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Kenmore Bypass
Environmental Approvals Report ToR

Terms Of Reference

Department of Main Roads - Metropolitan District

30th October 2008

Environmental Approvals Report ToR

Prepared for

Department of Main Roads - Metropolitan District

Prepared by

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1.0 Introduction

1.1 Description of the Project

The Kenmore Bypass is a 3km preserved corridor between Moggill Road at Pullenvale and the Centenary Motorway at Fig Tree Pocket. When preserved in the 1970s, this section of the road corridor was surrounded by a semi-rural environment. However, substantial portions of the adjacent green field space particularly in the Gem Road section of the corridor have been subjected to residential development.

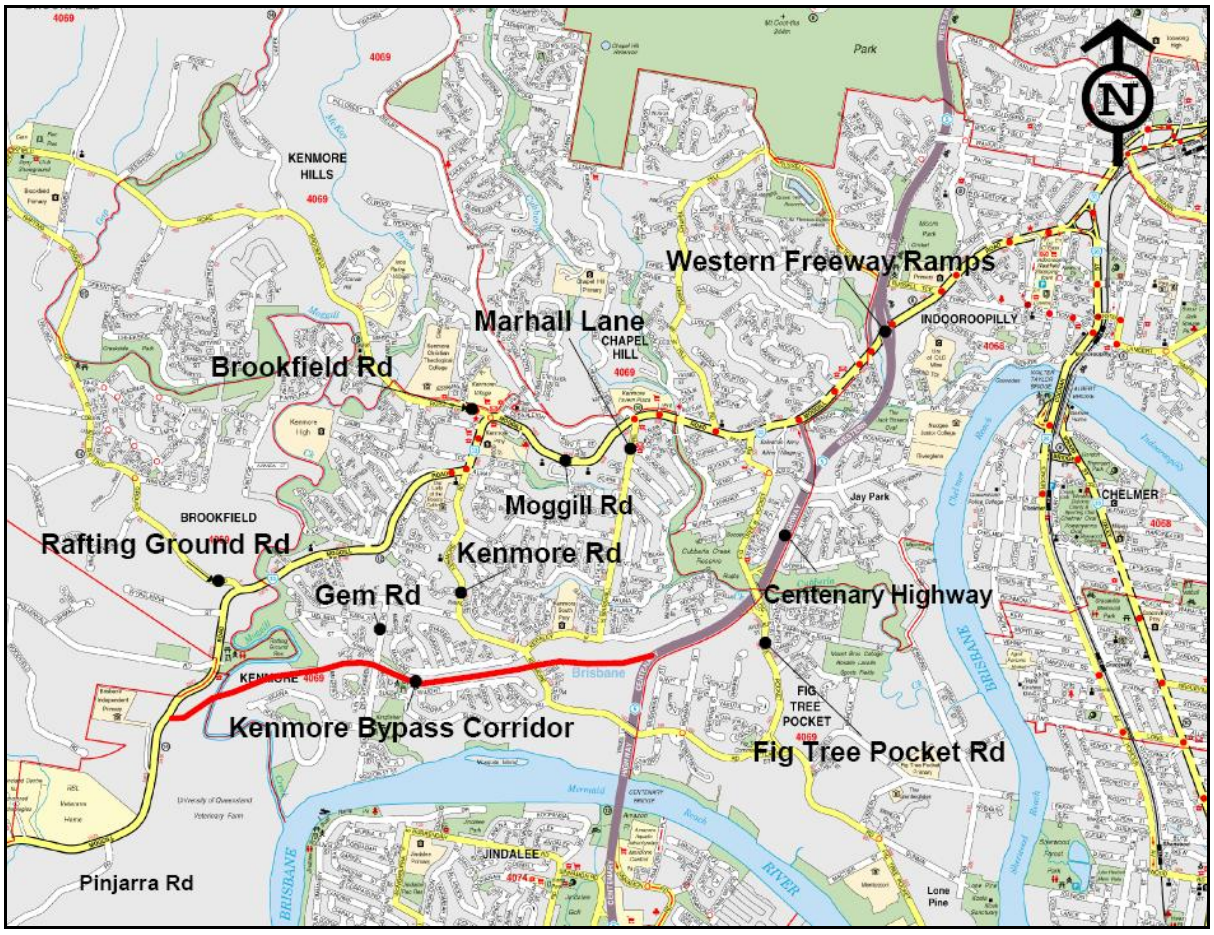

Figure 1 The Kenmore Bypass Corridor

The reserved corridor commences in the east at the Centenary Highway to the southwest of the Fig Tree Pocket interchange and connects in the west to Moggill Road at Pinjarra Hills north of the University of Queensland farm. At the time the corridor was preserved in the 1970's much of the land was rural/residential. However, in the ensuing period it has been redeveloped into residential areas.

In the east the corridor traverses an area of large residential blocks up to its crossing of Kenmore Road. The corridor then runs for approximately 1 kilometre from Kenmore Road to cross Gem Road. In this area the corridor is abutted by the back of residential blocks on both north and south sides, these being houses of Marland Street to the north and Twilight Street to the south. To the west of Gem Road the corridor traverses a ridge, still abutted by residences for approximately 200meters before crossing the valley of Moggill Creek to meet Moggill Road, traversing a distance of approximately 3,100 metres. The study area for this Environmental Assessment Report (EAR) includes consideration of the Centenary Highway to the north east to the Moggill Road off-ramp; since upgrading of the Highway to accommodate traffic from the bypass might need to be considered as part of this project.

Characteristics of the corridor that affect the EAR include:

- the bushland to the east adjacent to Centenary Highway;
- The close proximity of sensitive receptors (houses, schools) along the corridor;
- Traversing of parks at Gem Road;
- Crossing the Moggill Creek floodplain; and
- The catchments of Moggill Creek and Cubberla Creek.

1.2 Prior Assessments and Documentation

In 2006 an Environmental Scoping Study (ESS) was completed for the Kenmore Bypass (Forsyth), as was a desktop cultural heritage report.

As part of a Preliminary Feasibility Study, GHD completed a Preliminary Environmental Assessment (PEA) (GHD – September 2007). This was a desktop review of environmental factors and should be used as a base for developing the EAR. The PEA described a draft Terms of Reference (ToR) for an EAR in the corridor. The draft ToR has been adapted with inputs from Main Roads (July 2008) for the generation of this ToR for the EAR.

1.3 Environmental processes

1.3.1 DMR Processes

The current DMR environmental processes are described in the "*Road Project Environmental Processes Manual*", Second Edition dated May 2004 (Manual). The Manual encompasses the relevant legislation with respect to environmental aspects of road projects and discusses their triggers. It also describes the requirements of an EAR for road projects.

The first stage of the DMR environmental processes for an EAR is to determine the appropriate level of assessment within a minimum of fourteen environmental elements. It is the EAR which is then used in the ensuing the relevant matters ate considered in the preparation of Environmental Management Plans (EMP) for the project.

1.3.2 Level of Assessment

The level of assessment is determined in a pro-forma provided in Appendix C of the Manual. A summary of the levels recommended and the reasons for the choice are summarised below in alphabetical order:

Table 1: Assessment Requirements and rationale for inclusion for the Kenmore Bypass

Element	Recommended level of assessment	Rationale/Comment/Considerations
Air Quality	Moderate	The Bypass will be a new road traversing residential areas. This warrants modelling of air quality and assessment of the impacts on sensitive receptors.
Climate Change	Moderate	The Bypass has the potential to provide a beneficial impact to climate change through the more rapid movement of traffic. The ToR should investigate the impacts of the construction and operation of the Bypass on climate change and the relevant impact of climate change on the project.

Fauna	High	The preserved corridor has become a green belt in the inner western Brisbane area. Particular attention should be given to identifying environmental values in the area and in as much as possible, preserve them or mitigate impacts upon them.
Flora	High	
Hydrology/Hydraulics	High	The corridor traverses the floodplain of Moggill Creek and will need to be at elevated above flood levels. Any fill or structures used in this area will need to be modelled in some detail to assess any possible afflux impacts on flood waters.
Land Use and Planning	Moderate	Although some resumptions may be necessary, the Bypass is unlikely to alter zoning in the area. Moderate assessment is warranted.
Landscape and Visual Amenity	High	Visual impact of the Bypass will represent a significant alteration of existing environmental values.
Noise	High	The corridor is adjacent to significant areas of residential development. The construction of a new road requires a high level of acoustic assessment to be undertaken.
Social and Economic Issues	Moderate	The Bypass represents a significant change to transport patterns in the area, and there may be some resumptions necessary (these should be investigated in the Land Use and Planning section of the EAR). There is also the possibility of community severance around Gem Road.
Soils/Topography/Geomorphology	Low	There is the possibility of Acid Sulphate Soils in the low lying areas near Moggill Creek. The corridor has had minimal prior use that would suggest any contaminated land issues.
Water Quality	Moderate	The Bypass will be built in the Moggill Creek sub-catchment of the Brisbane River and the Centenary Highway interchange will be constructed in the Cubberla Creek catchment. Both creeks have previously been monitored as part of BCC and EPA initiatives, and accordingly, there is a significant amount of data available concerning water quality. There is a catchment management group for Moggill Creek.

1.4 EAR Structure

The EAR will include the following chapters

Introduction

- Description of the project;
- Project Number and relevant DMR references; and
- Map of the proposed works.

Legislative Requirements

- Identify all relevant legislative and permitting requirements, including State an Federal and local permitting requirements
- Relevant legislation may include:
  - Commonwealth
    - *Environmental Protection and Biodiversity Conservation Act*;
  - Queensland
    - *Environmental Protection Act*;
    - *Fisheries Act*;
    - *Integrated Planning Act*;
    - *Nature Conservation Act*;
    - *State Development and Public Works Organisation Act*;
    - *Transport Infrastructure Act*; and
    - *Water Act*.
- Tabulate all material indicating the permit licensing requirements and responsibilities.

Assessment of Environmental Elements – *The detailed ToR for each chapter is given in Section 2 of this ToR*

Environmental Management Plan

References

Appendices

2.0 Issues and Activities

2.1 Air Quality

Objective

To identify existing air quality within the corridor and surrounds and determine any impact of the proposed project on air quality within the study area.

Key issues/activities

- Undertake a desktop review of aerial photographs and site inspection to identify the nearest air sensitive receptors;
- Consider the requirements of the *Environmental Protection (Air) Policy* 1997;
- Describe existing air quality within the study area;
- Undertake baseline monitoring at selected locations.
- Identify potential impacts on air sensitive receptors during the construction and operational phases of the proposed project, and assess their significance.
- Recommend management measures to mitigate potential impacts.
- Predict traffic emissions during operation and compare with relevant guidelines.

2.2 Climate Change Impact Statement

Objectives

To identify the potential climate change impacts produced by the project as well as the potential climate change impacts the project may be subject to.

Key Issues/activities

- Identify potential sources of greenhouses gases produced throughout the life of the project;
- Identification of potential climate change impacts on the project;
- Description of the projects greenhouse gas impact on the State's greenhouse gas emission profile.
- Description of mitigation measures to decrease the impact of greenhouse gas production; and
- Description of the climate change adaptation undertaken by the project to account for the potential impacts listed above.

2.3 Fauna

Objective

To identify the existing faunal environment and determine if there will be any significant impacts of the proposed project on the fauna of the study area.

Key issues/activities

- Research and review relevant reports and databases, maps and aerial photograph of the location of terrestrial and aquatic fauna species and populations in the study area, including but not limited to:
  - databases that identify species protected under International treaties such as JAMBA and CAMBA, the Commonwealth Department of Environment, Water, Heritage and the Arts, Schedules 1 to 4 of the *Nature Conservation (Wildlife) Regulation* 2006 and common species e.g. Queensland Museum, Wildnet, Birds Australia;
- Review aerial photographs and vegetation maps to identify fauna corridors or other habitat features such as roosting sites, tree hollows etc;
- Identify whether any vegetated corridors occur within the corridor and establish which fauna species are most likely to utilise the corridor;
- Undertake field surveys by a qualified ecologist to identify the presence and extent of species, populations and ecological communities within and in proximity to the proposed corridor and their potential to support significant fauna species including:
  - Interpretation of remote sensing data and/or aerial photography;
  - Collection of anecdotal information (including local sightings, specialist interest groups, indirect evidence of species existence);
  - Collection of field survey data on fauna through the identification of scratch marks, scats, footprints, nests, Cage and Elliott traps samples, spotlighting, anabat detection and other specialised techniques. Five night/five day assessments should be undertaken;
  - Identification of any scheduled species, populations or communities or their habitats in accordance with the *Environment Protection & Biodiversity Conservation Act* 1999 and Nature Conservation (Wildlife) Regulation 2006;
  - Presence of any declared Fish Habitat Reserves; and
  - Compare to identified and relevant earlier studies.
- Assess any impact of the proposed activity on fauna species, populations and communities, with particular emphasis on scheduled species and those protected under International treaties such as JAMBA and CAMBA, the Commonwealth Department of Environment, Water, Heritage and the Arts, Schedules 1 to 4 of the *Nature Conservation (Wildlife) Regulation* 2006;
- Assess the impacts of the proposed project on all fauna species (including aquatic species, insects, soils etc), populations and communities in particular where:
  - habitat is critical to life cycle events of species;
  - locally or regionally significant species and populations occur or are likely to occur in the study area, especially those at the limit of their known distribution;
  - dispersal routes/wildlife corridors significant locally or regionally are affected or potentially affected by the proposed project; and
  - barriers to interbreeding opportunities between populations that will result from the proposed project.
- Recommend management measures to mitigate potential impacts; through propose ameliorative measures to reduce the extent of the proposed project on all species and/or communities in accordance with a hierarchy of '*avoid, minimise, ameliorate'* including:
  - Identify any measures which would avoid impacts (e.g. route options, alignment options, design details);
  - Identify measures to minimise impacts that cannot be avoided and assess the likely effectiveness of those measures including waterway measures to facilitate the passage of fish, in accordance with relevant guidelines;

- Provide recommendations for design and location of proposed measures to minimise impacts;
- Provide details of any monitoring required to assess the success of measures to minimise impacts;
- Describe opportunities for improvement of habitat adjacent to existing roads in the study area; and
- If necessary, consider the possibility and cost effectiveness of providing compensatory habitat, particularly when avoidance or minimisation of impacts is not practical.

2.4 Flora

Objective

To identify the existing floral environment within the corridor and determine any significant impact of the proposed project on that flora.

Key issue/activities

- Research and review relevant reports and databases on terrestrial and aquatic flora species, populations and ecological communities in the study area, including but not limited to:
  - databases that identify scheduled and common species, populations and ecological communities e.g. the Commonwealth Department of Environment, Water, Heritage and the Arts, Schedules 1 to 4 of the *Nature Conservation (Wildlife) Regulation* 2006 and common species; Herbrecs; PestInfo; and
  - maps of ecological communities e.g. Regional Ecosystems, Catchment Management Plans, Fish Habitat Areas etc;
- Review aerial photographs to identify the presence of any vegetation communities within and directly adjacent to the corridor and particularly those communities that could support any of the significant flora species identified from the database search;
- Review regional ecosystem mapping to identify whether any 'endangered' or 'of concern' communities occur within the area of proposed works;
- Undertake field surveys by a qualified botanist to identify the presence and extent of species, populations and vegetation communities within and adjacent to the proposed corridor including the:
  - Identification of any significant species, populations or vegetation communities in accordance with the Commonwealth Department of Environment, Water, Heritage and the Arts, Schedules 1 to 4 of the *Nature Conservation (Wildlife) Regulation* 2006 and common species;
  - Interpretation of remote sensing data and/or aerial photography;
  - Collection of anecdotal information; and
  - Prepare plant species list for each vegetation associations by representative sampling;
- Prepare maps, photographs and a description of the distribution of significant species, populations and vegetation communities (with separate and specific reference to those as listed under Schedules of the Commonwealth Department of Environment, Water, Heritage and the Arts, Schedules 1 to 4 of the *Nature Conservation (Wildlife) Regulation* 2006;
  - Identify and classify vegetation types as per regional ecosystem classifications; and
  - Describe the existing condition of each of vegetation communities; especially in relation to the degree of disturbance (weed invasion, clearing, grazing etc.).

- Assess the impacts of the proposed project on all flora species (including aquatic vegetation), populations and vegetation communities in terms of the *Environment Protection & Biodiversity Conservation Act 1999* and Nature Conservation (Wildlife) Regulations 2006 will be affected;
- Identify the levels of disturbance and list declared plant species found within and adjacent to the proposed site;
- Recommend management measures to mitigate potential impacts on 'endangered' and 'of concern' vegetation communities as described in the *Vegetation Management Act 1999*;
- Propose ameliorative measures to reduce the extent of the proposed project on all species and/or communities in accordance with a hierarchy of '*avoid, minimise, ameliorate'* including:
  - Identify any measures which would avoid impacts (e.g. route options, alignment options, design details);
  - Identify measures to minimise impacts that cannot be avoided and assess the likely effectiveness of those measures;
  - Provide recommendations for design and location of proposed measures to minimise impacts;
  - Provide details of any monitoring required to assess the success of measures to minimise impacts;
  - Describe opportunities for improvement of habitat adjacent to existing roads in the study area; and
  - If necessary, consider the possibility and cost effectiveness of providing compensatory areas of habitat, particularly when avoidance or minimisation of impacts is not a practicable or cost effective option.

2.5 Hydrology/Hydraulics

Objective

To identify existing hydrology and determine any significant impact of the proposed project on the hydrology/hydraulics of the study area.

Key issues/activities

- Review/research all existing data on the hydrological characteristics of the catchments located within the corridor;
- Review the hydrological modelling reports and identify and map flooding data and issues;
- Describe the existing hydrological characteristics within the proposed project area including catchment area, waterways and peak flood flows;
- Identify natural and artificial hydrological features of the catchment;
- Identify potential impacts of the proposed project on peak flood flows and velocities, particularly in the vicinity of any waterway crossings;
- Identify catchments that have (or are in the process of developing) a catchment management plan, water area management plan or other similar management plan. Describe the requirements of these plans in relation to the proposed project;
- Identify if the catchment is subject to a declared catchment plan, declared irrigation area or declared groundwater area and the effect of the proposed project on these declarations or vice versa;
- Identify if any Floodplain Management Guidelines or Management Plans apply to the study area and if so document the requirements in relation to the proposed project;

- Identify if the catchment flows into a significant environmental area and any flow requirements in relation to this area;
- Identify if the study area has an Approved Property Plan under the *Soil Conservation Act* 1986 and describe the implications;
- Identify if the study area has Land and Water Management Plan under the *Water Act* 2000 and describe the implications.
- Recommend management measures to mitigate potential impacts; and
- Identify the requirement for any further detailed hydrological investigations.

2.6 Land Use and Planning

Objectives

To identify existing land use and determine any significant impact of the proposed project on the current and future land use of the study area.

Key issues/activities

- Review maps/aerial photographs and undertake a site visit as required to identify current land use within and adjacent to the area of proposed project;
- Review of planning scheme provisions and maps to identify current planning designations within and adjacent to the area of proposed works and determine compatibility of the proposed project with desired intent of the planning scheme;
- Identify and assess potential changes in land use during construction and operation phases of the proposed project;
- Identify areas of Good Quality Agricultural Land (GQAL) and assess potential loss of productive lands; and
- Review of land tenure to identify various tenures in particular areas potentially subject to Native Title.

2.7 Landscape and Visual Amenity

Objective

To identify existing landscape features and determine any significant impact of the proposed project on the landscape and visual amenity of the study area.

Key issues/activities

- Identify and describe existing landscape and visual values within and adjacent to the proposed project area in terms of landscape elements, character, value and sensitivity;
- Identify significant view sheds and assess the potential impacts of change;
- Evaluate and discuss the likely visual impacts of the route on both the natural and cultural landscapes. This shall include extension of the viewshed analysis to locations outside the corridors.
- Advise on landscape improvement, protection and mitigation guidelines relating to:
  - noise attenuation measures;
  - cut and fill embankments;
  - interchanges and grade separations;
  - town entry, bridge design and road furniture;
  - erosion control; and
  - visual and headlight screening to preserve visually and ecologically significant areas.
- Evaluate and discuss simulated views likely to be experienced by drivers along the proposed route ie. sequential experience, landmarks etc;
- Identify and assess potential changes to landscape and visual values (both natural and man-made) as a result of the proposed project;

- Provide management measures to ameliorate visual impacts on nearby residents, maintain sight lines and provide a pleasant driving experience for motorists;
- Recommend a landscape strategy; and
- Recommend mitigation measures (if required).

2.8 Noise

Objectives

To identify the existing acoustic environment and determine any significant impact of the proposed project on the acoustic environment.

Key issues/activities

- Undertake desktop review of aerial photographs and a site inspection to identify the nearest noise sensitive receptors;
- Describe existing noise sources in the study area;
- Identify locations where background pre-construction noise levels may be measured and describe adjacent land use in the area;
- Identify the source and types of noise during the construction and operation phases of the project and their potential impacts on noise sensitive receptors;
- Consider the requirements of the *Environmental Protection (Noise) Policy* 1997;
- Obtain traffic volumes prediction data from DMR for ten years following completion of the road, and identify potential impacts;
- Review existing information and plans for construction to assess potentially high noise impact locations that may arise as a result of both construction and anticipated traffic noise and identified noise sensitive sites and assess levels against DMR guidelines;
- Assess potential construction noise and vibrations in relation to identified noise sensitive sites and assess levels against relevant standards and guidelines;
- Submit for concurrence prior to commencement of the work a baseline survey methodology for approval by DMR which details:
  - scope of the work;
  - sampling locations;
  - equipment to be used; and
  - proposed documentation.
- Carry out field assessments of selected locations and take suitable noise measurements of both day time and night time noise levels for representative background locations and noise sensitive locations, taking due consideration of wind and other meteorological conditions during the survey and land use in the area;
- Model predicted noise levels along the route, especially in the identified high noise locations, taking into consideration:
  - pre-construction noise levels, based on hourly traffic flows;
  - predicted traffic volumes, composition and speed 10 years from project completion;
  - effects of topographical and other physical features along the route; and
  - existing land use.

- Assess the results against Figure B1.1 of the DMR Road Traffic Noise Management: Code of Practice;
- Investigate various alternative options to mitigate against excessive traffic noise levels anticipated as a result of the proposal, in relation to noise level objectives established by relevant guidelines;
- Recommend management measures to mitigate potential impacts;
- Make recommendations for implementation of any noise mitigation measures that may be required to reduce excessively high construction or operational noise, including:
  - specific community liaisons;
  - hours of operations;
  - erection of temporary barriers;
  - timing of construction of permanent barriers, house treatments or other attenuation measures; and
- Notify the Contact Officer if noise barriers are required.

2.9 Social and Economic Issues

Objectives

To identify the existing socio-economic environment and determine any significant impact of the proposed project on the socio-economic characteristics of the study area.

Key issues/activities

- Undertake a review of ABS Census of Population and Housing, and other related data to describe the basic local community structure and patterns;
- Identify and assess changes in access or movement (vehicular, pedestrian and bicycle);
- Identify and assess changes in local business operations as a result of the proposed project (such as changes to operating hours or access to businesses, particularly during construction;
- Identify and assess any impacts of the proposed project on the community;
- Assess the impact of the proposed project on the local and regional economy.
- Develop a community profile including:
  - population structure;
  - household income;
  - dwelling structure and tenure;
  - labour force status;
  - mobility.
- Develop management measures where required to mitigate potential impacts; and
- Integrate findings of the community involvement to establish potential social issues and concerns.

2.10 Soils/Topography/Geomorphology

Objective

To identify existing soil/topography/geomorphology characteristics of the study area and determine any significant impact of the proposed project on these characteristics.

Key issues/activities

Soils:

- Undertake a desktop review to identify, describe and map the soils within the study area;
- Assess erosion potential and recommend soil erosion mitigation measures where required;
- Identify any land within the study area that is listed on the Contaminated Sites Register; and
- Identify any land within the study area that is likely to contain potential acid sulfate soils.

Topography:

- Undertake a desktop review to identify and describe the topography within the study area, including any significant topographical features; and
- Identify any potential impacts of the proposed project on the topography of the study area and recommend mitigation measures (where necessary).

Geomorphology:

- Undertake a desktop review to identify, describe and map the geological units of the study area;
- Identify any existing or proposed quarries/borrow pits within the road reserve; and
- Identify any geomorphological constraints to the project and recommend mitigation measures (where necessary).

2.11 Water Quality

Objective

To identify existing water quality within the catchment and determine any significant impact of the proposed project on water quality of the study area.

Key issues/activities

- Research and review existing data sources to collate and document any water quality data if available;
- Identify and describe any waterways (natural or artificial) or groundwater within the proposed project area;
- Identify any catchment management plans and/or catchment management groups within the proposed project area;
- Identify and assess the impact of the proposed project on water quality, including the potential for pollution of surface and groundwater;
- Identify any developments or land degradation in the study area or the immediate catchment that may affect water quality;
- Identify users of water resources (including recreational and industry purposes) within the proposed project area;
- Identify any sensitive environments, especially wetlands of national significance;
- Consider the requirements of the *Environmental Protection (Water) Policy* 1997;
- Examine and discuss measures to mitigate the potential impacts of the proposed works;

- Conduct a surface water quality assessment according to ANZECC (1992) guidelines and the EPA (1999) Water Quality Sampling Manual including:
  - existing surface water quality;
  - types of pollution affecting surface waters; and
  - their effects and probable sources;
- Conduct a groundwater quality assessment including:
  - existing groundwater quality;
  - types of pollution affecting ground waters; and
  - their effects and probable sources.
- Assess the requirements of the pre-construction, construction and post-construction water quality monitoring programs (if deemed necessary); and
- Liaise with other statutory authorities (eg DNR and EPA).

3.0 Minimum Outputs

3.1 Air Quality

Minimum outputs

- Aerial photographs showing locations of nearest air sensitive receptors.
- Description of existing air quality characteristics and potential impacts;
- Discussion of the:
  - principal sources of air pollution during construction and operation;
  - potential impacts on air sensitive receptors and the surrounding environment; and
  - preferred mitigation measures.
- Report and discuss any baseline monitoring;
- Predict traffic emission for 5 and 10 years following opening of road;
- Present and discuss results of modelling.

3.2 Climate Change Impact Statement

Minimum Outputs

- Identify potential sources of greenhouse gas emission created over the life of the project;
- Explain how the project will mitigate impacts of the identified emissions;
- State the impacts of the resultant emissions will have on the State's emission profile;
- Identify what Climate Change impacts could affect the project;
- Explain how the project will adapt to accommodate these potential Climate Change impacts;
- Summary for inclusion in EAR.

3.3 Fauna

Minimum outputs

- List scheduled and common species identified within and directly adjacent to the area of proposed works;
- Describe the habitat requirements of significant fauna species (includes International, Commonwealth, State protected and locally significant species) and impacts on these habitats;
- Description of current fauna characteristics and fauna habitat value;
- Description of methodology used for field investigations including timing, rainfall & temperature prior to and during surveys;
- A comprehensive report detailing the findings of field investigations, including appropriately scaled figures that show the location of sightings of significant species and the location and extent of preferred habitat for significant species;

- Maps the location of scheduled species;
- Discussion of potential impacts on fauna and fauna movement;
- Recommended management measures to mitigate potential impacts. Include maps/diagrams to show location, extent and configuration of proposed management measures; and
- Summary for inclusion in EAR..

3.4 Flora

Minimum outputs

- List scheduled species likely to occur within and directly adjacent to the area of proposed works as per the database search and discussion as to the likely presence of these species based on the vegetation communities present;
- Identification of any remnant vegetation within and directly adjacent to the area of proposed works;
- Comprehensive species list for each vegetation community identified, including weed/introduced species;
- Provide a description of vegetation communities present including:
  - extent;
  - condition;
  - significance within the local area; and
  - regional ecosystem classification.
- Description of methodology used to undertake flora assessment, including number of days in field, survey techniques and identification techniques;
- Map the location of vegetation communities on an aerial photograph and discuss these communities in relation to Regional Ecosystems and;
  - location of vegetation communities;
  - location of any significant species identifiedl and
  - boundary of survey area.
- Summary of the potential impact on vegetation communities within and adjacent to the area of proposed works;
- Recommended management measures for each 'endangered' and 'of concern' vegetation community as described in the *Vegetation Management Act 1999*, to mitigate potential impacts. Include maps/aerial photographs to show location and extent of proposed management measures;
- Provide a list of plant species recommended for revegetation and landscaping; and
- Summary for inclusion in EAR.

3.5 Hydrology/Hydraulics

Minimum outputs

- Define catchment and sub-catchment boundaries;
- Describe hydrological characteristics within and adjacent to the area of works;

- Discuss any potential impacts on hydrology/hydraulics within and adjacent to the area of proposed works;
- Provide a list of any buildings or other structures that are likely to be impacted as a result of the proposed works;
- Map of the catchment and sub-catchment boundaries and hydrological features of the catchment;
- Recommended mitigation measures;
- Provide recommended measures to be incorporated into road design; and
- Summary for inclusion in EAR with:
  - description of current conditions and flooding characteristics;
  - methodology employed and information sources e.g.. model used;
  - predicted flooding impacts including peak heights and velocities for 50 and 100 year ARI; and
  - recommended mitigation measures to be incorporated into design.

3.6 Land Use and Planning

Minimum outputs

- List and description of land uses within and adjacent to the area of proposed project and map as required;
- List of planning scheme designations within and adjacent to area of proposed project;
- Map indicating various tenure and summary of implications;
- Summary of compatibility of the proposed project with the relevant planning scheme;
- Summary of potential impact on existing and future land use as a result of the proposed project;
- Summary of potential impacts on GQAL and justification for proposed project in accordance with State Planning Policy 1/92;
- Recommended mitigation measures; and
- Summary for inclusion in EAR.

3.7 Landscape and Visual Amenity

Minimum outputs

- Description of existing landscape and visual values within and adjacent to the proposed project;
- Indicate viewshed for the surrounding area as viewed to and from the proposed route.
- Photographs of existing landscape and visual values within and adjacent to the proposed project that may be affected;
- Representative sections of proposed landscape treatments and preferred treatment for the route;
- List of recommended mitigation measures for affected areas;
- Landscape strategic plan for the proposed route (1:10,000) for use in community consultation;
- Landscape concept plan (1:10,000) showing various landscape treatments for the road;
- Colour photomontages (A3) from selected viewpoints;

- Provide selected artist perspective's (A3) of after-view only showing the existing environment and visual impacts of the proposal on landscape sensitive areas, road users, pedestrians, adjoining residential and commercial areas; and
- Provide a summary of the Landscape and Visual Amenity Report for inclusion in EAR.

3.8 Noise

Minimum outputs

- Discussion of:
  - Principal noise sources during construction and operation; and
  - Potential impacts on noise sensitive receptors.
- Description of methodology used for noise monitoring;
- Maps/aerial photographs showing noise contour, locations for background monitoring and nearest noise sensitive receptors with preferred mitigation measures;
- Discussion of the findings of the noise assessment;
- Summary of noise assessment report in EAR.

3.9 Social and Economic Issues

Minimum outputs

- Basic community profile including population characteristics;
- Discussion of potential impacts on the socio-economic environment within and adjacent to area of proposed works;
- Description and discussion of potential impacts on local and regional community structures and patterns;
- Description and discussion of potential on the local and regional economic characteristics;
- Recommend management measures to mitigate potential impacts;
- Recommended management measures;
- Summary for inclusion in EAR.

3.10 Soils/Topography/Geomorphology

Minimum outputs

- Description and map of soil types, geology and topography within the study area, including the soil classification system used (eg Northcote, Australian Soil Classification System or Great Soil Groups);
- Discuss erosion risk of each identified soil type;
- Recommend mitigation measures for construction and operational phases; and
- Summary for inclusion in EAR.

3.11 Water Quality

Minimum outputs

- Discussion of the current condition of waterways and groundwater and potential impacts of the proposed works;
- Maps/aerial photographs showing location of rivers, creeks or other waterways within and adjacent to area of proposed works;
- Discussion of potential impacts on water quality during construction and operation of proposed works;
- Pre-construction, construction and post-construction water quality monitoring programs;
- Recommended management measures to mitigate potential impacts; and
- Summary for inclusion in EAR.