Dixon Road bridge would only be glimpsed through breaks in the existing tree cover retained on the lake edge. Over time the dry land vegetation on the edge of Bibra Lake combined with the rehabilitation of Hope Road may preclude views to the lower parts of the structure. No noise walls are proposed on the structure or would be visible.

Should elevated lighting columns be used on the top of the retaining structure, the impacts at night may be easily perceptible and, given lighting is not precedent in the backdrop of the view, the change at night may be highly visible.

Considering the above, the change would result in the introduction of a distinct new element into a visually prominent but distant part of the view. Given this valued landscape has no precedence for large scale elevated road infrastructure the capacity to absorb change of the proposed project is inherently lower. However at this distance the magnitude of change has been judged as **noticeable.** The change during daylight and night time

hours is predicted to be the same. The introduction of large scale road infrastructure into a waterscape landscape is anticipated to generate an **adverse** change.

Visual impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate a **moderate** adverse significance.

Existing view north east from jetty off Bibra Lake Reserve

Scenario 1: Photo simulation illustrating "unmitigated" proposed project

Scenario 2: Photo simulation illustrating a "mitigated" proposed project

Viewpoint 12: View north east from footpath by Bibra Lake Reserve

Viewing situation

This close to middle distance viewpoint, at approximately 300 metres viewing distance, has been taken from the edge of Bibra Lake, in the open formal parkland. The foreground in this viewpoint is dominated by the formal parkland landscape and marginal water edge habitat. Similar to viewpoint 11, this view has been selected to illustrate Landscape Character Unit 3: Bibra Lake, where the existing public open space fronts the lake.

The viewing situation provides a clear, uninterrupted view from the footpath at the edge of the lake, across Bibra Lake to the project site. It has been selected to illustrate the "worst case" view from the edge of Bibra Lake Reserve.

Visual sensitivity

Unlike viewpoint 11, this viewing location does not represent a "lookout" and instead is representative of a transient view from the footpath around the lake. However it is considered to be of **high** visual sensitivity as the footpath is a popular local and regional recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the area for potentially prolonged periods of time. In addition, given there is no precedence for large scale road infrastructure in the view, this elevates the sensitivity of the viewers.

Magnitude of visual change and viewpoint viewshed analysis

Similar to viewpoint 11, both the construction and eventual operational activities associated with the proposed embankment / retaining structure between Bibra Lake and Horse Paddock Swamp, the PSP, and the relocated power line are anticipated to be visible in this view. However unlike viewpoint 11, should the vegetation be removed, views to Progress Drive bridge and Dixon Road bridge would be achieved. This is illustrated in the viewpoint analysis.

During the construction phase, the following key activities are predicted to be visible, from the viewpoint:

- removal of the dry bush land communities (*Melaleuca* and other Karrakatta woodland trees); and
- construction equipment, such as earthmoving equipment and possible elevated structures such as cranes, used to install elevated road lighting and the power line.

Once operating, some stands of the taller dryland vegetation between the structure and Bibra Lake would be permanently removed and a full height retaining wall (up to 8 metres high) in the backdrop of the view would be visible. Furthermore the PSP would be visible at ground level in front of the retaining wall. In addition, the upper components of the power lines and poles are predicted to be visible, as is the case in the existing view and illustrated in the Viewpoint 12 photomontage (overleaf). From this viewpoint the Dixon Road bridge would not be visible given intervening tree cover on the lakes edge in the foreground of the view.

Over time the dry land vegetation on the edge of Bibra Lake combined may preclude views entirely to the lower parts of the elevated structure and the PSP. No noise walls are proposed on the structure or would be visible.

Should elevated lighting columns be used on the top of the retaining structure, the impacts at night may be very perceptible and, given lighting is not precedent in the view, the change at night may be highly visible.

Considering the above, the change would result in the introduction of a distinct new element into a visually prominent part of the attractive view. Given this valued landscape has no precedence for large scale elevated road infrastructure the capacity to absorb change of the proposed project is inherently lower and therefore the change is rated as **dominant**. The change during daylight and night time hours is predicted to be the same. The introduction of large scale road infrastructure into this landscape is anticipated to generate an **adverse** change.

Visual impact

The combination of a high visual sensitivity to change and a considerable adverse level of visual change are predicted to generate a **major** adverse significance.

Existing view north east from jetty off Bibra Lake Reserve

Scenario 1: Photo simulation illustrating "unmitigated" proposed project

Scenario 2: Photo simulation illustrating a "mitigated" proposed project

Viewpoint 13: View from bench in Eliza Cave Reserve

Viewing situation

This is the longest distance representative viewpoint at approximately 1.7km viewing distance from the proposed project. It has been taken from the edge of Bibra Lake, in the open formal parkland, where clear views across Bibra Lake in a northerly direction are afforded. This vantage point's foreground is dominated by the open existing lake, with the formal and informal parkland landscape framing the view to the west and east. The image also includes some marginal water edge rehabilitation works. This illustrates that funding is being provided and that there are high community values associated with this informal recreation facility. It has been selected to illustrate Landscape Character Unit 3: Bibra Lake, where the existing public open space fronts the lake.

The viewing situation provides a clear, uninterrupted view north, across Bibra Lake to the project site. It has been selected to illustrate the "worst case" view from the southern part of Bibra Lake Reserve and Bibra Drive.

Visual Sensitivity

This is a key viewing location of **high** visual sensitivity as it is a popular local and regional recreational facility, which is anticipated to attract relatively large numbers of locals, who would frequent the area for potentially prolonged periods of time. In addition there is no precedence for large scale road infrastructure in the view. A bench has been provided for people to sit and "appreciate" the landscape context.

Magnitude of visual change and viewpoint viewshed analysis

Both the construction and eventual operational activities associated with the embankment / retaining structure between Bibra Lake and North Lake are anticipated to be visible in this view, but at a very long viewing distance. Views of the structure to the east of the view and over Roe Swamp are unlikely to be visible, however, unlike viewpoint 11, the construction and operation of Progress Drive Bridge is predicted to be just perceptible.

During the construction phase, the following key activities may be visible, however at some distance from the viewpoint:

- removal of the dry bush land communities (*Melaleuca* and other Karrakatta woodland trees); and
- construction equipment, such as earthmoving equipment and possible elevated structures such as cranes, used to install elevated road lighting and the power line.

Once operating the taller dry land vegetation would be permanently removed and the full height retaining wall (up to 8 metres high) is predicted to be perceptible in a small portion in the background of the view. In addition, the power lines and poles may be perceptible, as is the case in the existing view. No noise walls are proposed on the structure or would be visible.

Should elevated lighting columns be used on the top of the retaining structure, the impacts at night may be easily perceptible and given lighting is not precedent in the backdrop of the view, the change at night may be noticeable.

Considering the above, the change during the day and night would be minor, even though this landscape has no precedence for large scale, elevated, road infrastructure and therefore an inherently lower capacity to absorb change. However the change would be at some distance in the backdrop of the view, would make up a very small portion of the view and would therefore generate a **noticeable** change**.** The introduction of large scale road infrastructure into a waterscape landscape is anticipated to generate an **adverse** change.

Visual Impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate an impact of **moderate** adverse significance.

Existing view from bench in Eliza Cave Reserve

Existing view from bench in Eliza Cave Reserve zoomed in to illustrate the project area

Viewpoint 14: View from Hope Road by the Wetlands Education Centre

Viewing situation

This north facing view is approximately 380 metres viewing distance from the Dixon Road bridge. It has been selected to represent the current view from Hope Road and the perimeter trail by Bibra Lake. In addition it has been selected as this would be representative of the future view from the City of Cockburn car park for the Wetlands Education Centre. This car park would be just beyond the access to Native ARC in front of this viewpoint.

This image has also been used to illustrate the worst case scenario impacts on the Cockburn Wetlands Education Centre and for close distance residential receptors in representative viewer group G (Bibra Lake).

The view is typical of Landscape Character Unit 4: Bibra Lake Bushland and illustrates the sparse nature of some of the vegetative cover in this character unit.

Visual Sensitivity

This viewpoint has been selected to illustrate the impact from the Cockburn Wetlands Education Centre, whose users are considered to be of **high** visual sensitivity. This is because users of this regional centre have a proprietary interest in the environment and associated landscape and visual amenity values. They may frequent the area for longer periods of time and currently don't have large scale road infrastructure in their views.

Magnitude of visual change and viewpoint viewshed analysis

The construction and eventual operational activities associated with Dixon Road bridge, the principal shared path and Hope Road rehabilitation are anticipated to be the key components visible in this view.

Viewshed analysis depicts as visible: the remainder of the elevated structure between North and Bibra lakes; the relocated power line; and the structure over Roe Swamp. However, it is predicted that in reality, they would be screened by intervening vegetation.

During the construction phase, the following key activities may be visible, from the viewpoint:

- removal of the open Jarrah *Banksia* community vegetation, including that for the principal shared path (PSP); and
- construction equipment, such as earthmoving equipment and elevated machinery such as cranes, used to install elevated road lighting and the power line.

Once operating the following key elements are predicted to be visible:

- the wide Dixon Road bridge in a small portion of the background of the view;
- elevated lighting used on the elevated structure between Progress Drive and Roe Swamp (including that on Dixon Road bridge);
- the reduction of Hope Road to a 6m wide service road and a cul-de-sac just west of the driveway to Native ARC;
- revegetation works to the rehabilitated area of Hope Road; and
- a 3 metre wide red tarmac PSP (with 1 metre on either side cleared of vegetation) to the north of Hope Road, including lighting of this facility.

Should elevated lighting columns be used on the top of the structure between Progress Drive and Roe Swamp and along the PSP, a considerable increase in the light levels compared to the current situation at night would occur. It is recommended that as part of the mitigation measures the introduction of low level lighting is investigated along the PSP to reduce the visual impact of lighting. It is not recommended lighting is removed from the PSP to reduce the visual impact of light at night for CPTED reasons.

Considering the above, the change during the day and night would be minor. The landscape already contains road infrastructure and therefore has some capacity to absorb change associated with the introduction of the road and PSP. Both Hope Road rehabilitation works and the introduction of Horse Paddock Swamp (or Hope Road) bridge would be at some distance in the backdrop of the view and therefore make up a relatively small portion of the view. Accordingly the magnitude of change is considered to **noticeable** but **adverse** in type.

Visual Impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate an impact **moderate** adverse significance

Existing view from Hope Road by the Wetlands Education Centre

Viewpoint 15: View north from Hope Road by the Blue Gum Montessori School

Viewing situation

This close viewpoint is at approximately 60 metres viewing distance from the closest part of the proposed project. It is located on the northern footpath of Hope Road beside the Blue Gum Montessori School car park. It has been selected to represent the worst case views for users of the school as well as viewers in Bibra Lake (representative viewer group G).

Currently the view affords a clear, uninterrupted view into the open informal landscape of Landscape Character Unit 5: Hope Road Reserve.

Visual sensitivity

Hope Road potentially has a moderate number of users (less than Stock Road but more than the local residential access streets). However it is being used to illustrate the impact from a sensitive viewer group, which in this case is the Blue Gum Montessori School. The visual sensitivity is therefore considered to be **high.** This is because users of this type of school are anticipated to have a proprietary interest in the environment and subsequently landscape and visual amenity values and there is no precedence for large scale road infrastructure in the existing view.

Magnitude of visual change and viewpoint viewshed analysis

The southern embankments of Bibra Drive modifications and the MAC access would be visible during both the construction and operational phase from this close distance view and subsequently from the school. Views further north of the main carriageway would not be possible.

During the construction phase the visible activities are anticipated to be raising of the vertical alignment associated with the introduction of large embankments for the new bridges over Roe Highway and the off / on ramp to Roe Highway, the principal shared path (PSP), relocating of the power line and clearing of the remnant vegetation.

Once operating, the main direct change is anticipated to be generated by the introduction of the Bibra Drive bridge southern ramp in the middle ground of the view. This would result in the introduction of large scale, elevated road infrastructure in a landscape which this type of infrastructure is currently not precedent. See photomontage for illustration.

In addition should elevated lighting columns be used on the top of the embankment structure, the impacts at night would be easily perceptible, generating a considerable change. However, lighting impacts are unlikely to affect the Blue Gum Montessori School users as they will primarily observe the view by day.

Considering the above, the change would result in the introduction of a distinct new element into a substantial part of the view, where large scale infrastructure is not precedent and thus the landscapes capacity to absorb change of the proposed project is inherently lower. At this very close distance the magnitude of change is considered to be **dominant.**

The introduction of large scale road infrastructure into this open landscape is anticipated to generate an **adverse** change.

Visual impact

The combination of a high visual sensitivity to change and a dominant adverse level of visual change is predicted to generate a **major** adverse significance.

Existing view north from Hope Road by the Blue Gum Montessori School

Scenario 1: Photo simulation illustrating "unmitigated" proposed project

Scenario 2: Photo simulation illustrating a "mitigated" proposed project

Viewpoint 16: View north from junction of Hope Road and Gilchrist Avenue

Viewing situation

This close distance and partially elevated view, is no distance from the proposed project infrastructure. The view shows a typical situation where a local residential access road "fronts" the corridor and the worst case scenario views for residents in the north east part of Bibra Lake (representative viewer group F).

Currently this is a clear, uninterrupted view into Landscape Character Unit 5: Hope Road Reserve from the footpath on the northern flank of Hope Road, at Gilchrist and Hope Road intersection. The view illustrates the open character of the reserve in this location and sparse tree cover. A key feature in the view is a line of trees along the northern edge of Hope Road.

Visual sensitivity

Even though the view is of a lower to medium scenic value, i.e. it has a poor quality vegetation structure; this view is representative of views from a residential suburb in close proximity to the viewing location. When considering the nature of the residential viewers, the sensitivity is considered to be **high** and these viewers would be sensitive to change associated with the introduction of road infrastructure into a view, where it is otherwise unprecedented.

Magnitude of visual change and viewpoint viewshed analysis

The most visible construction activities would be those associated with the construction of the 2.4 metre high noise wall (between the main carriageway and the principal shared path – PSP) and the PSP at the top of the main carriageways cutting, directly in front of the viewpoint.

Should the noise wall be constructed after the main carriageway, it is predicted that removal of the remnant open Jarrah *Banksia* woodland in the middle to background of the view would be highly evident as well as the main carriageways cuttings and lighting.

Once operating, the main direct change is anticipated to be generated by the introduction of the noise wall and the PSP directly in front of the viewpoint. The PSP is anticipated to be a 3 metre wide red tarmac path (with 0.5 metre offset on either side) and would be lit. There is no lighting along Hope Road in this locality. However, there may be sky glow from local properties. The introduction of a lit piece of infrastructure into a principally unlit area would result in a considerable increase in the light levels compared to the current situation at night.

The noise wall would preclude views to all other parts of the proposed project road infrastructure to the north, to the west and east to with the exception of elevated road lighting (should it be installed).

Overall the introduction of the noise wall, the PSP and lighting in very close proximity to this view would generate a long lasting and major change in the view. A substantial part of the view would be affected obstructing views to an open undeveloped landscape. The changes during both day and night time hours would represent an **adverse considerable** level of change.

Visual impact

The combination of a high visual sensitivity to change and a considerable adverse level of visual change are predicted to generate an impact of **moderate - major** adverse significance.

Existing view looking north west from junction of Hope Road / Gilchrist Avenue intersection

Existing view looking north east from junction of Hope Road / Gilchrist Avenue intersection

Viewpoint 17: View south and west from Allendale Entrance, over Granton Garden

Viewing situation

This middle to long distance and partially elevated view orientated in a south – west direction, is approximately 250 metres from the closest proposed project infrastructure, but 600 metres from the nearest visible component of the project. The view has been selected to represent typical views from residents on the northern side of the proposed project in North Lake (representative viewer group G) and from the public open space, Granton Garden, within this new residential development.

The view is currently a filtered view from the eastern edge of pocket park, through breaks in the tree cover towards the existing road corridor and the Golf Club. This tree cover currently mostly precludes views of this area.

Visual sensitivity

This is a view of **high** visual sensitivity as it is a well developed park that has the potential to attract relatively large numbers of locals, who could frequent the area for potentially prolonged periods of time. Furthermore the sensitivity of the receptors is elevated as existing large scale road infrastructure is not perceptible in the view.

Magnitude of visual change and viewpoint viewshed analysis

Construction and operational activities associated with Murdoch Activity Centre (MAC) access and potentially Bibra Drive modifications are anticipated to be visible from this middle to longer distance view.

During the construction phase the most visible activities are anticipated to be associated with the introduction of large embankments for the new bridges over Roe Highway and clearing existing vegetation.

Once operating, the main direct change is anticipated to be generated by the introduction of the extended Murdoch Activity Centre access road and bridge over Roe Highway in the background of the view, introducing large scale and elevated road infrastructure in a landscape which currently has no large scale road infrastructure. However, much of this would be partially screened by the existing vegetation at Murdoch Pines.

Should elevated lighting columns be used on the bridge, the impacts at night would be easily perceptible and given existing lighting levels in this portion of the view are low, the visual change at night would be noticeable.

Considering the above, the change during the day and night would be minor. The proposed project would be at some distance in the backdrop of the view, would make up a relatively small portion of the view and therefore the magnitude of change is considered to **noticeable** but **adverse** in type.

Visual impact

The combination of a high visual sensitivity to change and a noticeable adverse level of visual change are predicted to generate an impact of **moderate** adverse significance.

Existing view south and west from Allendale Entrance, over Granton Garden

Viewpoint 18: View south east at the junction of Peterborough Circle and Tulkara Way

Viewing situation

This middle distance and partially elevated view orientated in a south – east direction, is approximately 30 metres from the closest proposed project infrastructure (the principal shared path). The view has been selected to represent typical views from residents on the northern side of the proposed project in North Lake (representative viewer group G) within this new residential development.

The view is currently a directional view through an easement between the houses along Peterborough Circle and affords some clear views of a number of components of the existing Kwinana interchange infrastructure.

Visual sensitivity

Even though the view is of a lower scenic value, i.e. it is of elevated large scale infrastructure with poor vegetation structure; this view is representative of views from a residential suburb in close proximity to the viewing location. When considering the nature of the residential viewers combined with the fact that the view currently contains existing infrastructure, the sensitivity is considered to be **medium**.

Magnitude of visual change and viewpoint viewshed analysis

This view would be of the two north bound ramps from the Roe Highway to the Kwinana Freeway and the Kwinana Freeway southbound ramp. The Kwinana Freeway southbound ramp would be viewed behind the two lower Kwinana Freeway northbound ramps. The combination of these three ramps would preclude views to the remainder of the interchange.

During the construction phase the visible activities are anticipated to be particularly associated with:

- the introduction of the embankments for the northbound ramps from Roe Highway to Kwinana Freeway;
- the introduction of large embankments for southbound ramp from Roe Highway to Kwinana Freeway;
- the introduction of large embankments for the new bridges over Kwinana Freeway;
- the 2.4 metres high noise walls along the garden fences of Peterborough Circle;
- the construction of the principal shared path (PSP) in the foreground on the view; and
- clearing of the remnant vegetation.

Once operating, the main direct change is anticipated to be generated by the new interchange ramps and bridges resulting in the significant increase in the level of large scale and elevated road infrastructure, including road barriers and lighting in the immediate middle ground of the view. In addition the PSP and potentially the upper elements of the noise walls may be visible at a middle to close distance.

Should elevated lighting columns be used on the top of the new structures, the impacts at night would be easily perceptible, bringing road lighting closer to the viewpoint. This visual change would be considerable.

Considering the above, the change would bring the large scale road infrastructure in much closer proximity to the view. The change would occur in a substantial part of the view, at a middle distance. However given there is precedence for large scale, elevated road infrastructure in the view, the capacity of this landscape to absorb change is greater and, therefore, the magnitude of change is considered to be **considerable.** The change would represent an intensification of an existing land use and would be **adverse**.

Visual impact

The combination of a medium visual sensitivity to change and a considerable adverse level of visual change are predicted to generate a **moderate** adverse significance.

Existing view south east at the junction of Peterborough Circle and Tulkara Way

5.2.3 Summary of visual amenity impact assessment

The assessment of ZTVs, 18 representative viewpoints and 5 photomontages has been used to determine the visual impacts associated with the proposed project.

Despite the mildly undulating topography of the study area, the two final proposed project ZTVs (**Figures 8 and 9**) illustrate a relatively contained potential zone of visibility. In particular a narrow band of visibility is illustrated on the preferred alignment ZTV (**Figure 8**) from Stock Road to North Lake Road and east of the Kwinana Freeway / Roe Highway interchange. For the remainder of the project area, particularly through LCU3 and 4, the level of visibility increases. This is because of the open, lowland waterscape of Bibra Lake and North Lake and the flatter, low lying topography of the Bibra Lake and North Lake residential areas. From these areas some views of up to 1.5 km from the proposed project can theoretically be achieved. However it is important to note that the field investigations determined many of the areas identified as “visible” in the ZTV were in reality “not visible” due to the effect of intervening land cover (i.e. vegetation and built form).

The locations of the viewpoints are illustrated in **Figure 10.** These views were selected using an upfront ZTV analysis (refer **Section 5.1**), followed by a number of field investigations conducted between December 2009 and August 2010. The assessment above assumes no relief for affected receptors provided by the implementation of landscape and urban design mitigation measures of the LUDF (AECOM, 2011a). The effectiveness of the landscape and urban design measures is provided in the following residual visual amenity impact assessment presented in **Section 6.0**.

The views selected represent the “worst case scenario” from publicly accessible locations where the clearest views from the most sensitive viewer groups, at both close and longer distances from the proposed project are anticipated.

A range of visual impacts significance were identified, from minor / moderate to major. All were considered adverse in type. A summary of these results is presented in the summary **Table (3)** below.

The viewpoints with a significance grading of moderate / major or major are those that should be given the greatest weight, relative to other levels of visual impact in determining the acceptability of the visual impacts of the scheme and in determining acceptable levels of mitigation.

Table 3 Assessment of significance of impact on viewpoints

Viewpoint	Representative Viewer Group	Sensitivity to Change	Likely Magnitude of Impact	Significance of Impact
1	n/a	Low - Medium	Considerable	Moderate adverse
2	D	High	Day: noticeable Night: considerable	Day: moderate adverse **Night: moderate / major adverse**
3	D	Medium	Dominant	**Moderate / major adverse**
4	E	Low	Considerable	Moderate adverse
5	C	Medium	Day: noticeable Night: considerable	Day: moderate adverse Night: moderate adverse
6	C	High	Day: noticeable Night: considerable	Day: moderate adverse **Night: moderate / major adverse**
7	C	High	Day: noticeable Night: considerable	Day: moderate adverse **Night: moderate / major adverse**
8	D	High	Day: noticeable Night: considerable	Day: moderate adverse **Night: moderate / major adverse**
9	n/a	High	Noticeable	Moderate adverse
10	E	High	Dominant	**Major adverse**
11	n/a	n/a	Noticeable	Moderate adverse
12	n/a	High	Dominant	**Major adverse**
13	n/a	High	Noticeable	Moderate adverse
14	G	High	Noticeable	Moderate adverse
15	G	High	Dominant	**Major adverse**
16	F	High	Considerable	**Moderate / major adverse**
17	G	High	Noticeable	Moderate adverse
18	G	Medium	Considerable	Moderate adverse

** Where there is disparity in the significance of visual impact during the day and night, the difference has been defined in the table above. Where no differences are described assume the visual impact significance during the day and night is the same*.

Most of the affected viewers would be in close proximity to the proposed project i.e. less than 100 metres from the closest part of the proposed project. Most are considered to be of high, though local, visual sensitivity, given they are predominantly residential or recreational viewers. These viewers would have a proprietary and in many cases prolonged interest in the surrounding landscape, as opposed to a fleeting interest such as users of Stock Road (assessed in viewpoint 1). There are no designated scenic lookouts in the study area; however for key views across Bibra Lake, such as that from the jetty in viewpoint 11, it could be argued that this is a “regionally” important viewpoint with potential to be designated as a lookout in the future.

Three (3) of the representative viewpoints (10, 12 and 15) are anticipated to sustain visual impacts of a major adverse significance. These viewpoints are in very close proximity to elevated structures of the proposed project, where a larger proportion of the view would be changed. In the case of viewpoints 10 and 12, these are in close proximity to the Progress Drive bridge and the structure between Bibra lake and Horse Paddock Swamp, whilst in the case of viewpoint 15, this view is in very close proximity to the embankment of Bibra Drive modification. Viewers at these viewpoints are of high sensitivity - being either recreational or related to the Montessori School. Sensitive, site specific and high quality, landscape and urban design intervention would be desirable to mitigate these major adverse impacts. Refer to **Section 5.3** and the LUDF (AECOM, 2011a) for details on the proposed interventions.

Two (2) other viewpoints (numbers 3 and16) have been rated as moderate / major or major during both the day and night. These views allow clear, unobstructed views of parts of the proposed project and are within a close distance. Again sensitive, site specific and high quality landscape and urban design intervention would be required to mitigate these moderate / major adverse impacts. Refer **Section 5.3** and the LUDF (AECOM, 2011a) for details on the proposed landscape and urban design interventions.

In addition four (4) viewpoints (numbers 2, 6, 7, and 8) have been given a moderate / major impact significance during the night. All these views are in close localities and in situations where the existing light level of the project area is very low. The proposed project would therefore introduce light into inherently dark landscapes. Should elevated street lighting be introduced it is possible that the light source would be seen directly from these very close viewpoints, substantially intensifying light levels and generating a considerable level of change. Given the potential significance of this visual impact it is recommended that low level and / or directional LED lighting be investigated through further design work (refer **section 5.3**).

Viewpoints 11 and 12 significance were determined as “moderate” and “major” respectively, and are potentially regionally important views which require high quality urban design intervention to increase the overall aesthetics and visual appearance of the elevated structure, so that it complements the character of the waterscape landscape. The introduction of elevated road infrastructure into these views (and other close to middle distance similar views around Bibra Lake) is incongruous and out of character with the existing waterscape landscape. Furthermore it visually severs (both physically and visually) North Lake / Horse Paddock Swamp from Bibra Lake. Given the potential regional importance of the views from Bibra Lake, sensitive landscape and urban design intervention is required to screen the infrastructure (e.g. use vegetative buffer treatments) and apply architectural treatments to the structure to increase the overall aesthetics and visual appearance of the infrastructure. The application of appropriate architectural design intervention to the structure itself is the preferred mitigation measure and if applied appropriately, removes the necessity for vegetative buffers to screen the proposal.

In the context of Bibra Lake, it is recommended that the urban / architectural design intervention complements the natural character of the waterscape landscape, with the aim of visually integrating it into the landscape as opposed to highlighting the infrastructure and creating a feature. The interventions should aim to make the structure a recessive element in the landscape and not increase the visual mass of the proposed structure.

Finally it is noted, that the benefit of some specific actions that have been incorporated into the design are clearly recognised in this preliminary assessment. In particular, minimising the vegetation clearing footprint to three (3) metres on either side of the carriageway, particularly between Stock Road and Progress Drive, has allowed a wide vegetative buffer to be maintained, which either blocks or partially filters most views of the proposed project. This action has allowed the visual amenity management objectives “*to maintain the sense of a vegetative visual buffer between the residential suburbs*” for LCUs 1 and 2 to be achieved. However, there is scope for this buffer to be enhanced with rehabilitation works, thus increasing its screening effectiveness further. Visual amenity management or mitigation measures are discussed in the following **section 5.3**, have been developed in the LUDF (AECOM, 2011a) and their effectiveness tested through the residual impact assessment in **section 6.**

5.3 Visual amenity management measures

The visual amenity impact assessment in **Section 5.2** has assessed the engineering scheme without an integrated landscape and urban design scheme. The following landscape and visual amenity mitigation opportunities have been agreed with the Project team and where appropriate adopted in the Landscape and Urban design. The key visual amenity mitigation and management measures are illustrated on the subsequent page in **Figure 22** and are described in detail **Table 4**. Furthermore they are described in the LUDF (AECOM, 2011a).

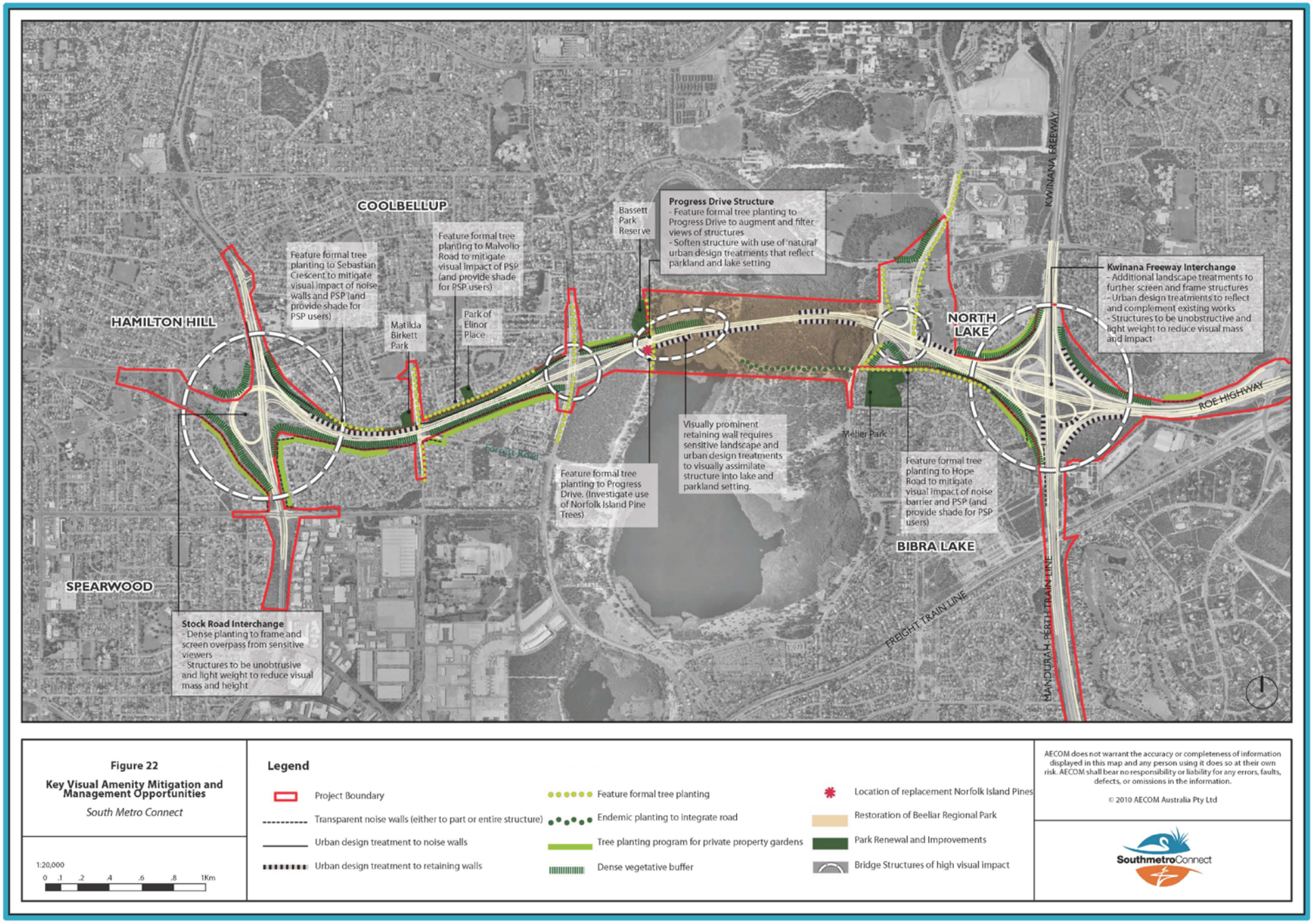


Figure 22

Key Visual Amenity Mitigation and Management Opportunities

South Metro Connect

1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Transparent noise walls (either to part or entire structure)
- Urban design treatment to noise walls
- Urban design treatment to retaining walls
- Feature formal tree planting
- Endemic planting to integrate road
- Tree planting program for private property gardens
- Dense vegetative buffer
- Location of replacement Norfolk Island Pines
- Restoration of Beeliar Regional Park
- Park Renewal and Improvements
- Bridge Structures of high visual impact

SouthmetroConnect

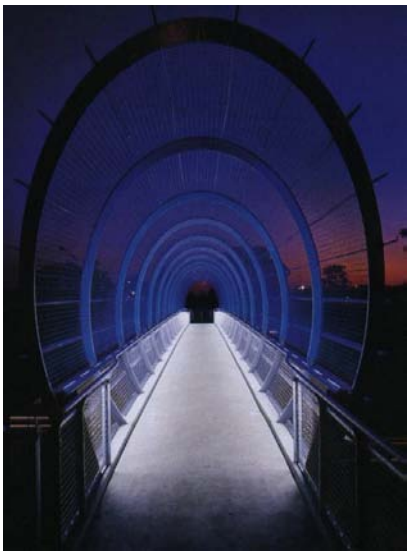
Table 4 Potential mitigation for construction impacts

Impact	Mitigation
A reduction in visual amenity values during the construction period associated with the introduction of contrasting features and elements into a typically suburban and parkland landscape e.g. construction traffic, temporary works compounds, stockpiles	- Works compound areas are proposed to have locations in areas furthest from sensitive viewer groups e.g. users of Bibra Lake, Horse Paddock Swamp, Roe Swamp, schools, residents. Or in localities where views from residential areas are harder to achieve. E.g. Stock Road intersection, east of Progress Drive, at Kwinana Freeway intersection. - Control the spread of invasive species, for example, through the preparation of a weed management plan. - Limit disturbance of existing topsoil where possible. Where unavoidable, stockpile soil which is free from invasive species for use within the project. - Construction works to be undertaken 7am to 7pm Monday to Saturday other than in unavoidable circumstances. - Avoid disturbance in the residential areas to the greatest extent possible e.g. limit construction access to main arterial roads and avoid using local streets with residential properties along them.
Loss of characteristic landscape elements such as existing tree cover, due to clearance e.g. Tuart tree cover from Stock Road to Progress Drive	- Seek appropriate areas for offset replacement tree planting e.g. rehabilitation works to the landscape buffers between Stock Road and Progress Drive (LCU1 and 2), around Bibra and North lakes (LCU3) and Hope Road Reserve, LCU5. - Replace two Norfolk Island Pines (*Araucaria heterophylla*) close to Bibra Lake. - In areas not impacted by the proposed project seek opportunities for advance planting. e.g. rehabilitation works to the landscape buffers between Stock Road and Progress Drive (LCU1 and 2), around Bibra and North Lakes a(LCU3) and Hope Road Reserve, LCU5.
Availability of views of uncharacteristic construction activities : introduction of uncharacteristic construction activities into an open space corridor and regional park	- Minimise clearing the vegetation, as far as possible and tag trees that are in the planting plans and on site, worthy of retention at detailed design stage, prior to construction. - Protect existing vegetation falling outside the construction footprint in all the project area in line with AS4970-2009 *Protection of trees on development sites*, in order to prevent inadvertent damage or unnecessary removal during the construction process. Particular attention should be made to existing tree planting along private property boundaries and in existing open spaces i.e. Matilda Birkett Reserve, Bassett Reserve, Quickly Crescent, Ophir Court, Forillion Avenue, Provincial Mews, Paddington Court, Rainbow Gardens, Glasshouse Close, Marshwood Rt, Malvolio Road, Moennich Court, Tait Place, Madeleine Court Lygon Court, Samual Court, Peterborough Circle. - Investigate use of hoardings with art work or project information to be added to fences in visually prominent locations such as near the Cockburn Wetlands Education Centre - Undertake progressive landscape works to the Roe Highway Extension during the construction process to encourage early plant germination, in order to minimise visual disturbance as soon as possible. - Where properties are in very close proximity to the work, investigate an offsite planting program in private properties and along back garden fence lines which front the proposed project area i.e. at Madeleine Court, Lygon Court, Samual Court by LCU2 and Peterborough Circle by LCU5.

Table 5 Potential mitigation for operational impacts

Impact	Mitigation
Land take of perceived and actual recreational open space: Introduction of uncharacteristic transport infrastructure into an open space corridor and regional park	- Investigate the provision of an adequate width of planting between the residential property boundary and proposed road to function as a visual barrier and screen between the residential property and the road. Where this is not achievable e.g. at Madeleine Court, Lygon Court, Samual Court by LCU2 and Peterborough Circle by LCU5 investigate an opportunity for a tree planting scheme within the private property in consultation with the property owner. - Utilise the implementation of the proposed project as a catalyst of restoration for parts of North Lake and Bibra Lake. Explore opportunities to upgrade existing facilities and to make provision for new recreational facilities e.g. cycle and footpaths, furnishings such as seating, BBQ, interpretative trails, boardwalks. All works should be consistent with the objectives and actions in the Beeliar Regional Park Management Plan, Bibra Lake Management Plan and the North Lake Management Plan and conducted in consultation with the City of Cockburn and the local community. - Utilise the implementation of the proposed project as a catalyst of renewal for other pocket parks in very close proximity to the proposed project i.e. Matilda Birkett Reserve (illustrated in viewpoint 6), the unnamed park off Elinor Place, Bassett Reserve (illustrated in viewpoint 10) and Meller Park (by viewpoint 15). Explore opportunities to upgrade existing facilities and to make provision for new recreational facilities e.g. footpaths, furnishings such as seating, BBQ, play equipment. The works would be conducted in consultation with the City of Cockburn and the local community.
Availability of views of uncharacteristic transport infrastructure: Introduction of uncharacteristic transport infrastructure (i.e. road, noise walls) into an open space corridor and regional park	- Develop detailed Landscape, Revegetation and Urban Design Guidelines at the detailed design stage. - Screen the following key components of the proposal with dense vegetative buffer treatments: - ***Stock Road intersection***: to screen views from users of Hamilton Senior High School, residents around Quickly Crescent, Forillion Avenue and Sebastian Crescent. -***North and south parts of the alignment from Stock Road to North Lake Road*** (approximate chainage 300-9000): to screen views from residents around Forillion Avenue, Provincial Mews, Malvolio Road, Sebastian Crescent, Paddington Court, Marshwood Retreat, Rainbow Gardens, Glasshouse Close, Tait Place and Moennich Court. In addition to screen views from Matilda Birkett Reserve. -***North part of the alignment from North lake Road to Progress Drive*** (approximate chainage 9000-9700) for residents around Madeleine Court, Lygon Court, Samual Court and recreational users of Bassett Reserve. - ***Northern part of the elevated structure between North Lake and Bibra Lake (***approximate chainage 9700 – 10250) for recreational users of North Lake and the surrounding parkland. - ***Southern part of the alignment from Bibra Drive Modifications / Murdoch Activity Centre Access to Kwinana Freeway intersection*** (approximate chainage 11100-12300) to screen views for users of the Blue Gum Montessori School, from residents along Hope Road, Pausin Crescent, Stone Court ,Currie Place and Tetlow Place and recreational users of Meller Park. - ***Northern part of the alignment at Kwinana Freeway interchange*** (from approximate chainage 11600 to 12300), to screen views from residents around Peterborough Circle. - ***Kwinana Freeway intersection*** (approximate chainage 12400 to 13100:) to screen views from residents in Leeming such as Timber Ridge Retreat, Green Croft Gardens. The planted buffer should be adequate in width to form a visual barrier along the road edge. Where this is not achievable e.g. at Madeleine Court, Lygon Court, Samual Court by LCU2 and Peterborough Circle by LCU5 investigate an opportunity for a tree planting scheme within the private property in consultation with the property owner. -

Impact	Mitigation
Availability of views of uncharacteristic transport infrastructure (continued): Introduction of uncharacteristic transport infrastructure (i.e. road, noise walls) into an open space corridor and regional park	- Investigate feature formal tree planting schemes to visually integrate the infrastructure and partially screen from sensitive viewers e.g. along local roads with the PSP (e.g. Malvolio Road and Sebastian Crescent) and along key connector roads e.g. Murdoch Activity Centre Access. - Where retaining structures or steep embankments or cuttings are required (e.g. the structure between Bibra Lake and North Lake), seek opportunities to visually integrate the engineered features into the landscape to soften or “green” structures e.g. benching to facilitate planting or green walls.  - Design cuttings and embankments so they can be vegetated, where practicable. Ensure gradient of embankments are sufficiently shallow and/or treated with stabilisation techniques for successful establishment and maintenance of vegetation treatments. In particular, consider the embankments and cuttings at Stock Road intersection, the north side of the structure between North Lake and Bibra Lake and the Kwinana Freeway interchange. These areas should be planted with dense vegetation to screen views from residential areas and recreational areas. - Avoid duplicating the noise walls and property boundary fences, when in close proximity to each other. Investigate removing property fences entirely in these cases and liaise with property owner regarding use of transparent panels for elevated sections of the noise wall to reduce visual mass and avoid over shadowing. Recommended locations include: • By LCU1: Forillion Avenue, Provincial Mews, Blue Ridge Crest, Paddington Court, Rainbow Gardens and Glasshouse Close : • By LCU2: Madeleine Court, Lygon Court and Samual Court; and • By LCU6: Pausin Crescent, Stone Court, Currie Place, Tetlow Place, Greenlea Rise, Tana Court and Briar Court. 

Impact	Mitigation
Availability of views of uncharacteristic transport infrastructure (continued): Introduction of uncharacteristic transport infrastructure (i.e. road, noise walls) into an open space corridor and regional park	- In cases where noise walls abut local road boundaries, e.g. At Provincial Mews by LCU1 and at Hope Road by LCU5, provide a landscape strip (minimum 1.5 metres or greater if possible) between the noise wall and road boundary to soften the visual impact of the barrier. - Avoid reflective materials on all structures that would be viewed by private residents. - Use recessive colours (for example, muted, sandy colours) on structures through Bibra Lake LCU and Bibra Lake bushland LCU4 to assist integrating structures into the informal parkland and waterscape landscapes. *(Use bolder colour to highlight key exits / entry points and nodes along the road corridor e.g.at Kwinana Freeway interchange, Stock Road interchange and to mark the entrance / exit to Beeliar Regional Park).* - Where significant infrastructure structures, such as noise walls, retaining walls and bridges are required, seek to create a consistent urban design language to unify the structures and integrate (but not necessarily be consistent with) with the existing urban design treatments at the Kwinana Freeway interchange. The language or theming should reflect aspects of the local character to engender a sense of place and community pride. For example patterning on concrete noise walls and retaining structures.  -
Potential for light pollution on sensitive receptors such as residents i.e. sky glow and direct light spill: associated with the introduction of a large scale highway through a residential suburb	- Detailed lighting design to be in line with best practice and with Australian Standards. - Investigate passive means of lighting e.g. installation of reflectorised roadway markers, lines, warnings or informational signs. - Investigate solar powered LED studs in roadways and paths of travel. - Investigate the use of low level and / or directional LED lighting to focus light only upon the area required to be illuminated and away from properties. - Use aesthetic lighting in localities which are not close to sensitive receptors (i.e. residents and fauna) e.g. concentrates at the key nodes such as Kwinana Freeway interchange and Stock Road. 

Impact	Mitigation
Potential for adverse change in visual amenity values and decline in existing suburban and parkland quality: introduction or invasion of non-indigenous plant species and weeds	- Develop a detailed Landscape, Revegetation and Urban Design Guidelines at the detailed design stage. - Control invasive species, for example, through preparation of a weed management plan. - Ensure that sufficient funds are set aside for planting establishment and landscape management. - Seek to include a minimum 12 month establishment period for vegetation.
Perceived visual community severance of North Lake, Coolbellup and Bibra Lake: Introduction of large scale road infrastructure into an existing residential suburb	- Ensure the proposed pedestrian / cycle underpasses are a positive urban design feature that are attractive, designed to urban design best practice, and are safe to use (i.e. comply with best practice CPTED principles).
Perceived visual severance of Beeliar Regional Park: Introduction of a new large scale road corridor into the regional park, particularly between North Lake / Horse Paddock Swamp and Bibra Lake	 - Investigate ways that intervisibility i.e. views “through” and “under” the proposed road infrastructure are achieved between North Lake / Horse Paddock Swamp and Bibra Lake - Urban design treatments to the elevated structure should not add to the visual mass or bulk e.g. if noise walls are required, the use of transparent walls could be deployed

6.0 Residual visual amenity effects assessment

Considering the impacts identified earlier and the mitigation opportunities offered by the landscape and visual mitigation (**Section 5.3**) in the LUDF (AECOM, 2011a), the remaining residual impacts are summarised below. This allows an assessment of the effectiveness of the mitigation measures.

This residual impact assessment is a shorter assessment, utilising the same viewpoints and method of assessment as the main assessment i.e. it identifies the sensitivity of the receptor (this will remain the same in the residual impact assessment) and the magnitude of change (which may have been modified by the proposed mitigation measures) to determine a significance level of impact.

Where there is change in the residual impact, it is highlighted in **BOLD** in the Residual Visual Impact Significance column of the assessment table.

Regarding the impacts at night, the only mitigation measures considered are the application of low level lighting to the PSP and the section of road through Beeliar Regional Park between Progress Drive and Bibra Drive overpass. In all other instances it has been assumed that the remainder of the project would have standard, elevated road lighting.

6.1 Residual effects assessment findings

Table 6 Summary of Residual Visual Impacts

Viewpoint	Significance of Visual Impact (section 5.2)	Key Mitigation Measures and anticipated magnitude of change	Residual Visual Impact Significance
1	Moderate adverse	*-Dense vegetative buffer planting to Stock Road verges and interchange* *-Architectural treatment to noise walls fronting the road on north side of interchange e.g. concrete patterning* *-Architectural treatment to bridge structure over Roe Highway westbound on ramp e.g. to retaining structure, throw screen* It is predicted that these measures would not reduce the magnitude of visual change from considerable and therefore the residual significance would remain as ***Moderate adverse***.	Moderate adverse
2	Day: moderate adverse Night: moderate / major adverse	*-Architectural treatment to noise wall e.g. concrete patterning and use of transparent materials to reduce visual mass* *-Dense vegetative buffer planting behind noise wall and landscape treatments in alley to partially screen noise wall* *- Tree planting program to gardens of private properties (in consultation)* During the day it is predicted that these measures would not reduce the magnitude of visual change from noticeable, however if high quality measures are implemented this could enhance the alley space creating a beneficial impact. The residual significance could change to ***Moderate beneficial.*** At night there would be no change in the magnitude of change and therefore the residual significance would remain as ***Moderate / major adverse***	**Day time: moderate beneficial** Night: moderate / major adverse
3	Moderate / major adverse	*-Architectural treatment to noise wall e.g. concrete patterning and use of transparent materials to reduce visual mass* *- A minimum of a 1.5 metre wide landscape strip (to accommodate tree planting) between the noise wall and Provincial Mews* *- Dense vegetative buffer planting behind noise wall* During the day it is predicted that these measures would reduce the magnitude of visual change from considerable to noticeable and therefore the residual significance could reduce to ***Moderate adverse.*** At night there would be no change in the magnitude of change and therefore the residual significance would remain as ***Moderate / major adverse.***	**Day time: moderate adverse** Night: moderate / major adverse
4	Moderate adverse	*-Feature formal tree planting to Sudlow Road and the proposed roundabout* *-Dense vegetative buffer planting behind noise wall* *-Tree planting program to private property gardens* During the day it is predicted that these measures would reduce the magnitude of visual change from considerable to noticeable and therefore the residual significance would reduce to ***Minor - moderate adverse.*** There would be no change during the night and therefore the residual significance would remain as ***Moderate / major adverse.***	**Day time: minor – moderate adverse** Night: moderate / major adverse
5	Day: moderate adverse	*-Architectural treatment to noise walls* *-Feature formal tree planting to Sebastian Crescent and landscape treatments to all edges of PSP including consideration of a minimum of a 1.5 metre*	Day: moderate adverse

	Night: moderate adverse	*wide landscape strip between the noise wall and PSP* *-Dense vegetative buffer planting behind the noise wall* *-Use low level lighting to the PSP* During the day magnitude of visual change would remain as noticeable given that a noise wall would be close to the viewpoint. This would generate a **moderate adverse** residual significance. At night, the application of low level lighting to the PSP could reduce the change to noticeable, however this would still generate a **moderate adverse** residual significance	Night: moderate adverse
6	Day: moderate adverse Night: moderate / major adverse	*-Matilda Birkett Park renewal and improvements* *-Feature formal tree planting to Coolbellup Avenue* During the day it is predicted that these measures would not reduce the magnitude of visual change from noticeable, however if the full suite of recommended mitigation measures are implemented it would enhance the public open space creating a beneficial impact and, therefore, the residual significance would change to ***Moderate beneficial.*** At night there would be no change in the magnitude of change and therefore the residual significance would remain as ***Moderate / major adverse***	**Day time: moderate beneficial** Night: moderate / major adverse
7	Day: moderate adverse Night: moderate / major adverse	*-Dense vegetative buffer planting in front of the noise wall* *-Feature formal tree planting to Malvolio Road and landscape treatments to all edges of PSP* *-Use low level lighting to the PSP* During the day it is predicted that these measures would not reduce the magnitude of visual change from noticeable, however if implemented would enhance the viewing situation, providing additional tree cover and a new recreational facility creating a beneficial impact and, therefore, the residual significance would change to ***moderate neutral.*** At night it is predicted that low level lighting to the PSP could reduce the magnitude of visual change to noticeable, therefore generating a **moderate adverse** residual significance.	**Day time: moderate neutral** **Night: moderate adverse**
8	Day: moderate adverse Night: moderate / major adverse	*-Architectural treatment to noise wall e.g. concrete patterning and use of transparent materials to reduce visual mass* *-Dense vegetative buffer planting behind noise wall* *-Tree planting program to private property gardens(in consultation with landowner)* During the day it is predicted that these measures would reduce the magnitude of visual change to imperceptible, therefore, the residual significance would change to **minor to moderate adverse*.*** At night there would be no change in the magnitude of change and therefore the residual significance would remain ***Moderate / major adverse***	**Day time: minor to moderate adverse** Night: moderate / major adverse

9	Moderate adverse	*-Dense vegetative buffer planting on the northern embankment dividing Bibra Lake from Horse Paddock Swamp* *-Restoration of Beeliar Regional Park – in particular Horse Paddock Swamp* *-Use of low level lighting to the structure dividing Bibra Lake from Horse Paddock Swamp* During both the day and night it is predicted that these measures would reduce the magnitude of visual change to imperceptible, therefore the residual significance would change to **minor to moderate adverse.**	**Minor to moderate adverse**
10	Major adverse	*-Bassett Park Reserve renewal and improvements* *-Restoration of Beeliar Regional Park – in particular Horse Paddock Swamp* *-Dense vegetative buffer planting on the northern embankment dividing Bibra Lake from Horse Paddock Swamp* *-Feature formal tree planting to Progress Drive* *-Architectural treatment to Progress Drive bridge structure* *-Use low level lighting to the structure dividing Bibra Lake from Horse Paddock Swamp* During both the day and night it is predicted that these measures could reduce the magnitude of visual change to considerable, therefore the residual significance would change to **moderate - major adverse.**	**Moderate – major adverse**
11	Moderate adverse	*-Restoration of Beeliar Regional Park around the north fringe of Bibra Lake e.g. installation of a boardwalk* *-Dense vegetative buffer planting on the northern embankment dividing Bibra Lake from Horse Paddock Swamp in the backdrop of the view* *-Architectural treatment to bridge and underpass structure between Bibra Lake and Horse Paddock Swamp* *-Use low level lighting to the structure dividing Bibra Lake from Horse Paddock Swamp* During the day it is predicted that these measures would not reduce the magnitude of visual change from noticeable, therefore the residual significance would remain as moderate adverse. However during the night, at this middle to longer distance view, the introduction of low level lighting would reduce the magnitude of visual change to imperceptible, therefore the residual significance would change to **minor to moderate adverse.**	Day: Moderate adverse **Night: Minor to moderate adverse**
12	Major adverse	*-Restoration of Beeliar Regional Park around the north fringe of Bibra Lake e.g. installation of a boardwalk* *-Dense vegetative buffer planting on the northern embankment dividing Bibra Lake from Horse Paddock Swamp in the backdrop of the view* *-Architectural treatment to bridge, underpass and retaining structures between Bibra Lake and Horse Paddock Swamp* *-Use of low level lighting to the structure dividing Bibra Lake from Horse Paddock Swamp* At this middle to close distance it is predicted that these measures would not reduce the magnitude of visual change from dominant, therefore the residual significance would remain as Major adverse. This would be the same for the impacts during the day and night time.	Major adverse –
13	Moderate adverse	*-Restoration of Beeliar Regional Park around the north fringe of Bibra Lake e.g. installation of a boardwalk* *-Dense vegetative buffer planting on the northern embankment dividing Bibra Lake from Horse Paddock Swamp in the backdrop of the view* *-Architectural treatment to bridge, underpass and retaining structures between Bibra Lake and Horse Paddock Swamp* *-Use low level lighting to the structure dividing Bibra Lake from Horse Paddock Swamp*	Day: Moderate adverse **Night: Minor to moderate adverse**

		During the day it is predicted that these measures would not reduce the magnitude of visual change from noticeable, therefore the residual significance would remain as **moderate adverse.** However during the night the introduction of low level lighting would reduce the magnitude of visual change to imperceptible for this long distance view, therefore the residual significance would change to **minor to moderate adverse.**	
14	Moderate adverse	*-Restoration of Beeliar Regional Park around Hope Road* *-Architectural treatment to bridge and retaining structures between Bibra Lake and Horse Paddock Swamp* *-Use low level lighting to the PSP and the structure dividing Bibra Lake from Horse Paddock Swamp* *- Endemic planting to Hope Road* During the day the increased level of planting in the fore to middle ground of the view would principally screen views of Dixon Road bridge. The visual change would remain noticeable but, if implemented sensitively, could be considered to be beneficial to the view. Therefore, this would generate a **moderate beneficial** residual impact. However, during the night the introduction of low level lighting would reduce the magnitude of visual change to imperceptible, therefore the residual significance would change to **minor to moderate adverse.**	**Day: Moderate beneficial** **Night: Minor to moderate adverse**
15	Major adverse	*-Feature formal tree planting to Hope Road* *-Architectural treatment to bridge structure over Roe Highway e.g. to throw screens and crash barriers* *-Dense vegetative buffer planting on the southern embankments of Bibra Drive overpass and the MAC access* The dense planting on the embankments could partially screen parts of the interchange, however given the scale of change in the view the change would remain dominant and the residual significance as **major adverse**.	Major adverse
16	Moderate / major adverse	*-Architectural treatment to noise walls* *-Tree planting to Hope Road and a minimum of a 1.5 metre wide landscape strip (to accommodate tree planting) between the noise wall and the PSP* *- Dense vegetative buffer planting behind noise wall, where space permits* *-Use low level lighting to the PSP* Given the current view allows sweeping long distance views, the level of change would remain considerable. However with the introduction of high quality and sensitive landscape and architectural treatments to the noise wall and PSP, the type of impact could be perceived as less negative and therefore the residual significance is judged to change to ***moderate / major neutral***	**Moderate / major neutral**
17	Moderate adverse	*-Architectural treatment to MAC bridge structure over Roe Highway e.g. to throw screens and crash barriers* *-Feature formal tree planting to the MAC access* It is predicted that these measures would not reduce the magnitude of visual change from noticeable, therefore the residual significance would remain as moderate adverse.	Moderate adverse

18	Moderate adverse	*-Architectural treatment to bridge structures at the Roe Highway / Kwinana Freeway interchange e.g. to throw screens, to abutments and crash barriers* *-Architectural treatment to noise walls e.g. concrete patterning and use of transparent materials to reduce visual mass* *-Where space permits provide a dense vegetative buffer planting between Peterborough Circle property line and the interchange infrastructure* *-Tree planting program to private property gardens (in consultation with residents), particularly those where a dense vegetative buffer cannot be provided between the road infrastructure and adjacent residential property* During both the day and night it is predicted that these measures would not reduce the magnitude of visual change from considerable however if implemented to a high quality could improve the current viewing situation for some viewers therefore changing the residual significance to **Moderate neutral.**	**Moderate neutral**

The residual impact assessment clearly illustrates that the application of the landscape and urban design mitigation measures, can in many instances reduce the level of adverse visual impact and if carried out sensitively and to a high quality, can actually reverse the type of impact from adverse to neutral or beneficial. Neutralisation of the impact is considered possible for 3 viewpoints (viewpoints 7, 16 and 18). Improvement to the existing views is predicted to occur for 3 viewpoints during the day (viewpoints 2, 6 and 14).

However there are still a number of situations, where the residual impact assessment illustrates that significant impacts and effects will occur on landscape and visual values (i.e. those adverse impacts over moderate / major significance). The three viewpoints where significant impacts during both the day and night are anticipated are viewpoints 10, 12 and 15. These views are concentrated around Bibra Lake and at the Bibra Drive overpass (by the Montessori School)

In addition there are five other viewpoints (2, 3, 4, 6 and 8) where significant visual impacts (moderate – major adverse) are anticipated at night. All these views are in the western section of the proposal between Stock Road and North Lake Road and are in the locality, where the corridor is at its most narrow and adjacent to residential areas.

6.2 Opportunities for additional visual amenity management measures

The residual impact assessment indicates that post-mitigation, some impacts on visual amenity values will remain (i.e. those over moderate / major adverse significance). The key impacts on visual amenity values identified through the assessment are impacts on views, on landscape character, on the community perception of visual severance and the visual impacts of proposed lighting. Accordingly, it is recommended that further investigation is made into visual impact reduction, through the pursuit of landscape, urban and architectural interventions during the detailed engineering design and the utilisation of the LUDF (AECOM, 2011a) to guide this design.

To reduce impacts on visual amenity values the following could be explored:

- In locations where there is insufficient space between the proposed project and a residential property to establish a dense vegetative buffer i.e. around Madeline Court and Samual Court, Peterborough Circle, and around Pausin Crescent and Stones Court, explore ways of reducing the operational engineered footprint to accommodate space for vegetative buffer planting.
- Through Beeliar Regional Park (from Progress Drive to east of Roe Swamp) explore ways of further improving the “aesthetics” and appearance of the elevated engineered structure itself, as opposed to relying on architectural “add on” measures such as an application of stone pitching or landscape treatments such as the provision of vegetative buffers to screen views to reduce impacts visual amenity.
- Through Beeliar Regional Park (from Progress Drive to east of Roe Swamp) investigate ways of reducing visual severance of the parkland by facilitating views under the carriageway for users of the Park. Should the future budget allow, re- explore the opportunity to utilise wider spans and longer lengths of bridge structures, split carriageways in bridges to allow light spill through the underpasses and viaducts particularly in the Bibra Lake locality.

- Allow adequate space both in front of and behind noise walls to allow for planting to soften the visual impact of the walls.
- Further investigate reducing the depth of cuttings and heights of embankments between Stock Road and Progress Drive and at Bibra Drive overpass, allowing the proposed project to follow the lie or form of the existing landform thus “mimicking” the natural landform.
- Investigate opportunities to facilitate mass, dense planting on embankments even when they have been designed to 1 in 2.5 or shallower gradients. Methods include provide benching and reducing gradients of the embankments. Particular attention is required to the southern side of the Bibra Drive overpass by the Montessori School and on the north west and south west areas of the Kwinana Freeway / Roe Highway interchange.

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7.0 Conclusion

The visual impact assessment has used a number of Zones of Theoretical Visibility (ZTVs), representative viewpoints and photo simulations to describe and determine impacts on visual amenity associated with the proposed project. This assessment has been conducted in two parts. Firstly a preliminary impact assessment was carried out (**Sections 5.1 and 5.2**), which assumes no relief for affected visual receptors provided by design mitigation measures. The second part of the assessment considers the effectiveness of the proposed landscape and urban design treatments in the residual impacts assessment (**Section 6.1**).

7.1 Construction Phase Impacts

Construction phase activities will have a relatively significant, but short-duration, impact on visual amenity within and adjacent to the project area. The most important of these impacts will be the introduction of temporary construction features, such as construction traffic, temporary works compounds and stockpiles, and the removal of tree cover. These activities will contrast with existing suburban, parkland and water/wetland landscape character; as well as the quality and values of the project area. They will be viewed by sensitive viewers (e.g. residents and recreational users) of Bibra Lake. Temporary night lighting and dust emissions will also have a temporary impact on visual amenity.

7.2 Operation Phase Impacts

Operation phase impacts on visual amenity values arise from the physical presence of uncharacteristic road infrastructure in the Beeliar Regional Park and the residential suburbs of Coolbellup, North Lake and Bibra Lake. The project area currently contains inherently natural and formal parkland and water/wetland landscapes, some areas of which have high regional and local recreational values.

The benefits of certain design elements of the proposed project are clearly recognised in this preliminary visual assessment. In particular, maintaining a two-metre project construction footprint on either side of the alignment between Stock Road and Progress Drive will allow for a wider vegetative buffer. This buffer will block or filter many views of the proposed project from adjacent residential areas between Stock Road and Progress Drive.

For ease of understanding and reporting, impacts on visual amenity values have been divided into consideration of:

- impacts on views;
- impacts on landscape character;
- perceived visual severance of the Beeliar Regional Park and the local communities of Coolbellup, Bibra Lake and North Lake; and
- overview of the impacts of lighting on visual amenity values.

7.2.1 Impacts on Views

The introduction of the transport infrastructure affects views achieved by sensitive viewers or viewer groups. Key views identified in the assessment that will be affected by the proposed project during day light hours are:

1. Views across Bibra Lake. The introduction of an elevated road into numerous views looking predominantly north from points around Bibra Lake is incongruous with the existing parkland view of the water body;
2. Views in close proximity to the proposed bridge at Progress Drive and the proposed elevated structure between Bibra Lake and Horse Paddock Swamp (e.g. from Bassett Reserve and the paths around Bibra Lake);
3. Views in close proximity to the proposed Bibra Drive modifications (e.g. from the Montessori School);
4. Close distance views of the proposed noise walls for residents living around Forillion Close, Provincial Mews, Blue Ridge Crescent, Paddington Crescent, Rainbow Garden, Glasshouse Close, Marshwood Retreat, Madeleine Court, Lygon Court, Samual Court, Hope Road (including Pausin Crescent, Stone Court, Currie Place and Tetlow Place), Peterborough Circle, Greenlea Rise, Briar Court and Tana Court. In many cases, these noise walls will block views of the remaining road infrastructure and parkland or natural areas; and

5. Potentially close-distance views of the elevated parts of the Kwinana interchange from Hope Road (including Pausin Crescent, Stone Court, Currie Place and Tetlow Place) and Peterborough Circle.

Most views assessed are of local importance (or sensitivity) and therefore the impact will be largely confined to a local context. Whilst there are no designated scenic lookouts in the study area, and hence no regionally significant viewpoints, key viewpoints do exist that could be designated as lookout points in the future (e.g. key views across Bibra Lake such as that obtained from the jetty in viewpoint 11 below which illustrates the existing view and a photomontage

For the purpose of the assessment, this and similar views (viewpoint 12) are considered to be 'regionally' significant, as they are of a wetland within a regional park and are obtained by local viewers as well as visitors. These viewers have a proprietary, and in many cases prolonged, interest in the surrounding landscape, as opposed to a fleeting interest such as users of Stock Road or Kwinana Freeway. .

Viewpoint 11 – Existing View From Bibra Lake Jetty

Viewpoint 11 – Photomontage From Bibra Lake Jetty Illustrating the Proposed Project

This assessment indicated that the most significant impact will result from changing part of the existing inherently natural and formal parkland and water/wetland landscapes into a transport corridor with related infrastructure. A range of adverse visual impacts have been identified from high to negligible (or major to minor) level of significance. The significance of this impact will vary depending on where the road infrastructure is being viewed from, who the viewer is and what the viewer will see. In most cases the highest level of impact (moderate to major significance) will be experienced at a close distance (e.g. views from paths around Bibra Lake that are close to the proposed project) from the Montessori School and from Bassett Reserve.

Finally, with regard to the impact of views on road users, including those along Kwinana Freeway, Stock Road and North Lake Road, these users will view intensification of road infrastructure and, in some cases, also lose

existing fleeting views of natural bushland. This visual experience will be altered, but given the short duration of the experience, it is generally assessed at moderate to negligible significance.

7.2.2 Impacts on Character

The operational phase will affect the character of the natural and formal parkland, and water/wetland landscapes in the project area. Parts of this perceived and actual recreational open space landscape will be replaced with previously uncharacteristic or unprecedented transport infrastructure. This will entail the permanent loss of tall trees throughout the project, such as the *Eucalyptus* trees growing between Stock Road and Progress Drive in Landscape Character Units LCU1 and LCU2 (**Section 3.2).**

Even though LCU1, LCU2 and LCU5 are not designated as public open space, they function as locally important open, green spaces that divide the suburbs and provide informal recreational use. The introduction of the road into these LCUs, will remove a large portion of the bush/vegetation quality and value, as well as the informal recreational use. This will generate a high or major impact. However, in the case of impacts on the landscape character of Beeliar Regional Park through LCU3 and LCU4, only a small portion of the park will be replaced by the new transport infrastructure. Therefore, existing parkland and wetland character and values will be maintained.

In LCUs 3 and 4 - the areas immediately around the park - will continue to function as recreational resources. The impact on Beeliar Regional Park is therefore considered low to moderate, given that the inherent character of this landscape will be retained. However, the introduction of the proposed project has the potential to diminish visual amenity values of LCU3 and LCU4 parkland; as well as reduced values associated with potential weed incursion. LCU6 has limited regional or local visual amenity value. The impact will be an intensification of transport infrastructure land use and the overall significance of this is judged to be negligible.

7.2.3 Impacts on Community Perception of Visual Severance

In terms of impacts on visual amenity values, the introduction of a new large scale road corridor into the area could be perceived to visually sever Beeliar Regional Park and the residential communities of North Lake, Coolbellup and Bibra Lake.

In the case of severing Beeliar Regional Park, with the introduction of the road corridor into LCU3 and LCU4, the impact is considered of medium (or moderate) significance, as the road infrastructure footprint has been purposefully kept as narrow as possible, does not include noise walls and has a number of existing crossing points in the form of Hope Road and Progress Drive. However, the impact is at a regional level, as the park is a regional recreational resource with high visual amenity values, which both the local community and visitors value. Given the current impact at a regional level, it would be essential for ongoing design work to ensure the crossing points under the road are maintained and beneficial for additional or wider crossing points to be further explored (refer **Section 6.2** for opportunities for additional visual mitigation measures).

In the case of severing the residential communities of North Lake, Coolbellup and Bibra Lake, the introduction of the road corridor, will both physically and visually sever community connections. The visual separation will be exacerbated by the introduction of the noise walls along both the north and south side sections of the road corridor. The visual severance of the residential communities associated with the introduction of the road into LCU1, LCU2 and LCU5, will generate a local adverse impact of high (major) significance.

7.2.4 Visual Impacts of Proposed Lighting

There is expected to be an intensification of night time light levels in close proximity to the proposed project. Night lighting can be divided into light glow, which is effectively the glow of night lighting off air particles, and light spill, which refers to those areas from which light sources are visible. This increase in night time light levels is predicted to impact views for a number of residents in close proximity to the project. These are located between Stock Road and Progress Drive, and for those residents around Peterborough Circle and Hope Road (including Pausin Crescent, Stone Court, Currie Place and Tetlow Place). At a local level, light glow is predicted to have a moderate impact and light spill is predicted to be negligible. The level of light spill cannot be determined without a fully resolved design and, therefore, cannot be effectively quantified at this stage.

7.3 Residual Effects Assessment

The residual impact assessment clearly illustrates that the application of the key mitigation measures identified in section 5.3 and in the LUDF (AECOM, 2011a) can, in many instances, reduce the level of adverse visual impact and if carried out sensitively and to a high quality, can actually reverse the type of impact from adverse to beneficial for some affected viewers.

However there are still a number of situations, where the residual impact assessment illustrates that significant impacts and effects will occur on visual amenity values (i.e. those adverse impacts over moderate / major significance) both during the day and night. These views are concentrated around Bibra Lake and at the Bibra Drive overpass (by the Montessori School). In addition the residual assessment illustrates some significant visual impacts (moderate – major adverse) at night in the western section of the proposal between Stock Road and North Lake Road. This is where the corridor is at its most narrow and adjacent to residential areas.

In light of these findings it is therefore recommended that further investigation is made into visual impact reduction, through the pursuit of landscape, urban and architectural interventions during the detailed engineering design and the utilisation of the LUDF (AECOM, 2011a) to guide this design.

7.4 Compliance with the Visual Amenity Management Objectives

To complete the conclusion section, the following table (**Table 7**) has been prepared to determine whether the visual management objectives, defined in **Section 3.2** for the individual project area LCUs would be met by the proposed project.

Table 7: Compliance with the Visual Amenity Management Objectives

Visual Amenity Management Objectives (Section 3.2)	The extent to which the Visual Amenity Management Objective would be met by the proposed project.
LCU1 Main Objectives	
1. To maintain Matilda Birkett Reserve by Coolbellup Avenue.	This objective would be met through the scheme. Furthermore the scheme has made allowances for enhancement of this park through “renewal and improvement” as part of the mitigation.
2. To maintain the sense of a vegetative “visual buffer” between the residential suburbs.	This objective would be met as the scheme minimises the vegetation clearing footprint to 2 metres on either side of the carriageway, between Stock Road and Progress Drive. In addition the assessment also provides for rehabilitation of these buffers and tree planting program for private property gardens as part of the mitigation.
3. To ensure that the lack of intervisibility between the residential suburbs on either side of the road corridor is maintained i.e. from one side of the road corridor ensures no roofs are seen on the other side of the road corridor.	This objective would be met. Refer to objective above.
Sub objectives to meet objectives 2 and 3	
Maintaining and further enhancing the existing remnant vegetation cover on the edge of the road, to its greatest extent possible without compromising the functionality and safety of the proposed project.	This objective would be met. Refer to objective above.
To provide endemic landscape design treatments along the road which reflect the existing remnant vegetation communities within the reserve.	This objective would be met as this assessment has put in place mitigation measures that promote endemic landscape treatments

Visual Amenity Management Objectives (Section 3.2)	The extent to which the Visual Amenity Management Objective would be met by the proposed project.
To provide road infrastructure that is cognisant of not only the road users but also the adjacent static residents. For example, apply appropriate and sensitive urban and landscape treatments to infrastructure sited immediately adjacent to private residential boundaries, such as noise walls and cut or fill treatments. Refer to the mitigation section (Section 5.3).	This objective would be met as this assessment has put in place mitigation measures for noise wall treatments and for a tree planting scheme to private properties where the noise walls would be on back garden fence lines.
LCU2 Main Objectives	
1. To minimise the direct impacts on Bassett Park Reserve adjacent to Progress Drive.	This objective would be met through the scheme. Furthermore the scheme has made allowances for enhancement of this park through “renewal and improvement” as part of the mitigation.
2. To seek to maintain the sense of a vegetative “visual buffer” between the residential properties and the proposed project north of the study site to the greatest extent possible i.e. Madeleine Court, Lygon Court, and Samual Court.	This objective would be met as the scheme minimises the vegetation clearing footprint to 2 metres on either side of the carriageway, between Stock Road and Progress Drive. In addition the assessment also provides for rehabilitation of these buffers and tree planting program for private property gardens as part of the mitigation
LCU2: Sub objectives to meet objectives 2	
Maintaining and further enhancing the existing remnant vegetation cover on the edge of the road, to its greatest extent possible without compromising the functionality and safety of the proposed project.	This objective would be met. Refer to objective above.
To provide endemic landscape design treatments along the road that reflects the existing remnant vegetation communities within the reserve.	This objective would be met as this assessment has put in place mitigation measures that promote endemic landscape treatments.
To provide road infrastructure that is cognisant of not only the road users but also the adjacent static residents. For example, apply appropriate and sensitive urban and landscape treatments to infrastructure sited immediately adjacent to private residential boundaries, such as noise walls and cut or fill treatments. Refer to the mitigation section (Section 5.3).	This objective would be met as this assessment has put in place mitigation measures for noise wall treatments and for a tree planting scheme to private properties where the noise walls would be on back garden fence lines.
LCU3 Main Objectives	
1. Minimise road infrastructure within Bibra Lake or Horse Paddock Swamp.	This objective would be met.
2. Use the implementation of Roe Highway Extension as a catalyst for restoration of Bibra Lake, including: • Improving the ecological health of the lake and surrounds e.g. by maintaining and further enhancing the existing remnant wetland and dry vegetation cover. • By providing endemic landscape design treatments along the road that reflect the existing vegetation within the reserve. • By upgrading the recreational facilities in the vicinity of the proposed project e.g. upgrading pedestrian and cycle paths, new bird hides.	This objective would be met as this assessment has put in place mitigation measures that promote the restoration of Bibra Lake in areas adjacent to the road.

Visual Amenity Management Objectives (Section 3.2)	The extent to which the Visual Amenity Management Objective would be met by the proposed project.
3. Minimise the level of visual intrusion that the proposed structures may have on views across Bibra and North Lakes. Recognising the fact that the road infrastructure may be highly visible through this LCU, and that the community values views of the lake, this part of the road should be cognisant of the surrounding landscape values. Aesthetics should be a key outcome of the engineering. In this setting it is suggested that the road infrastructure should be simple, of low visual mass and evenly proportioned. It should be simple, unified, uninterrupted, of rational order and rhythm (not necessarily symmetrical), slender and light weight. Should a bridge be used in this locality, best practice design and engineering needs to apply to ensure "A bridge is a whole not an assemblage of parts."(Bridge Aesthetics: RTA - NSW).	This objective would partially be met. The proposed PER concept design has to the greatest extent aimed to minimise the level of visual intrusion in Beeliar Regional Park. However it is recognised that the PER concept design is constrained by parameters such as functionality, safety, other environmental issues (e.g. retention of Black Cockatoo habitat) and the provision of a cost effective budget. With the above factors in mind, the design team have reduced the overall visual impact and improved the aesthetics of the scheme through Beeliar Regional Park with the following key design decisions: - kept the structure as low as possible through Beeliar Regional Park; - avoided direct land take impacts on Bibra Lake to the greatest extent possible; - minimised the construction (2 metre wide vegetation clearance) and operating footprint (retaining wall at Bibra Lake, instead of embankment) as far as possible; - provided a bridge to Roe Highway for a section between Horse Paddock Swamp and Bibra Lake; and - provided an archway design to the Progress Drive and pedestrian/fauna underpasses. However the VIA assessment illustrates, even with a number of additional landscape and architectural interventions to the proposed PER concept design, the impact on close distance views across Bibra Lake would remain major adverse The elevated structure would remain highly visible, and to some people appear incongruous, within the existing parkland setting of Bibra Lake and, therefore, it is recommended that as part of ongoing design work at the future D and C stage that a reduction of visual impact on views and consideration of the "aesthetics" of the structure through Beeliar Regional Park are pursued further through the engineering scheme. To improve the overall aesthetics of the structure itself, means to build in aesthetics as a key design parameters for the engineered structure, thus avoiding "add on measures" to beautify the structure (i.e. architectural treatments) or screen the structure (with buffer planting).
LCU4 Main Objectives	
1. Minimise locating any road infrastructure within Roe Swamp.	This objective would be met; given a bridge structure is proposed over Roe Swamp.
2. Minimise extent of vegetation clearance	This objective would be met as the scheme minimises the vegetation clearing footprint to 2 metres on either side of the carriageway. In addition the assessment also recommends restoration of Beeliar Regional Park in close proximity to the proposed project as part of the mitigation.

Visual Amenity Management Objectives (Section 3.2)	The extent to which the Visual Amenity Management Objective would be met by the proposed project.
3. Use the implementation of Roe Highway as a catalyst for restoration in this part of the park, including: • Improving the ecological health of existing habitats. • By providing endemic landscape design treatments along the road that reflect the existing vegetation within the reserve. • By upgrading the recreational facilities in the vicinity of the proposed project e.g. upgrading pedestrian and cycle paths, new bird hides	This objective would be met as the scheme assessment mitigation measures recommend restoration of Beeliar Regional Park in close proximity to the proposed project.
LCU5 Main Objectives	
1. To provide vegetative “visual buffers” between the residential suburbs on either side of the proposed project corridor, that respond to the fence setting on the northern side of the road corridor and the local service road on the south side of the proposed project corridor.	This objective would be partially met, as the assessment mitigation measures promote dense vegetative buffers to the edge of the roads, feature formal tree planting along Hope Road, and for a tree planting program for private property gardens.
2. To reduce the intervisibility between the adjacent residential suburbs and the proposed project with appropriate endemic vegetative treatments.	This objective would be met. Refer to objective above.
Sub objectives to meet objective 2	
Maintaining and further enhancing the existing remnant vegetation cover on the edge of the road.	This objective has been met as far as possible with the proposed project scheme.
To provide endemic landscape design treatments along the road that reflects the existing remnant vegetation communities within the reserve.	This objective would be met as this assessment has put in place mitigation measures that promote endemic landscape treatments.
LCU6 Main Objectives	
1. To provide full vegetative “visual buffers” between the residential suburbs of North Lake and Leeming between the proposed project and existing interchange.	This objective would be partially met, as the assessment mitigation measures promote dense vegetative buffers to the edge of the roads and for a tree planting program for private property gardens.
2. Provide additional connections to the cycle link along Kwinana Freeway.	This objective would be met.
3. Provide urban design treatments to infrastructure such as noise walls, lighting columns, bridge treatments, that “follow on” (not replicate but draw upon) from those existing on Roe Highway.	This objective would be met as this assessment has put in place mitigation measures that promote this design intent.

References

- AECOM (2011a) Roe Highway Extension Landscape and Urban Design Framework.
- AECOM (2011b) *Roe Highway Extension Kwinana Freeway to Stock Road: Vegetation and Flora Assessment. Including Targeted Declared Rare Flora Surveys.*
- Countryside Agency and Scottish Natural Heritage (2002) *Landscape Character Assessment Guidance for England and Scotland*.
- Department of Conservation and Land Management (1994) *Reading the Remote Landscape Characters of Western Australia*.
- Department of Planning (2009) *Directions 2031 Draft Spatial Framework for Perth and Peel.*
- Environmental Protection Authority (EPA) (2008) *Environmental Guidance for Planning and Development* (*chapter D3: Visual Amenity*).
- Landscape Institute and the Institute of Environmental Management & Assessment (2002) *Guidelines for Landscape and Visual Impact Assessment* Second Edition, SPON press.
- Queensland Government Department of Main Roads (1997) *Road Landscape Manual*.
- The Road and Traffic Authority (RTA) (2006) *Noise Walls Design Guidelines "Design guidelines to improve the appearance of noise walls in NSW*".
- RTA (2003) *Bridge Aesthetics "Design guidelines to improve the appearance of bridges in NSW"*.
- Seddon, G (1972) *Sense of Place: "A response to an environment". The Swan Coastal Plain, Western Australia"* Limited Facsimile Edition, Bloomings Book, first published in 1972.
- Syrinx Environmental PL & V & C Semeniuk Research Group (2011) *Roe Extension Project. Wetland Ecology Investigations parts 1 and 2.*
- US Forestry Service (1996) *The US Forestry Service, Scenic Management System* (SMS) in 'Landscape Aesthetics: A Handbook of Scenery Management' US Forestry Service (1996).
- Western Australian Planning Commission (2007) *Visual Landscape Planning in Western Australia; a manual for evaluation, assessment, siting and design.* http://www.planning.wa.gov.au.

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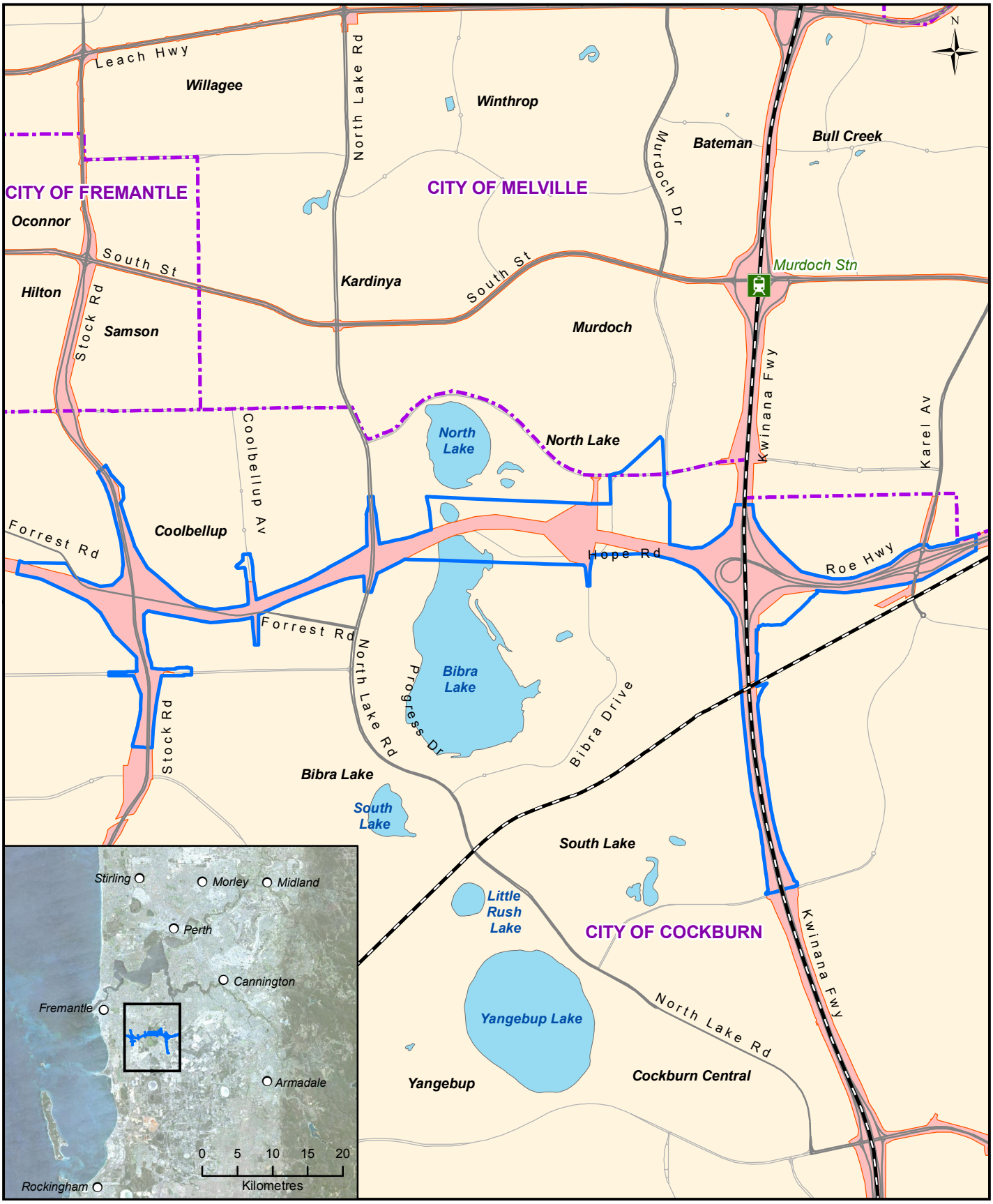
Appendices

Appendix 1: Figures

Figure Number.	Figure Name
1	Locality Map
2	Landscape Context
3	Topography : Landform
4	Topography: Slope Analysis
5	Landscape Character Units
6	Visual Context
7	Key Visual Components
8	A ZTV of the alignment
9	A ZTV of the noise walls
10	Representative viewpoints locations
11	Viewpoints 1 - 3
12	Viewpoints 4-5
13	Viewpoint 6
14	Viewpoints 7-8
15	Viewpoint 9
16	Viewpoint 10
17	Viewpoint 11
18	Viewpoint 12
19	Viewpoints 13-14
20	Viewpoint 15
21	Viewpoints 16-18
22	Key Visual Amenity Mitigation and Management



Locality Map

South Metro Connect

Figure 1

0 0.25 0.5 0.75 1 1.25 1.5
Kilometres
1:42,000 (A4)
Datum: GDA94 Projection: MGA z50

Legend

- Project Boundary
- LGA Boundaries
- MRS - Primary Regional Roads

SouthmetroConnect

Date Modified: 25/11/2010
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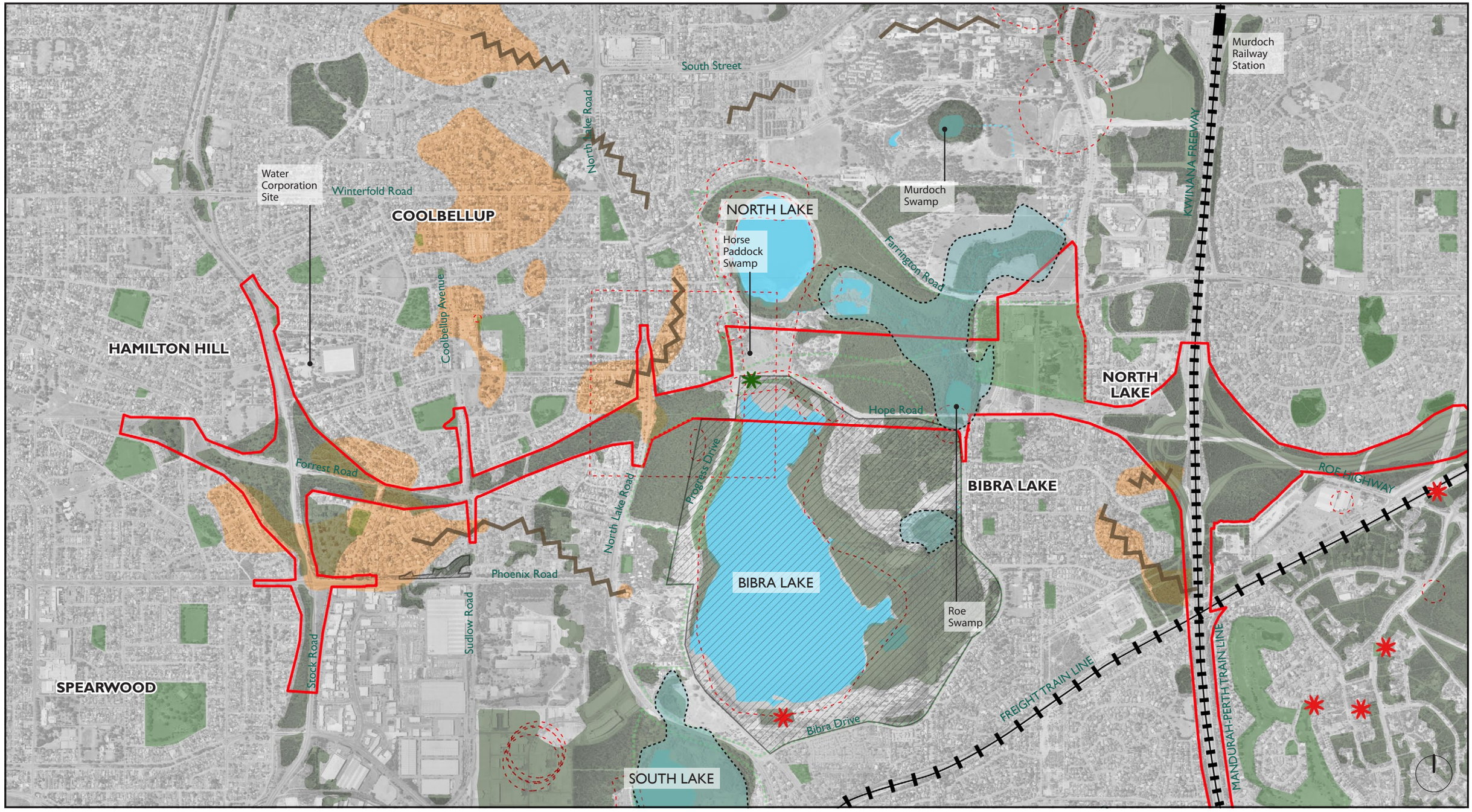


Figure 2

Landscape Context

South Metro Connect

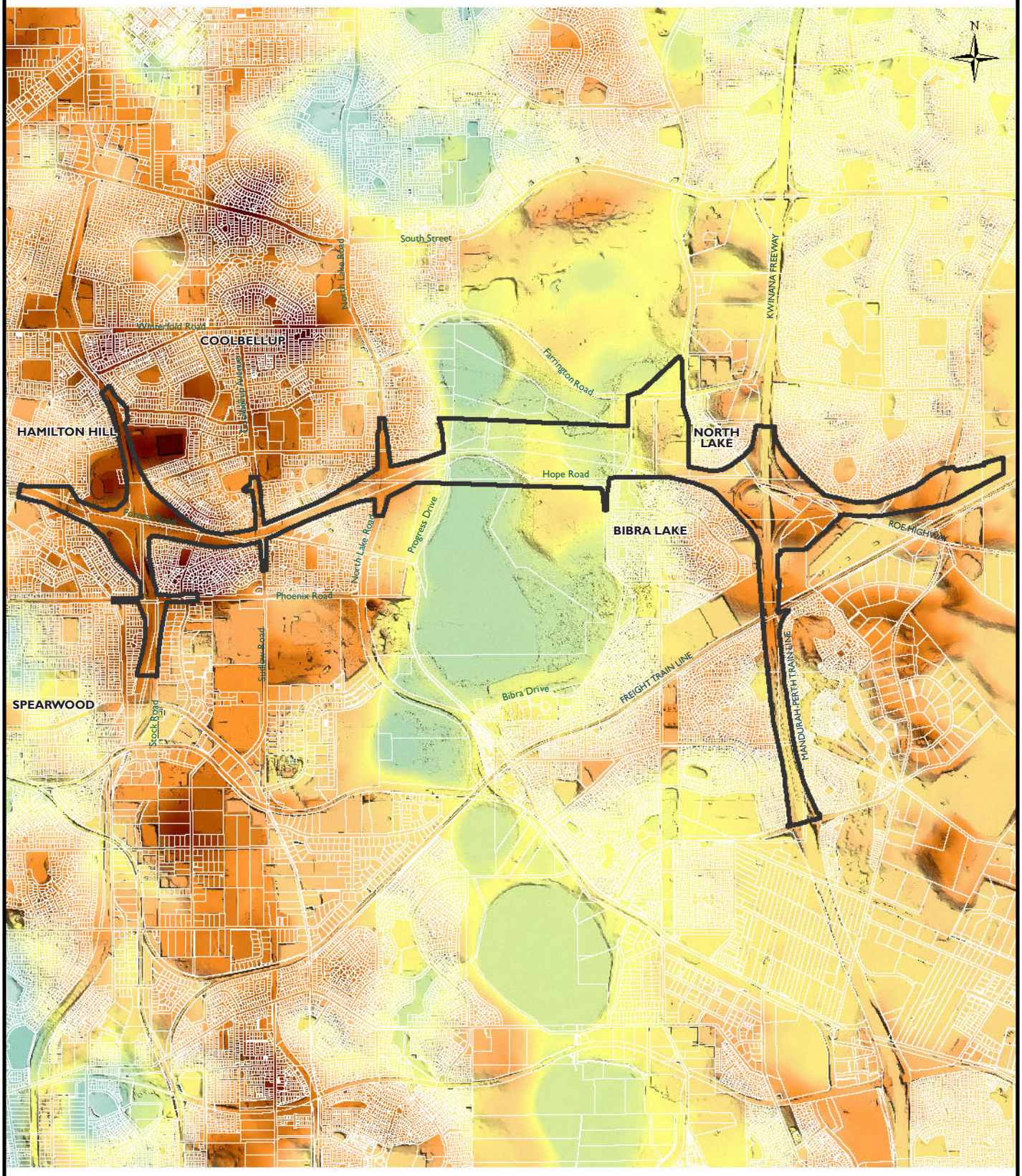
1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Bushland Forever Protection Area
- Beeliar Regional Reserve
- Parks
- Remnant Vegetation
- Permanent Wetlands
- High Ground
- Seasonally Inundated Wetlands
- Conservation Reserve Under Council Control
- Aboriginal Sites
- Ridge Lines
- Rare Flora
- Norfolk Island Pine Trees

SouthmetroConnect



Topography Landform

South Metro Connect

Figure 3

0 0.25 0.5 0.75 1 1.25 1.5

Kilometres

1:42,000 (A4)

Datum: GDA94 Projection: MGA z50

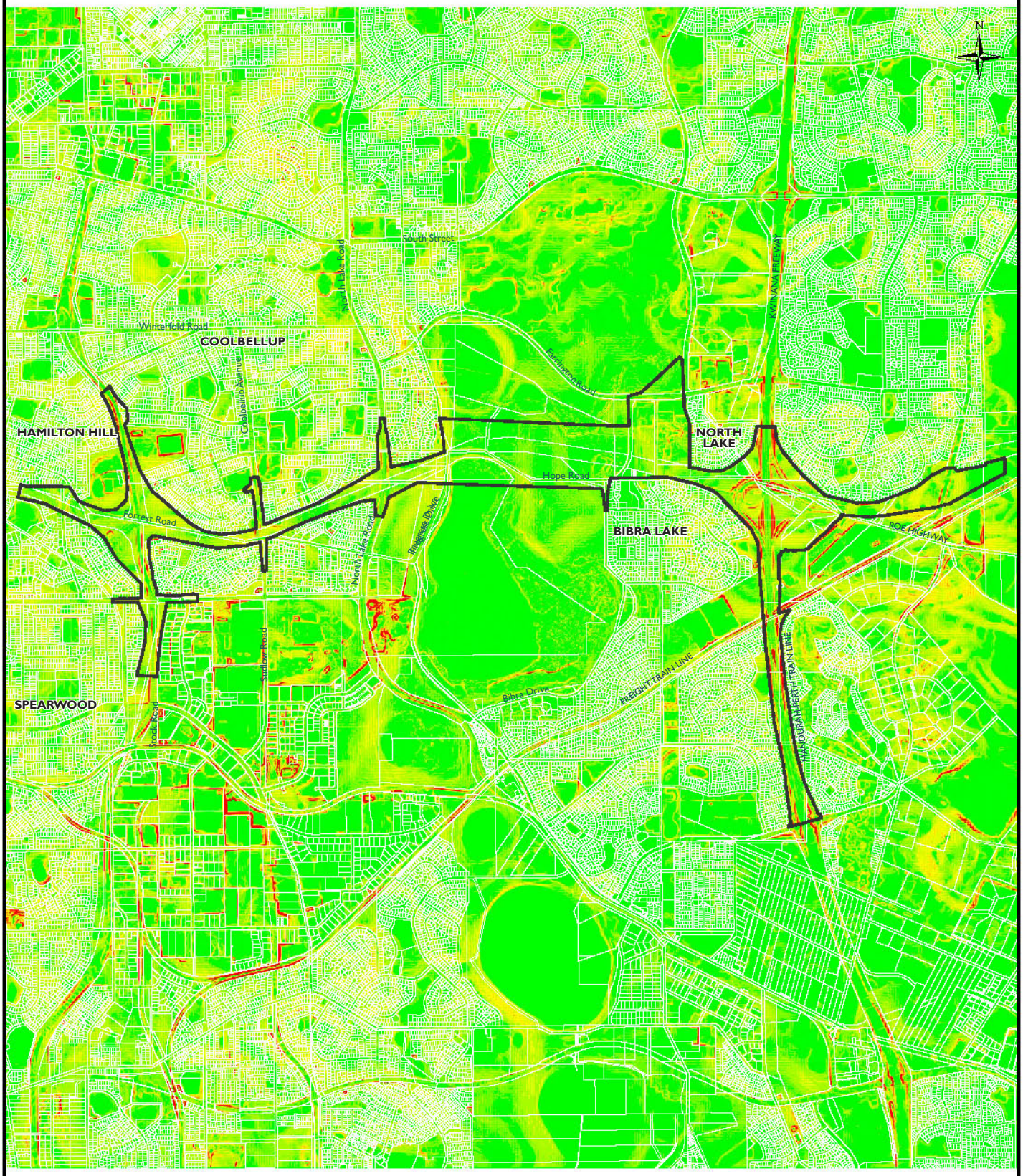
0m 10m 20m 30m 40m 50m 60m 65m

(Map Note : Slope derived from 1m Bare Earth LIDAR

SouthmetroConnect

Date Modified: 25/11/2010

Author: CBB J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\WPER\Section 4.14\Topography Slope Analysis\Topography_Landform.mxd



Topography Slope Analysis

South Metro Connect

Figure 4

0 0.25 0.5 0.75 1 1.25 1.5

Kilometres
1:42,000 (A4)
Datum: GDA94 Projection: MGA z50

Legend

Percent Slope

0 - 2.5 | 2.6 - 5 | 5 - 10 | 10 - 15 | 15 - 20 | 20 - 25 | 25 - 30 | 30 - 90

(Map Note : Slope derived from 1m Bare Earth LIDAR

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Date Modified: 25/11/2010

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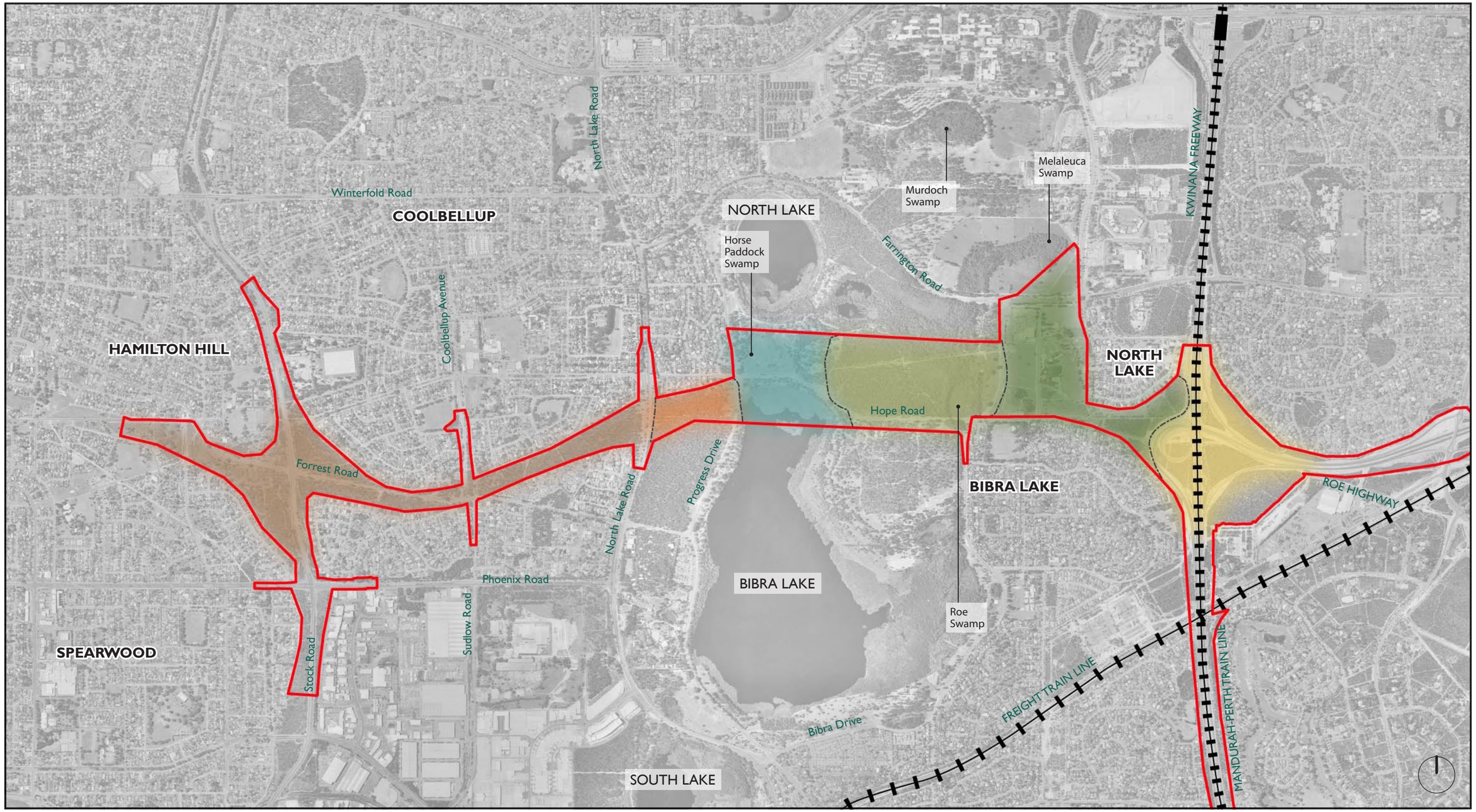


Figure 5

Landscape Character Units

South Metro Connect

1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Stock Road to Northlake Road Bushland LCU1
- North Lake Road to Progress Drive Bushland LCU2
- Bibra Lake LCU3
- Bibra Lake Bushland LCU4
- Hope Road Reserve LCU5
- Roe Highway & Kwinana Freeway interchange LCU6

SouthmetroConnect

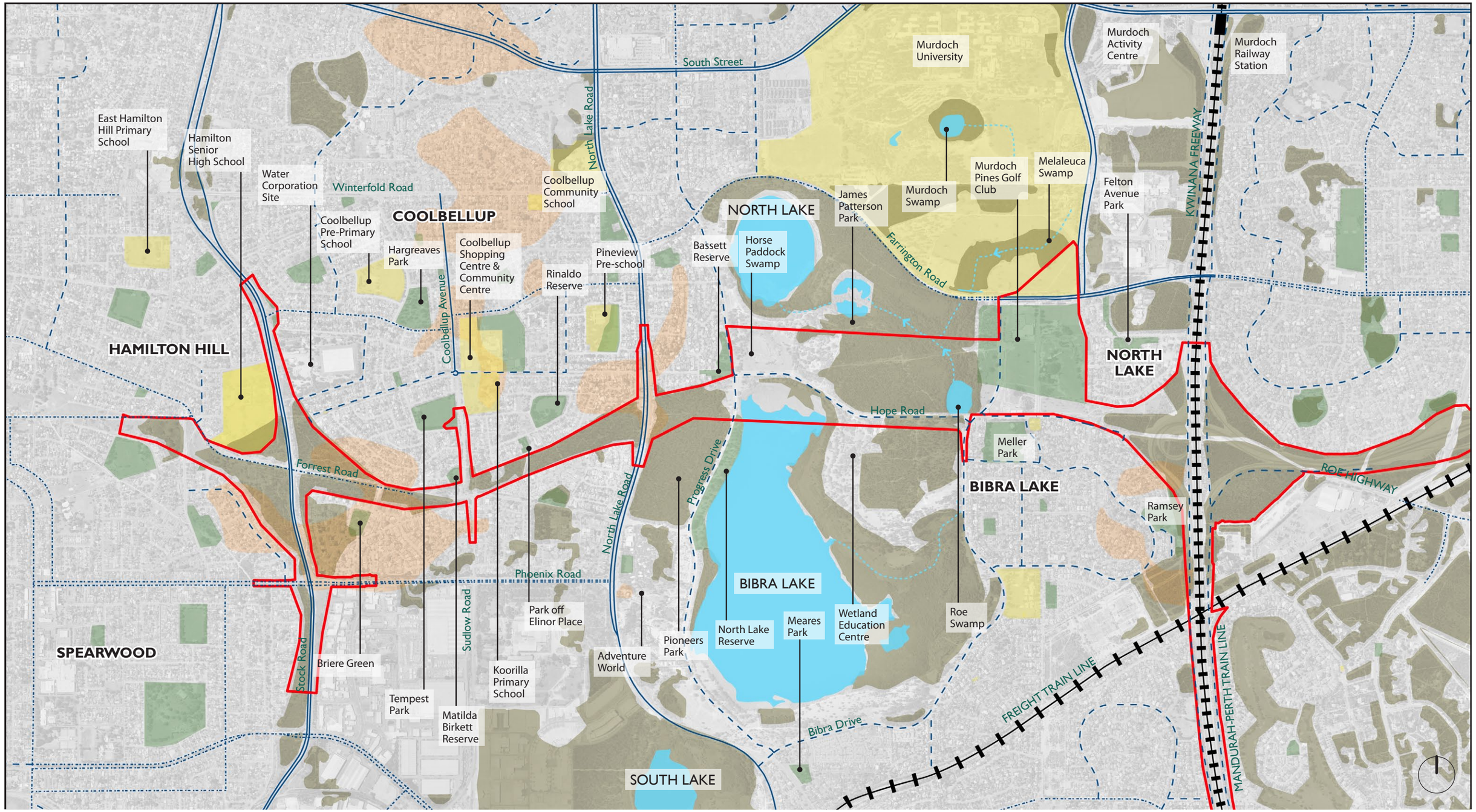


Figure 6

Visual Context

South Metro Connect

1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Parks
- Remnant Vegetation
- High Ground
- Permanent Wetlands
- Seasonally Inundated Wetlands
- School Sites
- Paths

Perth Bike Map series:

- Beginner Cycle Path
- Intermediate Cycle Path
- Experienced Cycle Path

SouthmetroConnect

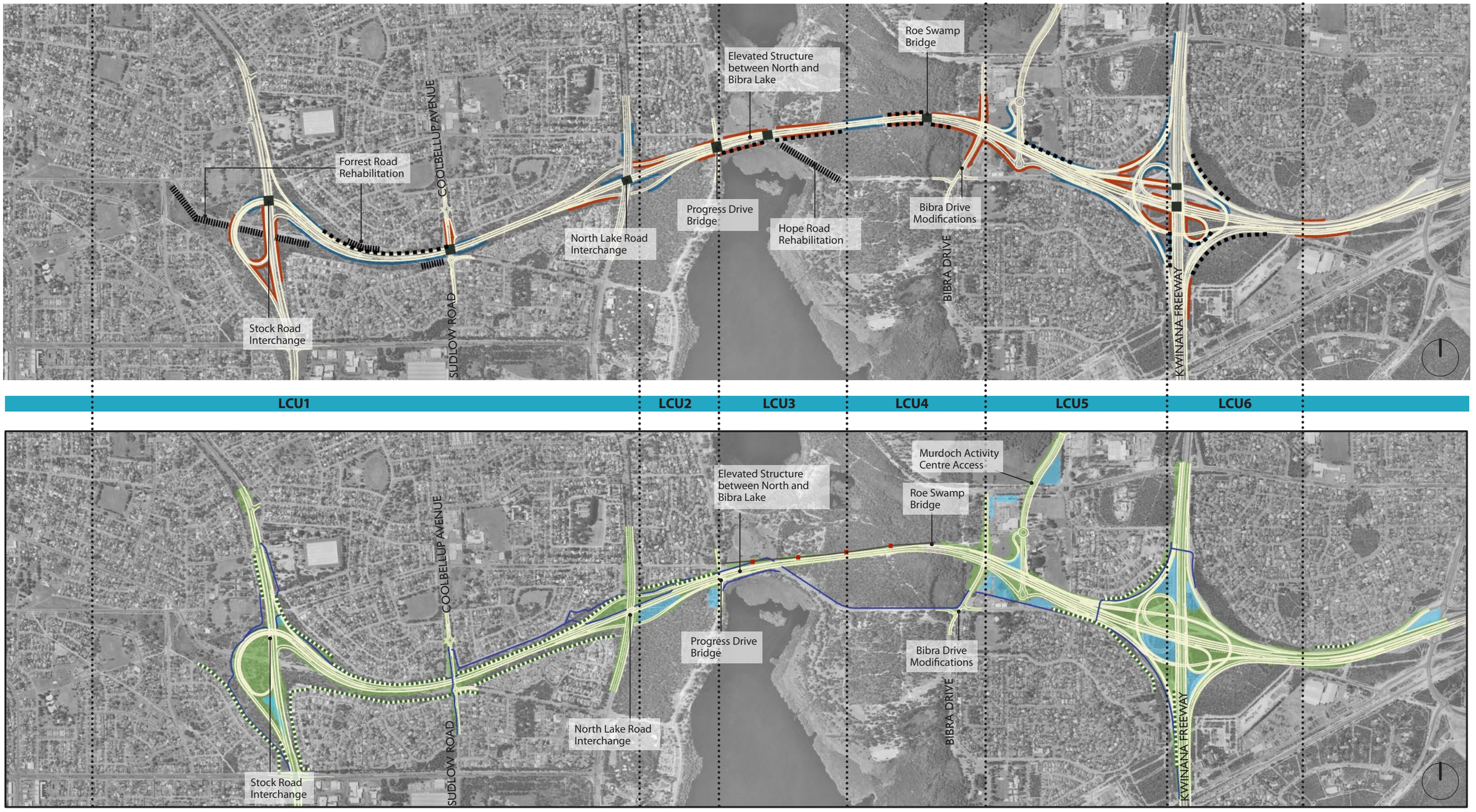


Figure 7

Key Visual Components

South Metro Connect

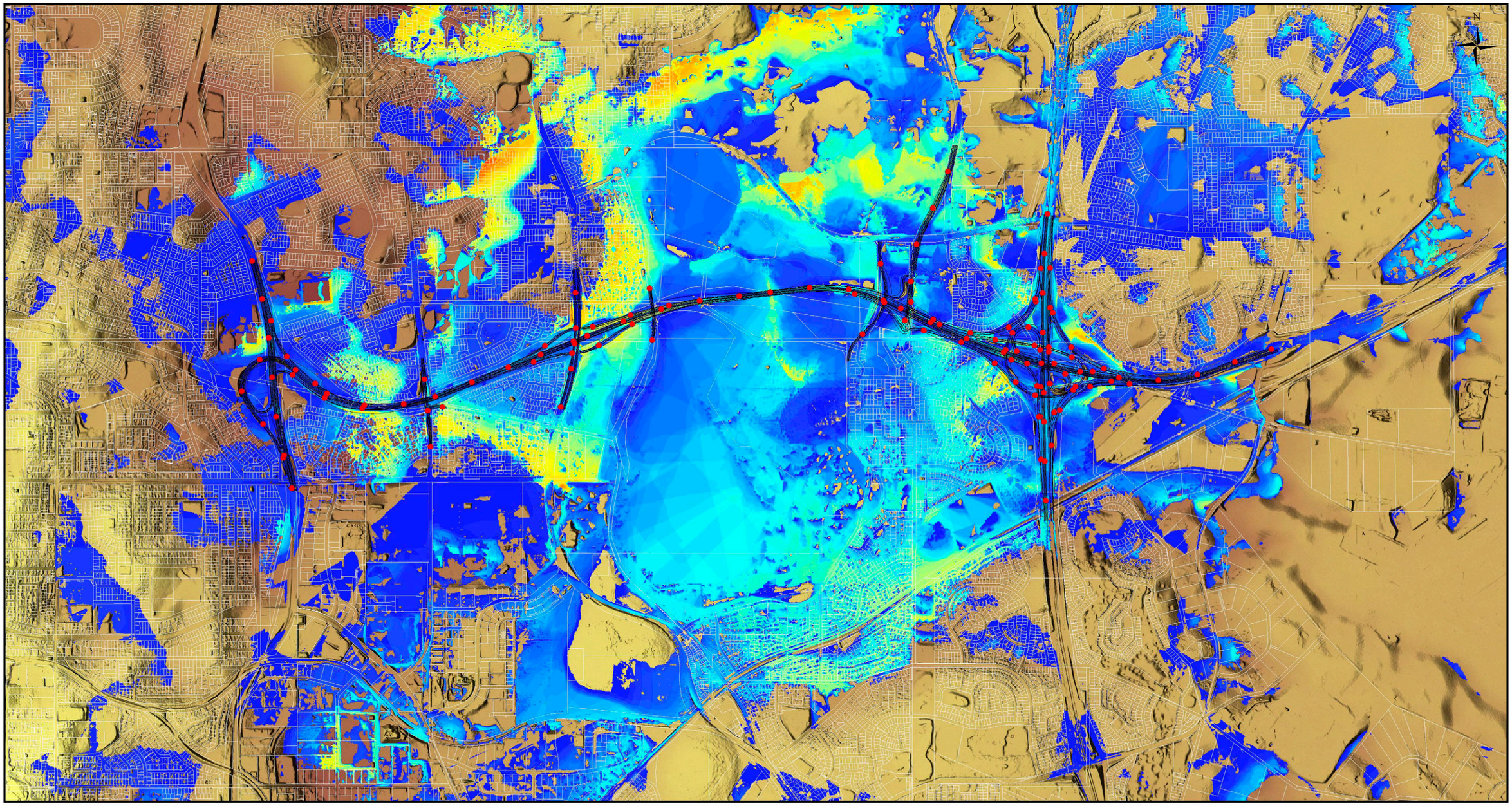
1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project PER Alignment
- Key Cuttings
- Key Embankments
- Retaining Wall
- Bridge
- Rehabilitation of Forrest & Hope
- Concept PER Drainage Basins
- Concept PER Construction Footprint
- Principal Shared Path
- Noise Walls
- Powerline Diversion

SouthmetroConnect



ZTV of the Alignment

Southmetro Connect

Figure 8

0 0.5 1 1.5

Kilometres

1:25,000 (A3)

Legend

- Target Point

ZTV

- Potentially High Visibility
- Potentially Low Visibility

SouthmetroConnect

Date Modified: 4/02/2011

Author: MR J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\#PER\Section 4.14\ZTV_Alignment_No_Noise_Walls_20110204\ZTV_Alignment_No_Walls_2011_02_04.mxd

ZTV
Alignment & Noisewalls

Southmetro Connect

Figure 9

DRAFT

0 0.5 1 1.5

Kilometres

1:25,000 (A3)

Legend

Noise Walls

ZTV

Potentially High Visibility

Potentially Low Visibility

This visibility analysis was conducted using a “bare earth” elevation model.
The model is a derived terrain model from existing digital elevation model (dem) with added Roe Hwy extension 3D design concept model.
This analysis shows where you would need to stand to potentially see the roadway.
Yellow or orange areas show the sites with potentially high visibility of the roadway

SouthmetroConnect

Date Modified: 8/02/2011

Author: MR J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\#PER\Section 4.14\ZTV_Alingment_With_Noise_Walls_RevB_20110207\ZTV_Alignment_Walls_2011_02_08.mxd

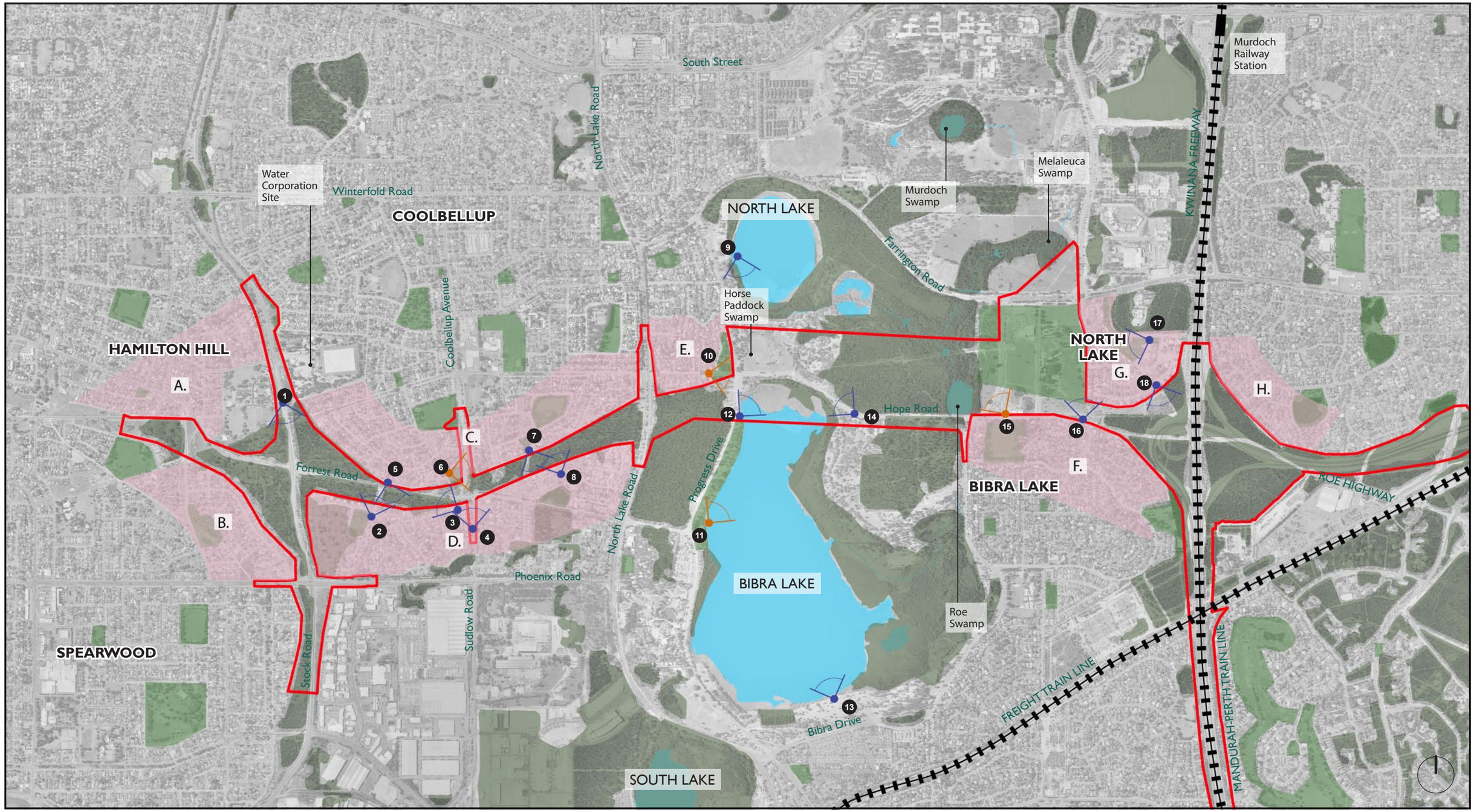


Figure 10

Representative Viewpoint Locations

South Metro Connect

1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Viewpoint
- Viewpoint (with photomontage)

Viewer Groups

A: Hamilton Hill (O'Connell Street)

B: Hamilton Hill (Quickley Crescent)

C: Coolbellup (Sebastian Crescent)

D: Bibra Lake (Forillion Avenue)

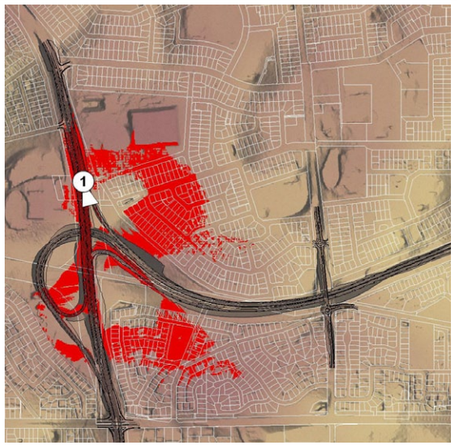
E: North Lake (Coleridge Place)

F: Bibra Lake (Hope Road)

G: North Lake (Allendale Entrance)

H: Leeming (Casserly Drive)

SouthmetroConnect



Viewpoint 1. View south from Hamilton Senior High School pedestrian footbridge

Viewpoint 2. View north from the junction of Forillion Avenue and Briere Green

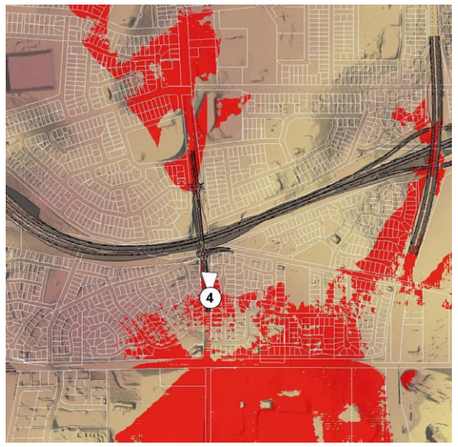
Viewpoint 3. View north west from Provincial Mews

Figure 11

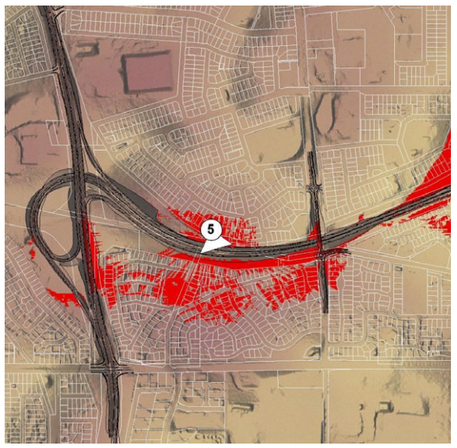
Viewpoints 1 - 3

South Metro Connect

SouthmetroConnect



Viewpoint 4: View north along Sudlow Road



Viewpoint 5: View south east from Sebastian Crescent near the junction with Juno Place

Figure 12

Viewpoints 4 - 5

South Metro Connect

SouthmetroConnect

Viewpoint 6: View south across Matilda Birkett reserve (off Whitmore Place) - Existing situation

Viewpoint 6: View south across Matilda Birkett reserve (off Whitmore Place) - Scenario 1, photo simulation illustrating an unmitigated proposed project

Viewpoint 6: View south across Matilda Birkett reserve (off Whitmore Place) - Scenario 2, photo simulation illustrating a 'mitigated' proposed project

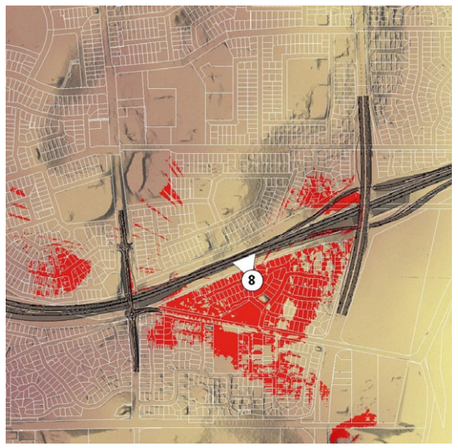
Figure 13

Viewpoint 6

South Metro Connect

SouthmetroConnect

Viewpoint 7: View south from unnamed public open space by Elinor Place and Malvolio Road



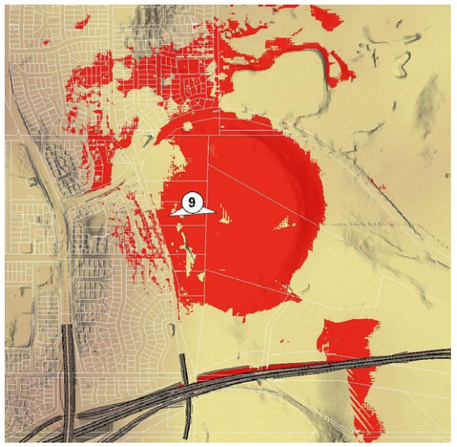
Viewpoint 8: View north from Paddington Crescent

Figure 14

Viewpoints 7 - 8

South Metro Connect

SouthmetroConnect



Viewpoint 9: View from trail looking south east across North Lake

Viewpoint 9: View from trail looking south east across North Lake - zoomed in

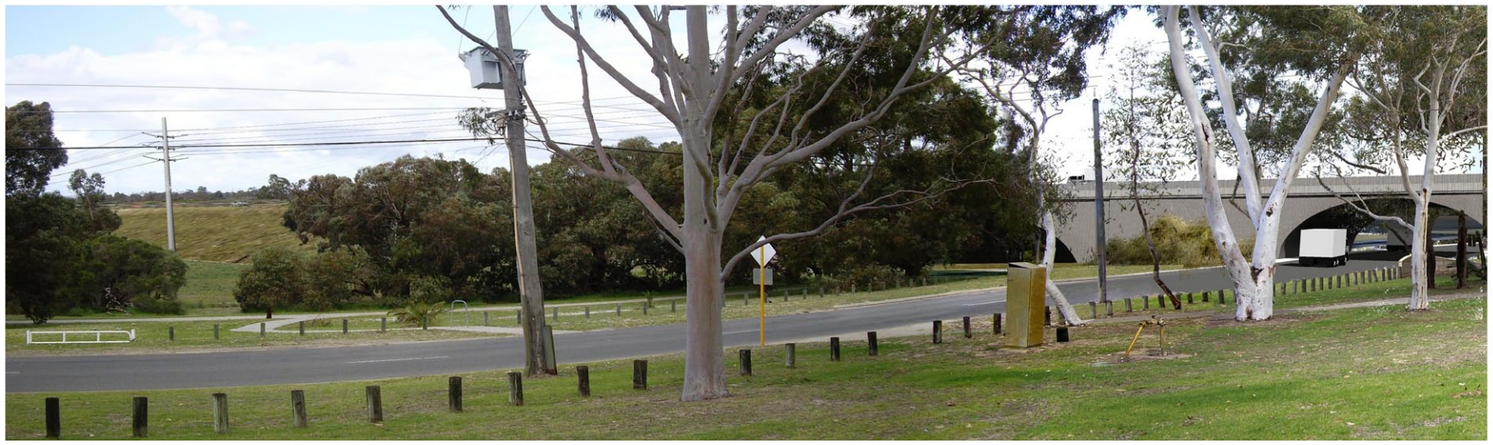
Figure 15

Viewpoint 9

South Metro Connect

SouthmetroConnect

Viewpoint 10: View from Bassett Reserve by Rossetti Court - Existing situation



Viewpoint 10: View from Bassett Reserve by Rossetti Court - Scenario 1, photo simulation illustrating an unmitigated proposed project

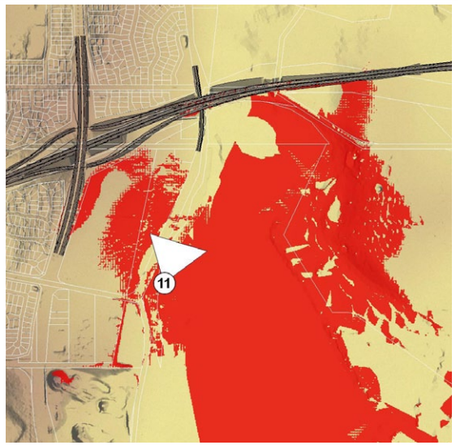
Viewpoint 10: View from Bassett Reserve by Rossetti Crescent - Scenario 2, photo simulation illustrating a 'mitigated' proposed project

Figure 16

Viewpoint 10

South Metro Connect

SouthmetroConnect



Viewpoint 11: View north east from jetty off Bibra Lake Reserve - Existing situation

Viewpoint 11: View north east from jetty off Bibra Lake Reserve - Scenario 1, photo simulation illustrating an unmitigated proposed project

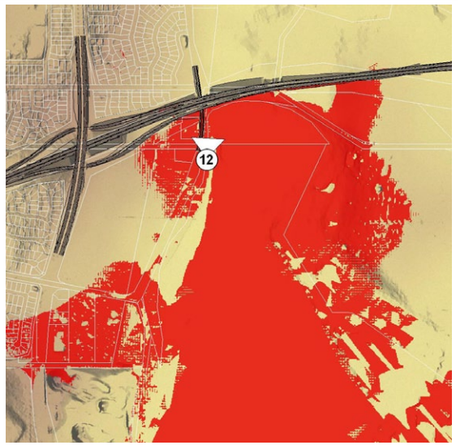
Viewpoint 11: View north east from jetty off Bibra Lake Reserve - Scenario 2, photo simulation illustrating a 'mitigated' proposed project

Figure 17

Viewpoint 11

South Metro Connect

SouthmetroConnect



Viewpoint 12: View north from Bibra Lake Reserve

Viewpoint 12: View north from Bibra Lake Reserve - Scenario 1, photo simulation illustrating an unmitigated proposed project

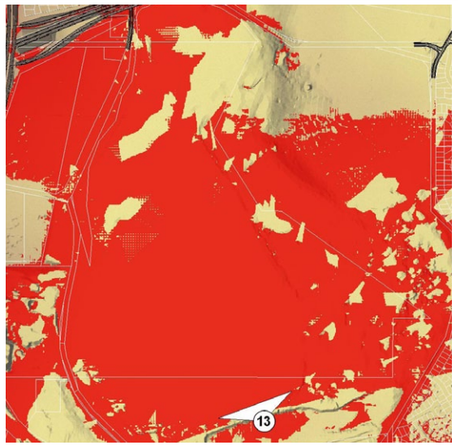
Viewpoint 12: View north from Bibra Lake Reserve - Scenario 2, photo simulation illustrating a 'mitigated' proposed project

Figure 18

Viewpoint 12

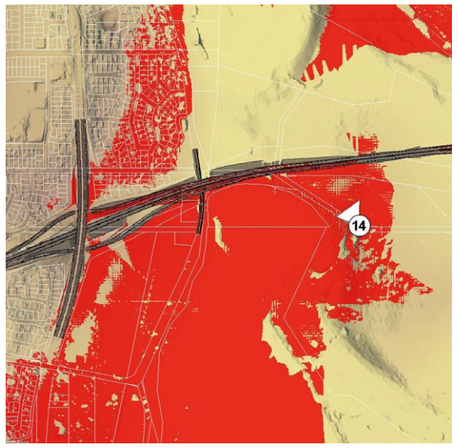
South Metro Connect

SouthmetroConnect



Viewpoint 13: View from bench in Eliza Cave Reserve

Viewpoint 13: View from bench in Eliza Cave Reserve - zoomed in



Viewpoint 14: View from Hope Road by Cockburn Wetlands Education Centre

Figure 19

Viewpoints 13 - 14

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Viewpoint 15: View north from Hope Road by the Blue Gum Montessori School - Existing situation

Viewpoint 15: View north from Hope Road by the Blue Gum Montessori School - Scenario 1, photo simulation illustrating an unmitigated proposed project

Viewpoint 15: View north from Hope Road by the Blue Gum Montessori School - Scenario 2, photo simulation illustrating a 'mitigated' proposed project

Figure 20

Viewpoint 15

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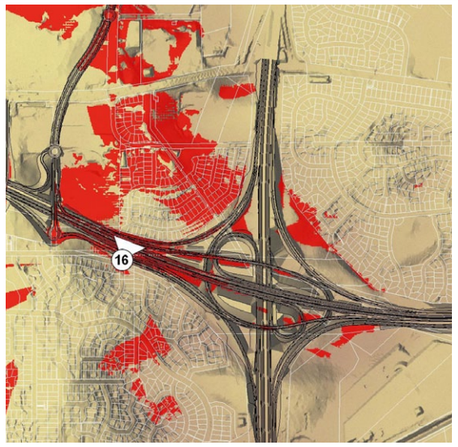
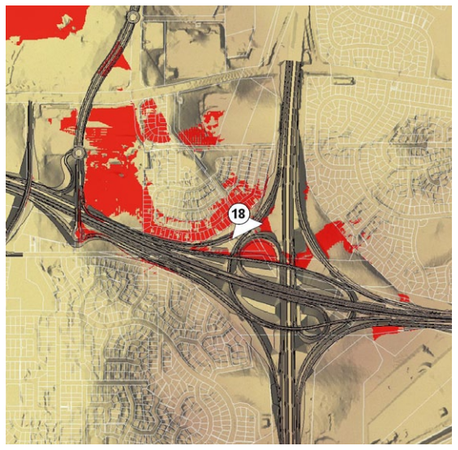



View looking north west


View looking north east

Viewpoint 16: View north from junction of Hope Road and Gilchrist Avenue

Viewpoint 17: View south and west from the Allendale Entrance over Granton Garden



Viewpoint 18: View south east at the junction of Peterborough Circle and Tulkara Way

Figure 21

Viewpoints 16 - 18

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COOLBELLUP

HAMILTON HILL

SPEARWOOD

NORTH LAKE

BIBRA LAKE

KWINANA FREEWAY

ROE HIGHWAY

FREIGHT TRAIN LINE

MANDURAH-PERTH TRAIN LINE

Forrest Road

Bassett Park Reserve

Matilda Birkett Park

Park of Elinor Place

Meller Park

Feature formal tree planting to Sebastian Crescent to mitigate visual impact of noise walls and PSP (and provide shade for PSP users)

Feature formal tree planting to Malvolio Road to mitigate visual impact of PSP (and provide shade for PSP users)

Progress Drive Structure
- Feature formal tree planting to Progress Drive to augment and filter views of structures
- Soften structure with use of 'natural' urban design treatments that reflect parkland and lake setting

Kwinana Freeway Interchange
- Additional landscape treatments to further screen and frame structures
- Urban design treatments to reflect and complement existing works
- Structures to be unobstructive and light weight to reduce visual mass and impact

Feature formal tree planting to Progress Drive. (Investigate use of Norfolk Island Pine Trees)

Visually prominent retaining wall requires sensitive landscape and urban design treatments to visually assimilate structure into lake and parkland setting.

Feature formal tree planting to Hope Road to mitigate visual impact of noise barrier and PSP (and provide shade for PSP users)

Stock Road Interchange
- Dense planting to frame and screen overpass from sensitive viewers
- Structures to be unobtrusive and light weight to reduce visual mass and height

Figure 22

Key Visual Amenity Mitigation and Management Opportunities

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1:20,000

0 .1 .2 .4 .6 .8 1Km

Legend

- Project Boundary
- Transparent noise walls (either to part or entire structure)
- Urban design treatment to noise walls
- Urban design treatment to retaining walls
- Feature formal tree planting
- Endemic planting to integrate road
- Tree planting program for private property gardens
- Dense vegetative buffer
- Location of replacement Norfolk Island Pines
- Restoration of Beeliar Regional Park
- Park Renewal and Improvements
- Bridge Structures of high visual impact

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