Transport and Main Roads

Road Landscape Manual

Edition 2

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Queensland Government

Road Landscape Manual

A Guide to the Planning, Design, Operation and Maintenance of Road Landscape Infrastructure

2nd Edition, June 2013

Prepared and issued by the
Engineering & Technology Branch

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Amendment Register

Issue / Rev No.	Reference Section	Description of Revision	Authorised By	Date
1	Road Landscape Manual	First Edition	Engineering & Technology Branch	1997
2	Road Landscape Manual	Second Edition	Engineering & Technology Branch	2013

Foreword

The Road Landscape Manual (2nd Edition) provides guidance on the planning, design, operation and maintenance of landscape infrastructure in urban and rural environments for the Department of Transport and Main Roads, Queensland.

The landscape is an important element in the road environment and therefore must be considered in all planning, design, construction and maintenance projects. The appropriate design, implementation and management of landscape treatments are vital to user safety, longevity of the asset and protection of the environment. This demands a holistic and multi-disciplinary approach to planning and design activities to determine an appropriate outcome and whole of life cost acceptable to the community.

The information within this manual is sufficient to undertake normal daily work. Competent planners, designers and engineers shall apply the requirements within this document in an intelligent way. However, it is expected that when situations arise that cannot be resolved using the guide, the subject will be examined in more detail using relevant experts. Non-compliance with the requirements and intent of this manual must be considered a design exception and will require appropriate technical certification and approval by the Department of Transport and Main Roads, Queensland.

Julie Mitchell

Chief Engineer

Engineering and Technology

June 2013

Important Information

The requirements of this document represent Technical Policy of the department and contain Technical Standards. Compliance with the department's Technical Standards is mandatory for all applications for the design, construction, maintenance and operation of road transport infrastructure in Queensland by or on behalf of the State of Queensland.

This Manual is a living document and will be revised and updated on a continuing basis as new information and techniques become available. The process will be enhanced and kept relevant and useful to users if the users continue to make appropriate contributions to the Manual. Feedback is therefore essential to the continued relevance of the document. Please send your comments and suggestions to the feedback email given below.

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Acknowledgements

The Content Owners of this new edition wish to acknowledge the effort of the various authors (both internal and external to the department) and members of steering committees involved with the first releases. Much of their work exists in this edition.

Key technical authors / contributors to the development of this edition are: Mr Michael Ostdick, Mr Julian Butler, Mrs Rani Ponomarenko, Mr Gavin Taylor, Mr Vincent Hsu, Mrs Andrea Jakobs and Mr Hayden Green. The Content Owners also acknowledge the departments Road Design Section who contributed to the development of this edition.

The on-going development and maintenance of the manual is the responsibility of the Road Design Section of Engineering & Technology Branch.

Manual content will be reviewed / updated / re-released as required, to reflect any changes to legislation, departmental policy and user feedback that impacts manual content.

Table of Contents

Listed below is an overall table of all sections of the manual. A more detailed table of contents is provided at the commencement of each of the four main parts.

Overview

June 2013

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Overview Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Overview

1 Purpose of this Manual

The Road Landscape Manual provides guidance on the asset management processes required for transport infrastructure projects within Queensland. These processes include concept and detailed design, implementation and maintenance of landscape and urban design components of transport infrastructure.

The primary focus of this Manual is the integration of landscape and urban design components into the transport corridor. Integration is achieved by conserving, protecting and enhancing the diverse communities through which these transport systems pass. This Manual identifies and defines common landscape architecture and urban design practices to achieve integration.

The Manual aims to ensure that all transport infrastructure projects are designed and built in accordance with Departmental standards. These standards aim to achieve:

- a context sensitive design response that integrates and balances safety, aesthetics, community, economic and environmental values
- design solutions which promote sustainability and public amenity
- high quality and consistent landscape and urban design outcomes through the incorporation of design principles and objectives
- consistent practice, processes and standards for landscape and urban design through all project management phases
- design criteria, considerations and measures that enable transparent decision-making on technical issues
- application of environmentally friendly, sustainable and cost effective maintenance procedures without compromising safety
- efficiency in the maintenance of assets through an inclusive approach to corridor planning and management.

2 Who Should Use this Manual

This Manual targets design professionals actively involved in the concept and detailed design, implementation and maintenance of transport infrastructure. By establishing and implementing measures, minimum design criteria and technical requirements, the Department aims to manage public expectations and produce high quality, consistent outcomes.

This Manual is the Department’s primary technical reference for professionals engaged in the planning and design of landscape and urban design assets for transport infrastructure.

3 Responsibilities of the Department

The Department has several responsibilities to fulfil and balance in relation to the assessment, planning, design and management (Figure O-1). These are:

- Legal requirements
- Corporate obligations
- Safety
- Aesthetics
- Environmental
- Community
- Economic.

Through the application of the processes identified in this Manual, these responsibilities will be addressed.

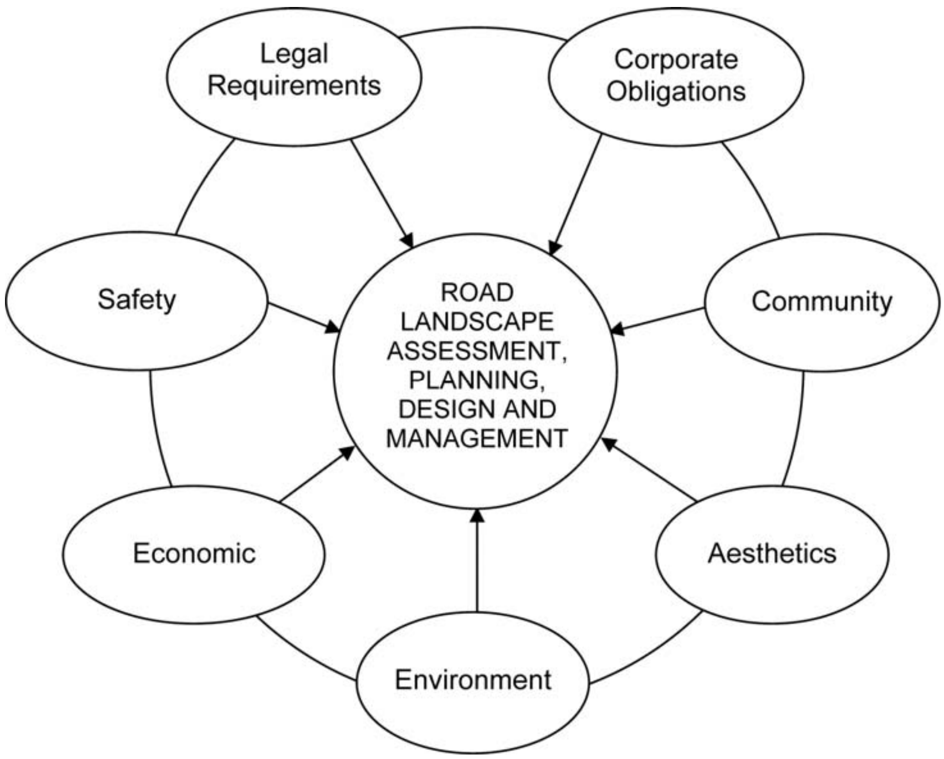

Figure O-1: The Department's responsibilities and relationship to the road landscape.

4 Relationship to Departmental Processes

Transport management throughout Australia is structured at three levels and involves input from Federal, State and Local Government Authorities with assistance from other agencies, conservation and community groups (Figure O-2).

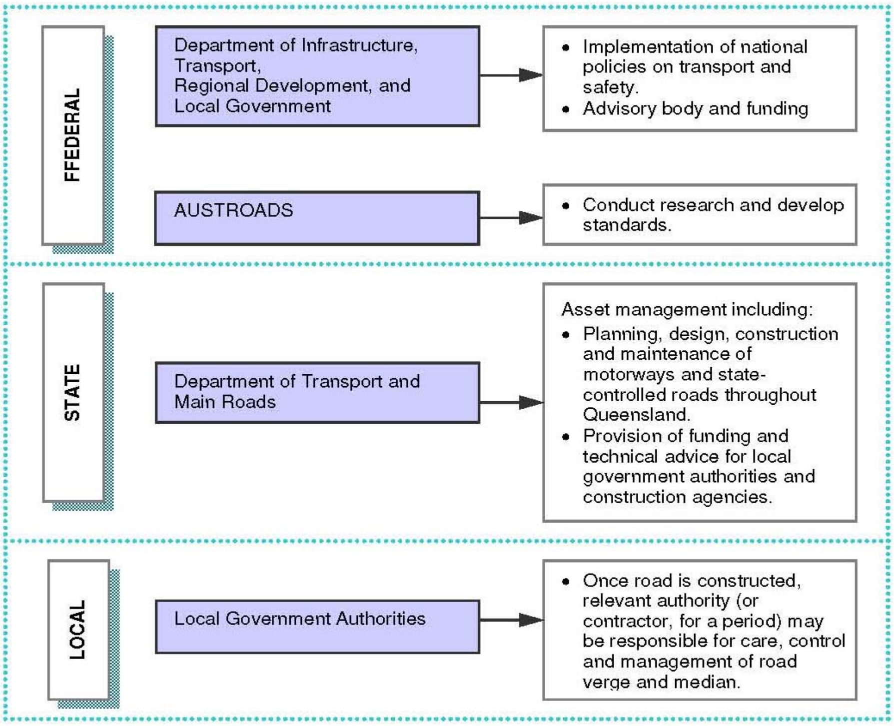

Figure O-2: Transport infrastructure managers in Australia.

This Manual focuses on the processes and roles of those involved in state transport management. Within Queensland, the responsibility for concept and detailed design, implementation and maintenance of transport infrastructure rests with the regional offices.

5 Feedback

Feedback on the content of this Manual may be sent to the Department's Landscape Architecture and Urban Design Unit at this email address: info_LAUD@tmr.qld.gov.au or mr.techdocs@tmr.qld.gov.au

6 Document Control

Users may obtain an electronic copy of Departmental Manuals by accessing www.tmr.qld.gov.au. Versions available on-line are the most current and up to date version available for use.

Guide to Using the Manual

June 2013

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Guide to Using the Manual Amendments – June 2013

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Guide to Using the Manual

1 Purpose of this Manual Structure

This Manual is structured in four parts which reflects the progression in transport infrastructure management from concept and detailed design through to implementation and maintenance.

Part A addresses landscape and urban design principles, policy, asset management and design theory. It introduces the principles of integration and sustainability that link to whole of government strategies, legislation and initiatives. Minimum levels of service are established for the asset management of the network to inform design and maintenance outcomes. Contemporary design theory provides a basis for understanding the application of design principles.

Part B provides guidance on the processes that commence in the conceptual design and subsequent phases. This includes the landscape architect and urban design brief and scope of services. Guidance is provided for the level of design service required for small, relatively simple projects through to the large and complex. The community engagement and landscape assessment processes are outlined. The assessment process considers impacts and mitigation strategy development unique to the project and alternatives.

Part C provides an overview of the design process and detailed design development. Alternative methods and means of obtaining the desired outcome are discussed. Specific design criteria and considerations, minimum technical requirements are established for the most common components and situations likely to be encountered. This part includes a detailed discussion of how to achieve the strategic objectives of aesthetics, safety, environment, community and economics.

Part D provides guidance on construction and operations for transport infrastructure projects.

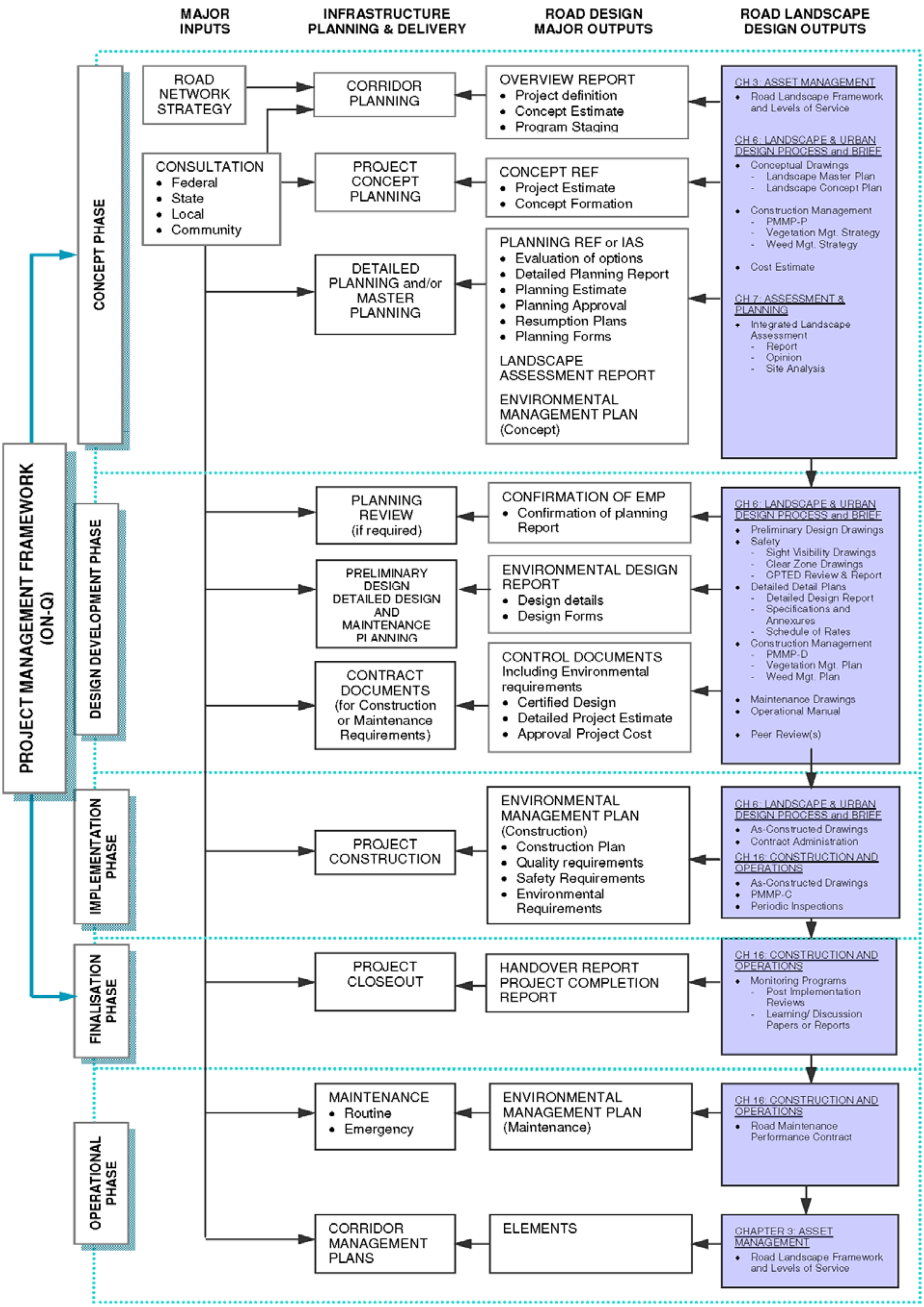

Figure G-1: Design process and relationships.

2 Manual Precedence

The Road Planning & Design Manual - A Guide to Queensland Practice takes precedence over this Manual. For the current version of this Manual, refer to www.tmr.qld.gov.au

Other technical Manuals that take precedence over this Manual include:

- *Environmental Management System* - for legislative requirements
- *Fauna Sensitive Road Design* - for fauna movement devices
- *Road Drainage Design* - for drainage devices
- *Road Traffic Noise: Code of Practice* - for noise attenuation barriers
- *Manual of Uniform Traffic Control Devices* - for traffic management and regulatory signage.

PART A

Landscape Principles, Policy and Theory

June 2013

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Part A - Landscape Principles, Policy & Design Theory

PART A

Chapter 1
Key Principles

June 2013

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Chapter 1 Amendments – June 2013
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Part A - Chapter 1
Key Principles

1.1 Introduction

This chapter provides a summary of the key principles which guide this Manual and the Road Landscape Policy (Chapter 2 of Part A). The key principles are:

- Integration
- Context sensitive design
- Collaboration
- Sustainability
- Liveability.

By applying these principles throughout the design process, the design team will fulfil its legal and corporate obligations throughout the transport network.

1.2 Integration

Integration is essential to create effective road landscapes. Blending the functional aspects of transport infrastructure into its surroundings can create benefits for all corridor users. Seamless access points, connections and transitions within the transport system can meet the needs of the local community while providing the functional needs of the broader community.

Road landscape integration requires that a consistent and harmonious approach is adopted. Transitions are required to distinguish the various road landscape settings of the journey. Reflecting and referencing the surrounding natural and built landscape is a method to achieve integration.

This Manual facilitates integration by providing theoretical and practical tools that are both broad and specific. Integration can be achieved by:

- **Respecting diversity:** the road landscape must not just value biodiversity, but also acknowledge and respect the *"diversity of place and of culture, of desire and need, the uniquely human element"* (McDonough, 2002);
- **'Fitting-est':** the road landscape must transcend fit for purpose and seek *"an energetic and material engagement with place and an interdependent relationship to it"* (McDonough, 2002);
- **Local sustainability:** the road landscape extends beyond the immediate corridor and impacts on the neighbourhoods, communities and the region; *"The idea of local sustainability is not limited to materials, but begins with them."* (McDonough, 2002).

1.2.1 Context Sensitive Design

Context sensitive design “equally addresses safety, mobility and the preservation of scenic, aesthetic, historic, environmental and other community values” (FHWA, 1995).

Context sensitive design underpins the strategic objectives of the Road Landscape Policy (Chapter 2 of Part A).

Applying this approach seeks to achieve the outcome of a context sensitive solution within the transport corridor. A context sensitive design solution provides *“a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community and environmental resources, while improving and maintaining safety, mobility, and infrastructure conditions”* (FHWA, 1995 and AASHTO , 2007).

A context sensitive design solution must:

- recognise and respond to the **road landscape setting**
- be achieve through **collaboration** with other professional disciplines
- view the design as a **coordinated design approach** rather than isolated, specialist silos
- maximise the use of flexibility in the **application of road standards** to achieve more creative solutions
- utilise **design technology** to better understand the implications of alternative designs.

1.2.1.1 Road Landscape Setting

Road landscape settings can be classified as:

- **Urban**
- **Rural**
- **Natural**

Urban roads (Figure A1-1) are often the most complex and difficult to achieve road landscape integration. Solutions which should be considered include:

- developing a suite of matching treatments and materials in design components within a project, such as bridges, lighting and signage
- adopting urban design solutions which are compatible with surrounding built structures. Design Components; such as retaining systems, barriers and bridge abutments, can be treated to reflect and improve awareness of the surrounding urban setting
- maximising the opportunity for vegetated gateways, boulevards and avenues in appropriate urban locations
- optimising local community access and circulation networks, and the subsequent need for any overpasses or underpasses.

Figure A1-1: Example of an urban landscape setting

Rural roads (Figure A1-2) should minimise disturbance to surrounding areas and provide an appreciation of the landscape as a result of the design. Design solutions which should be considered include:

- attempting to match and make compatible landscape responses to surrounding landforms;
- working with and balancing existing landforms to minimise extent of earthworks
- site sensitive road geometry that fits the road into the existing topography, frames views, providing an alternating and interesting sequence of experience for motorists
- avoiding continuous planting along corridors unless it is part of a habitat link and providing regular vegetation breaks, particularly at significant vistas and viewing locations
- reducing obtrusive roadside structures such as barriers and advertising structures, unless required for safety purposes
- considering local landholder needs; factors such as stock crossings and machinery access.

Figure A1-2: Example of a rural landscape setting

Natural roads (Figure A1-3) through sensitive areas such as regional open space networks, woodland, forest, heath, or wetlands require greater design resolution. Since some natural landscapes may be relatively untouched and unmodified, road infrastructure integration should minimise vegetation clearing and mitigate environmental disturbance. Solutions which should be considered are:

- minimising vegetation clearing through the alignment and road formation
- ensuring hydrological regimes are not significantly altered through provision of suitable structural infrastructure and drainage devices
- fauna sensitive road design.

Figure A1-3: Example of natural landscape setting

Identification and analysis of road landscape settings in the planning stage of a road proposal is required as part of the integrated landscape assessment process (Chapter 3 of Part B).

1.2.2 Collaboration

The input from numerous disciplines is required in a transport infrastructure design team to ensure a holistic design process and integration is achieved. These may include:

- planners – including strategic, town and land use, environmental and transport planning
- engineers – including civil, structural, electrical, traffic, hydraulic and environmental
- architects – including building, landscape and urban design
- geologists – including geotechnical, soil pedologists and scientists
- cultural heritage specialists
- environmental scientists and ecologists
- acoustic consultants and air quality specialists
- property consultants and developers
- artists
- other specialist consultants as required according to the complexity of the project.

These professionals may all be involved in the transport and road planning and design process. A holistic team approach will help facilitate integrated design. Collaborating with relevant local government authorities and determining their requirements is also important in achieving successful integration. Examples of these requirements include:

- regional environmental area plans
- local environmental area plans
- council development control plans, including townscape plans and city wide strategic plans (Figure A1-4)
- design guidelines, including local plant palettes and preferred landscape and urban design treatments.

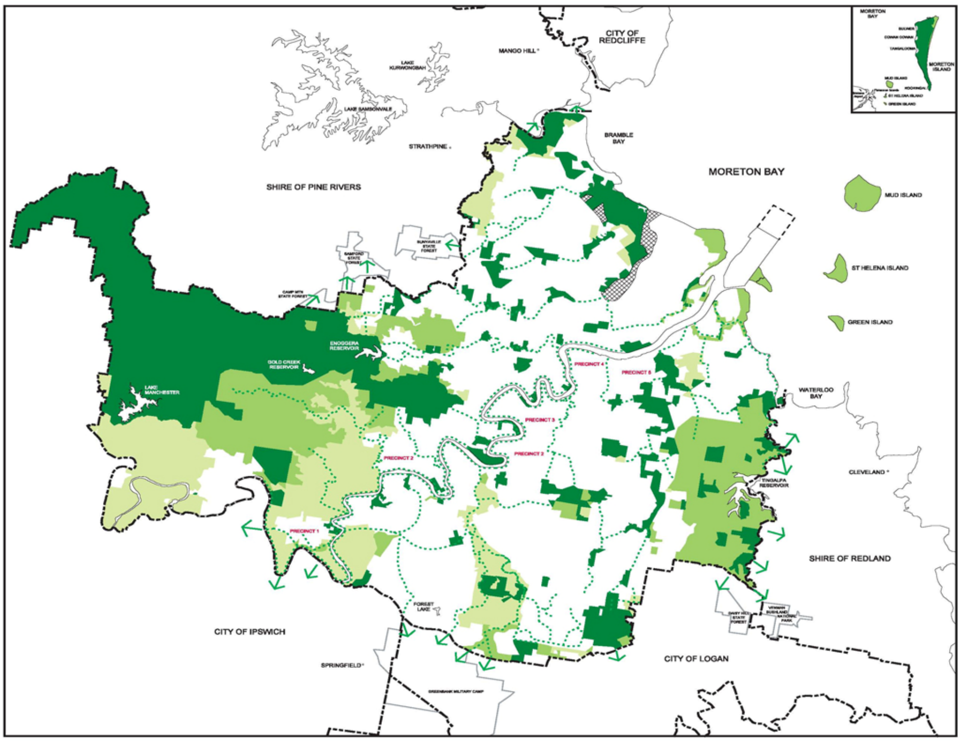

Figure A1-4: Example of a local authority city wide green space strategic plan

Source: Brisbane City Council (2000)

1.2.3 Coordinated Design Approach

When developing an integrated transport design package it must consider:

- how the road and transport system will be used
- the impact it will have on the local community
- the manner in which materials and details will need to relate to each other, the surrounding context and landscape setting types
- the detail which can be applied to design components to provide a better design outcome.

These considerations can be applied to all of the design components and is particularly applicable to urban settings. In critical locations such as highly visible inner city roads, transport networks and tourist destinations, the skill set of a design professional in the field of landscape architecture and urban design can add immense value to the project and the community. It is important that the design team have a clear set of design goals and an understanding of the road landscape design principles and design objectives (Chapter 4 of Part A).

1.2.4 Application of Standards

The Departmental standards have been developed to ensure consistency, in order to achieve a range of safety, economic and performance requirements. In most cases, standards have provision for flexibility and variation and should be considered when a better integration between roads, transport infrastructure and landscape can be achieved.

All landscape and urban design documentation shall be developed under the supervision of an Registered Practicing Engineer, Queensland (RPEQ). Landscape and urban design drawings and reports require review and certification by an RPEQ to ensure designs comply with relevant standards and do not negatively impact on civil and structural components of the project. The RPEQ, in consultation with the Landscape Architect, shall review the drawings and understand the impacts of the landscape treatments on the civil and structural design components. The signature on the drawings demonstrates the RPEQ's responsibility to direct, oversee and evaluate the work of others providing input to the project has been complied with as per the legislation.

The engineering standards provide guidance on managing safety risk. An RPEQ may vary standards following a risk assessment of the specific site conditions, proposed improvements and mitigation measures. This process must be documented as part of the design and noted as a design exception.

Any variance to standards must be reviewed by the Department and approved by the Regional Director.

1.2.5 Design Technology

A range of effective and affordable design tools can be utilised to assist with visualisation and achieve an integrated road landscape design. These include:

- generation of 3D wire frame images
- generated simulations overlaid on photographs
- video imaging and drive through animation.

Refer further to the Department’s *Drafting and Design Presentation Standards Manual* for examples of potential visualisation design tools available for use.

1.3 Sustainability

1.3.1 Ecologically Sustainable Development

The *Environment Protection and Biodiversity Conservation Act (1999)* sets the principles for ecologically sustainable development. These are:

a) *“decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;*
b) *if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*
c) *the principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*
d) *the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and*
e) *improved valuation, pricing and incentive mechanisms should be promoted.”* (Australian Government, 1999: Section 3A).

Transport infrastructure projects will always have a certain degree of impact on the environment. Effective asset management of the transport network, which is based upon the principles of ecologically sustainable development, will seek to minimise, mitigate and manage these impacts. Sustainability in road landscapes may be achieved by adopting the following approaches:

- value of the road landscape
- liveability.

1.3.2 Value of the Landscape

The values of the road landscape that contribute to the sense of community are:

- **environmental value**
- **community value**
- **aesthetic value**

Road landscapes are also areas which are used by many parts of the community, including infrastructure and utility authorities, tourists and commuters, and as a result, have significant environmental, community and aesthetic value.

Apart from obvious functional values within a transport corridor, road landscapes contain many features which are of social and economic value, and which sustain a sense of community.

1.3.2.1 Environmental Value

Human activities such as agricultural, urban and industrial development have substantially altered most of the natural landscape. This highlights the importance of roadside areas for conservation, particularly in corridors with significant biodiversity levels and values. Road landscapes are often the only places where remnant vegetation or rare or endangered plant species are found, which consequently, have immense value for nature conservation. Valuable vegetation can be conserved within a road corridor, and further enhanced through the revegetation of disturbed areas (Figure A1-5). Environmental values, goals and values relative to the road landscape are an integral part of the design process (Chapter 6 of Part C).

Figure A1-5: Environmental value – valuable roadside vegetation conserved and reinstated where disturbed

1.3.2.2 Community Value

In addition to their natural features, road landscapes have value for cultural reasons which can include aesthetic, historic, scientific, community and social aspects. Travellers also use the shade and amenity of roadsides, especially when travelling long distances. Developing and locating rest areas and open spaces adjacent to a road corridor can provide this reprieve and add value to the community (Figure A1-6). Rest areas and open spaces may also be important for building a sense of local pride and ownership. Community values, interests and needs relative to the road landscape must be considered throughout the design process (Chapter 7 of Part C).

Figure A1-6: Community value – an open space provides amenity to travellers and a sense of community

1.3.2.3 Aesthetic Value

Road landscapes are experienced in different ways by the corridor user. Apart from the physical experience of moving at varying speeds, the visual experience is equally important. The aesthetic values of the road landscape enrich the traveller experience (Figure A1-7). Maintaining, framing and creating visual compositions are an integral part of the road design process (Chapter 4 of Part C). Visual aesthetic relationships relative to the road landscape must be considered throughout the design process.

Figure A1-7: Aesthetic values within the road landscape providing interest for users of the road corridor

Collectively the diverse values within the roadside landscape; including environmental, community and aesthetic values, can contribute to the liveability of a region.

1.3.3 Liveability

Liveability relates to the quality of life and wellbeing of the community and is the human focus of sustainability. It does not exclude the natural environment but seeks to incorporate aspects of it into cities and towns, to manage and enrich the lifestyle of the area. Liveability is about *"providing a high quality street environment, where people derive pleasure and pride from the areas in which they live, work and socialise, therefore, wishing to spend more time and money there"* (Jones, 2008:p26).

A liveable transport corridor meets the needs of all its users by providing connectivity and accessibility for vehicular drivers, pedestrians and cyclists (Figure A1-8). Liveability is generated not only through retention of existing heritage and amenity values, but through delivery of high quality design outcomes which give places character and appeal. By making the road landscape more attractive to users; with enhanced facilities and activities to suit the needs of the local community, improvements in safety are also enabled, contributing to health and wellbeing.

Figure A1-8: Example of a liveable transport corridor

Liveability is also affected by the tourism potential of a region, as it brings with it economic benefits of the development of community facilities. The Tourism Queensland Themed Tourism Roads (Chapter 8 of Part C) and Scenic Routes network (Chapter 4 of Part C) within Queensland are therefore important contributors to the liveability of cities or towns.

PART A

Chapter 2
Road Landscape Policy

June 2013

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Chapter 2 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part A - Chapter 2
Road Landscape Policy

2.1 Introduction

This policy is the basis for this Manual, setting out the strategic framework from which all the road landscape design principles, objectives and desired outcomes are derived. This policy applies to all internal and external agencies undertaking activities contributing to or affecting the road landscape asset within the state controlled transport corridors.

It is envisioned that through the application of this policy incremental improvements will be achieved in the road landscape environment. These improvements will contribute to the everyday use and enjoyment of our transport corridors for transportation, amenity, recreation and environmental conservation now and into the future. Appendix 1 contains its *Supporting Framework*.

2.2 Defining Road Landscape

The road landscape is defined as the landscape within the state controlled transport corridor. The road landscape extends the full width of the road reserve. It includes all natural and built components and borrows elements from the broad setting in which it exists.

2.3 Policy Statement

The *Road Landscape Policy* supports the Department in meeting its legislative responsibilities and corporate commitments. It provides a framework of five Road Landscape Strategic Objectives. These objectives ensure road landscapes proactively contribute towards providing direct benefits to meeting Departmental obligations and priority outcomes.

The five road landscape strategic objectives are:

- **Safety** - *mitigate the risk of serious transport and road accident and contribute positively to a safer transportation environment.*
- **Environment** - *mitigate environmental impacts of transport and road projects (both within and beyond the corridor), maintain environmental values and contribute positively to the ecological potential and sustainability of the state controlled road corridors.*
- **Aesthetics** - *apply contextually appropriate landscape and urban design treatments of high aesthetic quality to improve the visual amenity value of the state controlled road corridors.*
- **Community** - *engender sensitive responses to public concerns while maintaining /improving the living standards of impacted communities and stakeholders.*
- **Economic** - *ensure cost effective treatments contributing towards reduced "whole of life" operational and maintenance costs.*

Underpinning and uniting each of these strategic objectives is the policy's key principle of ***integration***. This principle aims to ensure that:

- each of the five strategic objective is considered, addressed, prioritised and integrated within road landscapes;
- road landscape design is integrated with other transport and road design disciplines ensuring an holistic, big picture approach to all transportation planning and design processes; and

- broader contextual considerations inform the planning and design processes, promoting a contextually appropriate 'fit' to the transport and road corridor itself, as well as the local neighbourhoods and environments through which the corridor passes.

2.3.1 Applicability

Road landscape includes all manufactured landscape and urban design components and retained environmental features within the state controlled transport corridor. This includes:

Manufactured Landscape and Urban Design Components

- soft built landscape treatments including but not limited to median planting, vegetated fill embankment, cuttings and drainage device treatments, roadside buffer planting, structured planting design compositions, naturalistic planting, street tree and boulevard treatments; and
- hard built structures and urban design elements including but not limited to bridges, tunnels, noise barriers, retaining walls and pedestrian facilities.

Retained Environmental Features

- remnant naturally occurring vegetation and specimen trees;
- manufactured land including but not limited to cleared and cultivated land, public open space and urban development and elements;
- landform and hydrological features including but not limited to waterways, valleys, mountain ranges and ridge lines; and
- views within, to and beyond the state controlled road corridor.

Operations

- road landscape component of the Queensland Transport and Roads Implementation Program;
- maintenance of road landscape assets undertaken under the Routine Maintenance Performance Contract;
- management of road landscape assets under the Transport and Road System Manager Framework (Element Management: Road Landscape); and
- works conducted by all Departmental and external stakeholders impacting road landscape assets within the state controlled road corridors.

2.4 Road Landscape Strategic Objectives

The five **road landscape strategic objectives** are aligned to promoting deliverable, road landscape **desired outcomes** contributing direct benefits to achieving the Department's strategic priorities.

2.4.1 Safety

Objective Statement

Promote road landscapes that mitigate the risk of serious transport and road accident and contribute positively to a safer transportation environment.

Desired Outcomes

- Improvements to transport and road user safety and security, traffic operation and community well being.
- Reduced risk of transport and road accidents.
- Safer work environment for Departmental maintenance personnel.

- Reduced social costs (personal loss, insurance, demand on public health system, loss to commerce & industry due to accident delay and so on).
- Reduced risk of litigation against the Department.

Refer to Chapter 5 of Part C for design criteria and technical standards.

2.4.2 Economic

Objective Statement

Promote *road landscapes which deliver cost effective treatments contributing towards reduced whole of life operational and maintenance costs.*

Desired Outcomes

- Departmental alignment to current best practice (road landscape and urban design), innovation and sustainability.
- Reduced project capital costs and ongoing maintenance costs.
- Improved public perception of responsible tax funded expenditure by the Department.

Refer to Chapter 8 of Part C for design criteria and technical standards.

2.4.3 Environment

Objective Statement

Promote road landscapes that mitigate environmental impacts of transport and road projects (both within and *beyond the corridor), maintain environmental values and contribute positively to the ecological potential and sustainability of the state controlled road corridors.*

Desired Outcomes

- Compliance with legislative obligations towards environmental conservation.
- Improvements to state controlled road corridors and regional environmental values.
- Implementation of ecologically sustainable development practices.
- reduction in barrier effects to fauna and flora biota corridors and other ecological processes;
- Improvements to functionality of transport and road infrastructure (embankment stability, drainage/water quality devices and so on).
- Improved Departmental public profile within an increasingly, environmentally aware national and global community.

Refer to Chapter 6 of Part C for design criteria and technical standards.

2.4.4 Aesthetics

Objective Statement

Promote r*oad landscapes that apply contextually appropriate road landscape treatments of high* aesthetic *quality to improve the visual amenity value of the state controlled road corridors.*

Desired Outcomes

- Improvements to transport and road corridor scenic amenity values.
- High quality landscape and urban design reflecting the character of places and communities.
- Liveable neighbourhoods and urban centres.
- Enhancements to community well being through improved user experience.

- Opportunities for contemporary cultural expression.
- Sense of community pride and ownership over the transport and road asset.

Refer to Chapter 4 of Part C for design criteria and technical standards.

2.4.5 Community

Objective Statement

Promote road landscapes which engender sensitive responses to public concerns while maintaining */improving the living standards of impacted communities and stakeholders*

Desired Outcomes

- Effective relationship building between Queensland communities, stakeholders and the Department through recognition and respect of community values, concerns and aspirations.
- Support towards regional and local government authority planning and development schemes.
- Support towards stakeholder Transport and Roads Alliance Agreements.
- Improved community acceptance, connection and ownership of road landscape asset.
- Contributions to local economies through promotion of regional tourism and commercial interests (identity building, scenic route building and improved visitor amenity).

Refer to Chapter 7 of Part C for design criteria and technical standards.

PART A

Chapter 3
Asset Management

June 2013

Chapter 3 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part A - Chapter 3
Asset Management

3.1 Introduction

"*Asset management may be defined as a comprehensive and structured approach to the long term management of assets as tools for the efficient and effective delivery of community benefits. The emphasis is on the assets being a means to an end, not the end in themselves*" (Austroads,1997:p4).

The key community benefit of road landscape is in the provision of public amenity. The need for this asset has been outlined in the Road Landscape Policy (Chapter 2 of Part A). The means by which this will be delivered is through Queensland Transport & Roads Implementation Program (QTRIP) projects and Maintenance, Performance and Operations (MP&O) activities.

The Department has adopted an asset management business model. This model includes the principles of risk management, quality management, fit for purpose, affordability and project management. These principles are relevant for application to all assets. Asset management is a reiterative approach to planning, design and construction and operational works.

This chapter discusses these principles and outlines the minimum service levels for road landscape assets in the state controlled road and transport network. It focuses on establishing Road Landscape Frameworks for corridor management. These frameworks will guide QTRIP projects and the MP&O's Element Management Plans in accomplishing the strategic design objectives of the road landscape policy.

3.2 Fundamentals of Asset Management

Fundamental to the concept of asset management is the:

- establishment of minimum standards in the form of levels of service;
- consistent planning, design, construction and maintenance to meet these levels of service (Figure A3-1);
- progressively upgrading sub-standard facilities to meet the levels of service;
- renewal of assets that have failed or reached the end of their life span; and
- undertaking routine maintenance to maximise the longevity of the asset.

Figure A3-1: Consistency in planning, design and construction achieved at Tugun By-pass

3.3 Operating Context: The Roads Alliance Agreement

The Department has entered into an agreement with the Local Government Association of Queensland to share responsibilities in the maintenance of state controlled roads. While primarily focusing on cost sharing arrangements between parties, it also defines the physical boundaries of each party's responsibility. An understanding of these boundaries and responsibilities is fundamental to ensuring that the design of the road landscape asset is maintained to the standard envisioned and is economically affordable.

3.4 Road Landscape Framework

Road Landscape Framework set out in this manual defines the minimum service levels that the Department seeks to attain. There are several factors upon which the frameworks are structured.

3.4.1 Road Landscape Framework Factors

Within the Framework four factors are defined as follows:

- Road Type
- Contextual Setting
- Regional Landscape
- Urban Design Approach

3.4.1.1 Road Type

Within these frameworks four road types are defined as follows:

- **Access Controlled Motorway:** a high speed (80-110 km/h), multi-lane dual carriageway (Figure A3-2) providing a through traffic function and grade separated interchanges with access controlled by on and off ramp access.

Figure A3-2: Pacific Motorway at Tugun By-pass

- **Limited Access Highways:** a high speed (80-110 km/h) single or multi lane dual carriageway (Figure A3-3) providing a through traffic function, with limited access by at grade intersections.

Figure A3-3: Barkly Highway between Cloncurry and Mt Isa

- **Divided Arterial Roads:** a 60-80 km/h multilane dual carriageway (Figure A3-4) providing a connecting function, with access by at grade intersections, roundabouts and driveways.

Figure A3-4: Bucasia Road, Mackay

- **Undivided Arterial Roads:** a 60-80 km/h single lane dual carriageway (Figure A3-5) providing a connecting function, with access by at grade intersections and driveways.

Figure A3-5: New England Highway, Yarraman, Toowoomba

3.4.1.2 Contextual Setting

Within these frameworks, there are two contextual settings defined as:

- **Urban:** (Figure A3-6) the full extent of urban footprint or the future urban land use planning for cities, regional centres and towns as defined in the State Government's Regional Plans.

Figure A3-6: Access controlled motorway in an urban context

- **Rural:** (Figure A3-7) all other land uses outside the urban foot print or future urban land use including agricultural land, national parks and state forests.

Figure A3-7: Limited access highway in a rural context

3.4.1.3 Regional Landscape

Within these frameworks, there are three types of regional landscapes:

- **Core landscape areas** are *"areas of highest confluence of multiple regional landscape values and ecosystem services"* (South East Queensland Regional Plan 2009-31, p.58). Examples of core landscapes in the greater Brisbane area include the D'Aguilar Range, and the Glasshouse Mountains (Figure A3-8).

Figure A3-8: Core landscape area- the Glasshouse Mountains

- **Landscape corridors** are *"lineal areas with current or potential high confluence of landscape values and ecosystem services that have the capacity to improve connectivity between core landscape areas, people, places, infrastructure and ecosystems"* (South East Queensland Regional Plan 2009-31, p58). Examples of landscape corridors include the Karawatha-Greenbank-Flinders peak corridor linking Brisbane, Logan, Ipswich and the Scenic Rim as well as the Mountains to Mangroves (Figure A3-9) corridor linking the D'Aguilar Range to Moreton Bay.

Figure A3-9: Landscape corridor- Mountains to Mangroves

- **Inter-urban breaks** are *"areas separating major urban development areas"* (South East Queensland Regional Plan 2009-31, p58). Examples include Moreton Bay- Sunshine Coast and Pimpama- Jacobs Well (Figure A3-10) inter-urban break.

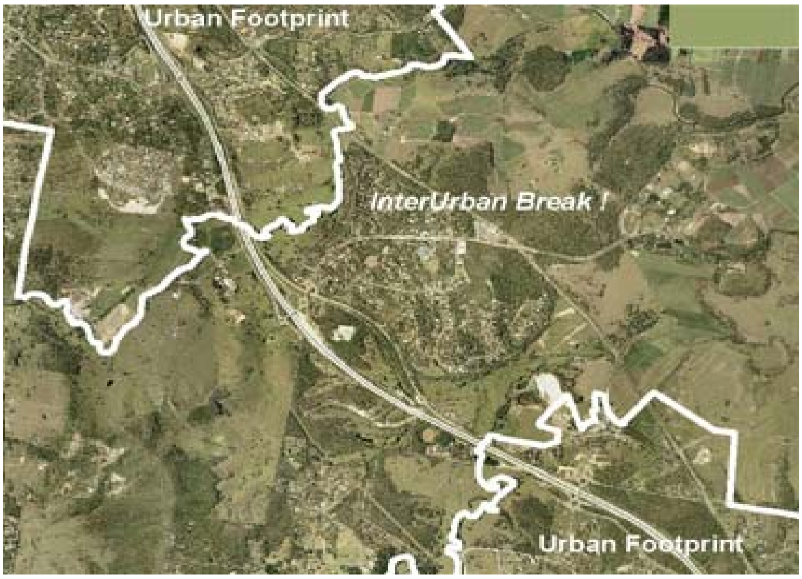


Figure A3-10: Inter-urban break along Pacific Motorway at Pimpama

3.4.1.4 Urban Design Approaches

Within these frameworks, there are six urban design approaches:

- **Regional Statement/ Treatments** are purpose built signs and/or sculptures that reference aspects of the regional urban landscape. This treatment marks a significant junction in or gateway into a region. Use of this treatment is restricted to high speed motorways and should be in scale with the speed at which it is viewed.
- **Landmark Statements/ Treatments** are purpose built signs and/or sculptures that reference aspects of the local urban context. This treatment marks a significant junction or threshold into a local urban environment.
- **Town Entry Statements/ Treatments** are purpose built signs and/or sculptures that reference aspects of the local urban environment which make the location unique. These treatments/ statements mark the commencement of a sequence of features leading into a town centre or Main Street Streetscape.
- **Main Street Streetscapes/ Treatments** are a mixture of hardscape design components that promote pedestrian and cyclist’s amenity and sense of place through the referencing of historically and culturally significant attributes. These streetscapes utilise locally occurring building materials that integrate with the town’s setting and are complimented with softscape treatments.
- **Public Art Treatments** are commissioned works of art incorporated into urban design components which reference local themes, detailing (such as colour, patterning and textured finishes) and materials in scale with the speed at which they are viewed.
- **Cultural & Historical Place-making** (Chapter 4 of part A) is related to urban design component theming and detailing that symbolises/abstracts/derives its form and aesthetic expression from cultural or historical references (Figure A3-11).

Figure A3-11: Theme used on screens reflects local culture and history of place

Road Landscape Frameworks have a hierarchical system based on the provision of public amenity and liveability. The quality and richness of this amenity is based upon the mixture of assets which are formulated into a framework of standards to be applied to the state controlled road network and transport systems. The basic premise to these frameworks is that it is uneconomical and undesirable to apply the same level of service to all state controlled roads in the network and transport systems.

3.4.2 How to Use the Road Landscape Framework Matrix

The levels of service are the minimum key result areas to be delivered and maintained by the QTRIP and MP&O Programs. The matrix defines the levels of service required in an urban context (Table A3-1) and in a rural context (Table A3-2). Both matrices list the road types across the top and include examples of state controlled roads with those attributes. The attributes and design components are listed down the page on the left and are divided into Landscape & Revegetation and Urban Design. With the exception of the Regional Landscape attributes and Urban Design Approaches, these attributes and design components are included as reference within this manual where further information may be found.

Applying this matrix and the design theory in this Manual will develop layers of meaning in the road landscape. Everyone should be able to read and understand some layers. The number of layers detected will be a factor of user perception. Some will see a shrub as only a flowering plant but it may function as a headlight glare screen and as part of the urban forest.

A well defined road landscape successfully translates the five strategic objectives of safety, community, aesthetics, environment and economics into intertwined layers of meaning. These are the primary drivers to successful road landscape designs.

ROAD LANDSCAPE FRAMEWORK - LEVELS OF SERVICE

URBAN CONTEXT

LANDSCAPE AND REVEGETATION

Road Type	Access Controlled Motorways	Limited Access Highways	Divided Arterial Roads	Undivided Arterial Roads
Regional Landscape - The Urban Forest				
Core Landscapes	Provide all forms of connectivity. Conserve and enhance environmental values			
Landscape Corridors (*Greenways Section Ch. 8)*	Provide connectivity and landscape buffers to infrastructure along corridor to conserve and enhance environmental values			
Inter-Urban Breaks	Locate interchanges/intersections away from inter-urban breaks to minimise clearing. Conserve and enhance landscape character		Locate intersections away from inter-urban breaks to minimise clearing. Conserve and enhance landscape character	
Queensland Scenic Roads				
Scenic (*Ch. 1, 7, 11 & 15)*	Maintain and enhance views and vistas to the urban skyline, landscape features and open spaces		Maintain and enhance long and short views within the urban fabric	
Cultural *(Ch. 1, 7, 11, 14 & 15)*	Provide references of cultural and historical value through landscape and revegetation treatments			
Natural *(Ch. 1 & 11)*	Maintain and enhance views and vistas to natural features including waterways, mountains, forests, islands and the ocean			
Landscape Approaches				
Open Forest *(Ch. 8)*	Provide as a means to framing, filtering or maintaining views		Provide as a means to transitioning to recreational open space	
Closed Forest *(Ch. 8)*	Provide as a means to buffer/screen adjacent land uses and undesirable views, as urban forest within interchanges and to transition into cut embankments		Provide as a means to buffer/screen adjacent land uses, as urban forest	
Structured Planting Approach LR-02 *(Ch. 8 & 9)*	Provide as a controlled outcome to interchanges, intersections, city/town entries and throughout the clear zone			
Naturalistic Planting Approach LR-03 *(Ch 8 & 9)*	Provide as buffer/transition to greenways, urban forests, significant environmental areas and remnant vegetation			
Water Sensitive Planting Approach LR04 *(Ch. 8 & 9)*	Provide throughout the corridor			
Landmark /Feature Treatment RF-08 *(Ch. 8 & 9)*	Provide at Interchanges and service road roundabouts	Provide at roundabouts and intersections to act as gateways to local area		
Landscape Treatments				
Grass & Turf LR-04 & LR-05 *(Ch. 9)*	Restrict use to service road verges and/or where sight distance precludes planting and intersections where maintenance access does not require lane closures. Minimise risk of creating fuel load		Restrict species selection to varieties reaching heights of 400mm or less. Minimise risk of creating fuel load	
Street Trees	Provide on service roads	N/A	Provide where clear zone requirements can be achieved and where supported by LGA street tree strategy	
Raised Medians RF- 07	Provide continuous headlight glare protection where sight distance permits			N/A
Depressed Medians RF-07	Provide continuous headlight glare protection where sight distance permits utilising water sensitive urban design principles			N/A
Cuttings RF-02	Assess and identify medium to high erosion risk soils and adopt specialised treatment			
Fill Embankments RF-03	Assess and identify medium to high erosion risk soils and adopt specialised treatment			
Maintenance, Performance and Operations				
Contaminated Land	Meet legislative requirements and adopt principles of Element 1 Contaminated Land Element Management Plans (EMP)			
Nature Conservation	Meet legislative requirements and adopt principles of Fauna Sensitive Road Design Manual and Element 2 Nature Conservation Element Management Plans			
Degraded Areas	Prioritise rehabilitation as required by Element 3 Degraded Areas Element Management Plans			
Weed Management	Meet legislative requirements and adopt principles of Element 5 Declared Pest Species Element Management Plans			
Road Landscape	Prioritise renewal and enhancements as required by Element 8 Road Landscape Element Management Plans			

<table>
<tr><th colspan="5">ROAD LANDSCAPE FRAMEWORK - LEVELS OF SERVICE</th></tr>
<tr><th colspan="5">URBAN CONTEXT (cont)</th></tr>
<tr><th colspan="5">URBAN DESIGN</th></tr>
<tr><th>Road Type</th><th>Access Controlled Motorways</th><th>Limited Access Highways</th><th>Divided Arterial Roads</th><th>Undivided Arterial Roads</th></tr>
<tr><td colspan="5">Urban Design Approaches</td></tr>
<tr><td>Regional Statement Treatments</td><td colspan="2">Provide as part of Regional Planning Scheme</td><td colspan="2">N/A</td></tr>
<tr><td>Landmark Statement Treatments (Local Context Scale)</td><td colspan="2">N/A</td><td colspan="2">Provide as part of local planning area scheme</td></tr>
<tr><td>Town Entry Treatments/ Statements</td><td>Provide at service road roundabouts and/or intersections</td><td colspan="3">Provide in towns with population less than 100,000</td></tr>
<tr><td>Main Street Streetscapes</td><td colspan="2">N/A</td><td colspan="2">Provide in towns with population less than 100,000</td></tr>
<tr><td>Public Art Treatments (Ch. 10 & Appx. 1)</td><td>N/A</td><td colspan="3">Provide treatments in scale with the viewing speed and in key locations that will not create driver distraction</td></tr>
<tr><td>Cultural & Historical Placemaking (Ch. 1, 4, 7 & 14)</td><td colspan="4">Provide treatments in scale with the viewing speed and in locations that will not create driver distraction</td></tr>
<tr><td colspan="5">Engineered Structures</td></tr>
<tr><td>Vehicular Bridges and Overpasses UD-02 (Ch. 10)</td><td colspan="2">Integrate purpose built structures into contextual setting</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Tunnels UD-03 (Ch. 10)</td><td colspan="2">Integrate purpose built structures into contextual setting</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Noise Attenuation Structures UD-04(Ch.10)</td><td colspan="2">Integrate purpose built structures into contextual setting</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Retaining Systems UD-05 (Ch. 10)</td><td colspan="2">Integrate purpose built structures into contextual setting</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td colspan="5">Rest Areas and Amenity Blocks</td></tr>
<tr><td>Heavy Vehicle Rest Areas</td><td colspan="2">Function to be provided by Commercial Service Centres</td><td colspan="2">N/A</td></tr>
<tr><td>Rest Areas UD-12 (Ch. 10)</td><td>Type 1</td><td>Type 2</td><td>Type 3</td><td>Type 3</td></tr>
<tr><td>Scenic Lookouts (Ch. 1, 11 & 14)</td><td colspan="4">Provide where high quality scenic opportunities exist adopting CPTED principles</td></tr>
<tr><td colspan="5">Pedestrian/ Cyclist Facilities</td></tr>
<tr><td>Cycleways UD-13 (Ch. 10)</td><td colspan="2">Provide multi-modal opportunities in corridor</td><td colspan="2">Ensure connectivity and linkages to cycling networks</td></tr>
<tr><td>Pedestrian/ Cyclist Underpasses (Ch 10)</td><td colspan="2">Provide high quality urban design finishes and detailing</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Pedestrian/ Cyclist overpasses (Ch. 10)</td><td colspan="2">Provide high quality urban design finishes and detailing</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Footbridges (Ch. 10)</td><td colspan="2">Provide high quality urban design finishes and detailing</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td>Pedestrian/ Cyclist Crossings (Ch. 10)</td><td colspan="2">Provide high quality urban design finishes and detailing</td><td colspan="2">Integrate standard structures into contextual setting</td></tr>
<tr><td colspan="5">Non-regulatory Signs</td></tr>
<tr><td>Themed Tourism Routes (Ch. 1, 7, 11 & 15)</td><td colspan="2">Incorporate into sign package for corridor</td><td colspan="2">N/A</td></tr>
<tr><td>Signs - Regional Gateway (Ch. 15)</td><td>Provide signs/ sculptures in scale with the viewing speed and in locations that will not create driver distraction</td><td colspan="3">N/A</td></tr>
<tr><td>Signs - Local Gateway</td><td>N/A</td><td colspan="3">Provide signs/sculptures in scale with the viewing speed and in locations that will not create driver distraction</td></tr>
<tr><td>Interpretative signs/ panels/ plaques - Regional</td><td colspan="2">Provide at rest areas and scenic lookouts</td><td colspan="2">N/A</td></tr>
<tr><td>Interpretative signs/ panels/ plaques - Local</td><td colspan="2">Provide tourism information within service road network</td><td colspan="2">Provide at rest areas and scenic lookouts</td></tr>
</table>

Table A3-1: Road landscape framework - urban context

ROAD LANDSCAPE FRAMEWORK - LEVELS OF SERVICE

RURAL CONTEXT

LANDSCAPE AND REVEGETATION

Road Type	Access Controlled Motorways	Limited Access Highways	Divided Arterial Roads	Undivided Arterial Roads
Regional Landscape				
Core Landscapes	Provide connectivity at environmental areas. Conserve and enhance environmental values			
Landscape Corridors	Provide buffers to infrastructure along corridor to conserve and enhance environmental values			
Queensland Scenic Roads				
Scenic *(Ch. 1, 7, 11 & 15)*	Maintain and enhance views and vistas to the rural landscapes			
Cultural *(Ch. 1, 7,11,14 & 15)*	Provide references of cultural and historical value through themed tourism route and interpretive signage			
Natural *(Ch. 1 & 11)*	Maintain and enhance views and vistas to natural features including waterways, mountains and the ocean			
Landscape Approaches				
Open Forest *(Ch. 8)*	Provide as a means to framing or filtering views and minimising maintenance	Provide as buffer to Significant Environmental Areas		
Closed Forest *(Ch. 8)*	Provide as a means to buffer/screen adjacent industrial land uses, as reinforcement of the regional landscape within interchanges and to transition into cut embankments		Provide as a buffer to Significant Environmental Areas	
Structured Planting Approach LR-02 *(Ch. 8 & 9)*	Provide as a controlled outcome to interchanges, intersections, landmarks/ town entries where required in the clear zone	Provide as a controlled outcome buffer to Significant Environmental Areas		
Naturalistic Planting Approach LR-03 *(Ch. 8 & 9)*	Provide as buffer/transition to national parks and state forests, significant environmental areas and remnant vegetation			
Water Sensitive Planting Approach LR-04 *(Ch. 8 & 9)*	Provide throughout the corridor	Provide within 300m of waterways		
Landmark /Feature Treatment RF-08 *(Ch. 8 & 9)*	Provide at Interchanges, town entries and service road roundabouts	Provide at roundabouts and intersections to act as gateways to local area		
Landscape Treatments				
Grass & Turf LR-04 & LR-05 *(Ch. 9)*	Restrict species selection to varieties reaching heights of 400mm or less. Minimise risk of creating fuel load and fauna attraction			
Street Trees	Provide on service roads where connecting to local area or town	Provide in main street where clear zone requirements can be met		
Raised Medians RF- 07	Provide headlight glare protection	Provide continuous headlight glare protection at curves where sight distance permits		N/A
Depressed Medians RF-07	Provide headlight glare protection	Provide continuous headlight glare protection at curves where sight distance permits		N/A
Cuttings RF-02	Assess and identify medium to high erosion risk soils and adopt specialised treatment			
Fill Embankments RF-03	Assess and identify medium to high erosion risk soils and adopt specialised treatment			
Maintenance, Performance and Operations				
Contaminated Land	Meet legislative requirements and adopt principles of Element 1 Contaminated Land Element Management Plans			
Nature Conservation	Meet legislative requirements and adopt principles of Fauna Sensitive Road Design Manual and Element 2 Nature Conservation Element Management Plans			
Degraded Areas	Prioritise rehabilitation as required by Element 3 Degraded Areas Element Management Plans			
Weed Management	Meet legislative requirements and adopt principles of Element 5 Declared Pest Species Element Management Plans			
Road Landscape	Prioritise renewal and enhancements as required by Element 8 Road Landscape Element Management Plans			

ROAD LANDSCAPE FRAMEWORK - LEVELS OF SERVICE				
RURAL CONTEXT (cont)				
URBAN DESIGN				
Road Type	**Access Controlled Motorways**	**Limited Access Highways**	**Divided Arterial Roads**	**Undivided Arterial Roads**
Urban Design Approaches				
Regional Statement Treatments	Provide treatments in scale with the viewing speed and at junctions of two national highways that will not create driver distraction			
Cultural & Historical Placemaking	Provide treatments in scale with the viewing speed and at significant C&H locations that will not create driver distraction			
Engineered Structures				
Vehicular Bridges and Overpasses UD-02 *(Ch. 10)*	Provide high quality urban design finishes and detailing		Integrate standard structures into contextual setting	
Tunnels UD-03 *(Ch. 10)*	Provide high quality urban design finishes and detailing integrating into contextual setting		Integrate standard structures into contextual setting	
Noise Attenuation Structures UD-04 *(Ch. 10)*	Integrate standard structures into contextual setting			
Retaining Systems UD-05 *(Ch. 10)*	Integrate standard structures into contextual setting			
Rest Areas and Amenity Blocks				
Heavy Vehicle Rest Areas	Type 1		N/A	N/A
Rest Areas UD-12 *(Ch. 10)*	Type 1	Type 2	Type 3	Type 3
Scenic Lookouts *(Ch. 1, 11 & 14)*	Provide where opportunities exist			
Pedestrian/ Cyclist Facilities				
Cycleways UD-13 *(Ch. 10)*	N/A			
Pedestrian/ Cyclist Underpasses *(Ch. 10)*	N/A			
Pedestrian/ Cyclist Overpasses *(Ch. 10)*	N/A			
Footbridges *(Ch. 10)*	Integrate standard structures into contextual setting			
Pedestrian/ Cyclist Crossings *(Ch. 10)*	N/A			
Non-regulatory Signs				
Themed Tourism Routes *(Ch. 1, 7, 11 & 15)*	Develop and provide sign package for designated routes		N/A	
Interpretative Signs/ Panels/ Plaques - Regional *(Ch. 15)*	Provide at rest areas and scenic lookouts		N/A	
Interpretative Signs/ Panels/ Plaques - Local (towns)	Provide tourism information within service road network		Provide at rest areas and scenic lookouts	

Table A3-2: Road landscape framework - rural context

3.4.3 Application of Road Landscape Frameworks

Road Landscape Framework levels of service must be applied to all state controlled roads in the network. The method of delivery is through two programs:

- Queensland Transport & Roads Implementation Program (QTRIP) for new and upgraded roads and transport systems
- Maintenance, Performance and Operations (MP&O) Program for renewal and upgrading to minimum levels of service as well as routine maintenance

This commitment will be realised progressively over time, with a program of continual improvement based on this manual and the MP&O Program.

3.4.3.1 Transport & Roads Implementation Program

The transport planning and design process is funded through the QTRIP as is the construction. The sources of the funding may include both the Federal and State Governments. The program funds special government initiatives for one-off projects. Application of the Road Landscape Frameworks will ensure consistent outcomes in the planning, design, construction and maintenance across the State. The frameworks are flexible enough to allow planners and designers to explore creative and diverse design responses that ensure public amenity, liveability and sense of place (Figure A3-12).

Figure A3-12: Effective urban design finishes and artwork creates a unique experience for users of integrated transport corridors

3.4.3.2 Maintenance, Performance and Operations (MP&O) Program

Maintenance Performance and Operations Program is a sub-program of within QTRIP that funds the Elements.

"A work element is a work activity, responsibility or system management issue driving the need for delivery of network enhancement works, maintenance and preservation works, and road system operations. A work element requires significant investment allocation or action and prioritisation over the long term. A work element also requires a consistent, defensible state-wide management approach, based on identified needs against performance targets" (Road System Manager Framework, 2008: p 20).

3.4.3.3 Transport and Road System Manager Framework

The transport and road system manager framework groups like elements together. The work elements have been categorised into the following groups:

- corridor management (environment) – including environmental legislative requirements as per the Department's Environmental Legislation Register;
- corridor management (road safety);
- program maintenance;
- rehabilitation;
- routine maintenance; and
- traffic operations.

The corridor management elements are contaminated land, nature conservation, degraded areas, heritage management, declared pest species, fire risk management and road landscape. The corridor management (road safety) include several elements to which road landscape makes a significant contribution towards. These include bicycle and pedestrian facilities, driver fatigue management, batter slope management, and pedestrian accessible overpasses (Figure A3-13).

The road landscape frameworks cross over numerous work elements requiring all asset managers to be aware of the requirements of this manual. It is through progressive implementation of these levels of service that the objective of the road landscape policy will be achieved.

Figure A3-13: Overpass for pedestrians and cyclists safely links rail station to car park, bus stops and pathways, providing effective access and connectivity for users

Routine maintenance addresses the reoccurring tasks across the whole range of assets and the network. The intervention levels are prescribed under the Road Maintenance Performance Contract.

3.4.3.4 Element Management Plans

The Road Landscape Frameworks support the Element Management Plans by establishing the minimum service levels for state controlled road corridors throughout Queensland. The purpose of an Element Management Plan is to set the technical governance for the administration of each element to meet legislative and corporate obligations. The plan outlines:

- the scope;
- legislative and corporate obligations;
- the network deficiencies against the levels of service;
- data collection and storage processes;
- forecasts costs; and
- business rules to set priorities.

The goal of these management plans is to deliver consistent outcomes across the state, focusing funding and resourcing in a systematic way. The environmental elements listed above are the primary method for achieving renewal and upgrading current deficiencies.

3.4.3.5 Maintenance Forward Planning

When planning and designing transport corridor upgrades, the maintenance activities of the existing corridor should be reviewed to create a benchmark for assessing against the road landscape frameworks level of service. While an upgrade may create a new set of maintenance requirements, the goal must be to reduce or eliminate the frequency of high cost activities. This may mean a higher capital investment.

There are significant differences in maintenance costs, as well as reduced safety risks to personnel, when alternative maintenance activities in lieu of traditional slashing / mowing practices are developed, adopted and applied.

The most common traits exhibited relative to existing roads prior to any upgrades occurring are:

- single carriageway (with no median);
- lower speeds;
- lower traffic volumes (potentially); and
- relatively undisturbed and minimal surrounding landforms.

The maintenance activities undertaken are standard activities are undertaken as a reactive measure to an unplanned event or once an intervention level has been reached (Figure A3-14). These activities are often limited to the following, as a way of maintaining sightlines for safety and also as a measure of weed control:

- tractor slashing and/or mowing;
- clearing; and
- herbicide treatment/ spraying or spot spraying.

Figure A3-14: Slashing/ mowing to grassed median and verge requires 8 to 10 maintenance interventions per annum

Upgrading to a multi-lane roadway creates a different physical environment often requiring alternative maintenance activities. The most common traits exhibited are:

- dual carriageway (with a median);
- possible higher speeds;
- increasing higher traffic volumes over time; and
- potentially a high level of disturbance to surrounding landforms, and the creation of often steeper and more extensive batters and embankments.

The maintenance activities required for these roadways are often not more intensive; they can actually be less intensive if the landscape and revegetation treatments are designed effectively (Figure A3-15). Different maintenance activities require planning and scheduling in order to be most effective. Some of these activities include:

- herbicide spraying;
- re-mulching – topping up the existing mulch in planting beds;
- renewal – removal of poor performing, dead or dying, or at end of life vegetation and replacement with like for like plant species; and
- tree pruning and/or thinning.

Figure A3-15: The maintenance interventions of planted median will progressively reduce to one intervention per annum

Understanding the magnitude of the change in the infrastructure profile should guide the design process in attaining a maintenance minimisation strategy for the constructed works.

3.5 Designing and Constructing to Regional Differences

Each region will have variations within them that must be taken into account when designing the road landscape. For ease of association, the state has been divided into three zones.

3.5.1 Arid Regions west of the Dividing Range

The vast arid areas west of the Great Dividing Range pose a unique set of challenges. These include:

- extremes in temperature;
- limited rainfall and prolonged droughts;
- highly dispersive soils that dissolve easily; and
- remoteness and limited available resources including water to economically rehabilitate disturbed area.

Areas disturbed in these regions may take years to regenerate. Design solutions need to be focused on protecting the soil layers until the next rainfall event.

3.5.2 Subtropical Regions east of the Dividing Range

Subtropical areas have the most flexibility in terms of design solutions. The challenges of subtropical areas are:

- moderate to mild temperatures;
- variable rainfalls with cyclical droughts;
- rapid growth of and high variety of subtropical and some tropical invasive weeds; and
- moderate diversity of micro-climate and vegetative communities.

Design responses need to focus on maintenance minimisation and safety while integrating the road landscape into communities.

3.5.3 Wet Tropics of Far North Queensland

The Wet Tropics of far north Queensland pose challenges that require specific management. This are:

- definite wet and dry seasons which limit most types of construction activity;
- prolonged periods of high humidity and rapid growth;
- tropical rainfall and cyclonic conditions which require higher resolution of erosion and sediment control measures;
- rapid growth of and high variety of invasive tropical weeds; and
- diverse micro-climates and vegetative communities.

Design responses need to focus on establishing permanent erosion and sediment control measures quickly while producing tree and shrub canopy to minimise weed infestation and establishment.

PART A

Chapter 4
Design Theory

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 4 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

Table of Contents

Figures

Part A - Chapter 4
Design Theory

4.1 Introduction

Design theory provides the basis for the design principles and design objectives which should be incorporated within the transport infrastructure corridor. Final design resolutions and outcomes of a project should clearly reflect this underlying design theory.

Transport infrastructure can play a major role in contributing to the physical and visual aspects of urban and rural areas, and to the quality of human life. The adoption of design theory into road landscape projects fosters exploration of alternative scenarios and incorporation of a wider range of design responses. This has the benefit of generating more creative, high quality and practical design outcomes in often challenging environments.

Considering and incorporating design theory when designing the road landscape reduces possible subjectivity, and personal, individual or group judgements. The theory provides a defensible rationale for decision making. Adopting design theory ensures that road landscape design resolutions are based on proven research, contemporary concepts and techniques, and have a strong theoretical foundation.

Implementing quality landscape and urban design through the integration of design theory provides numerous benefits including:

- the creation of a unique sense of place within communities;
- an improvement in the images retained and remembered of a particular area or location, both for locals and passers-by;
- enhanced amenity and structure within public areas; and
- improved community value of the environment.

Design theory should be applied consistently throughout all phases of a corridor project, including concept, design development, implementation and maintenance phases.

4.2 Design Components

Design Components encompass all manufactured road formation, landscape and revegetation, and urban design components (Figure A4-1). It includes soft built landscapes (such as planting works and drainage device treatment) and hard built structures and urban design elements (such as bridges and pedestrian facilities).

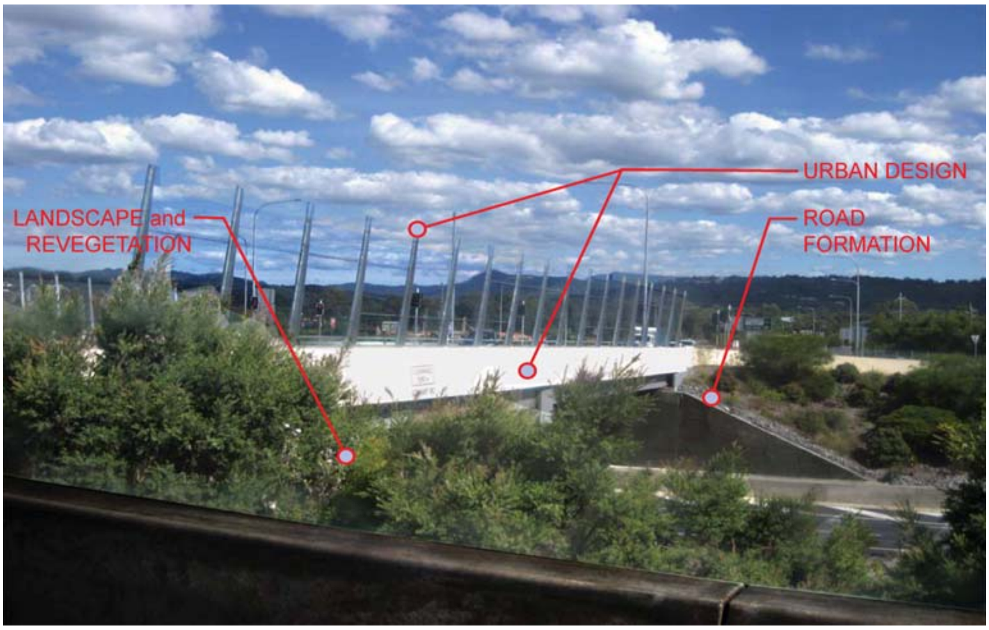


Figure A4-1: Road formation, landscape and revegetation, and urban design components within the road landscape

4.3 Design Principles

The key landscape and urban design principles include: legibility, form, function, connectivity, way-finding, accessibility and mobility, robustness, place-making and imaging.

The benefits of applying design theory include:

- **Liveability** – making places that preserve personal wellbeing and are appealing; that local people enjoy being in and experiencing, whilst also being attractive to tourists.
- **Social Inclusion** – making places secure and safely accessible to all, both physically and psychologically.
- **Responsiveness** – respecting existing landscape qualities and context. This is one of the most desirable qualities in a place as it allows users to engage with and experience places. Responsiveness should however, also include sensitivity not just to people, but also to nature, the surrounding environment, and to place. Design responsiveness requires that design components are sensitive to the immediate and wider road landscape, as well as to the locality's specific character or distinctiveness.
- **Uniqueness and Originality** – ensuring places portray a distinct character which is attractive to wider visitors, yet also gives the local community a strong sense of identity and cohesion. Design schemes should not be too abstract, and need to have meaning with a wide audience.
- **Uses and experiences** – providing a unique experience for the user. Designing the road landscape should always be informed by an understanding of and realisation of different people's needs, activities and views. This will enable for an inclusive experience to be adopted.

4.4 Application

This Manual describes the design principles in transport infrastructure context. The definitions illustrate the role that these principles provide within the road landscape.

Design principles are described individually, yet some interact with others and play a significant role when applied together. It is often this interaction between other principles, which achieves high quality outcomes.

4.5 Legibility

Legible areas are those where users can identify where they are and how to get to their destination. Legible layouts with an obvious arrangement of spaces and distinct visual patterns (Figure A4-2) ensure that users can read the landscape. Clear and recognisable symbols assist in providing identifiable and memorable points of reference. Legibility allows interpretation of a place, understanding of its purpose and contributes to establishing a sense of order. The structure and arrangement of a space should combine effectively to promote legibility.

Legibility also impacts on user perceptions and positively behaviours and contributes to improving road safety. A legible road landscape is ordered and configured appropriately (Figure A4-3) to match driver expectations to enable accurate prediction of what is ahead. This allows users to plan their actions in advance.

Figure A4-2: Improved legibility through the use of directional pattering in walls and clear signage

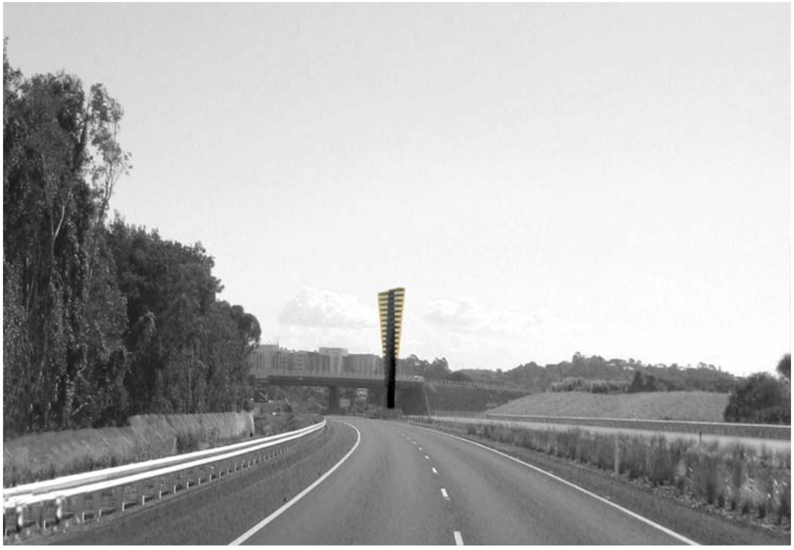


Figure A4-3: Improved legibility through feature vertical reference points

There are also other aspects, or visual cues that contribute to the creation of legible spaces. Cues include:

- **paths**;
- **edges**;
- **precincts**;
- **nodes**; and
- **landmarks**.

The five visual cues relevant to legibility, all act as individual markers along journeys of travel.

4.5.1 Paths

Paths offer linear places of movement largely for pedestrian users and an organised structure through their directional quality. Paths provide the connecting link from one place to another, creating networks of circulation. Developing a hierarchal system of paths is often required to achieve a cohesive network.

Design components are often arranged along paths and act as strong visual and directional indicators (Figure A4-4). These components, when integrated with the surrounding environment also allow opportunity for observation and contribute to heightening the experience of the journey.

In addition to movement, paths can also be places of social and recreational activities contributing to liveability. Rather than providing direct access, they may be designed to meander (Figure A4-5), allowing for exploratory opportunities. This will depend on the overall functional requirement and design intent of the path. Paths may also be designed wider to accommodate stationary activities such as viewing opportunities for appreciation of the surrounding landscape.

Figure A4-4: Improved legibility reinforced by lighting, walls and overhead structures

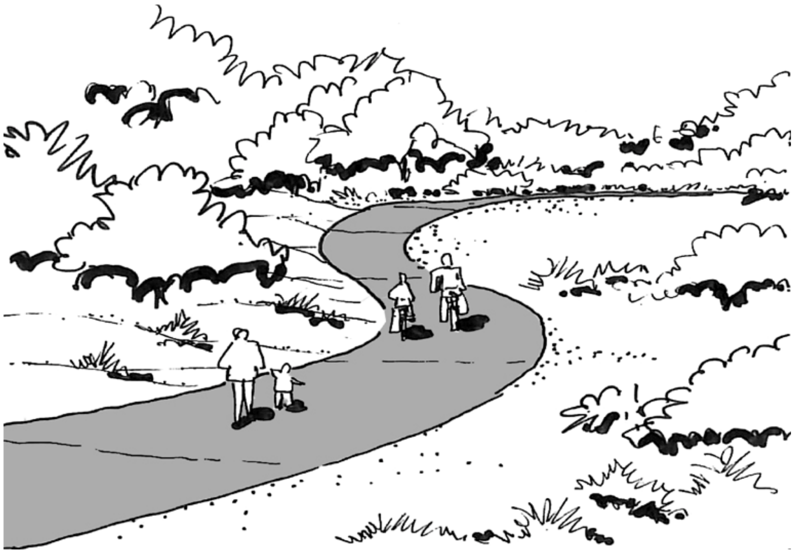


Figure A4-5: Improved legibility through path design and integration with surrounding environment

4.5.2 Edges

Edges provide a linear connection or an interlocking area between defined spaces, uniting the separate spaces together (Figure A4-6). Often these interconnecting spaces perform different functions or exhibit a change in physical characteristics. They can also act as linear transitional space where one defined space or area becomes another. Edges are important spatial components, enclosing and separating different areas.

Edges will be either fully or partially permeable, that is, provide some movement through (either physically or visually or both). They can also divide spaces, forming an impenetrable barrier where this is required. An example would be where an edge is used as a barrier fence, preventing access and detracting human activity.

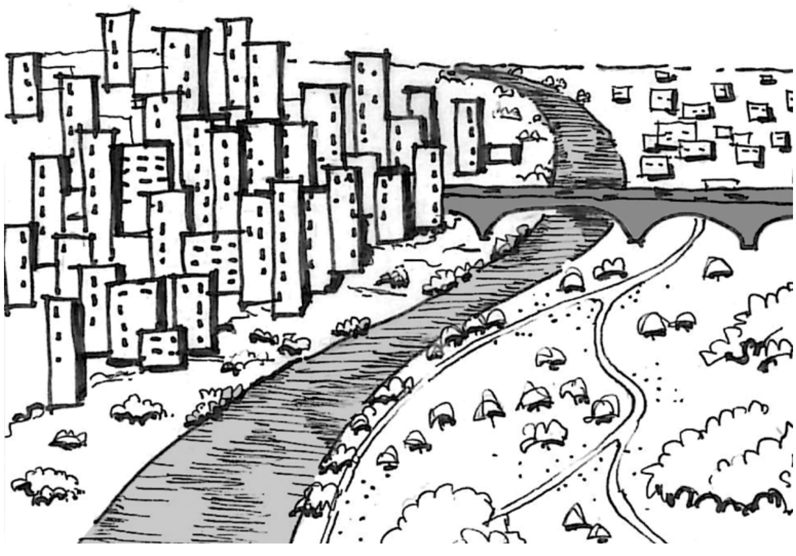


Figure A4-6: Improved legibility reinforced by clear edges that define different spaces and functions

Edges can be further classified into hard edges and soft edges.

4.5.2.1 Hard Edges

These types of edges are not as dominant as paths, yet still provide strong directional qualities. They often support pedestrian activity also by providing a transitional space adjacent to paths. Examples of these types of edges include buildings, bridges, tunnels, noise barriers, light poles (Figure A4-7) retaining walls, fences and drainage infrastructure.

Figure A4-7: Improved legibility reinforced by hard edge elements such as light poles

4.5.2.2 Soft Edges

These types of edges most often form subtle relationships between (Figure A4-8). Examples of these types of edges include planted medians, roadside buffers, open space, parkland, water bodies (where planted at margins) or boulevard planting and avenues of street trees.

Figure A4-8: Improved legibility reinforced by soft edge planting

When designing edges within a road landscape, there are opportunities to design them as permeable or impermeable, complex or subtle, active or passive, depending on what function they need to serve. Edges can also act as interfaces between public, private and semi-private areas, defining boundaries of ownership. These are often passive edges, that is, edges which do not provide scope for activity. Passive edges are often designed to provide visual relief or transition to another area within the road landscape.

The success of a public space will often be defined by the arrangement of, and around its edges. This is where active edges tend to occur, supporting diverse human activities, experiences and meanings. Well designed edges can stimulate visual interest, and contribute to landscape design quality and liveability. In publicly accessible areas, edges should aim to be active rather than passive, to ensure dynamic, vibrant and interesting spaces.

4.5.3 Precincts

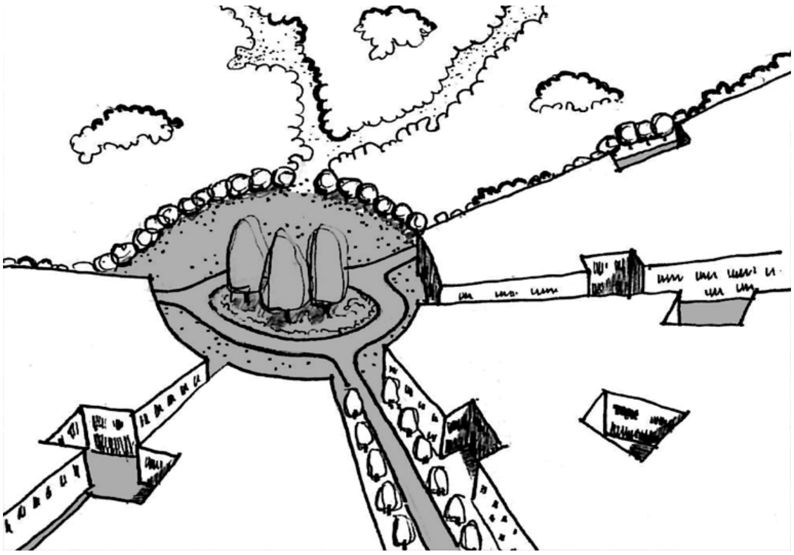
Precincts are areas which are able to be entered, and are often places of high activity. Although their boundaries are subtle, they define and display an identifying character (Figure A4-9). These boundaries can either be defined by soft or hard edges (Figure A4-10). Distinct character precincts may be developed in the road landscape through the theming of planting designs and urban design features, for example; developing unique colour palettes.

Figure A4-9: Improved legibility reinforced by subtle precinct boundaries

Figure A4-10: Improved legibility reinforced by soft and hard edges

4.5.3.1 Nodes

Nodes are placed reference points that are able to be entered, assist in providing directional guidance (Figure A4-11) and can become a key focus place along journeys travelled. Nodes can be small and simple, or more complex systems which contain a concentration of or junction of various uses or physical forms. However complex, nodes make a statement of differentiation; clearly defining an area, and are a significant feature within a road landscape. Roundabouts, junctions and interchanges are examples of common nodes within transport and road design. These are important stopping, or directional change locations within the corridor, as well as, decision-making points.



*A junction is a more complex **node** bringing together various uses and connections.*

Figure A4-11: Improved legibility reinforced by nodes

4.5.3.2 Landmarks

Landmarks are not dissimilar to nodes; they are also a type of reference point, distinguishing a location along a journey for travellers. However unlike nodes, they cannot be entered and are only experienced from the outside. Landmarks are also usually more simply defined as a singular physical object or a simplified group of elements, rather than a concentration of differing structures. They provide a strong individual symbol or focal point within a road landscape, often providing identity, visual structure, character and a sense of place. Landmarks can also be hard structures, such as a building or artwork, and soft vegetation such as distinctive individual tree specimens, masses, stands or groves of trees (Figure A4-12).

Figure A4-12: Improved legibility reinforced through hard elements, landmarks and distinctive tree planting

Public artwork or sculptures (Figure A4-13) can act as a key focal and orientation point within the road landscape. Often landmarks are designed to be largely vertical forms allowing them to be visually dominant from a long distance away.

Figure A4-13: Improved legibility reinforced by landmarks in the form of public art.

Legibility (including the visual cues of paths, edges, precincts, nodes, landmarks) in the road landscape (Figure A4-14) provides:

- ease of understanding for users;
- ability to be read or interpreted;
- structure and order;
- definition of boundaries;
- focal and strategic reference points;
- a sense of arrival or departure (through gateways and entry statements); and
- reinforcement (of direction, place and journey to travel).

Figure A4-14: Legibility maintained by views to mountain landmark

4.6 Form

Form refers to the various visible elements which make up the structure of a road landscape. It is a broad term used to define the particular shape, appearance or configuration of an object or space. Light and shadow also contribute to adding volume to objects, and define the appearances of surfaces.

Form, along with colour, is often one of the most obvious and identifiable features within a design component. This is particularly apparent when travelling through a high speed transit area where there is less time available to view and fully comprehend forms. In this situation, forms need to be simple, bold and strong enough to assist in interpretation and ongoing remembrance by the traveller (Figure A4-15). In comparison, when travelling through slower speed areas, there is more time available to identify and remember detail in the surrounding forms. Form is one of the most fundamental parts to design effectively within a road landscape.

Use of particular planting species with distinct, individual appearances can define spaces and their ***form****; making them more easily remembered and responded to by people.*

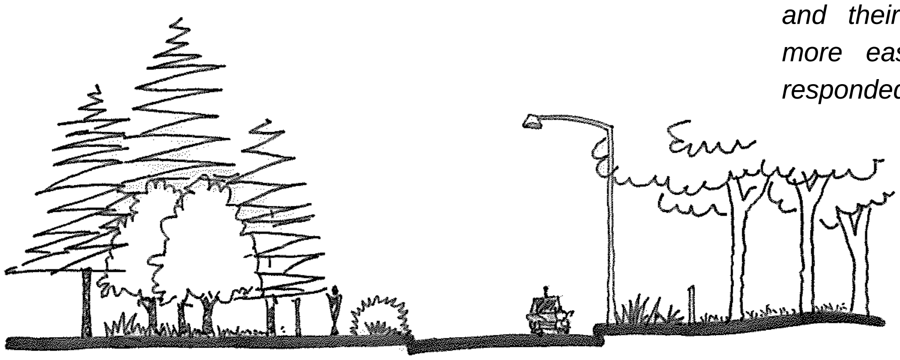


Figure A4-15: Improved space recognition through distinctive tree planting

Form can be achieved through either or both **soft** and **hard** landscape treatments. **Soft form** can include structured planting layouts or the individual use of particular planting species with distinct appearances and/ or unique growth habits (Figure A4-16). **Hard form** can include the structural/ architectural design of urban design components such as bridges, or the individual detailing to particular parts of tunnels (Figure A4-17), retaining walls and noise barriers.

Figure A4-16: Soft landscape form through structure planting layouts

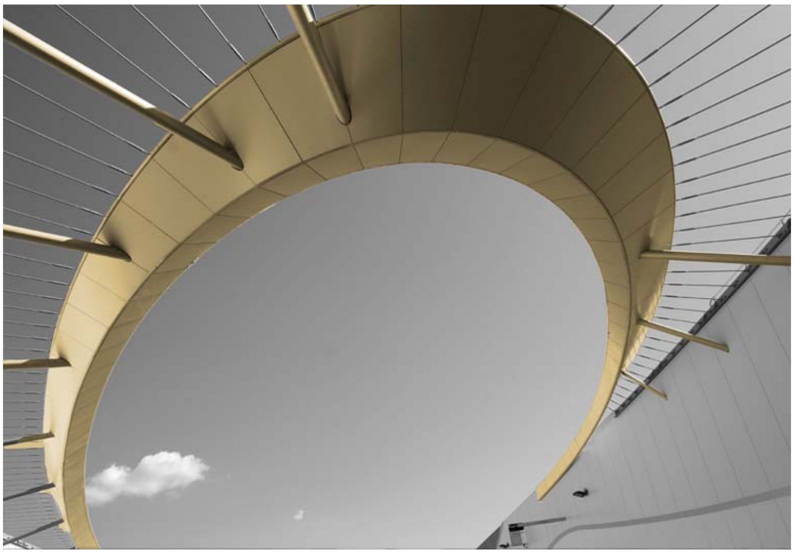


Figure A4-17: Hard landscape form through a tunnel entrance

Form in the road landscape provides:

- differentiation (for example; physical or structural);
- memory (identifiable regularities and consistency);
- variety in detailing (simplicity versus complexity); and
- enhancement of built structures (through effects of sunlight and shadows).

4.7 Function

Function describes the organisation of spaces to support the variety of intended uses of a space or particular area. Several functions can be operating simultaneously at the same time within a road landscape (Figure A4-18). One function may be more dominant than another and sit higher within the hierarchy of functional requirements. The concept that **form follows function** within the road landscape is based on the design theory that the **function** of a space directly stems from the physical **form** and makeup of the road and transport system (Figure A4-19).

*Different **forms**.*

*A **functional** design meets different users' expectations and needs.*

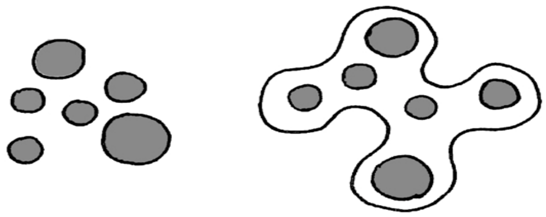
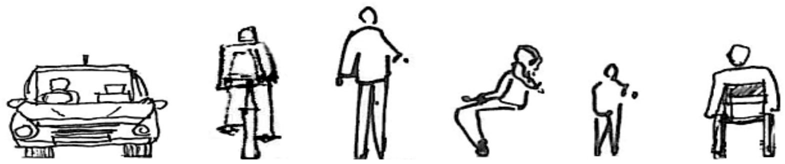


Figure A4-18: Different forms (above) and functions (below) can be arranged to operate together within a road landscape

Vehicular driver Cyclist Pedestrian Rest Play Access



*A **functional** design meets different users' expectations and needs.*

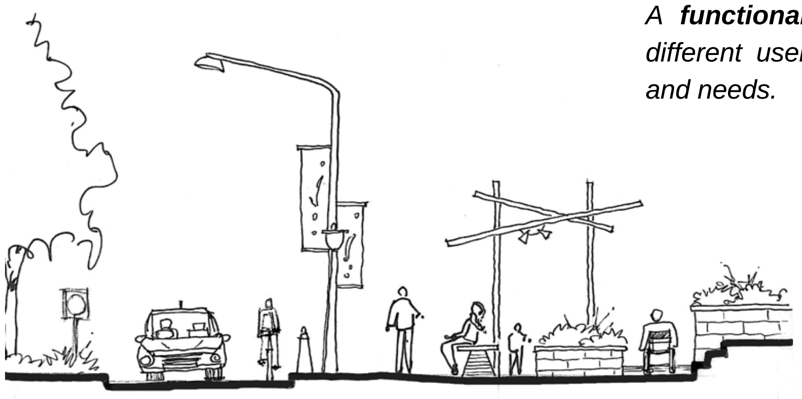


Figure A4-19: Different forms and functions arranged to operate together within a road landscape

Function in the road landscape provides:

- the outcomes of form;
- well functioning and utilised spaces;
- spaces and/ or design components that fit in with context (physically and visually);

- spaces and/ or design components that meet a specific purpose or have a universal use (Figure A4-20); and
- provision for meeting user expectations (for example, vehicular drivers, pedestrians, cyclists) (Figure A4-21).

Figure A4-20: Universal design components, like noise barriers that fit together to achieve a road function

Figure A4-21: Universal design components like paths, seating and shade structures that fit together to meeting user needs

4.8 Connectivity

Connectivity is the direct linkage created between places, areas destinations. Connections can be either or both visual and physical. The more connective links provided, the greater the access points and choices available for movement and greater permeability of a space or region.

Connectivity can be further enhanced by implementing a variety of different transport methods between destinations. These transport routes may provide a direct connection or involve a series of inter-connections. Connectivity is the key to successful transport systems as they move people more efficiently, reliably, comfortably, safely and ultimately faster.

Connectivity is also linked to the concept of permeability; which relates to the ease with which one can move through a space and get to other locations. The sequencing of spaces as well as clear circulation routes (both within a space and outside of) improves connectivity (Figure A4-22).

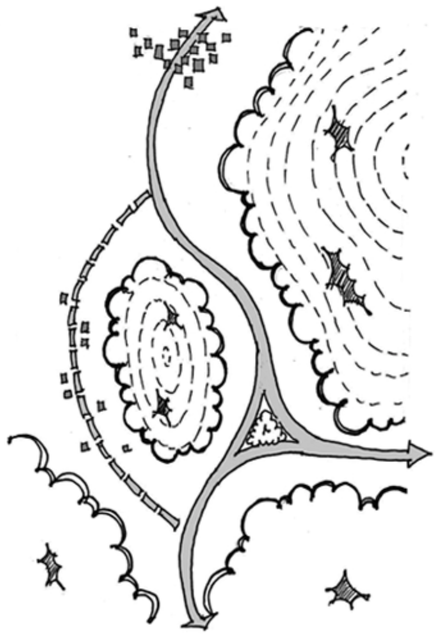


Figure A4-22: Connectivity provides permeability through spaces via clear routes critical for channelling movement, providing linkages and promoting interconnectivity

Connectivity in the road landscape provides:

- transport interconnection and interfaces (Figure A4-23).
- permeability (ease of movement through spaces and from one place to another);
- clear circulation routes;
- defined channels of movement;
- linkages and interfaces (Figure A3-24); and
- inter-connection (Figure A4-25).

Figure A4-23: Connectivity within the road landscape utilising multiple transport modes

Figure A4-24: Improved connectivity through the provision of overhead footbridges

4.9 Wayfinding

Wayfinding incorporates various design principles including **legibility** and **connectivity** to assist in orienting the user, and guiding them through a space; in particular guiding them from one specific place to another. Specific elements such as signage, lighting, and vegetation arrangements aid in achieving wayfinding (Figure A4-25).

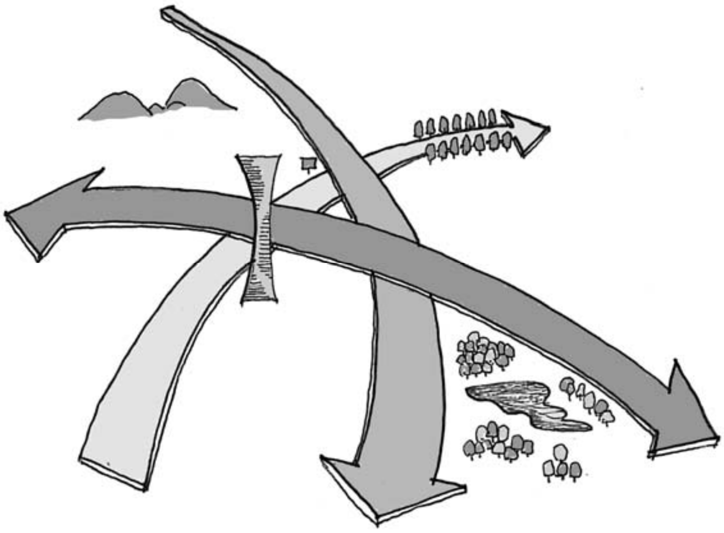


Figure A4-25: Wayfinding incorporates design components like signs, lighting, landmarks and vegetation

Wayfinding in the road landscape provides (Figure A4-26):

- orientation;
- direction;
- navigational ability;
- coherence;
- consistency;
- reference elements; and
- focus points.

Figure A4-26: Wayfinding signage assists users in navigation and direction

4.10 Accessibility and Mobility

A balance between accessibility and mobility is important in reinforcing the design principles of **legibility**, **connectivity** and **wayfinding**. It plays a significant role in urban spaces by promoting social inclusion for all users. Social inclusion ensures that transport and road environments are physically accessible, allowing access to, from and around an area. Places of movement such as paths and cycleways, should consider the sequential experience of the user moving from one place to another.

Accessibility

Accessibility is the degree to which a space allows as many users as possible to safely enter a space and reach destinations. Well designed spaces should be all inclusive; ensuring equal accessibility by all members of the community and allowing equal access rights by all. Road landscapes should be able to embrace, integrate and balance the needs and concerns of all users. The design of public urban spaces must allow fair access for the physically and mentally challenged, particularly ensuring that dignified and equitable access is maintained.

Mobility

Mobility relates to the ease of free movement that people experience within a space, or when moving from place to place (Figure A4-27).

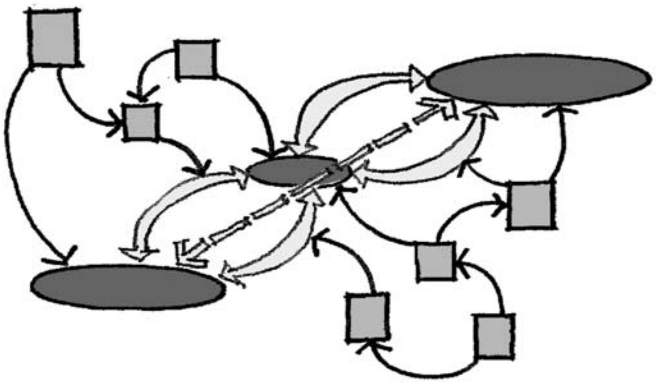


Figure A4-27: Increased mobility through a variety of connections enables safe access to all users

Accessibility and mobility in the road landscape provides:

- equitable access (Figure A4-28);
- user comfort;
- effective circulation patterns; and
- clearly defined destinations.

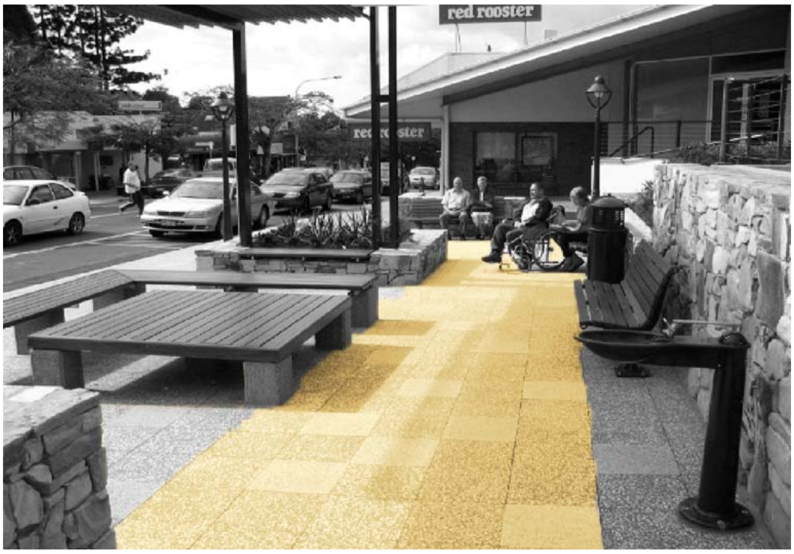


Figure A4-28: Accessibility caters for all users.

4.11 Robustness

Robustness relates to the ability of a space to be adapted and used successfully by a wide range of people for a variety of different purposes. Robust places have flexible qualities and can accommodate changing uses over time. In this way they are all inclusive, and become mixed use spaces. These mixed uses should be complementary to one other in terms of being conducive to interaction, irrespective of differing activities. Robust spaces are effective when a diversity of uses and experiences can be operating simultaneously.

Robust road landscapes offer a variety of experiences where varied forms, uses and meanings are encountered. Robust spaces are versatile to accommodate a wide range of uses, activities and purposes, and adapt to changing daily cycles as well as seasonal patterns. Adaptability and variety is a key requirement in creating successful road landscapes, as well as the ability to reconcile different uses.

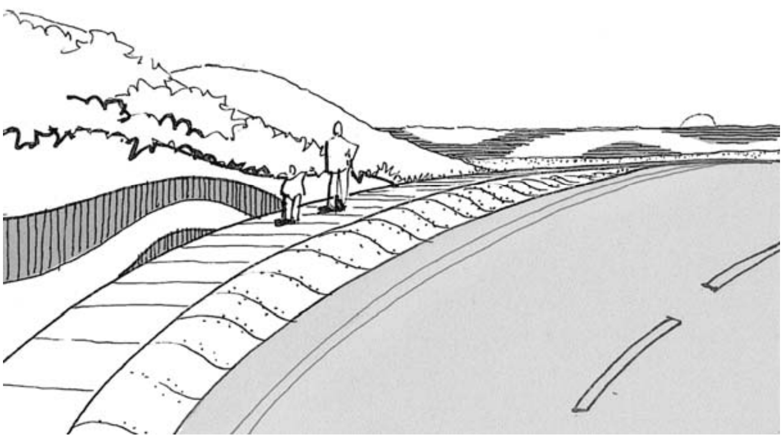
Robustness in the road landscape provides:

- flexibility;
- variety and diversity in uses;
- changeable experiences (within the space and for the user);
- adaptability of spaces;
- choice and decision making;
- a sense of either enclosure or openness; and
- transparency.

4.12 Place-making

Place-making generates, preserves or respects the existing landscape character and sense of place within a locality. Creating a sense of place within a road landscape involves recognising both the shared role and common identity of the people who make up the area; their needs, aspirations and spirit. It enhances the sense of community, fosters social interaction and generates a positive self-image. Community engagement and information exchange, in conjunction with research and analysis, is a key requirement for place-making to be successful.

Place-making strengthens the distinct qualities characterising both the immediate and the surrounding physical environment. It contributes to forming an immediate impression on outsiders and tourists travelling into or within spaces, and from one journey to another (Figure A4-29). It can define both the character and culture of a place, generating unique memories and experiences (Figure A4-30). Place-making recognises and values the inherent differences between one place to another, contributing to a sense of journey which can be experienced by the wider public.



*Curved patterning on retaining wall reflects and connects to the local beach surroundings. This contributes to forming an immediate impression in outsiders travelling into the area, of the **sense of place**.*

Figure A4-29: Place-making expresses context.

***Soft** landscape treatment - using local plant species and theming in planting schemes provides identity; defining the sense of place and characterising the area.*

Figure A4-30: Place-making expresses local landscape character

Place-making in the road landscape provides:

- character and identity (individual, local or regional) (Figure A4-31);
- authenticity;
- distinction;
- meaning and memories;
- symbolism;
- richness of place and experiences;
- liveability and livelihood; and
- defined/ signature theming (based on individuality and uniqueness).

Local vegetation values are expressed through urban design finishes on the noise barrier. The patterning expresses the distinct landscape character within the area, distinguishing it from other places along a journey. This treatment also forms an impression and appreciation of the ***place*** *by external visitors.*

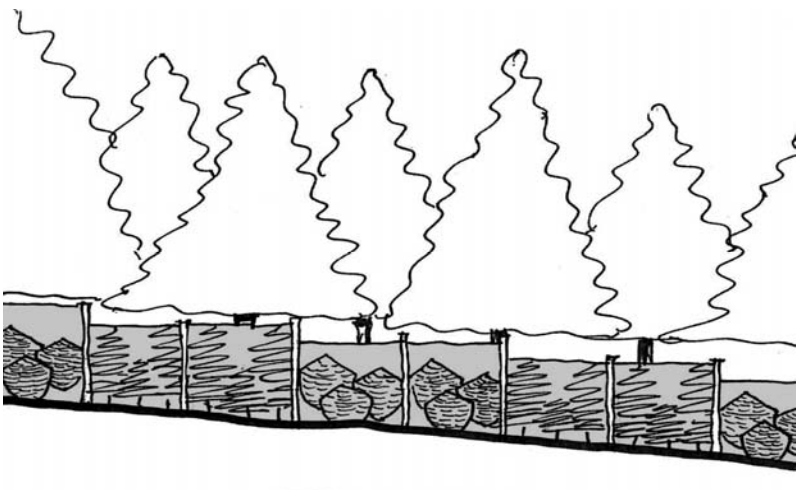
Figure A4-31: Place-making artwork derived from local context

4.13 Imaging

Imaging relates to imagination as well as to **legibility**. It is the quality within a physical object or place that conveys strong imagery or an immediate response in the observer.

Simple design measures as well as more complex detailing can achieve imaging. The clear visibility of significant images within the road landscape is also important as it enables users to clearly visualise the road imagery, improving user safety within the corridor. The clarity and sharpness of images within places can also stimulate attention and awareness by the user when travelling through a space (Figure A4-32). Strengthening the imaging of the road landscape through the incorporation of symbolic devices can generate a long term unique identity for a place.

A variety of images sequenced through spaces provides changing points of interest and choices for visual stimulation (Figure A4-33). The use of transitory and random images can be successful in achieving this within the road landscape (Figure A4-32). It is a balance of both structured and shifting images which provide variety, meaning to the traveller and a sequencing of visual interest.



Symbolic patterns which link to the surrounding landscape context can strengthen the visual ***image*** *of the area and generate a unique identity for a place.* ***Variety in detailing and sequencing of images*** *stimulates viewer interest, and provides meaning and memory.*

Figure A4-32: Artwork reflects local images

Imaging (including variety of imaging and sequencing of space) in the road landscape provides:

- clear and visible images;
- clarity to user observations;
- variety and diversity;
- visual interest and stimulation;
- engaging, vibrant experiences;
- striking and memorable physical qualities; and
- endurance (timeless design).

Median and road side planting design provides drivers with clear ***images*** *or views of road ahead, whilst also stimulating a directional response in the user. The planting layout and changes in landscape themes assist in providing* ***visual sequencing*** *and variety in user experiences.*

Figure A4-33: Image reinforced through theme planting

PART B

Landscape Planning and Design Processes

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Part B - Landscape Planning and Design Processes

PART B

Chapter 1
Community Engagement

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 1 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Figures

Part B – Chapter 1
Community Engagement

1.1 Introduction

This section provides a brief overview of how the Department's community engagement process supports the road landscape design process. The road landscape is a significant contributor to the public's perception of how responsive the Department is to public and community needs and expectations. The objective of the community engagement process is to build relationships that foster understanding of the decision making process, minimize impacts and adds value to the project outcomes. This process seeks long term solutions that will ensure the community's needs for the future are met.

1.2 Community Engagement Resources

The Department has developed a suite of documents to assist the undertaking of community engagement.

This suite consists of the:

- Community Engagement Policy Statement, Standards, Principles and Guidelines;
- Engagement Planner;
- Engagement Resource Guide; and
- Community Engagement Toolbox.

These resources may be accessed on the Department's website.

1.2.1 Community Engagement Principles

The Department has adopted six principles of community engagement community engagement principles which are:

"Inclusiveness – more inclusive practices will increase connection with the community, including those who are the hardest to reach.

Reaching Out – using innovative ways to connect to government and communities so they can work together for better outcomes.

Mutual Respect – listening, understanding and acting on experiences different from those of the department.

Integrity – open and accountable engagement as a means of promoting trust in the processes of government.

Affirming Diversity – incorporating diverse opinions and perspectives to help the processes of government achieve effective and sustainable outcomes.

Adding Value – communities and governments that work productively together will add value to policies, programs, services and projects." (Community Engagement Resource Guide, 2004).

1.2.2 Levels of Engagement

There are three levels of community engagement:

Information- a one-way relationship in which the Department gives information to communities and receives information from the communities;

Consultation- a two-way relationship in which the Department seeks and receives community views; and

Active participation- actively involving communities and individuals in shaping policy, programs, services and projects. (Community Engagement Resource Guide, 2010:p8).

Community participation is an important tool for determining locally significant areas; particularly environmentally sensitive locations, and those that have historical or cultural value. Active involvement can shape the design of these places; especially those areas that have particular meaning to the local community (Figure B1-1).

Figure B1-1 Engaging with the community can provide a unique insight into local history and the environment

The level of consultation undertaken is driven by the size, complexity and impacts of the transport and road infrastructure project. Major corridor planning and design development; that is, those projects acknowledged in the Queensland Transport and Roads Implementation Program, should involve active participation by stakeholders directly and indirectly affected by the proposed project. In contrast, a minor road widening project may only warrant an information exchange with stakeholders. The project manager needs to carefully consider what level of engagement is warranted for each project. It may be that a series of different methods and measures are required in order to ensure the best possible project outcomes.

Refer to the Department's community engagement resources to complete this assessment of the level of engagement required.

1.3 Community Engagement Planning

The Department's *Community Engagement Planner* should be used in planning all community engagement activities. It should be utilised prior to the physical engagement of the community, and aids the user in directing the engagement process effectively towards appropriate topics and outcomes. It also allows for progressive evaluation of the engagement process itself.

Figure B1-2 shows how the various inputs of community engagement come together in a plan.

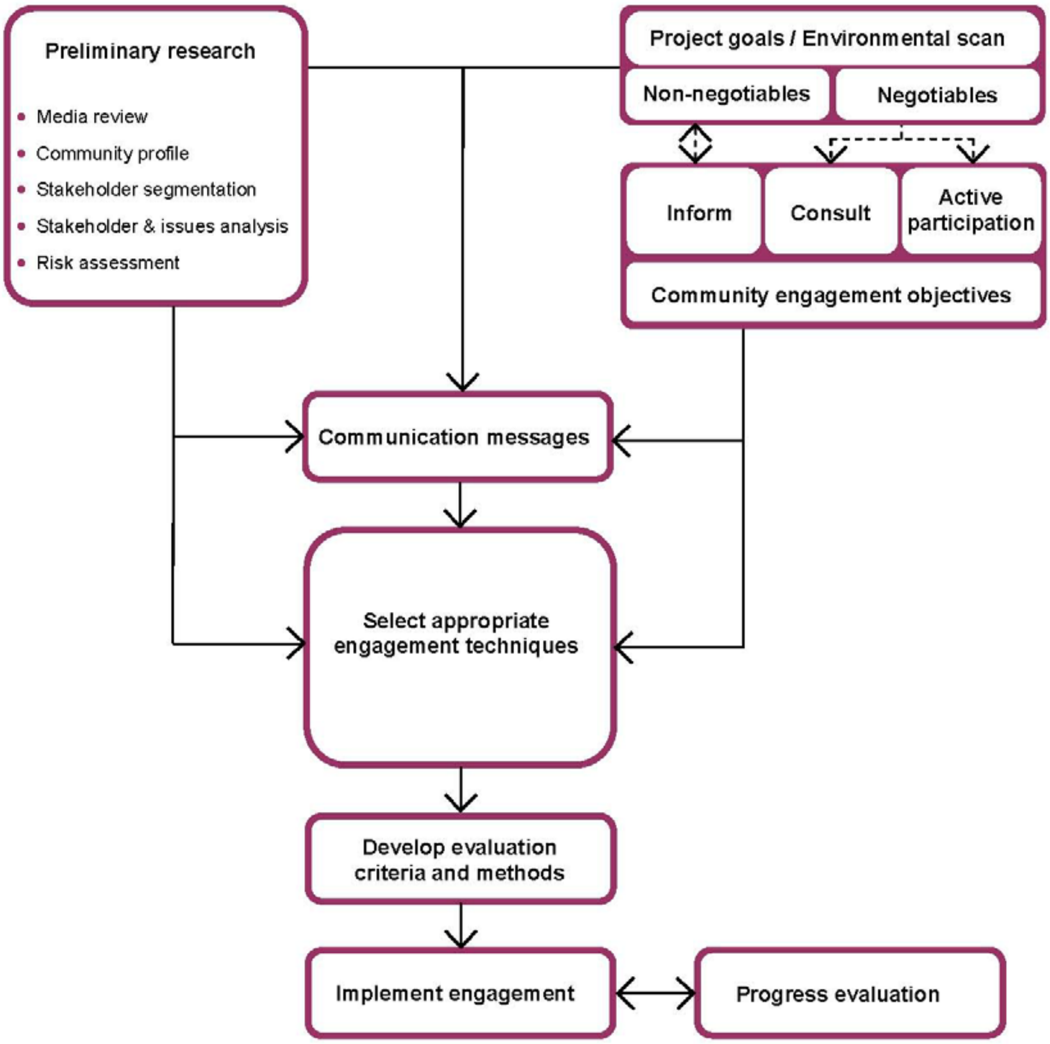

Figure B1-2 The Department's community engagement plan

Source: Main Roads (QLD), 2010: Community Engagement Planner

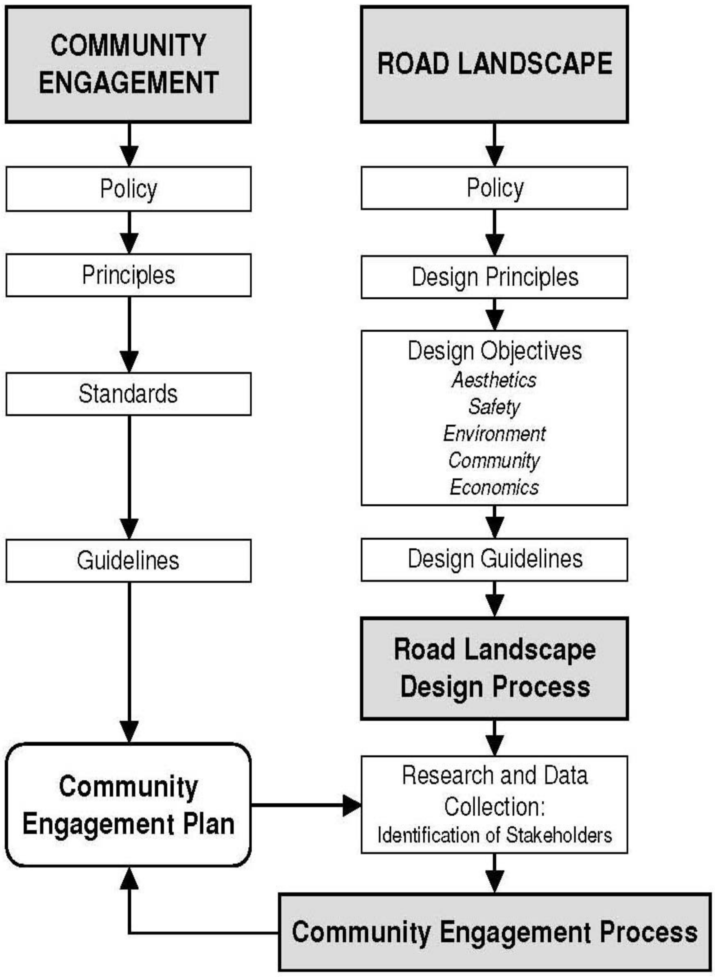

Figure B1-3 The relationship between the Department's community engagement process and requirements of the road landscape design process

1.4 Road Landscape community engagement process

There are strong parallels between the road landscape design process and community engagement (Figure B1-3). The landscape design process can merge into the community engagement process at the research and data collection stage.

1.4.1 Research and Data Collection

One of the most important parts of the research and data collection process is identifying stakeholders.

Identification of Stakeholders

The Department acknowledges the importance of proactively identifying and effectively engaging the community as key stakeholders in the engagement and consultation process.

The Department considers that communities encompass the following:

- communities of place, such as neighbourhood, suburb, region, catchment areas;
- communities of interest, such as interest groups, schools, business, working population; and
- communities that form because of a specific issue. (Community Engagement Resource Guide, 2010:p8).

Stakeholders are any single or body of people who have an interest in the proposal or are affected by it in any way or form. They have the right to be involved in all aspects of the proposal from initial decision-making, planning and design, through to completion and ongoing maintenance.

Stakeholders can include, yet are not limited to the following:

- professional individuals, organisations and special interest groups;
- environmental agencies;
- whole communities, schools and alliances;
- developers, businesses, industries, and industry bodies;
- national transport and road bodies; for example – Austroads and the Australian Road Research Board;
- Federal Government and other statutory authorities;
- other state road authorities and statutory authorities;
- local government and other statutory authorities;
- services and public utility providers;
- road administrators; for example – Queensland Motorways Limited;
- affected landowners and users of an affected facility;
- conservation groups;
- historical societies and Indigenous groups;
- internal departmental branches; and
- general public.

Formal and dynamic consultative procedures with associated local authorities are also necessary when engaging with the community. Local government authorities are an integral and valued member of the planning and design of state controlled roads. Working with local authorities seeks to achieve a whole of government approach to consultation and also serves to provide the community with local representation (Figure B1-4).

Figure B1-4 Consultation ensures community facilities are designed and implemented to meet council and community requirements

1.4.2 Engaging with the Community

Design Goals and Objectives

The road landscape design objectives provide an overall framework for the development of project specific design goals and objectives. These will be formulated as a result of the community engagement process in combination with the road landscape design process (Chapter 2 of Part B). The data collection and assessment process will occur at a suitably relevant design phase of the project.

There are many methods to convey the project specific design goals and objectives to the public. A reiterative approach (Figure B1-5) is most common whereby:

- concepts are developed, and then reviewed and commented upon by the public;
- design alternatives are explored by the project team and then further reviewed and commented upon by the public;
- refinements made to designs, with a final review and feedback undertaken by the public; and
- preferred option selected.

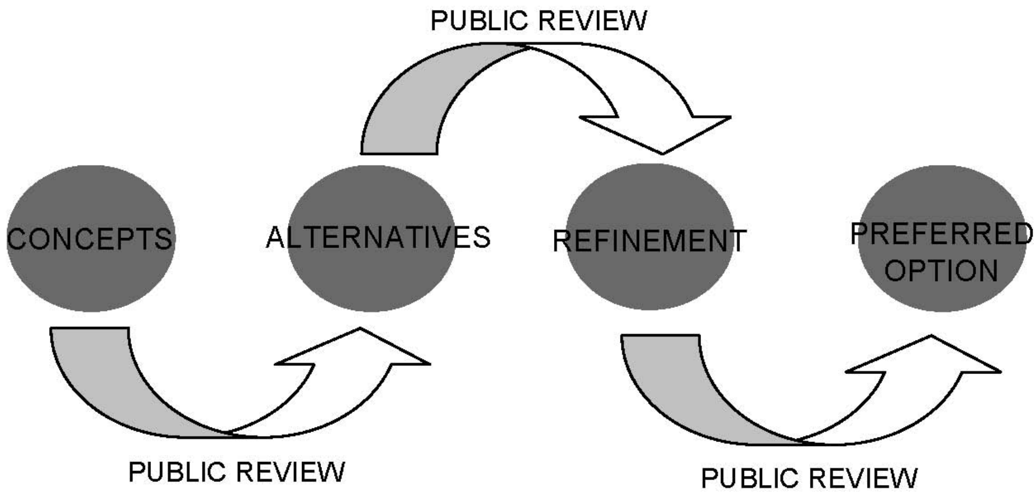

Figure B1-5 Conveying concepts to the public is a reiterative process

(Adapted from Farr, D, 2007, p82)

This is an effective approach to engaging with the public as it allows for constant feedback to be given as design options are explored, modified and refined into options. The process repeats itself as design alternatives are narrowed into the preferred option (Figure B1-6). Once this final option has been decided, more detailed planning and design can commence. The level of community engagement will determine the actual method and amount of communication with the public.

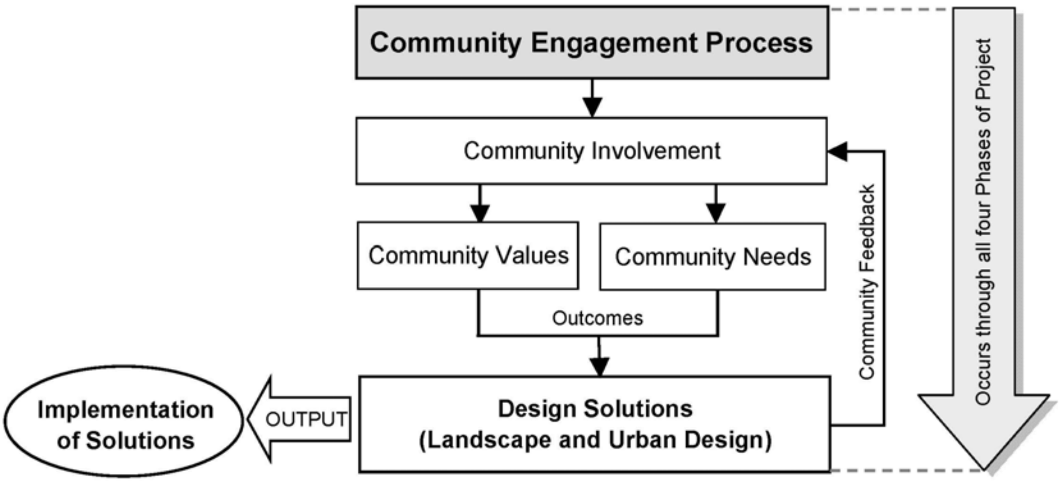

Figure B1-6 Implementing the outcomes of the community engagement process

The road landscape community engagement process ensures that the road landscape design approach is integrated with community values and needs. By engaging the community, it is possible that a common understanding of the project proposal is reached that manages public expectations and desired outcomes. It also allows for a professional assessment of design opportunities and constraints to be relayed from all disciplines.

1.5 Community Consultation Process

Prior to and during the actual engagement of the community, a seven stage process must be adhered to, to ensure best practice and required outcomes.

- Step one: project identification and phase of business;
- Step two: develop a community engagement plan;
- Step three: monitoring communication and evaluation;
- Step four: final checklist;
- Step five: approval;
- Step six: ongoing actions; and
- Step seven: next phase.

Further information on these phases can be found in the *Community Engagement Planner* on the Department's website.

Below are examples of how the community can be involved in the consultation process:

Directly: such as

- face to face interaction;
- operating on a regular basis;

Public / Community meetings: such as

- forums and briefings;

- small group discussions and focus groups;
- workshops and information awareness sessions;
- site/field office and staffed public displays;
- information days and exhibitions;
- project open days and community events;

Indirectly: such as

- media releases and advertisements;
- information bulletins, brochures, newsletters and community letters;
- surveys, written submissions, letter drops;
- hotline and project information lines, comments and complaints systems; and
- web-based tools.

PART B

Chapter 2
Landscape and Urban Design Process and Brief

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 2 Amendments – June 2013 Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Figures

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Part B - Chapter 2
Landscape & Urban Design Process and Brief

2.1 Introduction

The Department has adopted a project management framework (On_Q) to plan and manage its transport infrastructure projects. This chapter details the role/s of landscape and urban design specialists within this framework. It also includes the scope of works and level of service process and design outputs required to be undertaken by them at each project phase.

2.2 Project Management Framework

The Department's project management framework phases are:

- Concept phase;
- Development phase;
- Implementation phase; and
- Finalisation/ maintenance phase.

Each project management framework phase has an associated landscape and urban design phase, with the development phase being split into two sub phases (Table B2-1). Each phase varies depending on the project type and level of design service required. It is important that project managers and contractors understand the project management framework, their roles, responsibilities, the processes and requirements of each phase, as well as the degree of collaboration, coordination and design outputs required.

The landscape and urban design phases are:

- Concept and Master Planning;
- Preliminary and Detailed Design;
- Contract Documentation and Administration; and
- Finalisation/ Maintenance.

2.2.1 Supporting Process

There are supporting processes to the landscape and urban design phases which include:

- integrated landscape assessment and site analysis;
- planting media management planning;
- cost estimating; and
- safety review.

2.3 Design Consultancy Level of Service

The required level of landscape and urban deign specialist involvement for each of the project design phases is based on the project type and the road landscape frameworks (Chapter 3 of Part A). The table below (Table B2-1) depicts two of the four levels of service all Departmental projects are broken into along with the correlative obligation to engage landscape and urban design specialists in the design of road landscape infrastructure associated with the project. Implementation and finalisation are discussed in Chapter 1 of Part D.

		PROJECT TYPES There are generally three project types defined by the Department's Project Management Framework. Type 1 – significant transport infrastructure projects that are complex, high risk or expensive. Type 2 – moderate (or medium) scale projects that are relatively straightforward and low risk. Type 3 – minor scale projects that are enhancements or access related which pose the lowest degree of risk.	(Reference for Detail)	**Type 1**	**Type 2**	**Type 3**
CONCEPT PHASE	CONCEPT	**LANDSCAPE AND URBAN DESIGN**				
		Landscape Assessment	B3			
		• Integrated Landscape Assessment Report		☑		
		• Integrated Landscape Assessment Opinion			☑	
		• Landscape Site Analysis Assessment				☑
		Landscape and Urban Design Concepts	B2			
		• Landscape Master Plan and Report		☑		
		• Landscape Concept Plan and Statement			☑	
		• Landscape Concept Plan and Drawing Note				☑
		Construction Management Strategies	SMM			
		• Soil Management Plan – Link/ Concept		☑	☑	☑
		• Vegetation Management Strategy		☑		
		• Weed Management Strategy				
		Cost Estimate	B2			
		• First Principles		☑		
		• Unit Rate			☑	
		• Global				☑
DEVELOPMENT PHASE	PRELIMIANRY DESIGN	**LANDSCAPE AND URBAN DESIGN**				
		Landscape and Urban Design Preliminary Drawings	B2	☑	☑	
		Safety	C5			
		• Sight Distance and Clear Zone Plan/ Overlay		☑	☑	☑
		• CPTED Review and Report		☑		
		Construction Management Plans	SMM			
		• Soil Management Plan – Design		☑	☑	☑
		• Vegetation Management Plan		☑		
		• Weed Management Plan		☑		
		Cost Estimate – First Principles	B2	☑		

		PROJECT TYPES	(Reference for Detail)	Type 1	Type 2	Type 3
		There are generally three project types defined by the Department's Project Management Framework. Type 1 – significant transport infrastructure projects that are complex, high risk or expensive. Type 2 – moderate (or medium) scale projects that are relatively straightforward and low risk. Type 3 – minor scale projects that are enhancements or access related which pose the lowest degree of risk.				
DEVELOPMENT PHASE	DESIGN DEVELOPMENT	**LANDSCAPE AND URBAN DESIGN**				
		Detail Design Drawings • Specification and Annexure(s) • Tender Schedules	B2	☑	☑	☑
		Special Conditions of Contract • Landscape Representative	B2			
		Landscape Contractor Pre-qualifications	B2			
		Safety	C5			
		• Sight Distance and Clear Zone Plan/ Overlay		☑	☑	☑
		• CPTED Review and Closeout		☑		
		Construction Management Plans • Soil Management Plan – Design • Vegetation Management Plan • Weed Management Plan	SMM	☑	☑	
		Cost Estimate – First Principles	B2	☑	☑	☑
		Landscape and Urban Design Operational Guidelines	B2	☑	☑	☑

Table B2-1: Transport infrastructure landscape and urban design outputs within the context of the Project Management Framework

The project type, level of design service and phase dictates the landscape and urban design specialist role on projects. The following is a brief description of the components of each phase.

2.4 Concept Phase

2.4.1 Landscape Assessment

An integrated landscape assessment is required on all project types (Chapter 3 of Part B).

2.4.2 Landscape Master Plan and Report

A Landscape and Urban Design Master Plan and Report aims to ensure that the final road development integrates into its setting and provides a unique experience. Landscape master plans represent the broadest level of landscape planning and design for road projects. They provide a coordinated design approach to the landscape and urban design treatment of transport systems and roads within a particular area.

They are an illustrated report, containing plans and supporting written description that documents the design process including site analysis and integrated landscape assessment. This report should also identify specific design strategies which are to be incorporated later design phases.

2.4.3 Landscape Concept Plan and Statement

Landscape Concept Plan and Statement provides broad ideas and proposals that clearly communicate the design intent of the landscape and urban design proposal.

The Concept Plan and Statement should include simple conceptual drawings, cross sections and initial sketches showing broad focus areas and brief design statement that provides evidence of design process. The road landscape design objectives and principles should be the basis for concept designs, allowing translation into appropriate design responses.

2.4.4 Landscape Concept Plan and Notes

A Landscape Concept Plan and Drawing Notes provide the simplest form of broad ideas and proposal that meets the simplest of projects. Notes provided on the plan shall provide evidence of design process.

2.4.5 Soil Management Plans

Soil Management Plans should be undertaken at the planning stages within the project design process to assist in developing effective soil management practices and appropriate material and cost allowances.

For further information on the stages of planting media management planning, refer to the Department's *Soil Management Manual*.

2.4.6 Cost Estimating

Cost estimates should be prepared in accordance with the Department's cost estimating system for projects; Works Management System. Using this format ensures consistency in item rates across the whole of the project. Designers should use current industry prices for all other costs associated with landscape and urban design components. Refer to the Department's *Project Cost Estimating Manual* with regard to global, unit rate and first principle project cost estimates.

2.5 Development Phase

2.5.1 Design Development

The landscape design must be developed, reviewed and certified in consultation with a Registered Engineering Professional, Queensland (RPEQ). The RPEQ, in consultation with the Landscape Architect, shall review the drawings and understand the impacts of the landscape treatments on the civil and structural design components (Chapter 5 of Part C). The signature on the 'issued for construction drawings', demonstrates the RPEQ's responsibility to direct, oversee and evaluate the work of others providing input to the project has been complied with as per the legislation.

As part of the preliminary and detailed design phase clear zone and sight visibility calculations shall be provided to the landscape and urban design specialist by the RPEQ to guide the development of the landscape design. Project specific offset requirements for trees from structural elements shall also be provided to assist in the development of the design.

Clear zones and sight visibility zones must be clearly displayed on all landscape plans and sections to ensure the Landscape Architect develops appropriate design responses relative to the design constraints. This process also assists the RPEQ in reviewing and certifying that the design is in accordance with the safety requirements.

The landscape design must be reviewed and certified by an RPEQ at the completion of the detailed design phase.

2.5.2 Crime Prevention Through Environmental Design Site Assessment

A Crime Prevention Through Environmental Design (CPTED) assessment is required during preliminary and detailed design phases. Issues should be assessed and designs adjusted if required to enable close out prior to implementation (Chapter 5 of Part C).

2.5.3 Soil Management Plans

Soil Management Plans should be undertaken at the design and stage within the project design process to assist in developing effective soil management practices and appropriate material and cost allowances. A Planting Media Management Plan is prepared during the implementation phase to effectively manage soil and to determine the soils physical and chemical properties and associated amendments, to ensure Departmental requirements are met.

For further information on the stages of planting media management planning, refer to the Department's *Soil Management Manual*.

2.5.4 Preliminary Design

During the preliminary design phase, the design is developed to illustrate proposed treatments in greater detail. Preliminary design builds on the master planning phase to provide more detailed layout plans, sections and illustrations for the specific landscape and urban design treatments required.

Preliminary design drawings should clearly demonstrate the characteristics, constraints and opportunities identified by the site analysis. They shall clearly demonstrate the civil and structural constraints, as provided by the RPEQ. They should also indicate landscape and urban design themes, individual treatments, proposed environmental mitigation and disturbance measures, landscape and revegetation treatments, and the suite of urban design components and treatments. Since designs may not be fully resolved at this preliminary stage, areas still requiring resolution should be clearly marked on plans to indicate further design development to occur.

It is still expected however, that all landscape and urban design proposals are resolved to well over 50% in terms of detailed resolution (70-80% preferred), before commencing detailed design stage.

2.5.5 Detailed Design

Detailed landscape and urban design completes the contract documentation for tendering and construction. Detailed design includes plans, sections and details, cost estimates, specifications and other documents required for implementation. Drawings shall indicate landscape and revegetation treatments and operations, and the suite of urban design components and treatments. Drawings shall also clearly demonstrate the civil and structural constraints, as provided by the RPEQ.

<u>Landscape and Revegetation Works Standard and Technical Standards Suite</u>

The standard specifications and technical standards used by the Department for Landscape and Revegetation Works are:

- MRS16 Landscape and Revegetation Standard Specification Suite; and
- MRTS16 Landscape and Revegetation Technical Standard Suite.

These include related Appendices and Annexure and can be downloaded on the Department's website.

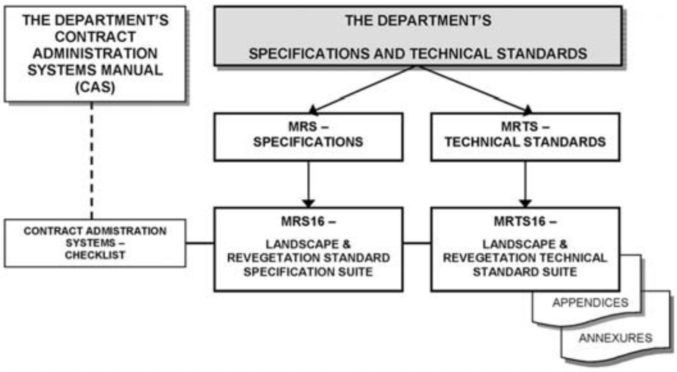

Figure B2-1: Landscape and Revegetation Works Standard Specification and Technical Standards Suite

The use of Standard Specifications versus Technical Standards is relative to the contract type applicable to the project. Figure B2-2 shows when either should be used according to the project's contract type.

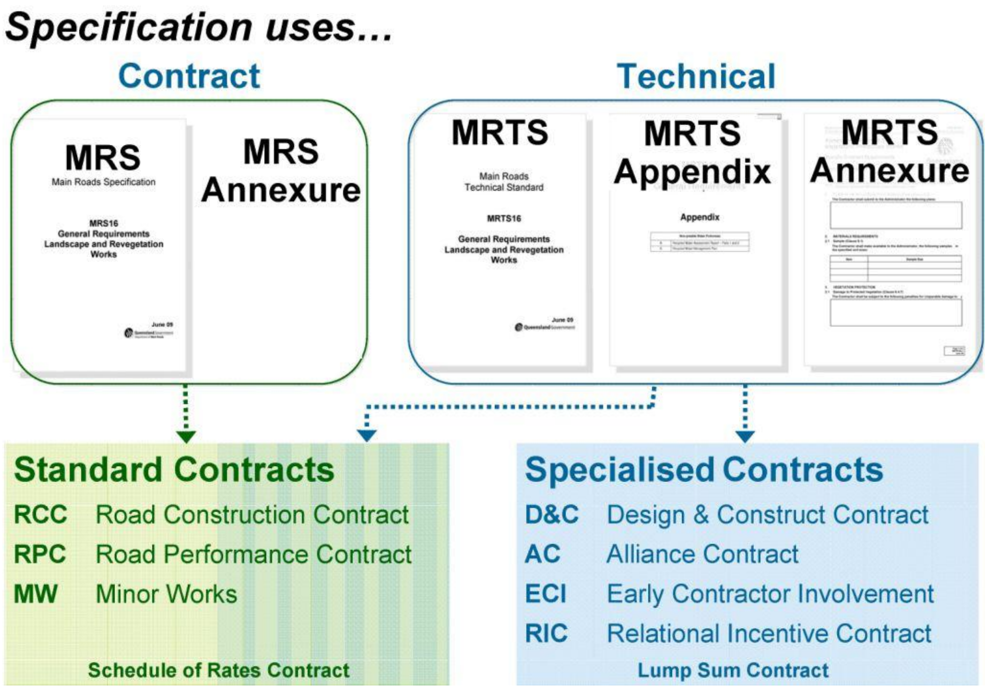

Figure B2-2: The use of Landscape and Revegetation Works Standard Specification or Technical Standards relevant to project's contract type

<u>Annexure</u>

An annexure should be prepared when further technical or performance criteria not covered by the technical standards, need to be included. An annexure is generally required for all road corridor projects. Project specific requirements are added directly into the standard Annexure template form, in a location relevant to the issue. An annexure allow for supplementary conditions to be added or modifications made, and are a key tool for customising specifications directly to a unique project.

For further information refer to the MRS/MRTS16 Specification User Guidelines available on the Department's website.

2.5.6 Cost Estimating

Cost estimates should be prepared in accordance with the Department's cost estimating system for projects; Works Management System. Using this format ensures consistency in item rates across the whole of the project. Designers should use current industry prices for all other costs associated with landscape and urban design components. Refer to the Department's *Project Cost Estimating Manual* with regard to global, unit rate and first principle project cost estimates.

2.5.7 Supplementary Conditions of Contract: Landscape Representative

The Road Construction Contract Supplementary Conditions of Contract has provision for a Landscape Representative to coordinate and provide conformance for the construction of the landscape works under the contract. The minimum experience for this role is 5 years and should be specified in the annexure to the Supplementary Conditions of Contract.

A Landscape Representative should be required where the landscape works exceeds $90,000.

2.5.8 Landscape Contractor Pre-Qualifications

For projects with landscape works exceeding $90,000, the following qualifications are mandatory:

- the company or an individual within that company must hold a license in structural landscaping from the Queensland Building Services Authority;
- a summary of evidence of previous relevant experience or qualifications to supply works of the type proposed;
- evidence of financial viability and capability; and,
- evidence of public liability and property insurance cover.

2.5.9 Operational Guidelines

Operational guidelines are a package of design and maintenance access related information as a reference to maintenance personnel.

2.6 Landscape and Urban Design Project Brief

The following generic design brief (Table B2-1) applies to all QTRIP projects. Its aim is to provide advice to assist TMR project managers and contract administrators as to the minimum requirements for the engagement of landscape and urban design specialists throughout the various TMR Project Management Phases. Discretionary amendments may be made to account for project specifics (issues, constraints, requirements) and contract delivery type.

Mandatory engagement of specialist landscape/urban design personnel is designated with an **M**. **Conditional engagement** is designated with a **C**, meaning project managers may engage these services at discretion. **Advisory engagement** is designated with an **A**, meaning that engagement of specialist personnel is recommended to ensure positive project road landscape outcomes; however mandatory designation should be considered on larger, more complex projects.

CP - Concept phase **DP** - Design development phase **IP** - Implementation phase **FP** - Finalisation phase	**PROJECT MANAGEMENT PHASES**				
	CP & DP			**DP & IP**	**IP & FP**
Notes on Landscape Services: **Peer Review:** undertaken by specialist TMR landscape architectural personnel to ensure compliance with TMR policy & technical governance systems. **Verification:** undertaken by independent party engaged by TMR or Contractor (dependent on contract type) to provide independent verification / peer review & monitor quality control under contract administration. **Superintendent:** undertaken by specialist TMR or Contractor (dependent on contract type) personnel to implement contract construction documentation & contract administration. **Advisor:** undertaken by specialist TMR or Contractor (dependent on contract type) personnel to provide specialist advice in a support role to non-specialist Superintendent in contract administration; this role is to be engaged where a suitable landscape/urban design specialist is unable to be engaged as a landscape construction Superintendent on the project	**CONCEPT DESIGN**	**DETAILED DESIGN**	**PEER REVIEW**	**VERIFICATION**	**SUPERINTENDENT / ADVISOR**
LANDSCAPE BRIEF CRITERIA	**LANDSCAPE SPECIALIST SERVICES**				
QUALIFICATIONS					
Landscape and urban design phases and process must be undertaken by qualified and experienced Landscape Architect/s & Urban Designer/s with a minimum five years experience in design of transport infrastructure projects.	M	M	C	A	
Landscape and urban design implementation (construction) phases and process must be managed / supervised or advised by qualified landscape personnel (refer MRTS16 for qualification requirements)			C	A	M
DESIGN - COLLABORATION					
Be engaged and fully committed from the commencement of the road design phases & process stages inclusive of but not limited to: • Preliminary design/s; • Options analysis; • Safety in design; • Risk management; • Maintenance minimisation and access strategies; • Community consultation (as required); • And so on.	M	M	C	A	A
Be involved & coordinated with relevant road infrastructure design disciplines to ensure integrated design outcomes for all visible areas and components of the road corridor inclusive of but not limited to – • Landscape and revegetation treatments; • Structures and their urban design finish / treatment; • Pedestrian and cyclist facilities; • Drainage devices; • Lighting including feature lighting and lighting to pedestrian and cyclist facilities; • Acoustic control (noise mounds and barriers); • Road furniture and fencing; • CCTV and other ITS infrastructure; • Signs and gantries; and	M	M	C	A	M

CP - Concept phase **DP** - Design development phase **IP** - Implementation phase **FP** - Finalisation phase	**PROJECT MANAGEMENT PHASES**				
	CP & DP			**DP & IP**	**IP & FP**
• Maintenance access. Involvement is to continue through implementation and finalisation phases to respond to changes initiated by other design disciplines or emergent constraints.					
Be coordinated with key stakeholder (local government authorities, PUP for example) requirements, including outcomes of community consultation processes.	A	M	C	A	
Be coordinated with and complementary of Environmental Management plans, systems & processes.	A	M	C	A	M
Be coordinated with clearing and grubbing operations to ensure retention of protected vegetation and capture of site won organic mulch for reuse on project works.	A	M	C	A	M
Be coordinated with earthworks to ensure effective planting media management of subgrade material and site won soils for reuse on project works.	A	M	C	A	M
Be coordinated with and complementary to erosion, sedimentation and water quality infrastructure.	A	M	C	A	M
Be coordinated with nurseries and other landscape industry suppliers to ensure availability of specified plants and products.	A	M	C	A	M
DESIGN - CONTEXT					
Minimise environmental disturbance and incorporate mitigation measures, with particular attention to environmentally sensitive areas and areas of high ecological, amenity and/or cultural value.	M	M	C	A	
Be responsive to, complementary of and in scale with the existing character of the natural and built environments through which the road corridor travels.	M	M	C	A	
Be developed in consideration of and integrated with adjoining sections of road corridor and interfaces with local roads.	M	M	C	A	
Create an identifiable character for the project, and contribute to the overall design integration of road infrastructure.	M	M	C	A	
Create feature gateway treatments at key interchanges and other junctions and linkages to suburban areas.	M	M	C	A	
Manage views and visual amenity from, within and to the road corridor through retention and enhancement of positive views (high visual value) & mitigation of negative views (low visual value).	M	M	C	A	
Match the existing spatial sequence of the landscape and remnant vegetation communities along the road corridor, so as to integrate with and reinforce local vegetation patterns and enhance local landscape character.	M	M	C	A	
Provide an attractive well vegetated road corridor with plantings appropriate for the function and visual significance of the project.	M	M	C	A	
Prioritise use of native species, particularly locally occurring species and remnant vegetation community types (RE types) endemic to the area to; Notwithstanding this, plant species selection must also prioritise species suited and viable for the growing conditions presented by the situation to which they are applied and generally tolerant of low water conditions typical of road environment. **Note:** exotic species may only be used in highly urbanised environments where they may be used to complement existing, visually prominent specimens present locally.	M	M	C	A	
Retain and enhance connectivity of local community, recreational and business centres, through improved amenity, access and visibility throughout the project.	M	M	C	A	
Integrate new pedestrian and cyclist facilities within existing local and regional networks.	M	M	C	A	
Landscape and urban design treatments shall be easily recognised as belonging to a suite, or group of unified treatments that utilise a consistent palette of plant species, construction materials, and urban design treatments and detailing (that is, colours, textures, patterns & finishes) that is consistently applied along the length of the road corridor; the palette is to reflect ambient conditions, local materials and character.	M	M	C	A	
Provide treatments that are integrated respective to each other and the surrounding natural and built environment.					

CP - Concept phase **DP** - Design development phase **IP** - Implementation phase **FP** - Finalisation phase	**PROJECT MANAGEMENT PHASES**				
	CP & DP			**DP & IP**	**IP & FP**
DESIGN - FUNCTIONALITY					
Be fully coordinated and responsive to road safety requirements inclusive of but not limited to: • Clearzone and sight distance requirements; • Offsets / clearances to structures, services, PUP infrastructure; • Headlight glare & driver distraction; • CPTED; • CCTV sightlines; • Limited access (fencing); and • Maintenance and inspection operations.	M	M	C	A	
Comply with the requirements of: • TMR Road Planning and Design Manual. • TMR Manuals, Specifications and Standard Drawings. • relevant Authorities, including local councils; and • Australian Standards and legislative requirements.	M	M	C	A	
Incorporate current best practice design methodology in relevant design field (for example, water sensitive urban design, ecologically sustainable design and so on).	M	M	C	A	
Landscape treatments are to cover all degraded and disturbed areas (excludes hardstand areas and structures) within the Project footprint.	M	M	C	A	
Promote self sustaining landscape treatments which: • contribute to the overall reduction of 'whole of life' inputs for the Project Works; • require no or minimal ongoing maintenance; and • establish readily in the changed / disturbed conditions.	M	M	C	A	
Promote landscape treatments and structural design which function to enhance ecological value of the road corridor including: • water quality of drainage and sediment control devices (marginal aquatic planting) • fauna habitat and bio-flow corridors (inclusive of culverts, bridge underpasses and fencing); • soil retention and bank stabilisation; • weed management; and • biodiversity.	M	M	C	A	
Prioritise no/low maintenance outcomes to minimise maintenance operations generally and mitigate requirement for traffic control to conduct safe maintenance operations.	M	M	C	A	
Support maintenance minimisation objectives and operations by ensuring: • earthworks batters not exceed a maximum 1:2 gradient (1:3 or flatter is preferred) where typical vegetation treatment (containerised stock, hydromulch) is used as primary stabilisation measure; • gradients greater than 1:2 (V:H) alternative revegetation or hardscape stabilisation treatment options must be provided; and • grass and lawn treatments areas requiring ongoing mowing maintenance not exceed maximum 1:4 gradient.	M	M	C	A	
Integrate maintenance access and operational requirements within landscape design, including sufficient vegetation setbacks from access ways, fencing and structures to ensure unimpeded access for vehicles and personnel.	M	M	C	A	
Prioritise use and effective management (amelioration, weed seed control, stockpiling and so on) of site won soils for reuse planting media.	M	M	C	A	
Prioritise planting in lieu of grassed / turfed treatments to minimise ongoing mowing / slashing maintenance.	M	M	C	A	
Provide alternative hard capped treatments in lieu of planting treatments in following situations: • to road side areas < 1.5m wide; • medians <3m wide;	M	M	C	A	

<table>
<tr><td rowspan="2">CP - Concept phase
DP - Design development phase
IP - Implementation phase
FP - Finalisation phase</td><td colspan="5">PROJECT MANAGEMENT PHASES</td></tr>
<tr><td colspan="3">CP & DP</td><td>DP & IP</td><td>IP & FP</td></tr>
<tr><td>• pedestrian areas where area between paths and adjacent hard edges / structures is <1m wide; and
• bridge undercrofts.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Provide planting design incorporating suitable mix of types (trees, shrubs, groundcovers and so on) species selection and densities which promotes full area coverage at maturity to assist in weed control, earthworks stabilisation and maintenance minimisation.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Prioritise planting design installed directly behind concrete and w-beam safety barriers inclusive of species types that at maturity will be visible a minimum height of 500mm above top level of barrier, where sight distance constraints permit.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Provide vegetative screening treatments along the interface with retaining and noise walls and areas of negative visual value adjacent the road corridor.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Structures design, placement, arrangement and treatment / finishing must generally:
• be simple, refined and without unnecessary embellishment;
• enhance the physical, functional, safety and aesthetic aspects of the structure, in lieu of being merely ornamental;
• aim to minimise road user distraction and visual intrusion upon the landscape, presenting as visually recessive;
• promote an uncluttered road environment;
• be painted finish only where colour finish is required; and
• colours are to match the Colorbond range of colours to assist in anti-graffiti management.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>More intensive urban design treatment of structures should be limited to high visibility and low speed environment sections of the project only where viewer attention may be greater; for example at interchanges, junctions, bridge underpasses and extensive sections of retaining and noise walls that cannot be effectively screened with vegetation.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Adopt innovative approaches where more intensive urban design is applied such as:
• architectural design and detailing;
• creating visual interest through varied use of construction materials;
• incorporation of raised and recessed patterns and images within construction formwork;
• use of visually distinctive, varied textured and colour treatments;
• incorporation of sculptural features and forms within structures; and
• consideration of night time presence (lighting effects)</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Integrate all non-structural items (including but not limited to mechanical, electrical, surveillance, signal and monitoring plant and equipment, services and other utilities components) within associated structures and road furniture to make them visually recessive without compromise to functional and maintenance requirements.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Integrate anti-graffiti management strategies within the design and urban design treatment / finish of structural elements with consideration given to:
• applied exterior quality acrylic paint as a sacrificial coating for all structures to support current TMR graffiti management strategy which is to reactively paint over affected areas with reparative, paint coatings;
• proprietary brand anti-graffiti paint coatings may be used on bridge structures only Note: it is permissible to apply suitable anti-graffiti coatings over initial colour paint coat if required for the urban design treatment of bridge structures; and
• deeply and widely ribbed recessing or highly textured finishes to disrupt plain surface areas and render less attractive to vandals.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
<tr><td>Coordinate security fencing, fauna fencing and noise barrier design to provide effective access exclusion.</td><td>M</td><td>M</td><td>C</td><td>A</td><td></td></tr>
</table>

CP - Concept phase **DP** - Design development phase **IP** - Implementation phase **FP** - Finalisation phase	**PROJECT MANAGEMENT PHASES**				
	CP & DP			**DP & IP**	**IP & FP**
DELIVERABLES – General Requirements					
Content of all landscape and urban design documentation is to be tailored to the intended audience, for example: • Public exhibition or community consultation; • Peer review by landscape architecture and urban design team; • Peer review by engineers within the Department; • Construction personnel; and • Maintenance personnel.	M	M	C	A	
Drawings are to be prepared: • in accordance with the Department's Drafting and Design Presentation Manual; • generated using the Department's current AutoCAD Customisation; • demonstrating integration with surveyed site conditions and other road design disciplinary drawings through clear incorporation of XREF (x-referenced) drawings; • presented equivalent in size, scale, sheet layout and presentation detail to the other design discipline drawings; notwithstanding this requirement, the absolute min. scale (@A3 sheet size) for site analysis and concept drawings shall be 1:4000, with a minimum of 1:1000 for detailed construction plans and min. 1:200 for cross sections; • in an A3 design package generally, supplemented by larger drawings as necessary (A3 reduced copies must also be provided); • including general construction notes and detailing as necessary to assist the constructor with interpreting the design intent, relationship to key site characteristics and compliance with TMR standards.	M	M	C	A	
Construction Plans (in accordance with MRTS16 specification suite) are to be provided at relevant project stages. Required plans include but are not limited to: • planting media management plan; • vegetation management plan; • plant and seeding supply plan; • weed and pest management plan; and • landscape maintenance manual.	M	M	C	A	A
Cost Estimations *are to* prepared in accordance with the Department's cost estimating system for projects - WMS (Works Management System);	M	M	C	A	
DELIVERABLES – Concept Phase					
Provide ***Preliminary Drawings and Support Documents*** which: • demonstrate the analysis site characteristics, constraints and opportunities; • identifies landscape and urban design treatments for all Project areas and structures; • demonstrates compliance with the requirements TMR standards, including safety criteria (clear zone, sight visibility and so); • indicates proposed environmental mitigation and rehabilitation measures; • includes plant schedule / palette detailing proposed species, sizes and densities; • includes schedule of proposed urban design treatments / finishes; • indicates proposed full site maintenance access strategy; • includes sections and preliminary construction details as necessary to demonstrate specific treatments; and • includes initial specification annexures.	M	M	C	A	A
Provide a ***Preliminary Design Report*** (if required by project manager) which: • includes a brief landscape and visual assessment; • demonstrates the analysis of site characteristics, constraints and opportunities; • provides the design rationale applied to the preliminary design package; • identify any restraints, limitations or modifications to Departmental requirements and the rationale behind modifications;	C	C	C	C	

CP - Concept phase **DP** - Design development phase **IP** - Implementation phase **FP** - Finalisation phase	**PROJECT MANAGEMENT PHASES**				
	CP & DP			**DP & IP**	**IP & FP**
• provide rationalisation to any change in requirements supported by an alternate approach and/or treatment; and • demonstrate constructability and incorporation of maintenance minimisation measures.					
Provide ***Preliminary Construction Plans*** to indentifying key issues (risks, constraints, opportunities and so on) and proposed practices, indicating how plan requirements will be addressed progressively throughout each project phase.	M	M	C	A	A
DELIVERABLES – Design Development Phase					
Provide ***Construction Drawings and Support Documents*** documenting finalised the details of the Preliminary Drawings suitable to allow construction of landscape and urban design works	M	M	C	A	A
Provide finalised ***Construction Plans***	M	M	C	A	M
Provide finalised ***Operational Guidelines*** detailing: • schematic maintenance access plan, demonstrating access arrangements and co-ordination with landscape treatments and other road infrastructure; • for urban design, detailed element descriptions, the supplier details and spec information; • maintenance practices intent and details to achieve the outcomes represented by the maintenance drawings; • items of significance during maintenance (for example, identification of a Red Fire Ant colony); • landscape maintenance requirements including: ▪ as built landscape plans clearly showing sight lines and clear zones; ▪ successional replanting and reseeding program; ▪ weed control program; ▪ formative pruning program; ▪ protection of vegetation to be retained during maintenance activities; ▪ fertilising program; ▪ watering program; ▪ pest and disease management program; ▪ removal of non-complying vegetation management program; and ▪ integration of the re-mulching and slashing/mowing requirements. • urban design maintenance requirements including: ▪ maintenance treatments; ▪ intervention levels; ▪ anti-graffiti management; ▪ monitoring frequencies and restoration standards of typical failures such as graffiti, vandal damage, paint, deterioration and dirt/water/mineral build-up and staining and so on; and ▪ (colours and treatments used for each surface and details of at least one supplier for each treatment.	M	M	C	A	M

Table B2-2: Transport infrastructure landscape and urban design brief

PART B

Chapter 3
Assessment and Planning

June 2013

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Chapter 3 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part B - Chapter 3
Assessment and Planning

3.1 Introduction

Undertaking an integrated landscape assessment process in the early stages of a project allows for potential opportunities and constraints to be clearly identified and mapped. It also provides a suitable method of communicating the possible impacts of transport infrastructure proposal to the community and stakeholders. Documenting the assessment undertaken and resulting outputs enables provision of a defensible and logical position to stakeholder groups. Completing this process is also an important step towards achieving effective landscape and urban design outcomes, integrated with the wider environment.

An integrated landscape assessment describes, classifies and evaluates the landscape in relation to the proposed project. This process provides a consistent methodology for determining key landscape character values, impacts and prioritising opportunities. The process is undertaken in association with other environmental studies, assessments and reporting. While landscape assessment refers to the visual appearance and value of the landscape, it should be noted that it may also encompasses, ecological and cultural heritage values.

3.1.1 Determine Scope of Assessment Required

The level of landscape assessment required is dependent upon joint consideration of the landscape setting and the type of road proposal. A guide to determining this is provided (Figure B3-1).

There are three levels of landscape assessment which should be considered in road projects. These should be determined by project managers through reference to this manual. These are:

- **Landscape Site Analysis Assessment**;
- **Integrated Landscape Assessment Opinion**; and
- **Integrated Landscape Assessment Report**.

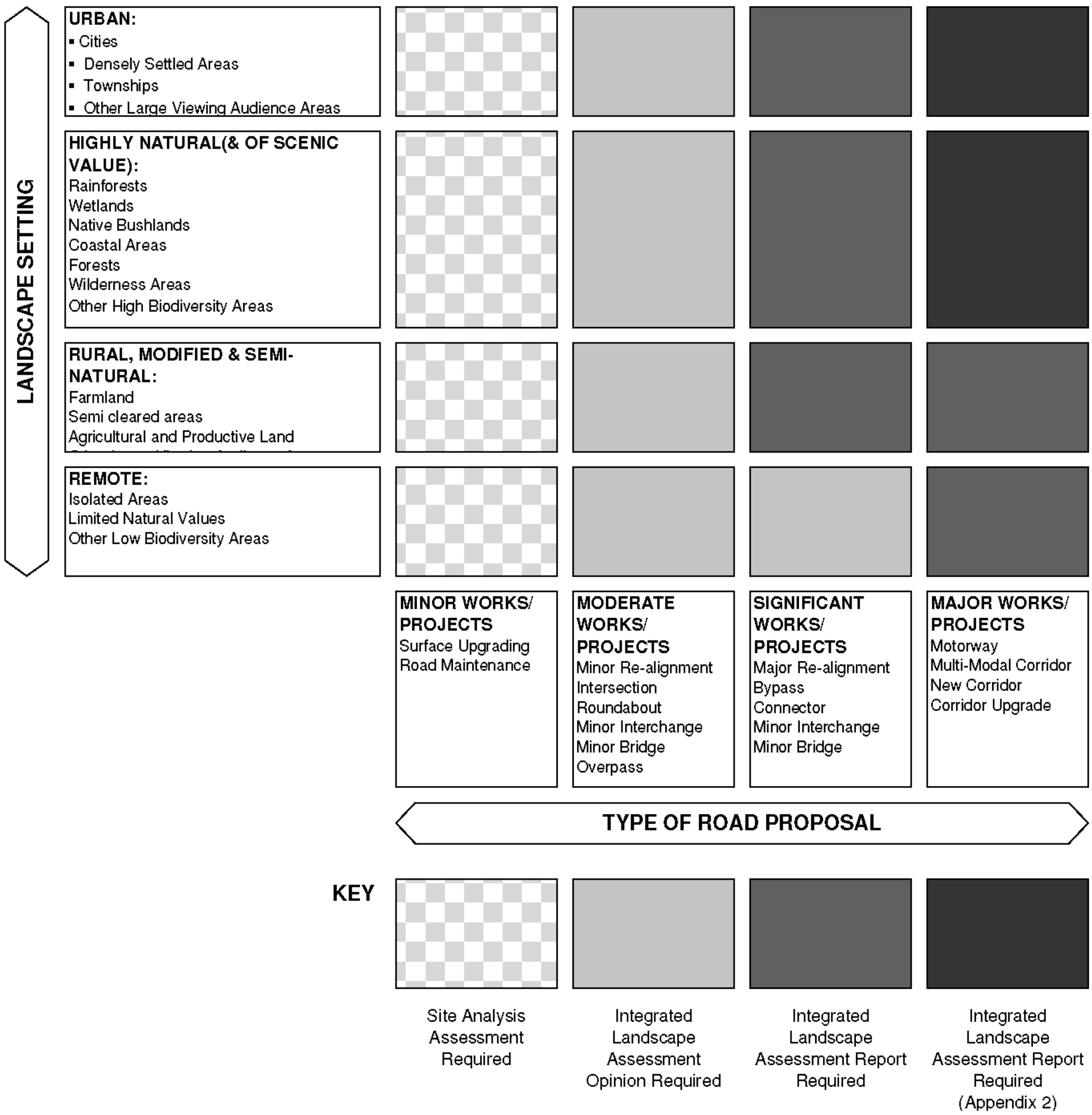

Figure B3-1: Guide to level of landscape assessment required for road projects

3.1.1.1 Landscape Assessment Site Analysis

In the majority of cases, minor road works require minimal (or no) landscape assessment to be undertaken other than that what would be considered appropriate for a typical landscape proposal.

3.1.1.2 Integrated Landscape Assessment Opinion

For moderate scale works such as minor re-alignments, new or upgraded intersections, roundabouts, overpasses and minor bridges, Steps two to five of the integrated landscape assessment process will still be required to be undertaken but not to the level of detail of a full integrated *Landscape Assessment Report*. As part of any environmental assessment processes and reporting undertaken; an integrated landscape assessment opinion should be prepared to ensure that landscape considerations are not overlooked. This should take the form of a short report of approximately two to five pages in length, summarising:

- Steps two to five of the integrated landscape assessment process; and
- Recommendations as to whether a full integrated *Landscape Assessment Report* is required to be prepared in the future.

3.1.1.1 Integrated Landscape Assessment Report

A full *Integrated Landscape Assessment Report* provides a comprehensive summary of landscape context and values and the manner in which they should be managed. These apply to more significant and complex major transport and road projects including deviations, bypasses, major interchanges and bridges, roads and multi-modal corridors (Figure B3-2).

Figure B3-2: Major Projects, such as busways, require a full Integrated Landscape Assessment Report to be produced, due to potential magnitude of impacts on surrounding landscape, particularly in urban areas

The scope of these reports will vary depending again on the landscape setting, scope of the transport and road proposal and level of complexity. The content of an *Integrated Landscape Assessment Report* should draw together all the analysis and reporting undertaken during the assessment process. Its format should follow the five steps of the integrated landscape assessment process; using the steps as key headings within the report, and similarly, the corresponding sub-sections as sub headings. The report should comprise an illustrated document, which may include maps, plans, cross sections, photographs, and any other required graphics. Including photomontages, perspectives, character sketches and artist's impressions are useful methods of indicating the predicted impacts upon the existing landscape, and measures to mitigate these effects.

In addition to the process outlined in this chapter, Appendix 2 provides detailed steps for the visual, ecological and cultural heritage analysis process.

3.2 Landscape Assessment Process

There are five steps in the landscape assessment process (Figure B3-3):

Step one – describe existing landscape conditions;
Step two – identify the interaction with transport infrastructure proposal;
Step three – undertake detailed studies (if so identified by step two);
Step four – combined assessment of effects and development of mitigation measures; and

Step five – formulate landscape integration strategy.

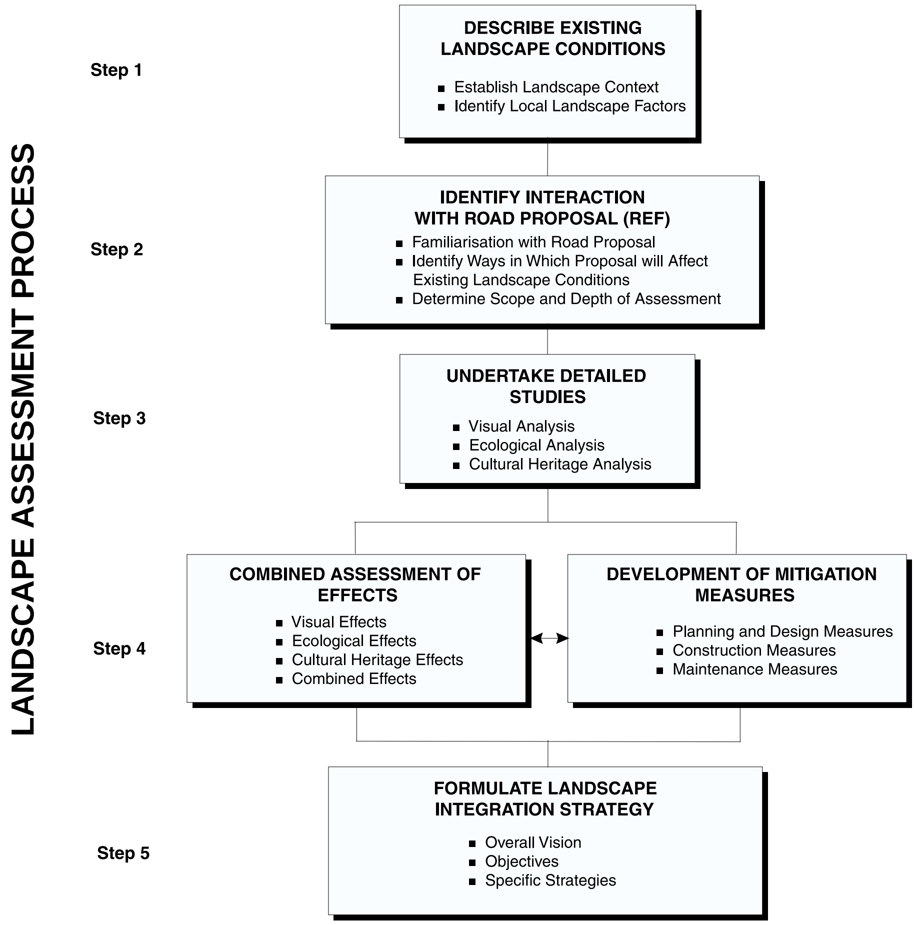

Figure B3-3: Landscape assessment process.

An integrated landscape assessment process should clearly identify and integrate the overall visual, ecological and cultural impact of the proposal, and mitigation measures to minimise these effects.

The process should clearly determine:

- the unique landscape characteristics and context of the area within and surrounding the transport infrastructure corridor;
- the significance of these areas in terms of landscape values;
- sensitivities, and modifications associated with the proposed transport infrastructure corridor changes; and
- overall impacts on landscape values, character and quality.

The process should provide clear conclusions on:

- identified opportunities and strategies for maximising benefits;
- constraints and impacts of the transport and road proposal; and
- determination of appropriate mitigation measures.

3.2.1 Step One – Describe the Existing Landscape Conditions

3.2.1.1 Establish Landscape Context

The first task is to establish a road proposal's broad landscape context. The awareness of regional landscape differences assists in developing a suitable response to roads in varying circumstances.

Queensland contains a diversity of landscape types from temperate uplands, through wet tropical zones, to dry arid inland areas. The geographic differences between these regions will affect the way in which decisions should be made in regard to the assessment, design and management of roads.

To highlight these differences and to assist in identifying broad regional landscape types, a classification has been undertaken of the main landscape regions of the state (Figure B3-4), including a brief description thereof.

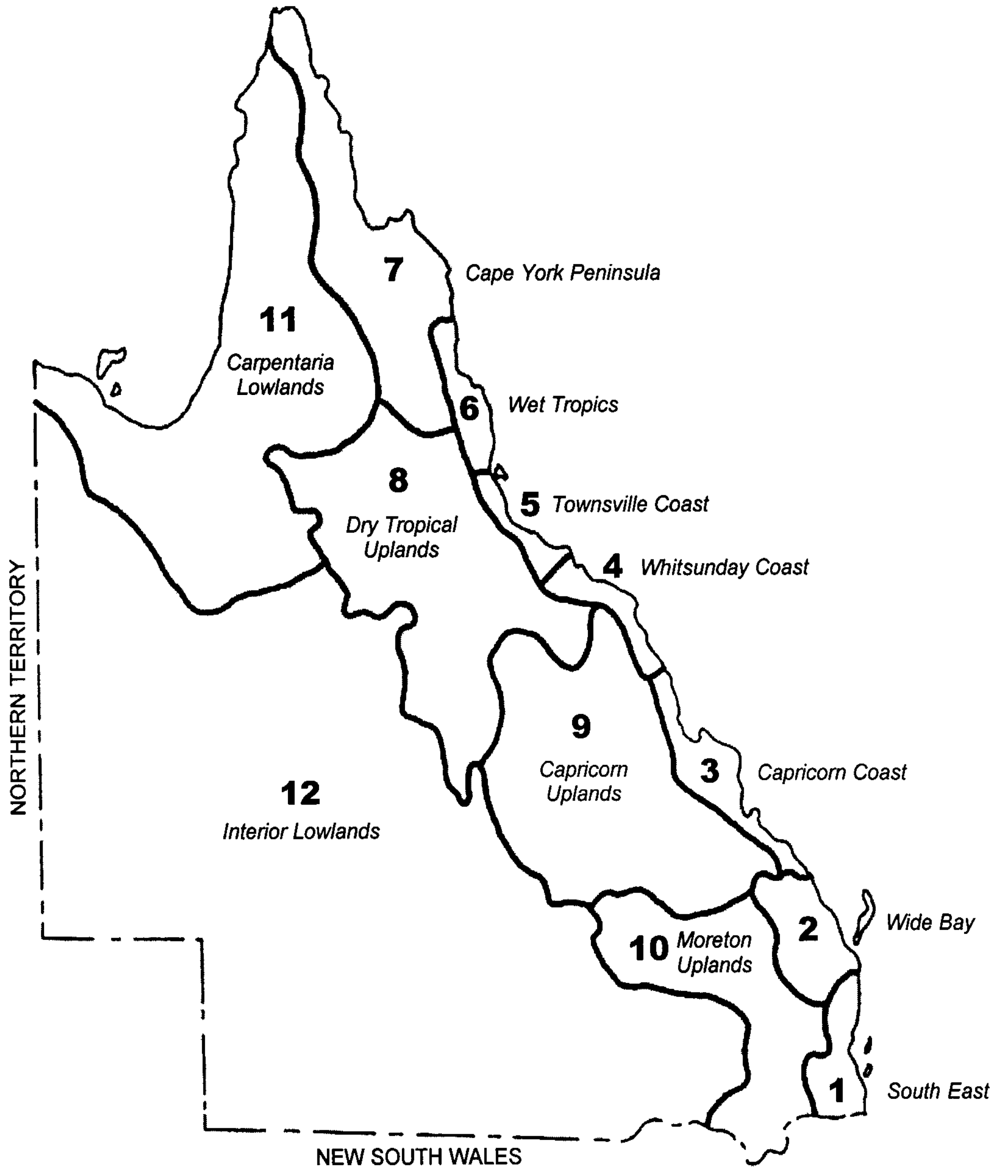

Figure B3-4: Broad landscape regions of Queensland

Region one – South East

The South East region is the most populated section of Queensland and comprises the area of Greater Brisbane City, located on gently undulating river valleys and the coastal plain. This region is framed by coastal hinterland and ranges and contains a variety of rural and semi-natural areas in addition to extensive urban development.

Region two – Wide Bay

The Wide Bay region, comprising the settled areas of Maryborough, Bundaberg and Hervey Bay, is located on a flat to rolling landscape mostly dominated by rural lands interspersed between grassy forest areas.

Region three – Capricorn Coast

The Capricorn Coast is a dry, flat to rolling landscape with remnant grasslands and forest areas. It features the cities of Rockhampton and Gladstone, together with smaller areas of coastal development. The dominant land use is low intensity farming.

Region four – Whitsunday Coast

The Whitsunday Coast, commencing south at Mackay, is a wet coastal landscape with forested hills, mountains and scenic offshore islands. Extensive natural areas are punctuated by small townships and tourism development.

Region five – Townsville Coast

The Townsville Coast comprises dry, flat to rolling farmland with coastal wetlands and areas of grassland. Dominant land uses are farming and small townships.

Region six – Wet tropics

The Wet Tropics, which includes the City of Cairns, feature steep forested coastal ranges including rainforest and rich coastal farming land.

Region seven – Cape York Peninsula

The Cape York Peninsula is very sparsely settled and contains mostly flatter landforms with a wide range of vegetation types from wetland, grassland and heath land through to woodland and rainforest.

Region eight – Dry tropical uplands

The Dry Tropical Uplands, inland of Townsville and the Wet Tropics, feature undulating to mountainous grassland and sparse forest and mulga. Agricultural uses are less intensive, with several mining areas.

Region nine – Capricorn uplands

The Capricorn Uplands comprise flat to gently undulating farmland, grassland, woodland and forest areas. Mining is also undertaken in this region.

Region ten – Moreton uplands

The Moreton Uplands are the most intensively farmed of the non-coastal areas of Queensland and comprise rolling to undulating landforms with several larger rural townships and cities.

Region eleven – Carpentaria lowlands

The Carpentaria Lowlands comprises a very flat landscape with minimal settlement. It extends inland from the Gulf of Carpentaria.

Region twelve – Interior lowlands

The Interior Lowlands comprise a predominantly flat channel country landscape with very minor relief and sparse grassland. Settlement is minimal and very dispersed.

3.2.1.2 Identify Local Landscape Factors

The previous classification of landscape regions provides a starting point for understanding the landscape resources of a particular area through which a road passes. There are other factors and data sources that need to be considered when establishing the landscape conditions of a particular place (Figure B3-5).

Information obtained on landscape factors can be interpreted through an overlay technique to determine areas of highest values and any particular constraints and opportunities that may affect roads (Figure B3-6). This information may include (but is not limited to) the following:

- **Land Use and Settlement Pattern -** broad scale topographic maps (1:100 000 and 1:25 000) will indicate the general land uses of an area and the settlement pattern as will local government planning schemes. Aerial photographic coverage is available for most of the state and is very useful in desk-top assessments.
- **Climate -** climatic data, particularly the frequency and distribution of rainfall throughout the year, is essential information which can be obtained from the Bureau of Meteorology.
- **Geology and soils -** geology and soil maps, together with other general information, can be obtained through the Department of Natural Resources and Mines. TMR Soil Group maps are available from the Department's Road Corridor Environmental Assessment Database.
- **Flora and fauna -** data on flora and fauna can be obtained from a number of sources including the Department of Environment and Resource Management and local government authorities.

A site visit should always be undertaken to confirm mapping and desktop investigation.

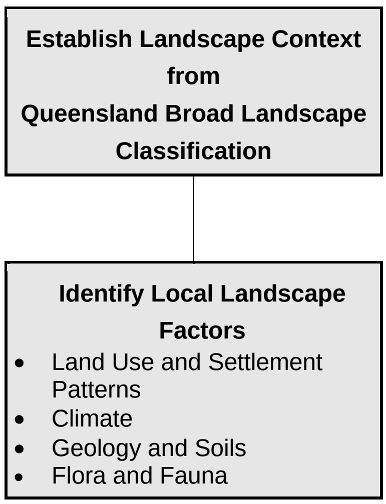

Figure B3-5: Describe existing landscape conditions

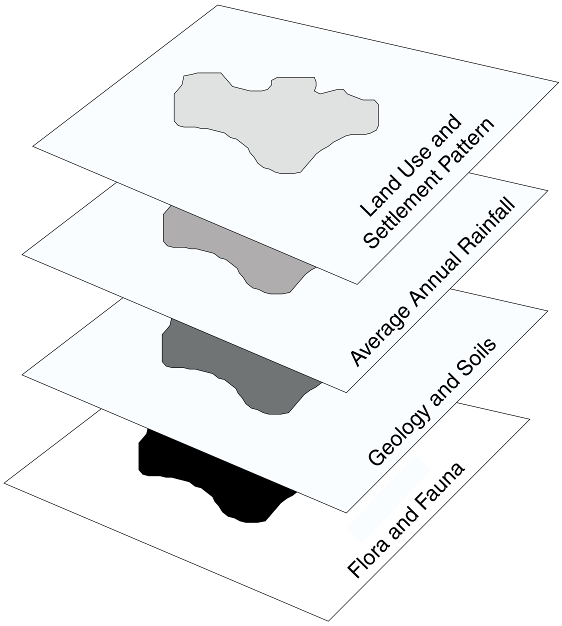

Figure B3-6: Overlay mapping of landscape factor

Other useful information for collection at the preliminary stage of the project include:

- previous studies, plans, reports and publications; and
- legislative requirements, policies and agreements (such as rare and threatened flora, fauna and declared weeds).

The data collected in step one should be combined in a logical manner to produce landscape analysis plans that highlight the sites characteristics, including (but not limited to):

- areas of existing vegetation, significant or functional with brief description thereof;
- presence of fauna on site, possible rousting locations or known movement corridors;
- geological and soil maps with relevant descriptions thereof;
- local site specific climatic conditions, including seasonal temperature, rainfall, humidity and prevalent wind/storm fronts;
- landform patterns, including manufactured and natural landscape features;
- identify views and vistas that require to be retained and or screened; and
- hydrological features such as rivers, creeks, streams and all noticeable drainage patterns.

3.2.2 Step Two – Identify Interaction with Road Proposal

3.2.2.1 Familiarisation with Road Proposal

While step one primarily involves familiarisation with the existing landscape conditions, step two is focused on understanding the detail of the actual road proposal.

It is not necessary, in the landscape assessment process, to be familiar with every detailed aspect of a road proposal. It is, however, vital to be aware of the critical elements which will affect the landscape.

The checklist (Figure B3-7) should be applied to all road projects. This data can generally be provided by the project manager responsible for design. For smaller projects, much of this information may not be applicable.

ROAD LENGTH	• Single or Multiple Routes • Length of Road
ROAD WIDTH	• Number of Lanes • Separation of Carriageways • Interchanges and Intersections • Presence of Service Roads • Total Land Corridor Required
ROAD CONFIGURATION	• Cross and Long Section • Batter Slopes • Median Width • Carriageway Surface • Culverts and Water Crossings
SEQUENCING OF ROAD	• Construction Staging • Use or Access Road Modification
ASSOCIATED ROAD ELEMENTS	• Major Signage • Traffic Control Barriers • Noise Barriers • Retaining Structures
LIGHTING	• Overhead Lighting

Figure B3-7: Road proposal checklist

3.2.2.2 Proposal Affects on Existing Landscape Conditions

A preliminary assessment of likely effects of a proposal on existing landscape conditions can be identified by considering broad visual, ecological and cultural factors associated with concept planning. This preliminary assessment assists with scoping the final reporting and focus of the landscape assessment. The level of detail associated with this preliminary assessment will be determined by the scale and significance of the road project. Possible effects on landscape conditions are listed in (Figure B3-8).

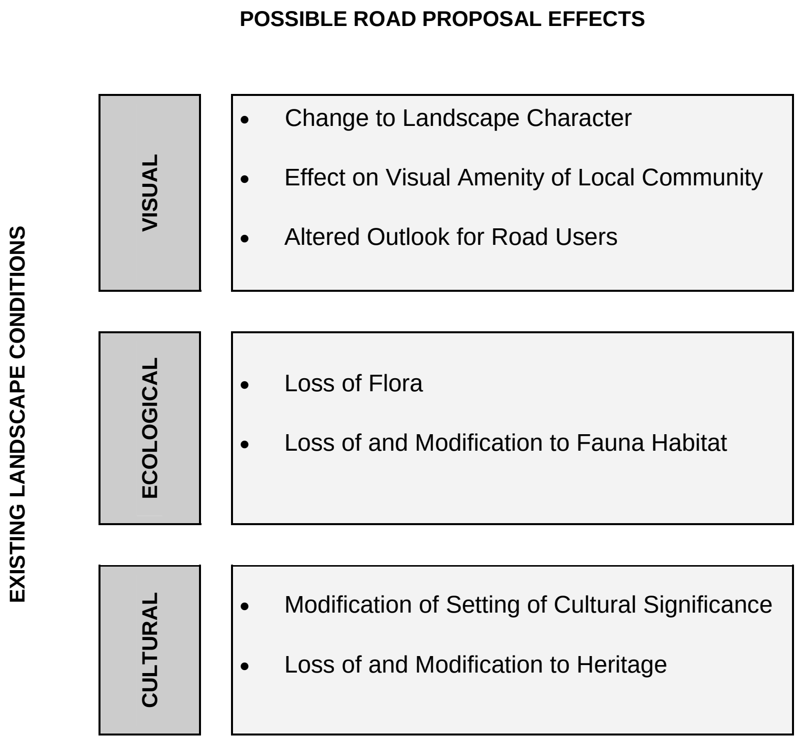

Figure B3-8: Effects of road on existing landscape conditions

3.2.3 Step Three – Undertake Detailed Studies

An integrated landscape assessment provides a culmination of the findings realised through undertaking a series of analyses at the local project area scale. These analyses are the basis of determining the landscape character of an area, and are:

- Landscape Context Analysis;
- Visual Analysis;
- Ecological Analysis; and
- Community Values.

For major projects in new corridors where route options are being explored a more detailed investigation is required (Appendix 2).

These four analysis processes are undertaken to clearly define the findings and outcomes relative to each individual value. They are then combined to determine how the analysis of landscape context and landscape values as a whole interrelates. This interrelationship is then analysed further relative to the overall impacts of the proposal on these landscape values. The full effects of the project as a whole on landscape context and landscape values can then be determined and appropriate design mitigation measures devised.

The findings from this analysis process assists in developing strategic direction and identifying public amenity improvement opportunities. These findings provide the basis for the integrated landscape integration assessment strategy to be developed at the end of the assessment process. Figure B3-9 illustrates the broad steps to be undertaken.

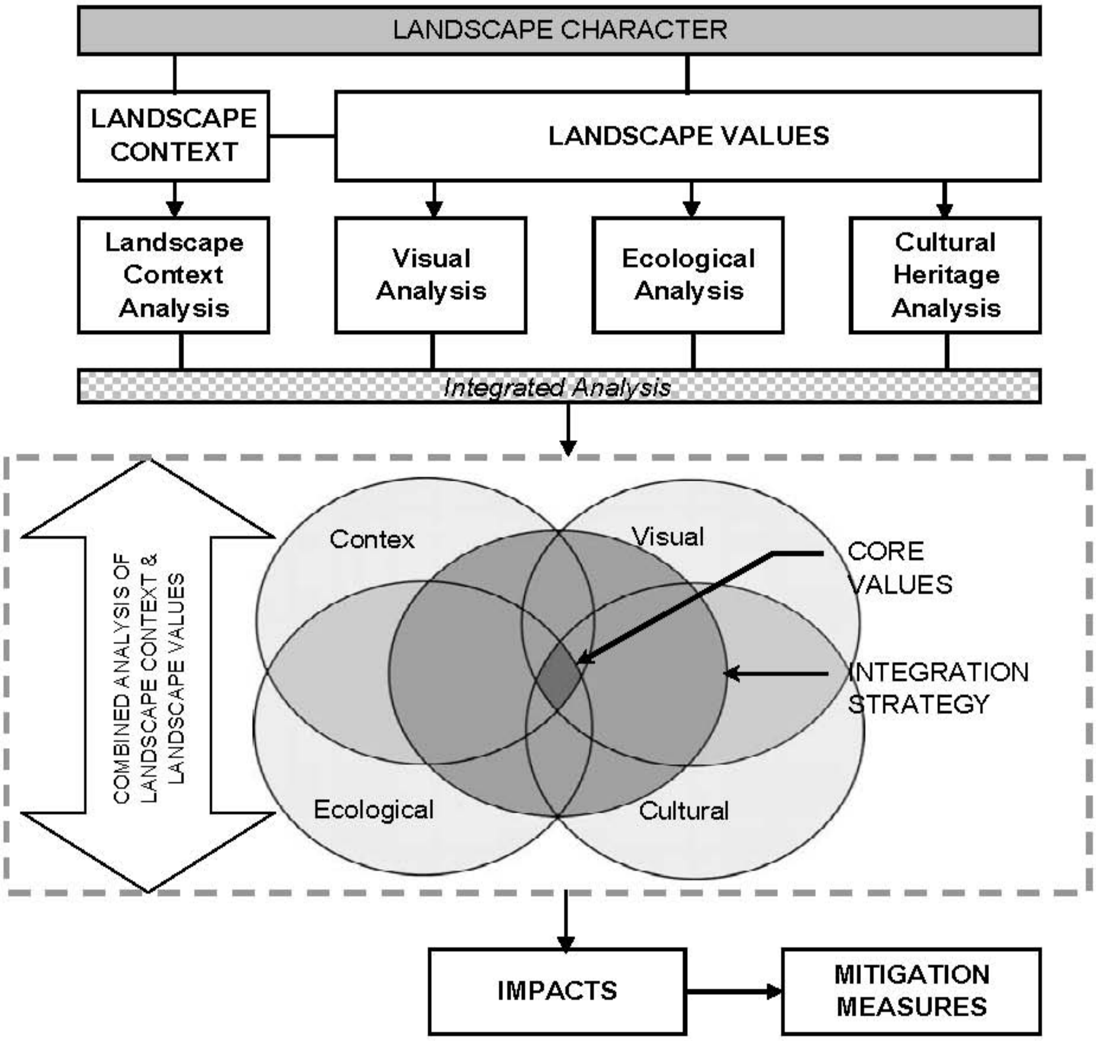

Figure B3-9: The role of landscape context and landscape values analyses within the integrated landscape assessment process

Mapping of landscape values is also a useful tool to use when undertaking the analysis process. Mapping can be used to identify, present and overlay the layers of landscape context and landscape values apparent within the project site. Mapping through overlays may be used to map individual layers (of landscape context, visual, ecological and cultural heritage values) and action of layers combined over each other to determine interrelationships, conflicts or constraints within the road landscape.

3.2.4 Step Four – Combined Analysis of Landscape Context and Landscape Values

The landscape value analysis is to synthesise the combined visual, ecological, heritage analyses. This should be a simple process of drawing together data collected and summarising key outcomes. The combined analysis should establish clear links between landscape context and values, and how they contribute to the landscape character of the area as a whole. The analysis should also identify potential mitigation strategies. For more detail on this process refer to Appendix 2 – Step 4.

3.2.5 Step Five – Integrated Landscape Assessment Strategy

The intention of a landscape integration strategy is to provide a proactive statement on how a proposal may best be integrated with its landscape setting. An integrated landscape assessment strategy should generally include the following levels:

- establishing an overall vision;
- developing project specific strategies; and
- master planning.

For more detail on this process refer to Appendix 2 – Step 5.

PART C

Landscape Design

June 2013

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Part C - Landscape Design

PART C

Chapter 1
Landscape Planning Concept and Design Themes

June 2013

Chapter 1 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Figures

Part C - Chapter 1

Landscape Planning Concepts and Design Themes

1.1 Introduction

The first part of this chapter discusses broad landscape planning concepts that must be applied in the development of landscape and urban design master plans. Urban forest and Greenway concepts create linkages between the transport corridor and the broader landscape.

The second part of this chapter discusses design themes that should be applied to segments of the road corridor at the master planning phase and into the detailed design phase. Landscape character themes establish the vegetative structure in terms of open and closed forest in the planning phase while specific themes establish the species selection and planting design approach to be developed in the detailed design phase. Landscape sequencing is a tool that assists in making the road legible to users through landscape treatments.

1.2 Urban Forest

The urban forest is more than just trees in urban area. The urban forest is the sum of all vegetation located within areas where people live and work (both on public and private land), which has ecological, economic, social and aesthetic benefits to the community. The urban forest is recognised for its importance in maintaining health, well-being and liveability of communities, its contribution to the environment and economic security. Maintaining existing and creating urban forests within transport infrastructure corridors can contribute to reducing heat island effects of walls and pavement.

The urban forest is recognised internationally as a valued intergenerational resource. It may effectively integrate the corridor and minimise the effects of environmental and community disturbances caused by transport infrastructure projects (Figure C1-1).

Figure C1-1: The urban forest should integrate with surrounding green space

The urban forest provides many values and performs a number of functions within the road landscape.

1.2.1 Value

Landscape master plans should explore and incorporate these Urban Forest values:

- Safety and traffic management: through its contribution to producing more positive and safer driver behaviour and increased user perception "*Green roads compared to roads with no greening can assist in mitigating daily stress levels of drivers and their attitude to other drivers"* (Roads and Traffic Authority of NSW ii), 2009:p14).;
- Community: providing recreational opportunities, contributing to better heath, wellbeing and a higher quality of life (liveability) (Figure C1-2).
- Economic: improving tourism potential and business growth through local identity and character (Figure C1-3).
- Social: initiating ownership, awareness and education.
- Psychological: providing mental relief to the stresses of urbanisation.

1.2.2 Function

Landscape master plans should explore and incorporate aesthetic and environmental functions.

- Aesthetics: improving the image of the corridor by enhancing visual amenity, user experience and sense of place. This can be achieved by providing landmark features, highlighting views and vistas, and framing entrances to towns that enhance travel to destinations.
- Environment: mitigating the effects urbanisation through improving air, water, regulating the micro climate, and conserving biodiversity. Providing habitat through food and shelter for native fauna, including coverage for escape from potential predators.

Figure C1-2: Retained and enhanced Urban Forest adjacent to and within arterial road corridors

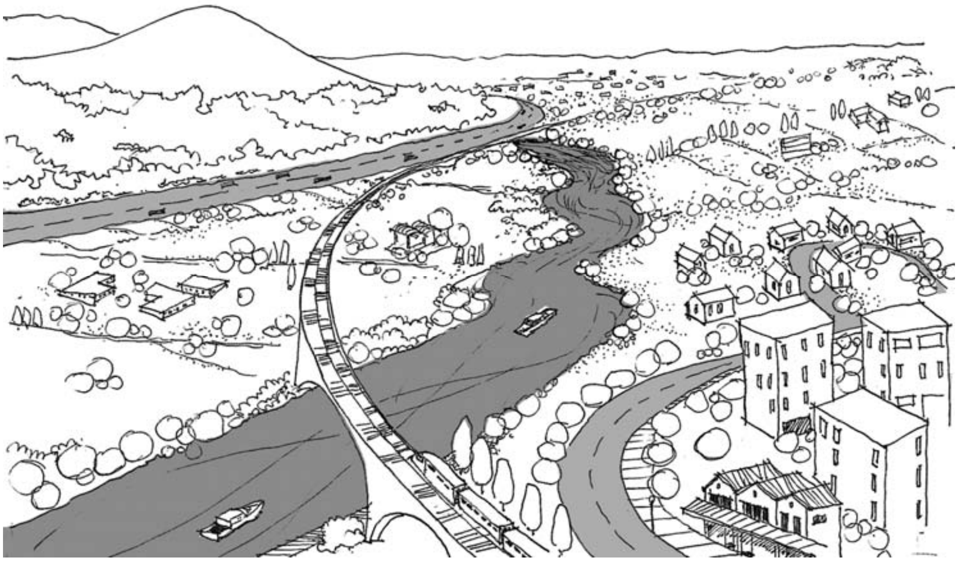
Figure C1-3: Urban Forests can create positive user experiences providing shade and public amenity

1.3 Greenways

Greenways are designed to provide connectivity (Figure C1-4). This is the ease at which movement occurs amongst habitats, communities and populations through the broader landscape. Greenways provide structured interconnected networks or corridors of green space. They are often more linear in form than Urban Forests, yet this is not a defined requirement.

Landscape master plans should provide links to Greenways and continuity of habitat networks by linking existing nodal points along or within Greenways (Figure C1-5). State and local government planning schemes identify landscape corridors which may form the basis of greenways integration with the road landscape. Greenways are crucial to uniting fragmented landscapes into one connected piece.

Vegetated corridors which cross roads need to be designed in accordance with the Department's *Fauna Sensitive Road Design Manual*, to accommodate the needs of wildlife. Connectivity can be



maintained through specific fauna movement devices, such as tunnels, underpasses and land bridges; designed to ensure the safe passage of animals across roads.

Figure C1-4: Greenways can be applied to achieve regional open space networks and connectivity

Source: Adapted from Cawood Hellmund, P & Somers Smith, D, (2006) – p9

Figure C1-5: Greenways implemented as part of pedestrian and cyclist routes

1.4 Design Themes

The landscape master planning phase should consider developing landscape character themes that establish the vegetative structure in terms of open and closed forest in the planning phase while specific themes establish the species selection and planting design approach to be developed in the detailed design phase.

While these themes are being considered, maintenance minimisation requirements shall override purely aesthetic design. Planting designs that require pruning and/or extensive weed management or large extents of grassland that require reoccurring maintenance are not value for money investments and should not be utilised. Landscape designs should be self sustaining after the initial construction contract with maintenance intervention progressively diminishing.

1.4.1 Landscape Character Themes

The broad themes of an open forest landscape versus a closed forest landscape contribute to enhancing the user experience. These themes should be the basis for any landscape design and be implemented appropriately according to the adjacent and/or surrounding context and landscape character. Changing the amount of enclosure versus openness in certain locations along a corridor also contributes to enhanced user perception. The differences between the two themes are:

1.4.1.1 Closed Forest

A ***Closed forest*** landscape:

- eliminates high frequency reoccurring maintenance;
- contributes to the urban forest of the local community;
- contributes to environmental enhancements of water quality and soil management;
- creates or maintains spatial enclosure; and
- channels views to focus areas and /or features.

Examples of where applying a closed forest (Figure C1-6) may be suitable are:

- urbanised areas to reduce heat island effect, managed infrastructures impact of local communities;
- to frame distant views of natural landscape features and landforms, such as mountains;
- areas which provide no opportunities to maximise quality views to the surrounding landscape;
- when passing through or adjoining an existing forest, to provide an effective buffer between the two and minimise edge effects; and
- to screen undesirable views (for example; industrial areas).

Figure C1-6: An example of a closed forest

A closed forest comprises dominantly shrub and tree planting (outside clear zone). Planting density (plants per square metre) should provide a visual screen or buffer. Understorey planting may also be used in addition for initial stabilisation, weed growth suppression and erosion control. This maximises the chances of successful establishment and lower maintenance in the long term. Species should be selected which have a denser, foliage to the ground habit.

1.4.1.2 Open Forest

An ***Open forest*** landscape:

- reduces high frequency reoccurring maintenance; and
- creates or maintains permeability to immediate and distant views.

Examples of where applying an open forest (Figure C1-7) may be suitable are:

- to maintain immediate filtered views and views to beyond the corridor;
- where there is an opportunity for users to experience views across open grasslands; and
- continue existing open forest character, where adjoining the corridor (for example; in rural landscape areas).

Figure C1-7: An example of an open forest

An open forest comprises small/medium shrubs and trees (outside clear zone). Trees are planted at low density (1 tree per 10-20 square metres) yet provide a shade canopy to assist with weed suppression. Tree species should be selected which have a more open habit to maintain an open character.

The planting design within open and closed forest areas should reflect both the species composition and structure of adjacent vegetation. Actual species selection will depend on the local ecological context, and may vary in response within the themed areas, according to changes in ecology. Species should be based on the relevant naturally occurring plant communities at a particular location. It should be noted that not all local species in adjoining areas will grow on fill embankments and may need to be sourced from wider areas to suit the road formation. Planting densities will also change throughout depending on the adjoining and/or surrounding habitats and communities present.

1.4.2 Specific Themes

If a landscape master plan has been developed, it should indicate the specific themes to be implemented in the detailed design phase. Where no master plan exists, the planting design should be developed based upon the road project setting (Figure C1-8).

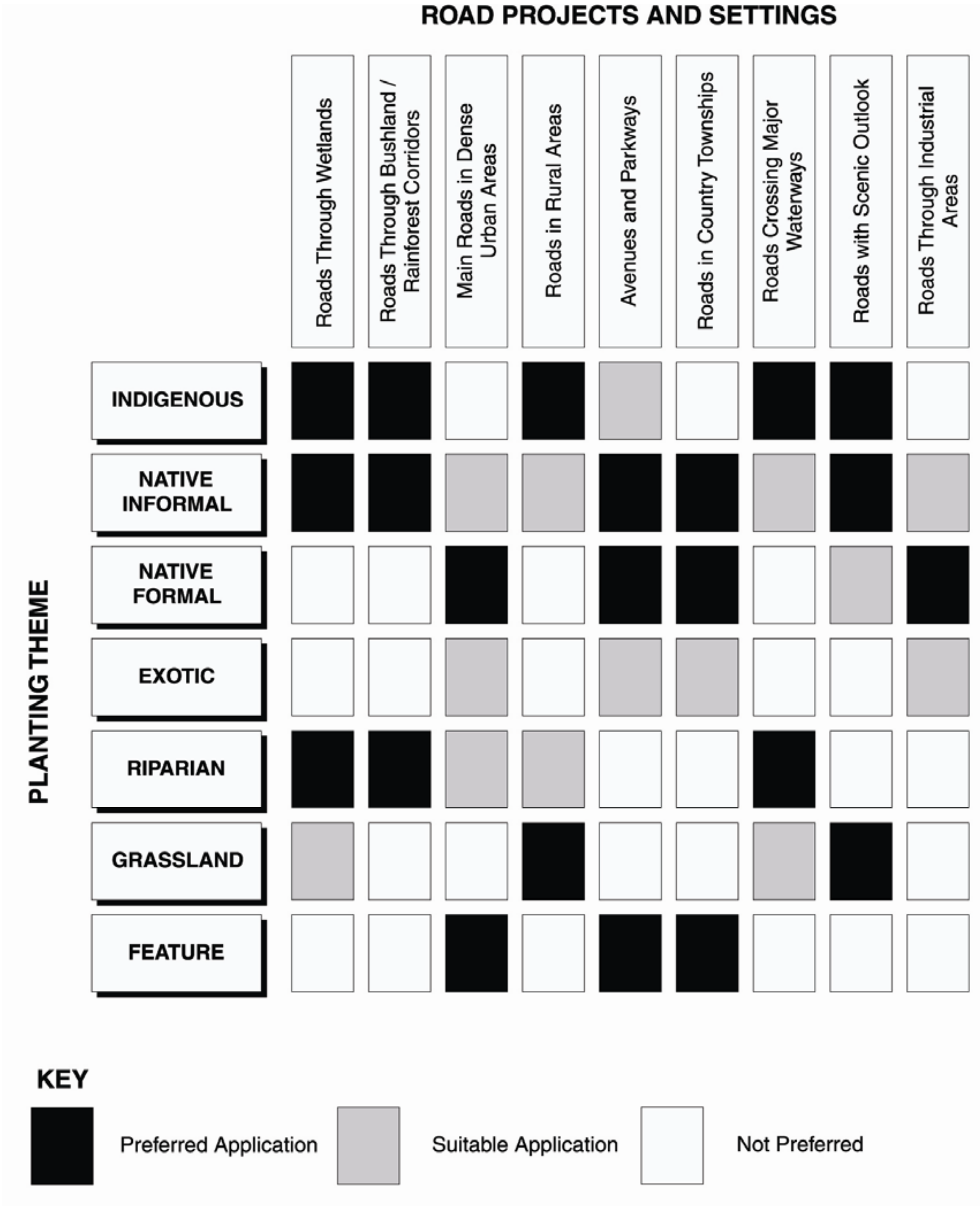


Figure C1-8: Guide to applying specific themes

1.4.2.1 Indigenous

The Indigenous theme can be used to maximise integration with endemic vegetation adjoining or located near the corridor (Figure C1-9). Endemic species are prevalent in or peculiar to a particular locality or region or Regional Ecosystem and may be used as the basis of the planting palette to assist in reconnecting fragmented landscapes or corridors, and to reinforce the ecological integrity and diversity of an area. This design theme typically adopts informal planting configurations to reflect and replicate the natural structure of the landscape. It should be encouraged for use in areas of significant remnant native vegetation and areas designated as conservation corridors. It may also be used in revegetation programs to ensure effective regeneration.

It should be noted that some endemic species will not be suited to growing conditions of an unnatural landform such as a road formation. Some require specific soils, hydrology or more shade than available or are short-lived. A common mistake is to utilise species from the regional ecosystem without considering the severely altered soil profile properties and growing conditions of the road formation.

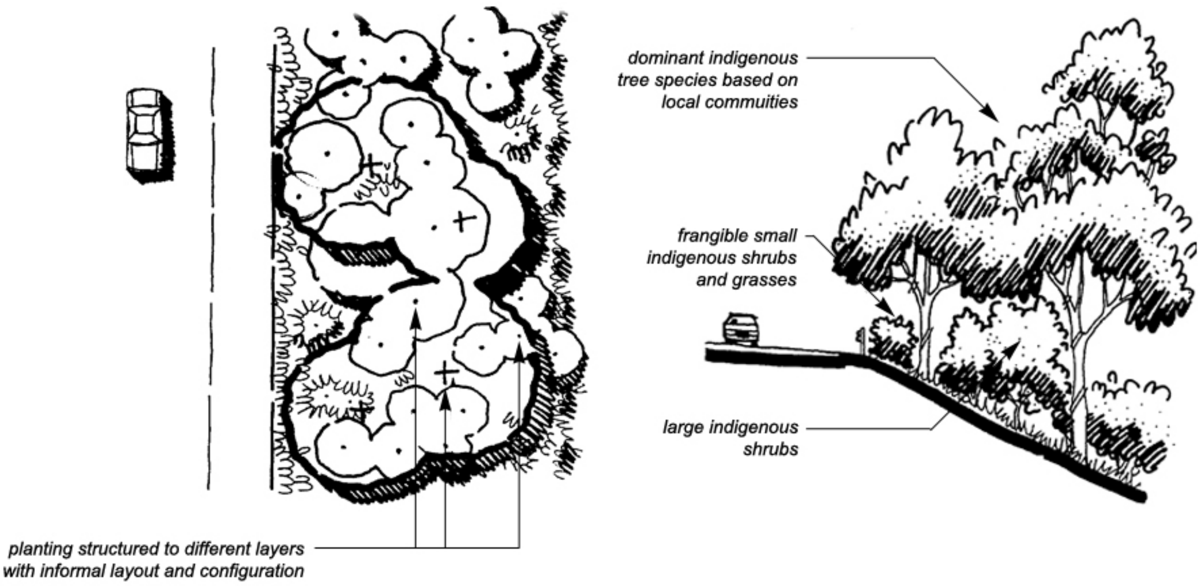


Figure C1-9: Indigenous theme

Source: Adapted from TRACT (1997)

1.4.2.2 Native Informal

The native informal theme may also be used to reinforce or replicate the existing setting (Figure C1-10 and Figure C1-11). It may use either endemic or native species, arranged informally/ naturalistic or in a semi-natural way. This theme is similar to the Indigenous theme yet may incorporate more commonly available native species. Species should be long-lived and predominantly with dense foliage full to the ground habit. This will assist in eliminating reoccurring maintenance.

The native informal theme often borrows the species and configurations from the local setting. While plants may not be indigenous to a local area they should be found within the general region and exhibit success in roadside planting. This theme may be further enhanced with understorey species including native grasses, shrubs and small trees.

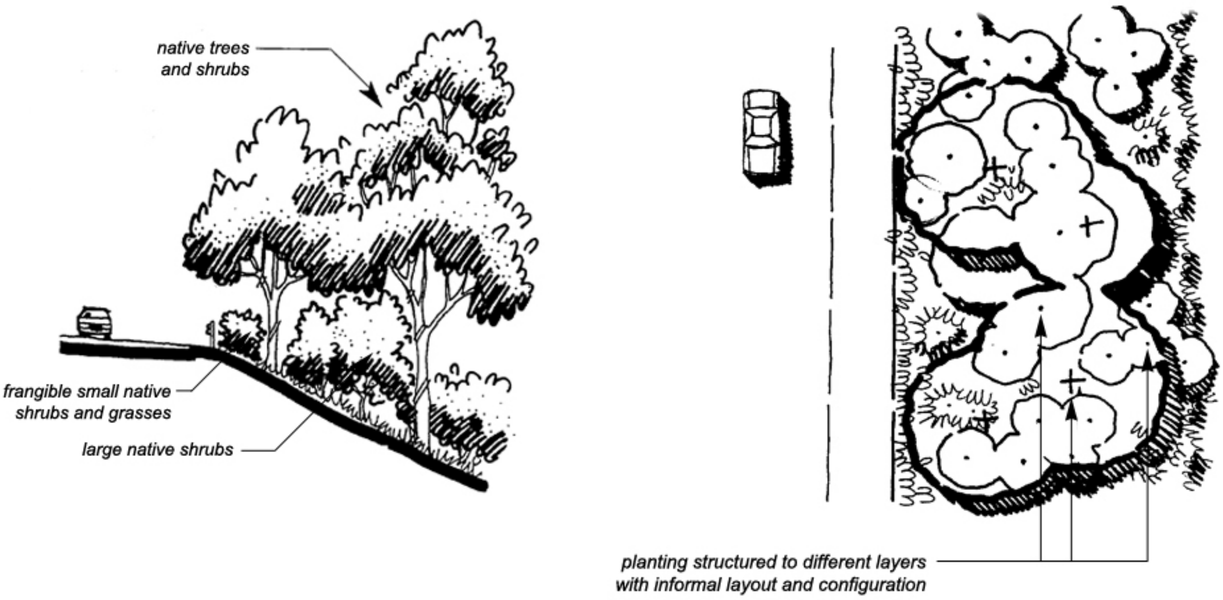


Figure C1-10: Native informal theme

Source: Adapted from TRACT (1997)

Figure C1-11: An example of a native informal median planting

1.4.2.3 Native Formal

The native formal theme uses either endemic plant species or native species (Figure C1-12). The planting configurations are formal/ structured in nature and may consist of a range of arrangements including formal avenues, geometric patterns or linear bands of trees, shrubs and groundcovers. Species should be long-lived and predominantly with dense foliage full to the ground habit. This will assist in minimising reoccurring maintenance.

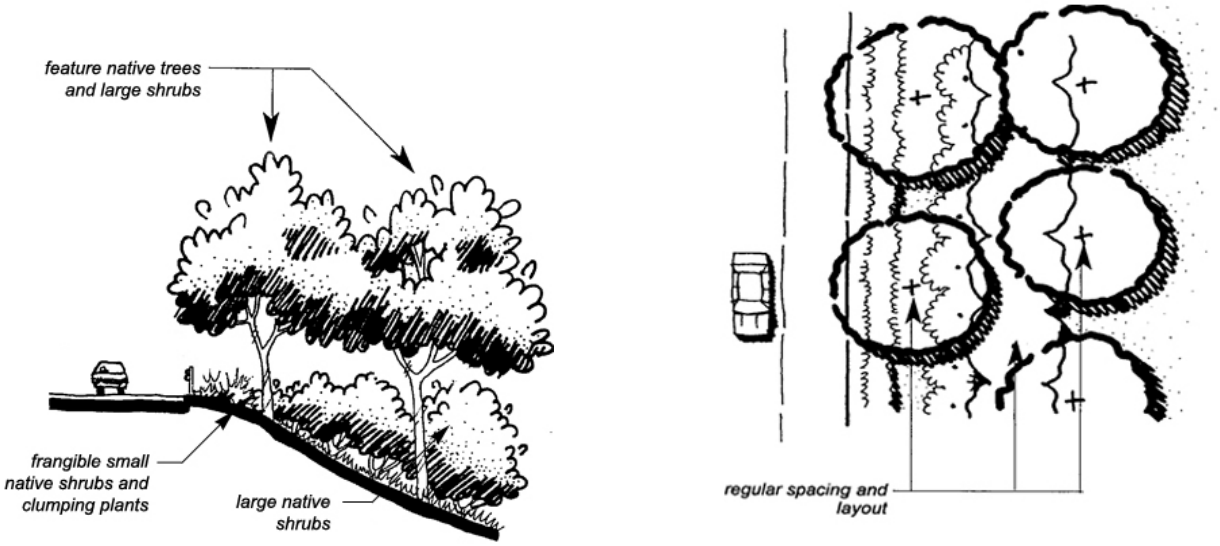


Figure C1-12: Native formal theme

Source: Adapted from TRACT (1997)

1.4.2.4 Riparian

The riparian theme involves the use of species naturally associated with water systems, such as river or creek systems. This theme may be used to promote awareness of watercourses and crossings. The choice and distribution of species should reflect the original planting and ecological integrity of the creek or river system (Figure C1-13).

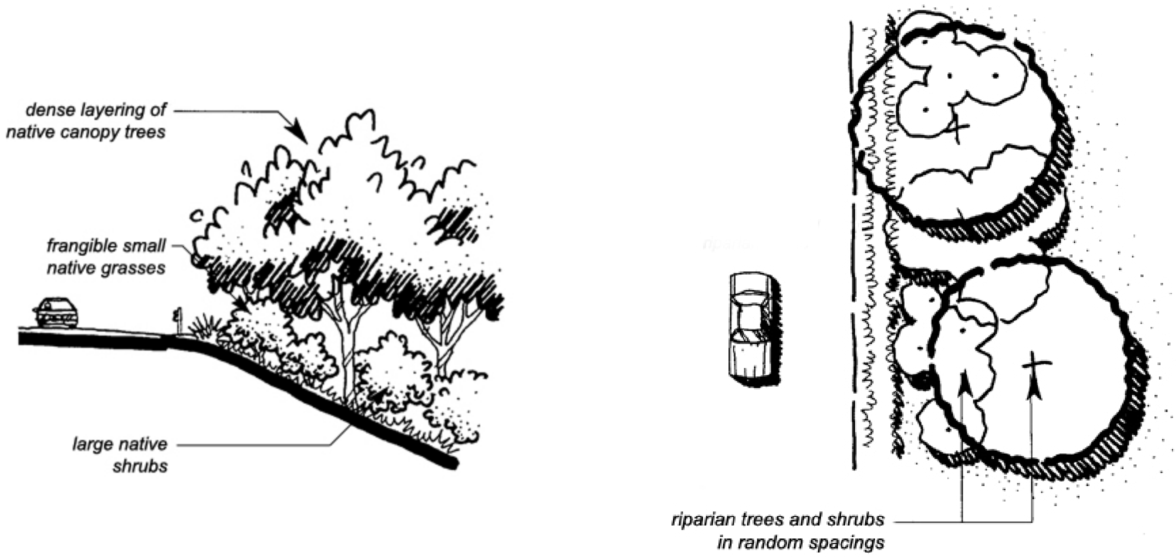


Figure C1-13: Riparian theme

Source: Adapted from TRACT (1997)

1.4.2.5 Feature

The feature theme is generally used in addition to any of the aforementioned themes to highlight a particular area or areas within the corridor. It may be used to identify an individual feature, define a key focal element within the landscape or announce an entire area or precinct. It is particularly useful for areas such as interchanges, junctions and other prominent locations (Figure C1-14).

Signature tree species relative to the surrounding landscape setting may also be included to define the area and reflect the local character. These will generally be specified as container or ex-ground plant stock to provide immediate impact. Plant species are generally selected which will promote a visual statement and variety in form, texture or colour.

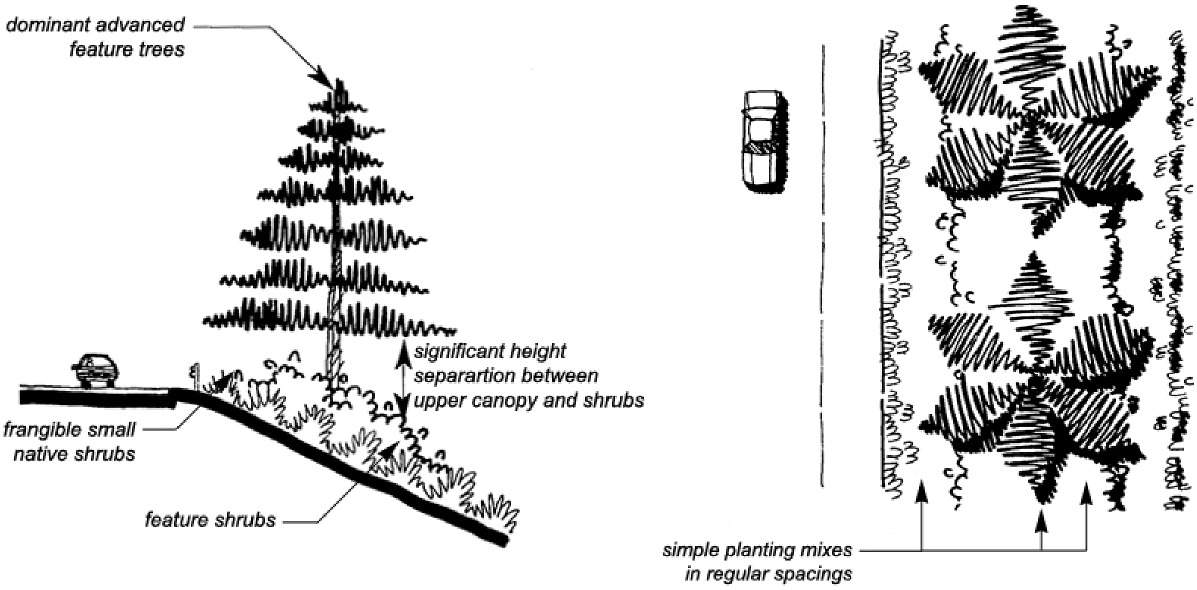


Figure C1-14: Feature theme

Source: Adapted from TRACT (1997)

1.4.2.6 Grassland

The exotic grassland theme is most commonly used where the corridor adjoins existing pasturelands (Figure C1-15). This is the most common revegetation method in rural areas. While the pasturelands have been developed to support livestock, the exotic grasses used are very prolific seed sources and when not grazed can obtain heights above the maintenance intervention level. It is important to select appropriate species to minimise the likelihood of maintenance intervention levels being triggered. Mowing these grasslands for sight distance and visibility is the single most expensive reoccurring maintenance task on a state-wide basis.

The native grasslands theme is a expensive and highest maintenance theme. This is primarily due to competition from weeds and pasture grasses that may occur in the surrounding area. As seed from many native grass species are very expensive and the ongoing maintenance requirements to maintain the treatment are high, the theme is not recommended. Native grasses are also highly susceptible to the effects of herbicides, which limits weed removal to hand methods.

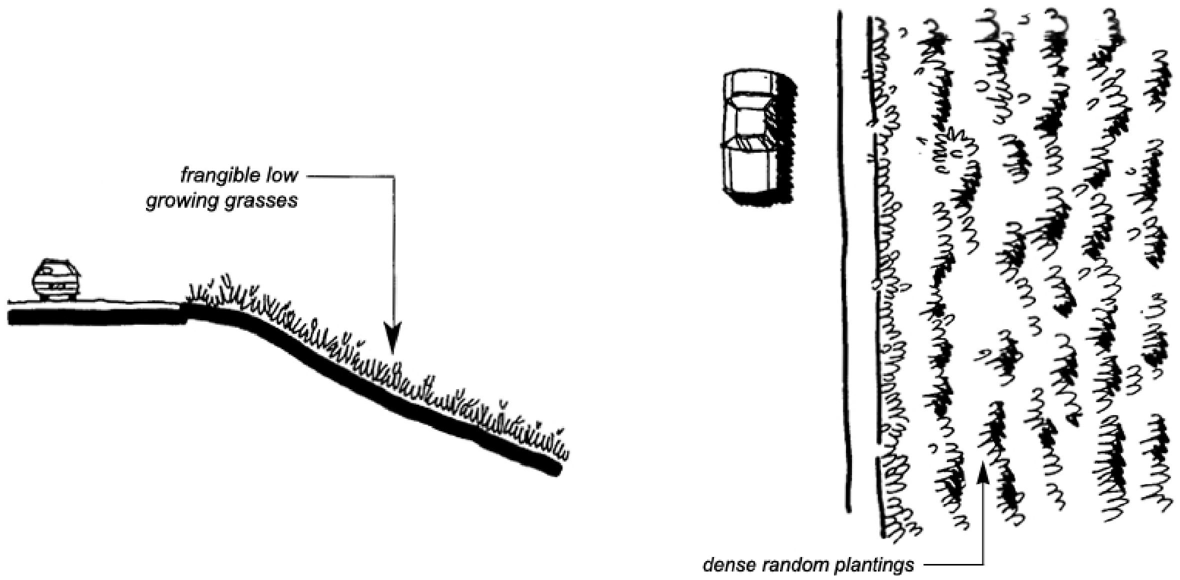


Figure C1-15: Grassland theme

Source: Adapted from TRACT (1997)

1.4.2.7 Exotic

The exotic theme is generally not advocated for use within corridors. Exotic plant species; that is, those of foreign origin or character, introduced from abroad, and not native to Australia, should only be used in instances where indigenous or native species will not meet the design intent for particular areas. Species selected should be non invasive, or carry a threat of becoming a weed in a particular situation over time.

The use of the exotic theme predominantly adopts a formal planting configuration in response to the design intent. Formal layouts may include the use of feature plant species arranged alongside the roadside or in medians, in bands or blocks and be layered vertically with different species. Plant species may also be selected for colour and textural qualities (Figure C1-16).

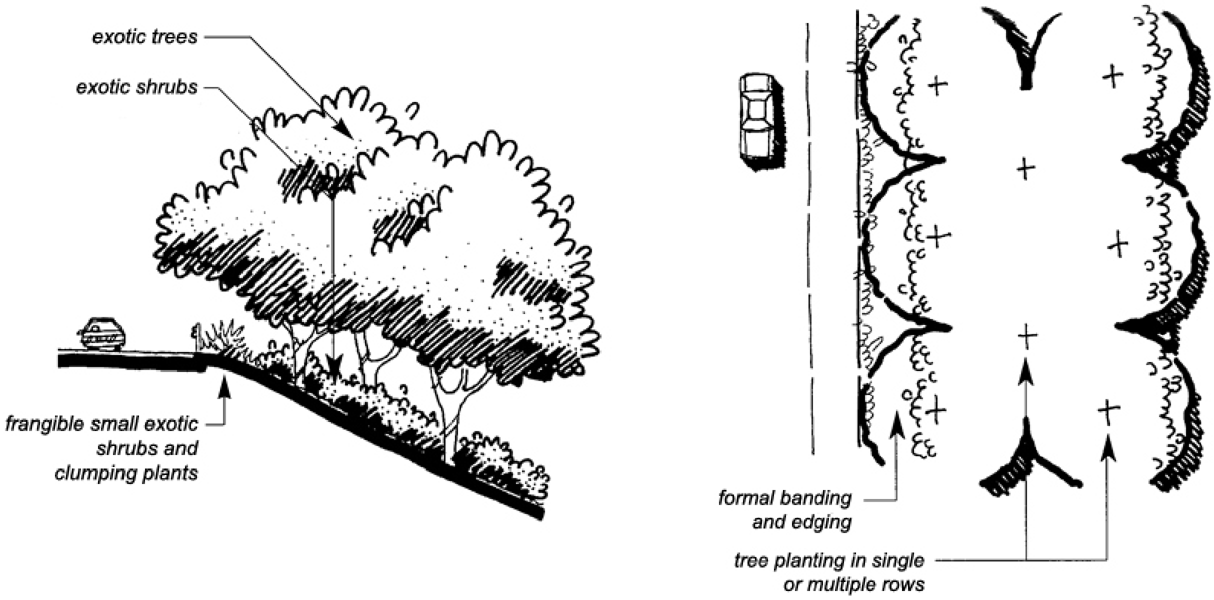


Figure C1-16: Exotic theme

Source: Adapted from TRACT (1997)

1.5 Landscape Sequencing

Creating landscape sequences within corridors improves the safety and visual experience for users. Landscape sequencing improves user perception through changes in visual cues. It can also effectively promote distinctive character precincts through which a corridor passes.

A successful landscape sequence will contain the following:

- breaks in vegetation;
- alternation of closed forest themed landscapes with open forest themed landscapes, at appropriate locations;
- avoidance of over stimulation and visual confusion; yet with enough variety to maintain user interest (preventing driver boredom);
- consistent treatments along the road cross section; for example, batter and embankment slopes, street furniture and so on; and
- use of appropriate visual cues to establish location along a journey.

In terms of landscape and revegetation treatments, sequences are generally created at particular areas through applying changes in rhythm, intensification and form.

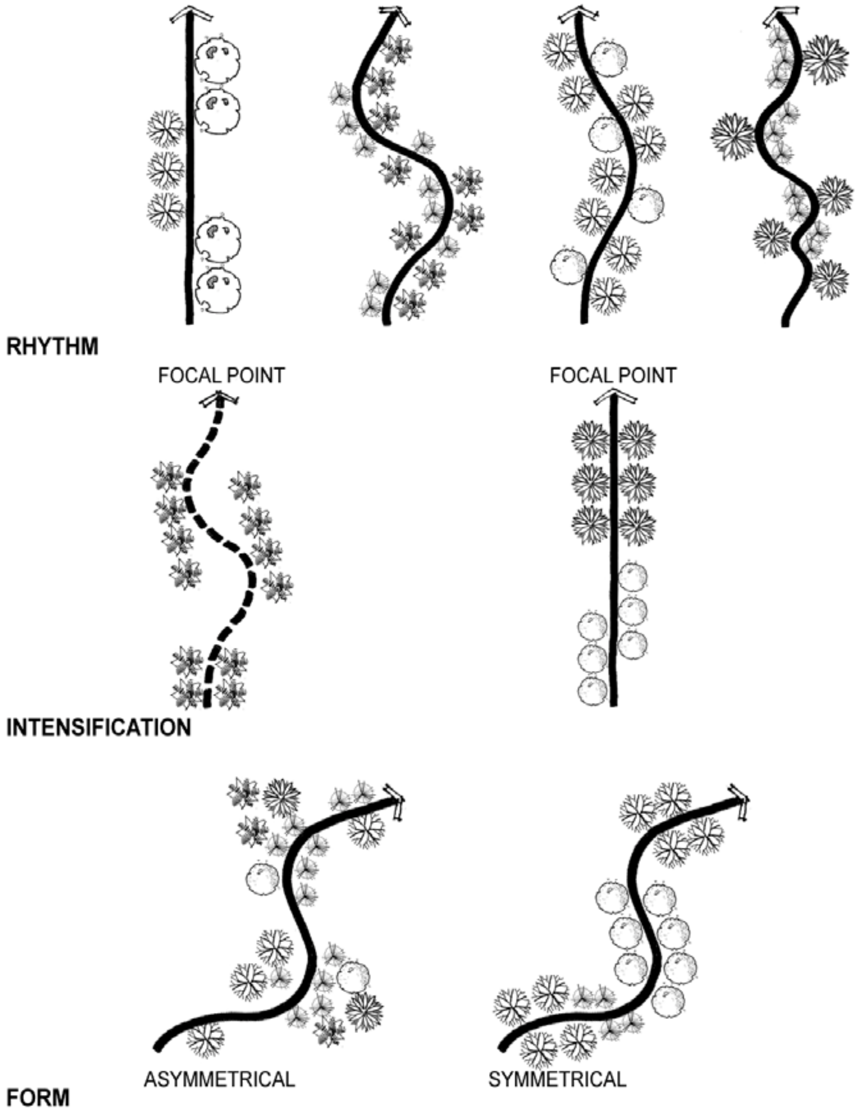


Figure C1-17: Ways of creating sequences with landscape treatments

Source: Adapted from Department of Transport and Works – Northern Territory (1988), p18

Sequences can also be developed by implementing changes in visual cues relative to urban design components. These changes can be permanent or temporary, natural or constructed. Potential visual cues useful to developing sequences are:

- form (and associated shape, size, height, colour, materials, texture, tactility and so on);
- scale;
- pattern;
- light and shade (and resultant light levels, light quality, temporal changes in light); and
- arrangement of spaces and associated perceived density.

Aspects to consider when constructing a sequence of images (Figure C1-18) within the road landscape are:

- functional aspects; for example the types of users and effects on their perception;
- surrounding landscape setting;
- landscape context and existing character; and
- configuration and location of design components, and their impacts on visual experience.

Figure C1-18: Layering of shrubs transitions to tree species while colour leads to focal point of exit sign

PART C

Chapter 2
Landscape Treatments

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 2 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Figures

Part C - Chapter 2

Landscape Treatments

2.1 Introduction

Landscape treatments are the combination of construction methods and attributes required to achieve a functional and sustainable service level. Landscape treatments are applied in the design process to facilitate the cost estimating process as well as to ensure the quality of the finished product. Road construction methods pose unique challenges to establishing a sustainable road landscape. The purpose of this chapter is to provide guidance on best practice methods for landscape and revegetation treatments and road formation treatments. Road formation treatments describe the preferred design and construction methodologies that ensure implementation of maintenance minimisation, safety and environmental considerations of the landscape works.

Vegetation setbacks and clearances are required for safety and maintenance purposes. Implementing and maintaining these setbacks and clearances ensures that clear zones and sightlines are maintained throughout the life of the project. They also ensure that sightlines necessary for Crime Prevention Through Environmental Design (CPTED) are provided. Vegetation should be selected and located based on the required setback and clearance parameters contained within this Manual.

Resources that supplement this chapter include:

- Appendix 5 Landscape and Urban Design Guidelines: design criteria and minimum technical requirements reference;
- Appendix 4 Vegetation Setbacks and Clearances Schedule; and
- MRTS16C Vegetation Works Specification and User Guidelines.

2.2 Landscape Treatments

Landscape and revegetation treatments describe the construction methodologies available for installing the landscape works on the road formation and within the road corridor. Landscape treatments include:

- structured planting approach;
- naturalistic planting approach;
- water sensitive planting; and
- grass seed and turfing.

2.2.1 Structured Planting Approach

A structured planting approach is utilised where a controlled outcome is required. Containerised plants are arranged within mulched areas. The design may be formal or informal and / or reflect surrounding landscape setting (Figure C2-1).

A structured planting approach is suitable for application in:

- urban areas to provide buffer between the road and surrounding land uses;
- as a sustainable, low maintenance alternative to high maintenance grass areas;
- medians, to provide headlight glare screen and minimise maintenance in high risk areas;
- highlighting the progression or transition to a different speed environment;

- designating feature areas or nodal points that creates a marker or landmark element such as at interchanges, junctions, major structures and regional/town entry gateways;
- in order to maintain or frame views;
- clear zone affected areas and where required to ensure sight visibility; and
- areas where minimum vegetation offset requirements are required.

Figure C2-1: An example of a low maintenance structured planting approach

2.2.2 Naturalistic Planting Approach

A naturalistic planting approach involves the application of native plant seed and/or a limited number of containerised plants in a random composition. The desired outcome is an informal distribution of individual plant species and natural appearance, reflective of bushland (Figure C2-2). It utilises perennial grasses as the primary cover to minimise erosion and *Acacia species* as the primary legume for shrub establishment. This method is an economical way to treat large areas but may be highly susceptible to weed invasion from site won topsoil.

Native seed success rates vary considerably and the seeds of certain species can be very expensive or have a very low establishment viability or short shelf life. For these reasons expectations must be managed when using species other than *Acacia spp.* as results are quite variable and unpredictable. Random plantings of container stock planting using single or mixed species are often used as a cost effective method of establishing species that are difficult or not cost effective to establish from seed.

Figure C2-2: A naturalistic approach achieved through a seeding process

2.2.3 Water Sensitive Planting Approach

A water sensitive planting approach uses macrophyte plants (aquatic and marginal aquatic plants) in water management systems. Macrophyte plants assist in the uptake of nutrients and other particulates from turbid water. They also contribute to improving water quality through filtering and stabilising sediment build up. These plants also serve as food sources and provide shelter for aquatic animals within water management systems.

Marginal aquatic plants such as sedges, rushes or similar can also be established in drainage channels and sediment basins. These types of grasses do not require rich nutrients for growth, are not competitive with other native plants during establishment, and may contribute to wildlife habitat.

The planting design to waterways seeks to achieve environmental rehabilitation. The plant layout simulates a natural creek setting which complements the character and habitat of the creek. An effective planting design can restore habitats for local fauna, visually softens exposed areas of rock rip rap, and assists in channel stabilisation by reducing soil erosion (Figures C2-3 and Figure C2-4).

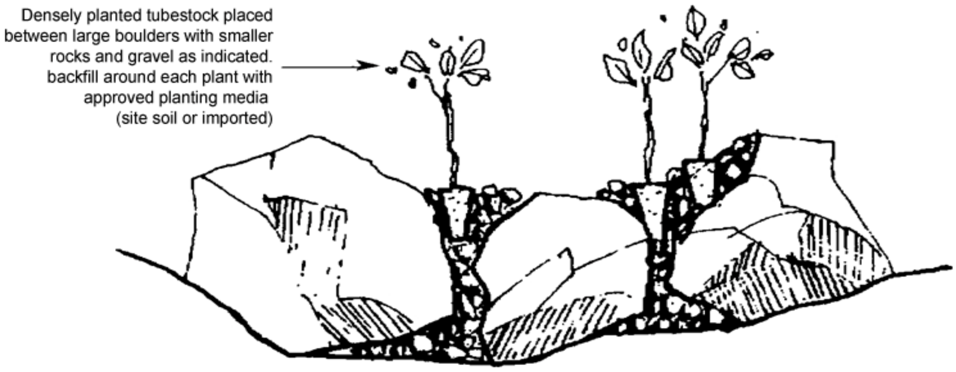


Figure C2-3: Planting in base of creek channel

Figure C2-4: Rehabilitation of creek channel

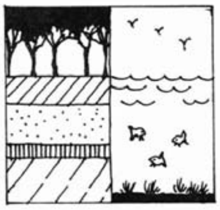
Particular plant types have different characteristics which can be used to achieve a specific landscape treatment outcome. Even though most are visual qualities, these characteristics also provide other important roles. These roles are the basis for the selection criteria of plants.

2.2.4 Grass Seeding and Turfing

There are numerous techniques available for establishing grass and turf. These are discussed in Appendix 5 and MRTS16 Specification User Guidelines.

2.2.5 Suitability Selection Criteria

Figure C2-5 summarises the factors to be considered for the suitability of plants. Overall, these are the most important criteria and should be the first addressed, particularly local climatic conditions such as rainfall and soil type. In most cases, native plants will be most suitable to local conditions.



FACTOR	DETAILED CONSIDERATIONS
Drought Resistance	■ Not resistant to drought ■ Moderately resistant to drought ■ Very resistant to drought
Frost Resistance	■ Not tolerant to frost ■ Withstands light frosts ■ Withstands heavy frosts
Rainfall	**Refer further to Road Drainage Manual (RDM)**
Soil Type	Refer further to Soil Management Manual
Lifespan	■ Less than 10 years ■ 10 - 20 years ■ More than 20 years
Salt Tolerance	■ Suitable for coastal locations
Fire Resistance	■ Resistant to bushfire
Pollution Resistance	■ Resistant to vehicle emissions

Figure C2-5: Suitability selection criteria

Source: Based on DPI (1995)

2.2.6 Functional Selection Criteria

Many planting situations require plants to be chosen for their ability to assist in achieving a desired practical function, for example as a windbreak through their mass and density, or to control erosion by binding soil (Figure C2-6).

FACTOR	DETAILED CONSIDERATIONS
Buffer Screening	▪ No visual screening ▪ Minimal visual screening ▪ Moderate visual screening ▪ Dense visual screening
Shade and Sunlight Control	▪ Glare relief or screening ▪ Shaded and cooler driving environment
Windbreak	▪ Effective windbreak
Physical Barrier	▪ Barrier to human access
Erosion Control	▪ No effect on reducing soil erosion ▪ Moderate effect on reducing soil erosion ▪ High effect on reducing soil erosion
Safety	▪ Minimise maintenance ▪ Falling limbs, branches ▪ Limited access
Noise Attenuation	▪ No noise attenuation ▪ Some noise attenuation

Figure C2-6: Functional selection criteria

Source: Based on DPI (1995)

2.3 Road Formation Treatments

Road formation treatments establish design criteria and considerations for addressing safety, maintenance minimisation, environment, aesthetics and community. Minimum technical requirements are established for each of these which assist in the selection of the landscape treatment. These treatments seek to:

- minimise disturbance while blending the formation into the local landscape context;
- minimise maintenance and reduce risk to maintenance personnel; and,
- provide opportunities for unique features which enhance user experience.

Specific design strategies and approaches for different types of road formation can be found in Appendix 5 Landscape and Urban Design Guidelines.

PART C

Chapter 3
Urban Design

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 3 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part C - Chapter 3

Urban Design

3.1 Introduction

This chapter introduces key design principles for the urban design of the hard infrastructure components of road landscape infrastructure.

All infrastructure components contribute in some way to the overall visual amenity of the road landscape. Therefore careful consideration must be given throughout each phase of the planning and design process as to how these components can be made to either positively enhance road user experience, or at the very least mitigate potential negative aesthetic effects they may cause.

As a brief, general definition in the context of road infrastructure, urban design refers to addressing and coordinating the physical aspects of hard structural components under the design process. These aspects include:

- **physical form –** the actual structural/ architectural design of the component, including the addition of integrated sculptural features as aesthetic embellishment.
- **material form –** the actual type and combination of material/s used to construct the component.
- **physical arrangement –** the arrangement and interaction of components with respects to the site and other infrastructure components.
- **integrated finishes –** integrated textures, concrete colour additives, off form patterns, exposed aggregates and so on.
- **applied finishes –** applied finishes such as painted colour treatments, honed and polished concrete surfaces and so on.
- **ornamental treatments –** purely aesthetic/ artistic additions, fixings and embellishments; special case treatments for especially featured or high visibility sites.

The primary, overarching aim of road infrastructure urban design is to provide aesthetically appealing outcomes, while maintaining and even enhancing the safety and operational functionality of the component. Urban design treatments should therefore aim to fully support cost effective outcomes, in lieu of providing merely aesthetic outcomes which provide no cost benefit.

To ensure these outcomes, urban designers must work collaboratively with other project team disciplines (civil, structural, mechanical and lighting engineers for example) from the earliest concept stages of the project in order to maximise functional, cost effective outcomes incorporating a high degree of aesthetic/ amenity value whilst complying with relevant technical standards. Common infrastructure components subject to urban design consideration and which should involve inclusion of urban designers throughout the design development stages include:

- vehicular bridges and overpasses;
- tunnels;
- noise attenuation structures;
- retaining systems;
- safety barriers;
- fencing and screens;
- road lighting;
- gantries and road signs;

- road furniture;
- fauna movement devices;
- rest areas and amenity blocks;
- pedestrian/ cyclist facilities; and
- advertising signs & structures.

3.2 Urban Design Principles

The primary aim in the development of urban design outcomes is to integrate high amenity outcomes which contribute to the functionality of the infrastructure components to which they are applied.

High amenity outcomes can be achieved as much by visually integrating structural components within the surrounding landscape, as much as they can by highlighting the element as a feature element. Generally in most cases the highest road landscape amenity value can be achieved by rendering the component as visually recessive as possible, such that its visual impact 'treads' lightly on the surrounding landscape. This is particularly important in natural environments with an intrinsically high visual amenity, or urban areas with a distinct character or heritage value in which the excessive visual dominance of road infrastructure would negatively affect existing visual values and local character. Urban design treatments should therefore seek to provide outcomes which address, retain, reflect and where possible enhance the existing ***context*** of the project area. In order to deliver contextually appropriate urban design treatments, designers will first have to assess the existing visual and landscape character values of the site (Chapter 2 of Part B) and develop appropriate design solutions accordingly.

A high level of design coordination between individual structures or components should also be aimed for, such that the whole array of varied structural elements share similar physical aspects, presenting as a visually cohesive and unified suite of treatments. Ideally structural components should appear visually as a related 'family' of elements rather than an assortment of visually unrelated items, which while functional, bear no visual relationship to each other.

Designers therefore need to ensure that urban design proposals are successfully integrated with the functional requirements of the component to which it is applied, other infrastructure components and achieve a contextual relationship with the surrounding landscape.

The following general principles should be applied in the development of urban design proposals for all components of road infrastructure. Principles for the design of specific components are discussed in greater detail further in this chapter.

3.2.1 Function

3.2.1.1 Construction

Urban design treatments should adopt innovative approaches to providing functional, high amenity outcomes through:

- architectural design and detailing;
- creating visual interest through varied use of construction materials;
- incorporation of raised and recessed patterns and images within construction formwork;
- use of visually distinctive, varied textured and colour treatments;
- incorporation of integrated sculptural features and forms within structures;
- consideration of night time presence (lighting effects); and

- integration of non-structural items (including but not limited to mechanical, electrical, surveillance, signals services and other utilities components) to render them visually recessive without compromise to functional and maintenance requirements.

Consideration should also be given to the urban designs capability of adapting to planned future road corridor redevelopment (lane widening for example) and changing operational requirements such that the urban design can accommodate these changes

3.2.1.2 Safety

Urban design treatments should aim to support and promote the safety function of civil design by generally:

- addressing safety in design for construction, inspection, maintenance and operation; considerations should include storage of equipment, parking and traffic management for construction, inspection, maintenance and operation;
- promote the legibility of the road landscape for road users, minimising risk of road user distraction by limiting unnecessary visual intrusion upon the road environment and conflict with regulatory signs and signals;
- promote visually recessive treatments and an uncluttered road environment;
- address risk of light reflection through use of reflective and high gloss finishes, particularly for morning and afternoon conditions where sun is low in the sky;
- address risk of excessive light glare and shadowing from illumination sources;
- limit outcomes which promote unauthorised access to structures (climbing); incorporate locks and restricted access measures as necessary to prevent unauthorised use and removal;
- limit refuge and roosting opportunities for animals that may become road hazards; and
- incorporate CPTED principles (Chapter 6 of Part C).

3.2.1.3 Maintenance

Urban design treatments and elements must:

- be of durable and robust construction and finish in accordance with Departmental material specifications;
- be weatherproof and ultra violet ray resistant;
- be designed to be self cleaning, free draining and resistant to dust and chalk adherence and minimise potential for chemical, dirt and mould staining;
- ensure detailing and integration of elements minimises potential for the creation of litter traps;
- promote resistance to damage, vandalism, unauthorised use and removal; and
- promote ease of cleaning and be fully accessible and responsive to maintenance activities, including mechanical cleaning procedures.

Integrate anti-graffiti management strategies with consideration given to:

- applied exterior quality acrylic paint as a sacrificial coating for all structures to support current Departmental graffiti management strategy which is to reactively paint over affected areas with reparative, paint coatings;
- inclusion of regular jointing or other design feature which effectively segments large flat areas into a patchwork of smaller areas that are easier to paint out under reparative operations; these should be incorporated to a minimum 3m height of the applied element as this typically represents the height most available to vandal attack;

- proprietary brand anti-graffiti paint coatings may be used on bridge structures only (as required by the Department's Structures Branch) Note: it is permissible to apply suitable anti-graffiti coatings over initial colour paint coat if required for the urban design treatment of bridge structures; and
- deeply and widely ribbed recesses or highly textured finishes to disrupt plain surface areas and render less attractive to vandals.

Where colour treatment is proposed for road structures, it shall be achieved through painted finish only:

- paint colours shall be limited to the *Colorbond TM* colour range for consistency and to assist in current Departmental graffiti management strategies;
- coloured concrete finishes (integrated cement additives/oxides) are permitted on pathways and street furniture elements only;
- colouration and surface finish shall mitigate negative visual impact of dirt, staining and adhesion of other pollutants; and
- paints must be commercial grade, exterior quality, acrylic paint with a with a minimum 10 year warranty on finishes; all finishing, pre-treatment and coating works shall be specified and applied in manner not to void manufacturers warranty.

3.2.2 Context

Designers will need to determine early in the design phase whether proposed urban design components shall be treated as either recessive elements that blend in with the surrounding environment or are rendered as highly visible, featured structures that impose themselves as dominant features within the road environment.

3.2.2.1 Integration

Typically for the majority of cases, structures should be designed, arranged and treated / finished to achieve a recessive visual presence within the road landscape, blending into the existing visual background as much as possible. Structural urban design should seek to provide outcomes that:

- are simple, refined and without unnecessary, non-functional embellishment;
- are balanced in terms of scale and mass with respects to existing natural features and urban building forms;
- respond to and are easily legible when viewed under conditions of the speed environment;
- responsive to local context (architectural themes, colours, visual and heritage values for instance) and complementary of existing natural / built environment character to assist in physically and visually integrating them within the locality; and
- mitigate visual obstruction and clutter of views within and out of the road corridor to the broader road landscape; particular care should be taken with respects to long range vistas and views of high visual value.

3.2.2.2 Feature Treatment

More intensive urban design treatment of structures as an attempt to promote visual prominence, should be limited to high visibility and low speed environment locations where a greater level of road user attention is required or desired; for example at interchanges, junctions, bridge underpasses, linkages to urban areas and extensive sections of retaining and noise walls that cannot be effectively screened by landscape treatment. In such cases the urban design should enhance and develop a distinctive character for these locations to highlight its significance (as a gateway, journey marker, landmark, node and so on) within the road network;

More featured urban design treatment should seek to create an identifiable character for project infrastructure, reflective if ambient conditions and context. Components should be easily recognised as a suite, or group of unified elements, utilising a consistently applied palette of:

- architectural / engineering / sculptural form;
- material/s construction;
- colours and finishes;
- textures, patterns and off form work;
- detailing; and
- urban art elements.

3.2.2.3 Murals

Wall murals have traditionally been used as both a means of integrating local themes within roads infrastructure and minimising graffiti vandalism. However murals are to be avoided as their typically literal representation of local themes is at odds with providing simple, refined treatments appropriate to the scale, speed and significance of the State Controlled Road network. Select use of murals may be considered in locations and on infrastructure which is not visible from the road corridor (for instance, rear side of noise fences facing community areas, pedestrian areas (particularly underpasses) or any other low visibility location area unseen from major motorways), however mural themes will require negotiation and approval from TMR, as per Chapter 5 of the Departments *Road Traffic Noise Management: Code of Practice*.

3.3 Urban Design of Infrastructure Components

This section briefly introduces aesthetic urban design considerations for each of the main infrastructure components listed at the head of this chapter. A broader and more detailed range of design criteria and requirements (with respects to safety, maintenance for example) are detailed in Appendix 5. These guidelines also include a comprehensive list of Departmental, national State Roads Authority and national design standards that should be consulted in the design development of each component type. Project specific landscape and urban design briefs may also detail requirements additional to these criteria that will need to be addressed throughout the design process.

3.3.1 Vehicle Bridges and Overpasses

Bridges and overpasses often present the most visually striking constructed element within the road landscape setting due to their typically elevated position. They often present as strong, visual focal points when viewed from within the corridor as well as from external vantage points, therefore addressing the aesthetic value of bridges is extremely important to delivering high visual amenity outcomes.

Bridges can provide distinctive character and identity value within the road network when effectively enhanced with urban design treatments, with bridge parapets, piers, headstocks, safety screens and abutment walls each presenting significant opportunities for urban design enhancement.

Care should generally be taken to minimise the visual impact of bridge structures by minimising apparent scale, weight and mass of the structure and ensuring a proportionally balanced and integrated relationship between each of the structural elements. Bridge design should aim to:

- emphasise a superstructure (deck and parapets) that presents smooth, clean lines and has a minimal structural depth promoting a slender, lightweight appearance;

- reduce the number of supporting elements (piers) and visual intrusion by maximising spans lengths between to greatest extent possible;
- prioritise open abutment treatments (spill through abutments), particularly in rural and natural settings to promote a more open, visually permeable structure;
- generally minimise the structural scale and mass of each structural element to render the bridge as visually recessive as possible; and
- incorporate contextually appropriate design features (slender parapets, tapered piers, light colouration and so on) such that bridge structures appear embedded and visually recessive within the landscape rather than imposed upon it (Figure C3-1 and Figure C3-2).

Figure C3-1: Bridge parapets incorporating urban design treatment

Figure C3-2: Tapered and textured piers create a visually recessive structure within the road landscape

3.3.2 Tunnels

Tunnel portals, canopies and trough walls provide ample opportunities for visual enhancement through urban design detailing (Figure C3-3). Tunnels create a natural arrival point and threshold experience between aboveground and subterranean road environments, natural and artificial lighting & open and closed views, which urban design treatments should aim to promote and enhance. Alternative, contextually appropriate solutions will be required for tunnels in urban and natural environments; simple, recessive portal design expressing the internal tunnel profile being moist appropriate in natural areas, while more architecturally detailed portal and canopy design may be considered in urban areas. Tunnel urban design should seek to:

- enhance the gateway/ threshold experience through detailed portal, canopy and trough wall design;
- increase intensity of the urban design treatment as drivers approach the portal entrance;
- integrate light coloured, higher gloss finishes to internal skin walls to promote light reflection and brighter internal carriageways; and
- recessive (darker) colour treatment for structural walls and internal fixings such that these blend into the visual background.

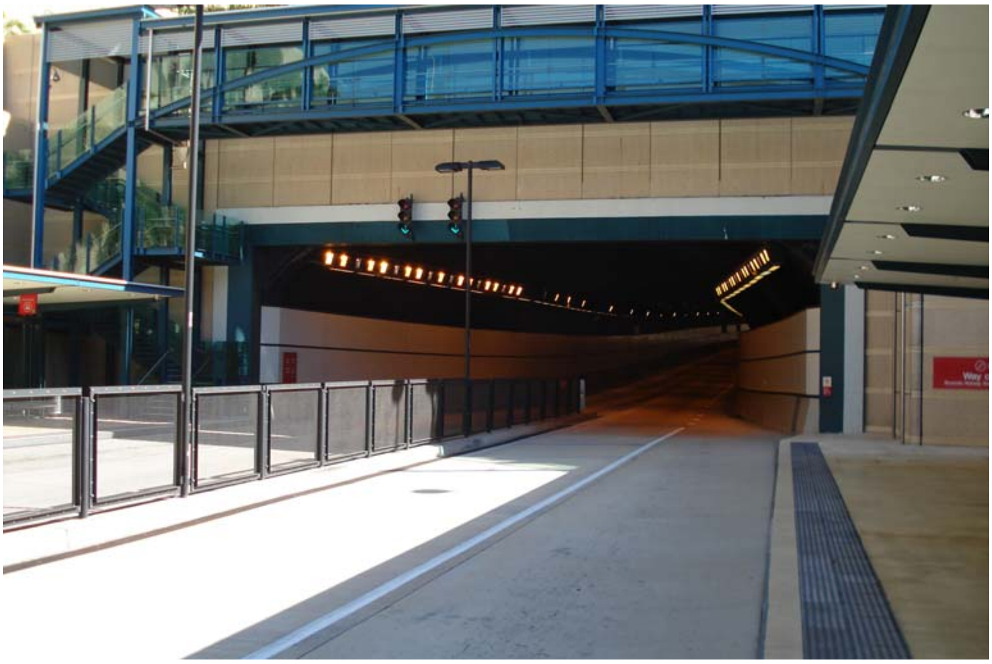

Figure C3-3: A functional and aesthetic tunnel portal through colour and material selection

3.3.3 Noise Attenuation Structures

Noise attenuation structures (including earth mounds and barriers/ fences), are designed primarily to mitigate traffic noise levels generated on roadways and transport systems to adjoining receptors (residences, community facilities, schools and so on). Noise structures also perform a secondary role in preventing unauthorised access into transport corridors, and their layout design is typically coordinated with boundary security fencing to prevent trespass into transport corridors.

Noise structures may be integrated with earth mounding to effectively diminishing the overall height (and cost) of the wall structure and promote a softer landscape approach to noise mitigation. Mounding can support vegetation to screen fencing and integrate the entire noise attenuation structure within the landscape, delivering enhanced road landscape amenity outcomes.

More than any other component of road infrastructure, noise structures can have the greatest effect on road amenity, due to the typically long distances they are required to be installed along the length of the corridor. This is particularly the case where corridor width constraints prevent the planting of an effective vegetation screen between the walls and the carriageway. Therefore the layout, selection (that is earth mounding vs. structure vs. mounding & structure combination), design, material selection and finish of noise attenuation structures is often critical to promoting high value road amenity outcomes. The aesthetic design quality of noise attenuation structures can be visually enhanced through effective urban design solutions, providing enhanced visual experience for drivers and delivering an important part of community infrastructure. Responsive noise barrier design should aim to provide a practical design layout and selection of materials that are both visually stimulating and appropriate to the local landscape setting.

3.3.3.1 Noise Barriers/ Fencing and Earth Mounding

Where available corridor width allows, earth mounding (either or on its own in conjunction with noise fencing) may be the most suitable method of noise attenuation as it can support a number of functions. Mounds assist in visual screening when vegetated and direct surface drainage to required destinations. It is preferable that the landform of mounding integrates with existing surrounding land profiles, avoids regular linear forms and incorporates rounded and undulating shapes which vary in height and width. Mounding design should also support road drainage requirements and avoid localised ponding and runoff. Mounds should support vegetation treatment of suitable plant species reflective of the surrounding landscape character to soften the roadside environment and integrate noise attenuation structures into the local environment (Figure C3-4). Planting media is important to apply on the top surface of compacted fill material in the earth mounds, to assist in root penetration for successful growth and establishment of the plants.

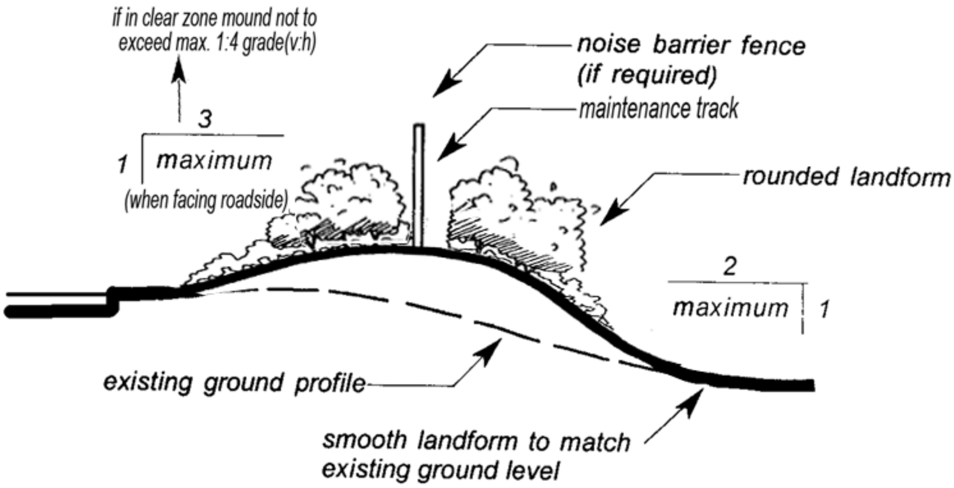

Figure C3-4: A typical cross section of an earth mound

3.3.3.2 Noise Barriers/ Fences

Due to cost considerations, standard off the shelf type noise fences are used to attenuate noise along extensive stretches of road corridor. Standard fences are often uniform in appearance across large, straight and continuous sections of the corridor and at risk of creating visual monotony and negative visual amenity as they have minimal intrinsic aesthetic value. However, without modification to the standard panel type, the often harsh visual effects of these fences can be mitigated through effective design responses.

Techniques for enhancing the aesthetic appearance of standard type noise fences include:

- reflecting the smooth, even geometry of the road design in the vertical and horizontal alignment of fencing sections; top lines of fencing should be flat and even, complementing the vertical geometry of the road as much as practicable, with the horizontal (plan) layout wall running perfectly parallel to the road alignment;
- staggered or stepped (Figure C3-5) wall alignments should only be used where required to accommodate natural undulating landforms, retain existing environmental features or in order to create specific visual interest relating to the overall urban design; this most practicable in natural areas with a highly undulating landform and where retention of roadside vegetation may be an issue, however awkward or unbalanced transitions are to be avoided;
- incorporate some means of end treatment which helps integrate the terminating wall within the surrounding urban or natural setting;
- aligning horizontal panel joints between panels in a fence to present a neat modular arrangement (Figure C3-7);
- consideration to the use of transparent panelling in select sections in order to retain key view-sheds of high visual amenity out of the corridor;
- providing screen planting along each side of the barrier to reduce the apparent height and visual impact of fences (Figure C3-6); and
- treating both sides with a simple, context sensitive colour scheme for improved visual amenity.

Figure C3-5: A stepped wall generating visual interest and views to landscape beyond

Where buffer planting to the frontage of fences cannot be achieved, these are typically are more susceptible to vandalism. Vegetation buffering of large exposed areas of fences with planting can assist in reducing opportunities for and incidence of graffiti, as it restricts access thereby acting as a deterrent. Vegetation buffering will also help screen graffiti damage that does occur, reducing its visual prominence and the need to repair under maintenance. Therefore a dense screen of vegetation to each side of noise fences should be prioritised to the greatest extent possible for improved aesthetic outcomes and to mitigate maintenance intervention.

Figure C3-6: Buffer planting protecting noise barrier from vandalism and graffiti

3.3.3.3 Purpose Designed Noise Fences

Purpose designed noise fences may be required in order to integrate noise fences within the overall urban design on a particular project, in order to fit within the suite or family of design elements discussed above under general principles. These should typically only be used in high visibility locations (unable to be effectively screened) and slower speed environments (where they will be viewed longer by drivers) where the visual impact they create is important to enhancing the urban design themes of the project or character of the area.

Purpose designed noise fences provide significant opportunities to utilise and develop distinctive designs, features and finishes. Due to their potentially significant expense, this type of design response is more suited to high profile locations; that is, feature areas such as gateways, key entries and landmarks within urban settings.

Purpose designed noise fences may include the following depending on location and design intent:

- incorporation of patterning and textural finishes; however these should promote bold imagery and minimise complex detailing, particularly in high speed environments where excessive detail will be visually ineffective and potentially distracting;
- complimentary planting within or adjoining the barrier to compliment its visual appearance; for example, shape or form;
- feature painted panels which provide areas of visual contrast; for example, colour treatments;
- mixture or variation of materials and colour for visual interest (Figure C3-7); and
- incorporate transparent panels to reduce adverse visual impacts at significant vantage points (for example; retain views with high scenic value or views from bridges to major rivers).

Figure C3-7: Colour and pattern in conjunction with material selection used in noise barriers design to create visual interest and express corridor themes

Careful consideration should be given to the use of transparent panelling due to the additional capital cost and as associated maintenance issues (shorter design life and breakage damage). Transparent panels should only be used where:

- retaining a distance view or portion of a view is warranted due to its level of visual significance and community value;
- panels function effectively as a CPTED measure by improving surveillance and personal security at vulnerable locations;
- contextually appropriate, in terms of compatibility with adjoining panel materials;
- set back appropriately from the carriageway to avoid unnecessary access and vandalism opportunities, particularly in low speed environments; and
- required to lower apparent or perceived height of the overall fence layout or reduce shadow line to an adjoining property.

Refer to Chapter 5 of the Departments *Road Traffic Noise Management: Code of Practice* for more detailed information relating to integrated noise barrier design.

3.3.4 Retaining Systems

Retaining systems are available in many forms depending on their location and function, and utilise different construction methods.

Like noise walls, retaining walls can be significantly enhanced through appropriate urban design detailing, with treatment selection determined by the sites context, the visual significance of the walls location and relationship to other components of urban design infrastructure (Figure C3-8 and Figure C3-9). Selected treatments should be based on both the physical constraints of the retaining system (size and structural depth of wall panels for instance will constrain type of recessed formwork possible) and visual themes being developed. Concrete retaining systems provide the most opportunity for visual enhancement and detailing.

As a general rule, shotcreting is to be avoided as a retaining system (particularly in urban and high visibility areas) due to the typically, negative visual amenity of the treatment. Where required (and unavoidable for geotechnical reasons and or cost), the selected colour of the shotcrete should be visually compatible with the other palette of colours used within adjoining design components.

Textures and finishes should aim to be as naturalistic as possible, and make use of surrounding forms and shapes to ensure visual compatibility with the surrounding existing landscape setting.

Figure C3-8: Colour and pattern in conjunction with three dimensional art used in retaining wall design to create visual interest and express corridor themes

Figure C3-9: Retained soil system wall panels incorporating contextually sensitive urban design detailing and colour palette

3.3.5 Safety Barriers

Barriers are essential within transport infrastructure to improve road user safety for users. There is little potential for urban design treatment of safety barriers, however barrier selection and integration with other components of infrastructure can yield improved road amenity outcomes. Barrier design considerations include:

- use of select barrier types (open rope barriers in lieu of full height concrete barriers for instance) to promote visual permeability across and out of the corridor where required, especially to allow views to areas of high visual significance;
- coordinate with vegetation treatments behind the barrier such that vegetation is visible above the top line of the barrier and contributes positively towards road amenity;
- physically and visually integrate barriers where required against retaining walls and bridge piers such that the combination of components reads visually as a single related structure; and
- consider maintenance access requirements behind barriers.

Concrete barriers provide limited opportunities for incorporating urban design detailing such as colouration of the inside of barriers to bridges to integrate with associated bridge parapet treatments or central median barriers built around colour finished bridge piers. However this form of treatment should be simple, visually recessive and strictly limited to critical barrier sections required to integrate within the overall urban design of a structure.

3.3.6 Fencing and Screens

Fencing and screen (anti-glare) design should seek to promote visually recessive outcomes such that the structures blend harmoniously into the background landscape with road users barely aware of them. To this end, fencing and screens should be of a type that minimises visual obstruction (minimal material construction, posts cross bars and so on), promotes visual permeability promote (open wire mesh, perforated steel types) with colouration that blends into ambient conditions. Black colour finish (posts and mesh) is the preferred Departmental colour standard for achieving visually recessive outcomes for fencing and screens (Figure C3-10). In the case of fauna fencing, the fauna exclusion strip should also be black on the roadside alignment facing side and any other side that may be seen from the road where the fence alignment changes.

Fencing used in prominent urban locations should exhibit a higher level of aesthetic design quality to improve its long term visual appearance. Where pedestrian and/or cyclist activity is more focused in areas adjoining fencing, it should also be able to withstand a higher level of wear and tear. Where possible, vegetation should be implemented to at least one side of fencing to soften its visual appearance, particularly when used in extensive linear extents along the road corridor. However it is important that maintenance is not compromised by allowing a suitable setback to facilitate access. Safety should also be retained by ensuring that adjoining planting meets CPTED requirements. Where open style fencing is installed to an adjoining pathway, planting used at the interface with the fence should be a compact species so as not to overhang and cause a hindrance to pedestrian and/or cyclist movement.

Ensure coordination with security fencing, fauna fencing and noise barrier design to provide cost effective access exclusion.

Figure C3-10: Black fencing visually blends into the landscape background

3.3.7 Road Lighting

While there is limited scope for urban design treatment of road lighting components, amenity improvements can be achieved through careful consideration of their placement to avoid visual clutter and imposing on existing views. To this end, the number of lighting poles should be minimised to the least number required for operational functionality. Strategies for reducing the overall number of lighting poles include combining double luminaires in central medians and integrating lighting fixtures to structures in lieu of separate individual poles.

Road landscape treatments need to be integrated with lighting also to ensure appropriate vegetation setbacks to prevent unwanted shadowing and support maintenance access.

3.3.8 Gantries and Road Signs

As with road lighting, sign placement should seek to minimise visual clutter and disruption of views. Avoid placement blocking scenic views and where possible locate below the skyline with a backdrop of vegetation so that the sign does not present to starkly. The number of elements should be reduced by combining signs in the same supporting structure where possible, and attaching to other structures (bridges for instance) where feasible. Careful consideration should also be given to placement of gantries to ensure that these do not overly dominate the road landscape and disrupt existing high value views from the road corridor.

Landscape design needs to consider sign locations to ensure sufficient vegetation setbacks and maintenance of sight lines to signs throughout the operational life of the road.

3.3.9 Road Furniture

General road furniture should be designed to be as visually recessive as possible and integrated with landscape treatments to blend into the visual background. Again, visual clutter generated by a multitude of elements should be reduced and placement to avoid disrupting existing views. Maintenance access requirements are to be addressed in the surrounding landscape design.

3.3.10 Fauna Movement Devices

Fauna movement devices play an important role within the road landscape by facilitating safe fauna movement and refuge opportunities across and within road corridors, and helping to prevent road hazards and road kill through fauna exclusion fencing. Devices can be successfully installed within the road landscape through integration with road structures which provide movement opportunities (bridge underpasses and culverts for example) and the considered design of associated landscape treatments to provide habitat opportunities and support desired fauna flows (Figure C3-11).

Refer to the Departments *Fauna Sensitive Road Design Manual* for design guidelines of various types of fauna movement devices.

Figure C3-11: Fauna fencing integrated within the road landscape

3.3.11 Rest Areas and Amenity Blocks

Not only do roadside rest areas and amenity blocks play a major role in enhancing the travel experience by providing road users with convenient toilet and recreational facilities, they also contribute to road safety in providing rest opportunities to address driver fatigue.

Situated typically in rural or natural settings between urban centres, rest areas and amenity blocks should be designed sensitively with respects to the surrounding landscape, particularly where constructed in locations of high environmental value. Analysis of road use and regional visitation data will be required to ensure rest areas consider and accommodate sufficient levels of vehicle parking service for the range of vehicle types anticipated for specific routes (articulated commercial vehicles, larger domestic vehicles including caravans, trailers and campervans for example). Consideration will also have to be given to the provision of associated park furniture (bins, seating, shelters, play equipment and so on) relative to expected level of service and the maintenance requirements of the facility. Hours of operation will also need to be addressed through appropriate provision of lighting and controlled access (lockable gates, doors and so on).

Some general design criteria for rest areas include:

- use of attractive, feature landscape treatments at site entrances to highlight facilities for road users;
- incorporation of CPTED measures for safe daytime and night time use, promoting a high level of visibility and passive surveillance from the roadway and within the facility itself; site planning and facilities design shall be cognisant of site topography and existing vegetation to maximise natural surveillance;
- robust design and use of durable materials to minimise risk of vandalism damage and ongoing maintenance requirements;
- provision of a high degree of shade amenity (particularly during noon through to late afternoon) is provided, with picnic/ play facilities, amenity block entrances and car parking bays to receive particular attention; consider location of rest area facilities relative to existing site vegetation to maximise shading potential; and
- inclusion of separation/ exclusion design features (bollards and barriers for instance) as required to prevent unauthorised vehicular access into rest areas from the roadway and car park areas; large trucks should also be separated from general domestic vehicle car parking to reduce risk of traffic hazards.

3.3.12 Pedestrian and Cyclist Facilities

Pedestrian and cyclist facilities play a crucial role in facilitating and promoting alternative means of transport network connectivity. The primary strategic objectives for all pedestrian/ cyclist facilities shall be to:

- provide safe, equitable, amenable and easily navigated circulation systems functionally integrated within vehicular transport networks and linked within the local/ regional urban framework;
- support access and community connectivity across and along the transport corridors; and
- promote and facilitate alternative transport modes mitigating road traffic volumes and supporting sustainable transport technologies.

Network planning studies will need to identify existing pedestrian/ cycle networks as well as determining future needs (at local scale and possible even regional scales depending on the size and scope of the project) in order to successfully deliver strategic design outcomes. Key arrival points, routes, desire paths, user groups and destinations will all need to be assessed, supported and accommodated in circulation network design.

Consideration must also be given to the designated use of the facility early in the design process, whether the facility will be limited to single use (restricted to either pedestrians or cyclists only) or shared use (both). Corridor width constraints may determine allowable usage, setting the available path width and may also determine whether cycle facilities will have to be integrated throughout select sections as on-road lanes.

The optimisation of equitable access must also be a key design consideration, compliance with disabled access standards being a primary key result area on all projects. Compliance with standards may prove to be difficult however, given the geometric constraints encountered on many road projects, and consultation with and design verification by suitably qualified disabled access auditors may need to be coordinated on complex projects.

The design of pedestrian/ cyclist facilities will need to consider a wide variety of elements (Figure C3-12) including but not limited to:

- paths, aligned to (behind kerb) and at the same general, longitudinal gradient as roads;

- other pathways not aligned to roadways but connecting the corridor with other routes within the regional pedestrian network, along local streets and through adjacent parklands for instance and across the road corridor via underpasses and footbridges;
- cycleway/ veloway dedicated for the high speed use of bikes only;
- ramps and road crossing devices;
- surface treatment of pavements; treatments will need to comply with anti-slip standards, promote self cleaning and integrate feature treatments as necessary for improved aesthetics and functionality;
- railings and balustrades;
- tactile ground surface indicator strips and other elements required for disabled access compliance;
- traffic separation devices including barriers and bollards;
- lane/ right of way demarcation devices and treatments including signs, pavement line markings and contrast pavements;
- wayfinding and directional signs; and
- associated street furniture, shade shelters, urban design and landscape/ revegetation treatments.

Figure C3-12: Integration of pavement treatments to cycleway facilities

Due to the pedestrian scale and increased opportunities for user appreciation, recreation and interaction, a high level of landscape amenity treatment should ideally be integrated with pedestrian / cyclist facilities. Landscape treatments should aim to:

- provide a high degree of shade amenity along the route, at key nodes and rest areas for user comfort, particularly through the hottest part of the day; consideration should be given to optimising the casting of shadows from northerly to westerly aspects (Figure C3-13);
- ensure sufficient setbacks and clearance envelope (inclusive of vertical head clearance for cyclists) for user safety and does not encroach upon or risks structural damage (root damage) to pathways;
- incorporates safety sightlines (to traffic and from traffic and for CPTED considerations) design measures throughout;
- utilise as visual and physical buffers between pathways and roadways;
- screening buffers against adjacent development that may detract from the amenity and recreational values of pedestrian infrastructure a

- to create more visually distinct treatments at path entrances, user nodes, junctions and slow down points to highlight the network significance of these areas and promote speed reduction; and
- accommodate maintenance access.

Figure C3-13: High degree of shade amenity provided at cycleway facilities

3.3.12.1 Pedestrian Underpasses

Underpasses are typically installed under roadways to facilitate pedestrian connectivity across the corridor. As such underpasses are generally hidden from view from road users and provide limited scope for passive surveillance. Pedestrian underpasses therefore need to integrate CPTED measures into the design to ensure that user safety and security is maintained or at least optimised. Underpass design will also need to address an increased potential for graffiti damage as the enclosed space can help conceal vandals from sources of natural surveillance. In order to maintain surveillance and personal security at these locations, design responses will need to address:

- lengthy sightlines and visibility throughout the facility to allow users to identify potential security risks;
- integration of landscape treatments at entrances to support natural surveillance into the underpass, particularly as viewed from the roadway and adjacent premises;
- adequate lighting and bold and bright finishes to promote natural illumination;
- clear accessibility without blind corners and minimisation of concealment opportunities; and
- vandal resistant fixtures (lighting for example) and an integrated anti-graffiti strategy.

Wall murals may be considered as potential finishing treatments for the internal areas of underpasses as these will typically be unseen from the road and traditionally play a positive graffiti management role, typically attracting less frequent vandalism damage.

3.3.12.2 Pedestrian / Cyclist Overpasses

Overpasses provide pedestrians and cyclists safe access over busy roads on footbridges and are critical to maintaining the connectivity of local pedestrian networks. These are largely used in urban areas where pedestrian and cyclist traffic volumes are higher, and are often a prominent visual feature in the road landscape. Footbridges should be visually integrated within the surrounding landscape setting and with the urban design treatment of adjacent road infrastructure. The same general urban design principles outlined for vehicular bridges apply to footbridges also, however given the pedestrian scale and use of the structure, more refined design approaches should be aimed for. Particular attention should be given to the design of safety/ throw screens and entry areas as these provide significant opportunities for urban design treatment and detailing (Figure C3-14).

Figure C3-14: Footbridge as a visual feature element within the road landscape with detailed attention to throw screen design

3.3.13 Advertising Signs and Structures

The road corridor provides an attractive prospect to commercial interests for advertising due to the large volume of road users that can be reached. The Department has separate policies and approval process with respects to the acceptance of advertising sign/ structure proposals within the state controlled corridor which are not addressed in this manual. The same general design principles as for road signs should be applied in their treatment, positioning and integration with landscape treatments.

PART C

Chapter 4
Aesthetics

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 4 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part C - Chapter 4
Aesthetics

4.1 Introduction

Aesthetics in the road landscape is the visual integration of the road and other transport modes into the broader landscape. This visual integration contributes to the perception of communities and the qualities of place. The user may be within the corridor or viewing into the corridor.

Aesthetics is more than creating a desirable view or user experience. *"Aesthetic properties provide its users with a clear picture of what is going on around them and what is expected of them. This is accomplished by using techniques and materials to provide better definition of the elements of the facility, to visually highlight important information, and to reduce the stress on users that results from operating a vehicle in a complex environment."* (TxDOT, 2009).

This chapter reviews some of the basic design tools and techniques which can be employed to preserve, maintain and create visual integration.

4.2 Scenic Routes

Scenic routes designation is part of the asset management condition assessment process. They are segments of road corridors that display unique aesthetic attributes of the broader landscape that merit preservation and enhancement. These segments have been mapped within the Element 8 Road Landscape condition assessment database. They possess characteristics that attain a level status of regional significance combined with at least one of the following aesthetic values:

- **scenic**;
- **cultural**; and
- **natural**.

4.2.1 Scenic Value

Scenic value is derived from a stimulating visual experience. It is the result of an emotional reaction created when viewing a natural or man made element as viewed from within or from outside the corridor (Figure C4-1). Scenic value offers a pleasing and memorable visual experience that is distinctive and unique within the road landscape. It may be one single element such as a tree or forest, or a combination of landform, water, vegetation and built features which display a sense of harmony and balance.

Figure C4-1: Scenic value within the road landscape

4.2.2 Cultural Value

Cultural value involves legacies, traditions and historic artefacts that tell a story about people, their past and their community. It includes evidence of past activities or practices, such as artwork, events, vernacular architecture, transportation systems or ruins (Figure C4-2). They may hold scientific, ethnic, social or community significance that educates the viewer of their relevance and instils an appreciation of their contribution to society.

Figure C4-2: Cultural value within the road landscape

4.2.3 Natural Value

Natural value relate to the road landscape that is in a relatively undisturbed state (Figure C4-3). While there may be evidence of some human interaction, the basic features remain largely undisturbed. This may include landforms, water bodies, forests and islands.

Figure C4-3: Natural values retained within the road landscape

4.3 Basic Design Tools

Basic design tools to achieve aesthetic outcomes within a road landscape include:

- **scale**;
- **proportion**;
- **colour**;
- **texture;** and
- **contrast**.

4.3.1 Scale

Scale is formed by the physical relationship between design components within the road landscape (Figure C4-4 and Figure C4-5). Human scale helps people relate to, interpret and appreciate features of the transport corridor. The perception of scale is dependent on the landscape context and angle of view.

4.3.3 Colour

Colour can create the most obvious visual impact within the road landscape. It is significant in defining the character and quality of design components. Colours may be used to compliment or create contrast to other parts of the road landscape.

4.3.4 Texture

Texture is achieved by incorporating variations and tactile relief to surface finishes (Figure C4-6). Texture helps to define form and add visual interest. Textural treatments to design components can either be subtle or dominant depending on its functional requirements and design intent. Light changes and shadows also affect the appearance of texture (Figure C4-7). Developing patterns in design components are simple measures in achieving texture

Figure C4-6: Subtle texture of the retaining wall design components

4.3.5 Contrast

Contrast is based on developing opposing visual characteristics within design components. Contrast can be achieved in many different ways, for example; through varying forms, shapes, colours, light and shadow (Figure C4-7). Design components are often designed to be highly distinguishable from the surrounding landscape setting. This contrast makes the component dominant, a strong feature or statement, and commands visual attention by users. Contrast can also be quite subtle in its effects, by using tonal colouring or slight texture relief to generate visual change. Contrast relieves monotony creating a stimulating driver experience. It also accentuates opposites within a design component, heightening viewer awareness of a singular or series of feature elements.

Figure C4-7: Contrast through colour, shape, light and shadow

PART C

Chapter 5
Safety

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 5 Amendments – June 2013

Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part C - Chapter 5

Safety

5.1 Introduction

The Department’s primary objective is to provide safer roads to support safer communities. This is supported through the department's key policy documents. This section promotes safe function of the road network for all users; including, pedestrians, cyclists, local motorists, commuters, tourists and maintenance personnel. Landscape Architect’s and Urban Designers need to be involved throughout all safety design processes for projects.

Safety must be considered throughout the design life of the project. This mitigates the risk of serious road accidents and contributes positively to a safe road corridor.

Safety considerations include, yet are not limited to resolution of clear zones, sight lines, sight distance requirements, vehicular, pedestrian and cyclist safety. The road landscape needs to be safe for all road users and should be designed to improve road safety, mitigate accidents and/or hazards, and where possible, encourage safer road user behaviour.

This chapter provides guidance and supportive instruction on safety requirements for design projects. These requirements shall be adhered to when reviewing and designing landscape and urban design proposals for new roads or existing road landscape upgrades. The Departments *Road Planning and Design Manual* must also be consulted in determining relevant clear zone and sight distance parameters.

All landscape and urban design documentation is to be developed under the supervision of a RPEQ. Landscape and urban design drawings and reports require review and certification by a RPEQ to ensure designs comply with relevant standards and do not negatively impact on civil and structural components of the project. The RPEQ, in consultation with the Landscape Architect, shall review the drawings and understand the impacts of the landscape treatments on the civil and structural design components. The signature on the drawings demonstrates the RPEQ's responsibility to direct, oversee and evaluate the work of others providing input to the project has been complied with as per the legislation.

This chapter contains:

- **Crime Prevention Through Environmental Design (CPTED)**
  Promoting a safe and secure environment for all users through design mitigation of public safety risks.
- **Road Safety and Landscape Design**
  Providing a safe and hazard free road landscape.

5.2 Benefits

The benefits of integrating safety within the road landscape are:

- reduced incidence of serious accident;
- creation of visual cues to improve legibility, awareness and reduce fatigue related accident;

- positive driver behaviour;
- safe work environments for TMR maintenance personnel; and
- improved user safety in pedestrian and cyclist zones.

5.3 Crime Prevention Through Environmental Design

The practice of CPTED is an important consideration in reducing the incidence of crime against people and infrastructure within or adjacent to road corridors. Utilising the broad strategic concepts of CPTED can improve public safety by applying a range of site specific principles into the design and management of the road landscape. The overarching premise of CPTED within the road landscape is that appropriate design can minimise and discourage the physical opportunity for criminal incidents. This leads to a reduced fear of crime and increases an individual's perception of personal safety. Enhanced public safety ultimately improves the enjoyment of the road landscape by the community.

CPTED can be applied within the road corridor by utilising design principles and visual cues to highlight the boundaries and purpose/s of particular spaces. Specific design treatments and components can also be used to influence the perceptions and behaviour of users. Implementation of CPTED principles define appropriate and acceptable behaviour, encourage legitimate use of the site and create feelings of security for users.

5.3.1 Concepts and Principles

The three main concepts are:

- crimes against people and infrastructure are less likely to occur if other people are around to intervene if illegitimate uses of spaces occurs;
- passive surveillance: the presence of people in adjoining buildings and spaces plays a major role in being able to see, monitor and report what is happening in the public realm; and
- giving people safe choices about where to be, how to anticipate and respond to potential threats, improves personal safety.

These concepts provide a broad basis for design within the public realm, including road corridors. Specific principles provide guidance on the planning and design of public spaces, as well as the interface with private space.

The six principles of CPTED are:

- surveillance;
- legibility;
- territoriality;
- ownership;
- management; and
- vulnerability.

These principles are complementary to each other. They need to be applied holistically, not in isolation. This ensures balance between them. These principles need to be considered throughout all stages of a road project. When applied to the physical and functional context, the optimum public safety enhancements may be achieved.

Consultation with local authorities, the Queensland Police Service, local schools and community groups may also facilitate awareness of key target areas. This can lead to the formation of informal working groups or partnerships to achieve common CPTED goals. It also assists in selection of measures being taken to reduce the likelihood and incidence of crime in a given area.

These principles should be applied to any open and/or enclosed publicly accessible space within the road corridor. This includes:

- parking areas;
- pedestrian walkways;
- cycle routes;
- rest areas;
- bridge overpasses;
- pedestrian underpasses; and
- bus shelters/ platforms.

The siting of all of these facilities have the potential to impact road geometry and significantly change civil design parameters. The design team should investigate alternatives which can minimise the safety risks associated with these spaces.

5.3.1.1 Surveillance

Maintaining natural surveillance is a key to reducing risk. Natural surveillance relates to publicly accessible areas being under observation by users of the adjacent spaces, residents and businesses. A sense of safety is created when users are under observation. A perception of risk or detection for potential offenders is also produced. Public spaces within the road corridor should be designed and managed to maximise the potential natural surveillance opportunities from surrounding areas (Figure C5-1).

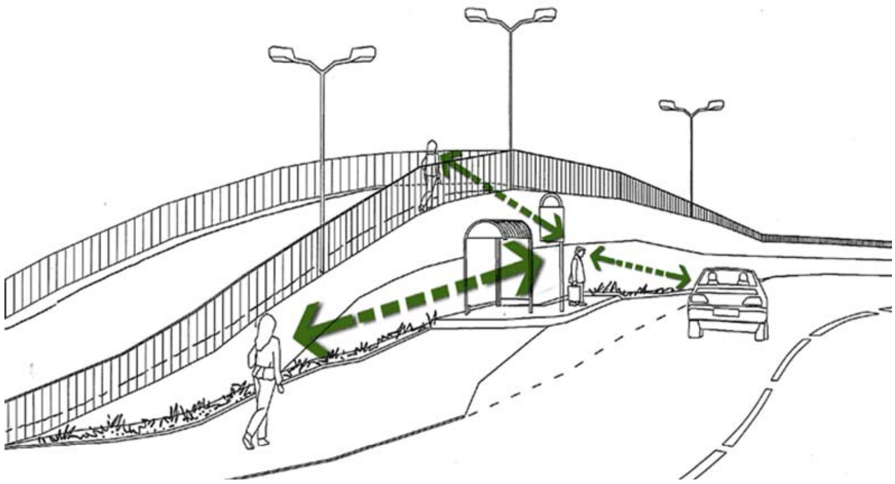

Figure C5-1: Maximise clear sightlines

Road landscape and urban design responses to support ***surveillance*** are:

- providing and maintaining unimpeded sightlines (Figure C5-1 and C5-5);
- avoiding blind spots, creating greater opportunities to see and be seen (Figure C5-5);
- utilising usually permeable materials that improve surveillance (Figure C5-3);
- providing well designed useable space that support natural surveillance (Figure C5-4)
- distinguishing differences in day and night usage of spaces and capacities for surveillance;

- providing spaces that are visible prior to entering and on exiting;
- using adequate lighting to avoid shadows and glare; and
- facilitating and encouraging legitimate community and/or individual activities and uses.

Figure C5-2: Improved surveillance through open style fencing

Figure C5-3: Improved surveillance through open weave wire mesh material selection

Figure C5-4: Improved surveillance through well designed useable and clearly defined space

Figure C5-5: Improved surveillance through transparent panels enabling multiple cross views to and from bridge

5.3.1.2 Legibility

Road landscapes should be designed and managed with a high degree of legibility, particularly pedestrian and cyclist areas (Figure C5-6). This ensures that users:

- may identify important or appropriate safe routes to take;
- may identify which places or routes are most likely to be frequented by other users; and

- are unlikely to become lost.

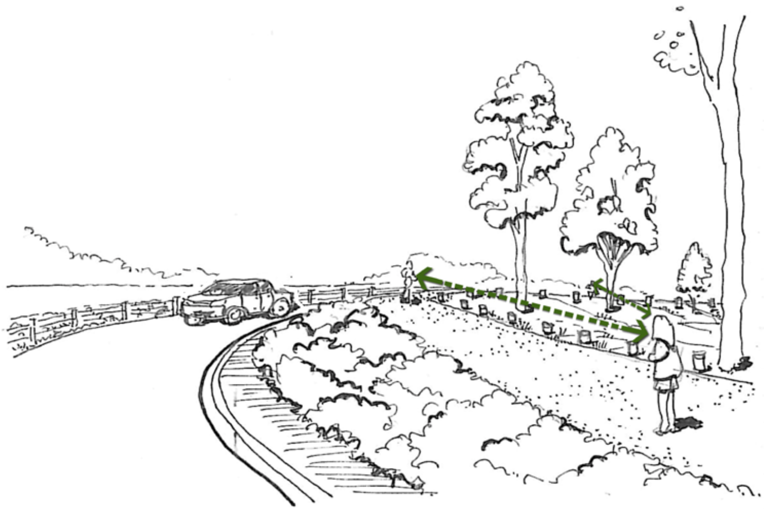

Figure C5-6: Improved surveillance through legible open design

Road landscape and urban design responses that support ***legibility*** are:

- spaces that are simple to navigate (Figure C5-7);
- boundaries are defined and functional use is easy to interpret;
- access to services (such as bus stops) that are both visible to users and in a logical position;
- building upon existing or creating new features that form landmarks, aid legibility and create space (Figure C5-8);
- clear entrances and exits which are easily identifiable both day and night; and
- clear signage identifying elements such as streets, and directions to services and/ or help areas.

Figure C5-7: Improved safety through legible design that is simple to navigate

Figure C5-8: Improved legibility through features that form landmarks

5.3.1.3 Territoriality

Territoriality is related to the instinctive desire to protect an area used or maintained by an individual and/or group. It relies on the principle of ownership in which individuals respond by protecting their territory. When designing and maintaining territorial spaces, it is necessary to balance unclear delineation between private and public space, with definite boundaries (Figure C5-9). This can be achieved by the use of both physical and visual boundaries.

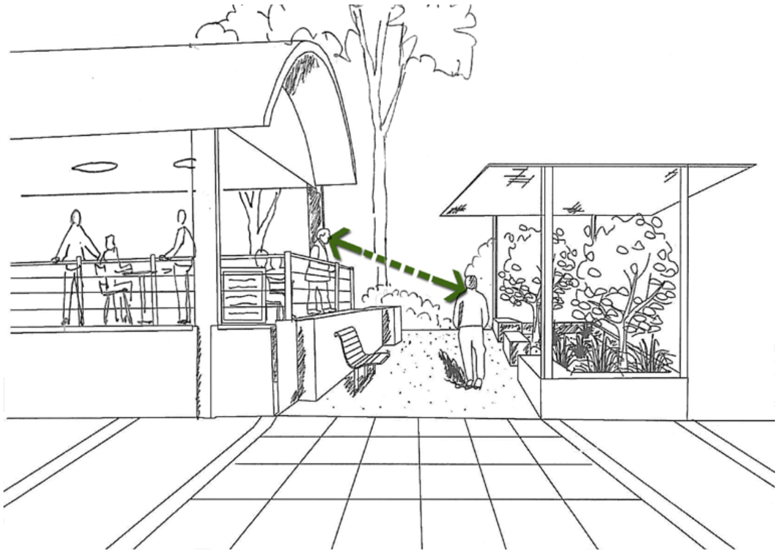

Figure C5-9: Improved safety through clearly defined private boundaries

Safety is improved by clearly defining boundaries between private, semi-private and public space. Ensure that security and natural surveillance into and out of a given area are maintained by defining of boundaries. Territoriality should be defined without significant compromise to surveillance opportunities. The need for surveillance must be balanced with territorial features in the design of the road landscape (Figure C5-10). Acknowledging the need for surveillance even in external private areas is important, particularly where they are physically accessible from publicly shared spaces.

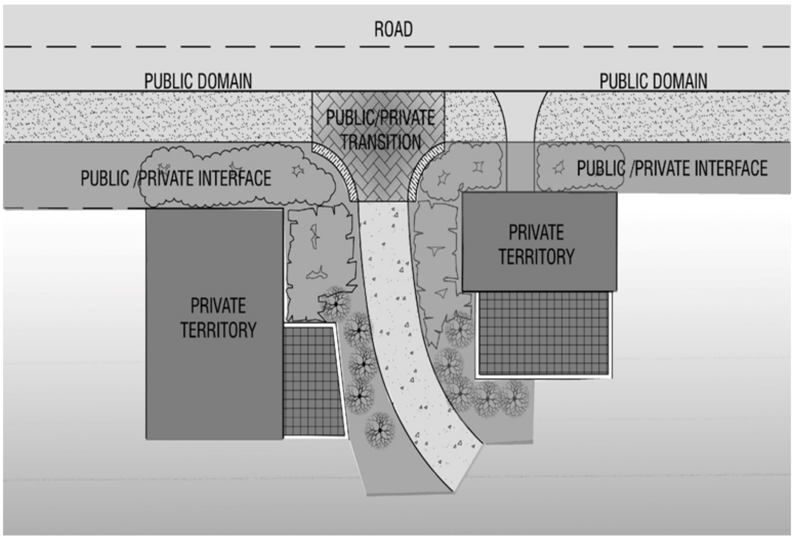

Figure C5-10: Improved safety through clearly defined territorial boundaries

Road landscape and urban design responses that support ***territoriality*** are:

- defining boundaries without using harsh devices such as walls, high fences and keep out signs; instead utilising subtle changes in paving, furniture and vegetation to delineate boundaries; and
- utilising design components such as changes in texture and material, planting, changes of level, artwork and signage to define public versus private spaces (Figures C5-11).

Figure C5-11: Territoriality reinforced through material selection

5.3.1.4 Ownership

A community's sense of ownership of an area enhances their response to criminal behaviour and increases the effectiveness of natural surveillance. Ownership increases the sense of respect for one's own property, reducing the incidence of crime. It also fosters pride in local surroundings, ensuring ongoing care and maintenance of the road landscape. A sense of community encourages individual ownership as well as shared responsibility for personal security. Urban design elements such as paving and retaining walls designed to reinforce community values and create a sense of place improves ownership of public spaces (Figure C5-12 and Figure C5-13).

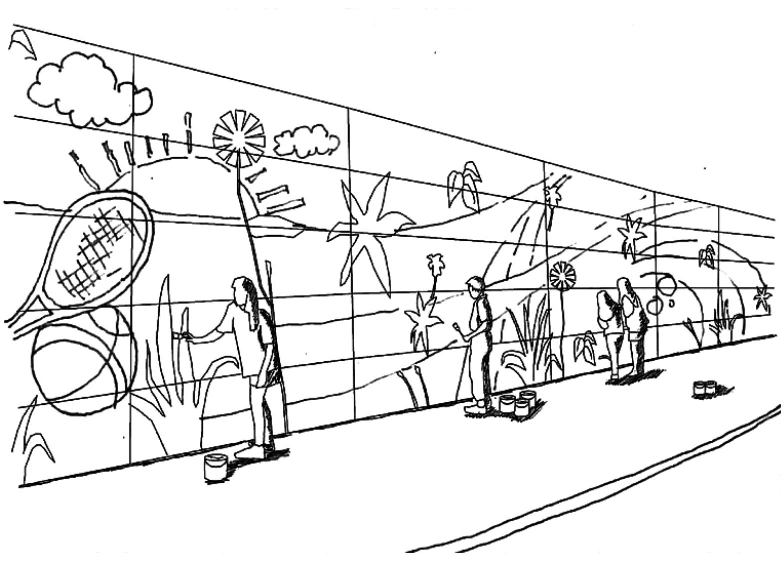

Figure C5-12: Improved ownership of public space through sensitive design

Road landscape and urban design responses that support ***ownership*** are:

- involving the community in decision making processes where proposed changes impact on their immediate surroundings;
- developing alliances with key agencies and stakeholders who have responsibility for the development and management of safety strategies and long term community ownership;
- recognising the needs, aspirations and cultural values of various groups within the community through consultation processes; and
- encouraging the involvement of the community in implementation of local enhancement works, particularly on sites or areas where a sense of pride, attachment and frequent use is present.

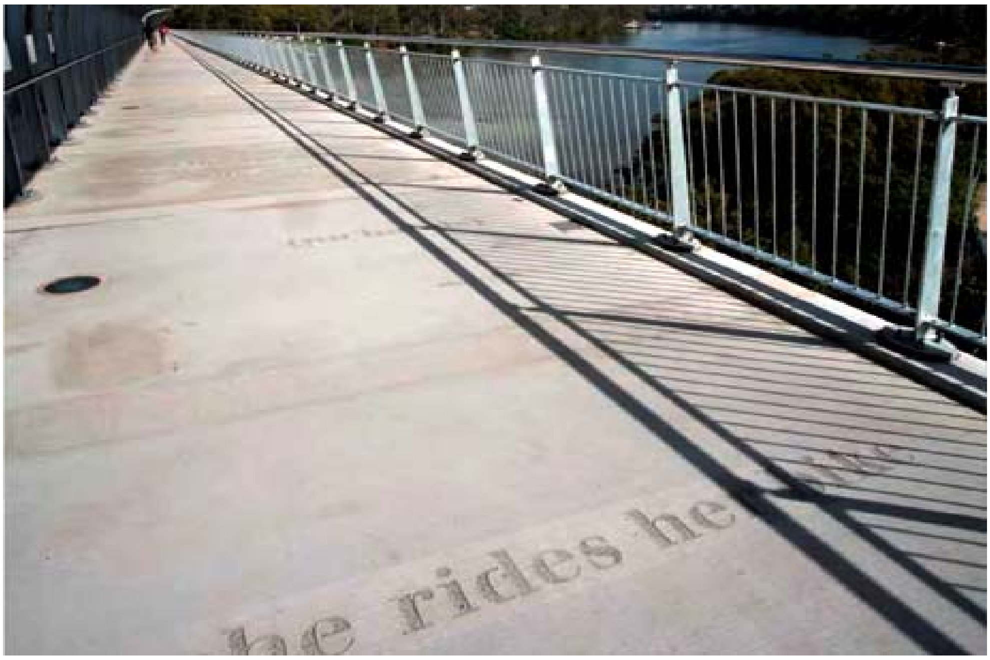

Figure C5-13: Improved ownership through subtle artwork

5.3.1.5 Management

Spaces need to be maintained; this inturn preserves the quality of its visual appearance and protect its legitimacy as a community area. Sound management principles contribute to economic sustainability, ensuring a space is used as intended. Well maintained spaces convey messages to potential offenders that the community cares about the image of the place. Routine maintenance and auditing systems need to be incorporated into the road corridor management practices.

Road landscapes must be designed to minimise undue maintenance and damage by vandals (Figure C5-14). The functional and aesthetic qualities that make the place attractive to the community should not be compromised. Routine maintenance practices and repairs are to be implemented to maintain the public amenity of places. A regular auditing scheme of CPTED issues should also be implemented.

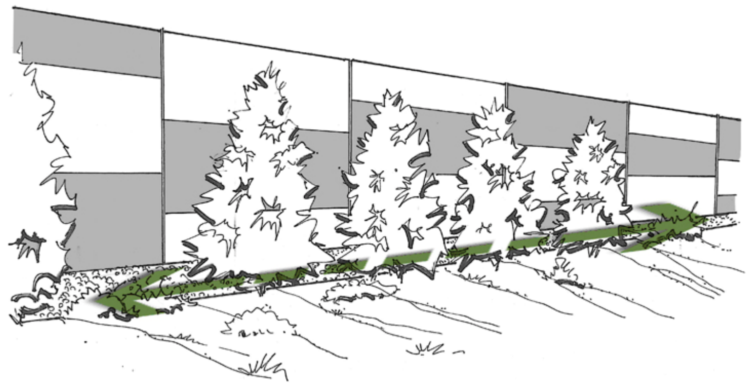

Figure C5-14: Strategic design that minimises maintenance management

Road landscape and urban design responses that support ***management*** are:

- using robust urban design fittings that are not easily removable, fragile or delicate (Figure C5-15);
- limiting graffiti opportunities through specifying resistant finishes, effective systems of quick replacement, cleaning and/ or repair;
- restricting vandalism through preventing access to susceptible areas; and
- implementing systems and procedures for regular long term maintenance and ongoing care of assets; not purely being the result of reactive responses to vandalism.

Figure C5-15: Maintenance management minimisation through robust material choice

5.3.1.6 Vulnerability

Poor spatial design can contribute to making public property and people more vulnerable to attack than others. Isolated places make people feel vulnerable. Maintaining visibility and access to other people in the immediate vicinity reduces the sense of vulnerability and improves safety (Figure C5-16). Designers must seek to reduce the potential vulnerability of a space at all times. The risk of assault is significantly reduced by providing well-lit, active and overlooked spaces. Reducing vulnerability through design should also be consistent with the differing uses and purpose of a place.

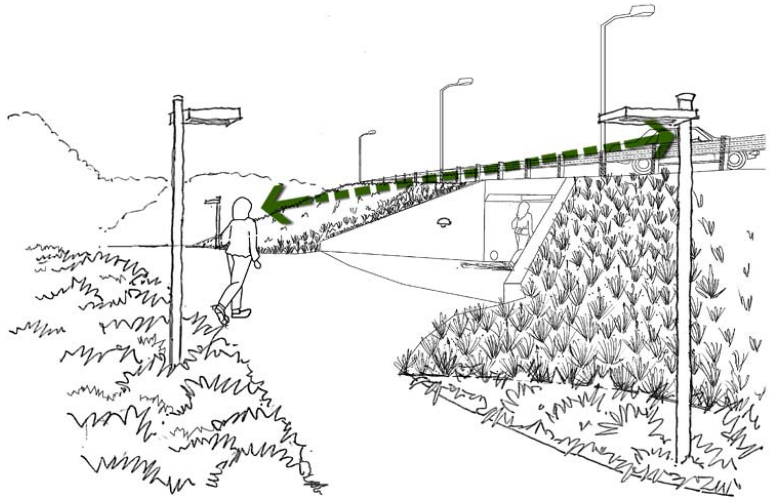

Figure C5-16: Improved safety through maintaining visual connections

Road landscape and urban design responses that addresses ***vulnerability*** are:

- eliminate personal harm by integrating throw screens; particularly on vehicular bridges and/or overpasses, and pedestrian/ cyclist footbridges to prevent objects being thrown onto the roadway;
- designing infrastructure components and spaces in a manner which avoids the creation of hidden places close to pedestrian and cycle travel routes, particularly at paths, blind spots or bends;
- improving urban design treatments to isolated and poorly lit places where movements and activities of people are easily predicted;
- improving the capacity for public response and access in highly concealed or entrapment areas;
- ensuring lighting is designed to improve visibility in spaces which have strong shadows and produce dark places;
- encouraging a mix of activities in a space;
- using visually permeable fencing and planting instead of walls and barriers, particularly in car parking and pedestrian facility situations;
- integrating pedestrian links with vehicular corridors wherever possible, ensuring pedestrian/cyclist bridges or tunnels allow adequate surveillance opportunities;
- limiting or preventing access to places that cannot be sufficiently monitored;
- providing design solutions that allow for increased surveillance (Figure C5-17);
- utilise materials that improve surveillance (Figure C5-18 and 19); and
- incorporating professional and/or mechanical surveillance systems in particularly vulnerable places.

Figure C5-17: Improved safety through designs that provide open areas that improve surveillance

Figure C5-18: Improved safety through careful design that improves surveillance

Figure C5-19: Improved safety through material selection

The Department's graffiti management policy should be referenced when implementing CPTED principles within the road landscape.

5.3.1.7 User Safety Perception

To maintain user perceptions of safety, openness versus enclosure must be balanced. Urban design detailing assists this perception when located close to pedestrian thoroughfares. Design features, particularly those that are relatively tall, solid and bulky can create a perception of enclosure. This can contribute to a sense of user discomfort and reduced perceptions of safety.

Selecting appropriate forms, colours and plant species relative to the overall profile of urban design components reduces user perceptions of enclosure. Reducing the perception of enclosure and scale can be achieved within the road landscape by implementing CPTED principles and appropriate design responses. This contributes toward visually permeable outcomes.

Using transparent urban design materials and plants with an open habit, or aesthetic detailing of bridge components are effective ways of improving user perceptions of safety.

The prospect and refuge theory is concerned with providing users views over the surrounding landscape, balanced with a degree of protection and enclosure. Applying this theory reduces a sense of exposure and safety fears. An example is on pedestrian footbridges, where views out from throw screens are optimised, yet perceived protection from potential attack is mitigated.

5.4 Road Safety and Landscape Design

5.4.1 Scope

The safety requirements for road landscape are unique to other elements within the road network, as the landscape construction medium is dynamic; it changes over time, due to natural forces or human intervention. It is for this reason, that whilst safety requirements for landscape works are calculated using the applications applied to civil design, the outcomes are specific to the landscape medium. For each new road scheme the safety requirements will be calculated by other disciplines (usually a civil designer), but it is the responsibility of the landscape designer to ensure landscape treatments do not impede or obstruct these safety requirements. The civil designer shall provide certification that the landscape design is compliant with relevant safety parameters.

5.4.2 Safety Analysis Process

The landscape designer must follow this safety analysis process. This process outlines the steps to assessing safety criteria. Each step refers to relevant sections within the manual which instruct the designer on the application and requirements of each criteria.

It is the intent of this section to provide a summary only of the relevant road safety design criteria that need to be determined, addressed and applied in road landscape design. For determining distances and offsets for road safety, designers are to refer to the Departments *Road Planning and Design Manual*.

Road project assessment: collates site specific information for the project.

- Clear zone: calculates clear zone requirements for all road types.
- Sight distance: calculates the requirements for all potential points of conflict.
- Clearance to other elements: calculates the vertical and horizontal clearances to all other elements.
- Pedestrian and cyclist safety: check and ensure landscape treatments comply with pedestrian and cyclist setback requirements.
- Functional planting for safety: consider landscape treatments are designed to assist in providing for a safe functioning road network.
- Maintenance: confirm landscape treatments are designed to satisfy road safety requirements without the use of maintenance.

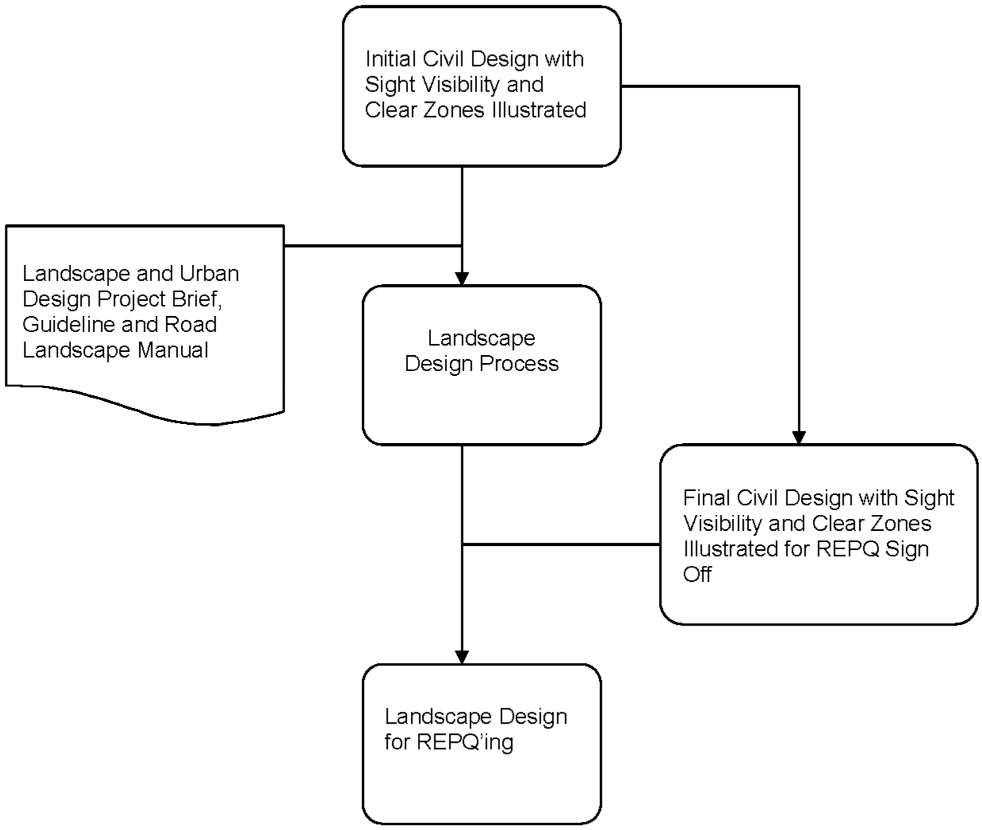

Figure C5-20: Safety analysis responsibilities

5.5 Road Project Assessment

Safety requirements are particular to each unique section of road. They are based on specific features within that section of road. In order to calculate safety requirements, an assessment of each proposed road project must be conducted to determine these features.

The road design information required on all road projects may include but not limited to:

- formation of the road; including details of median strips, interchanges, intersections, roundabouts;
- levels of service, including number of lanes and road users along this road section;
- design speeds of the major road/s, and all minor roads leading into junctions including the design speed on circulating carriageways and entry curves at roundabouts);
- traffic volumes, average annual daily traffic;
- road geometry, batter grades and configuration;
- road alignment, vertical and horizontal curvature of the road including curve radius, including sight triangles at intersection/conflict points;
- line markings, delineating lane lines, holding lines, stopping lines and turning lines;
- traffic signalisation and operational signage; and
- safety barriers and fencing.

Depending on the road project, the road design information should be requested from/ provided by the civil designer or the project manager. All detailed information must be supplied at the detailed design phase.

5.6 Clear Zone

The clear zone is a width (Figures C5-21 and C5-22) measured perpendicular to the road from the edge of the outside carriageway lane. It varies depending on several factors noted in the Road Planning Design Manual. It functions to provide space for the driver of an errant vehicle to regain control, while sustaining minimum damage to the vehicle and its occupants.

5.6.1 Landscape Requirements of Clear Zones

Clear zones shall be free of non-frangible objects, to minimise damage to errant vehicles and the occupants.

A non frangible object is a fixed rigid object which on impact does not breakaway or apart.

Landscape works occurring within clear zone areas are subject to restrictions on the types of treatments that can be applied to prevent landscape works becoming fixed roadside hazards. These restrictions also apply to medians and splitter islands due to their proximity to the carriageway which are subject to clear zone requirements. Clear zones should:

- be kept free of all large, fixed (non-frangible) landscape structures such as rigid support posts, street furniture, fencing and retaining walls;
- containing any tree and shrub planting having a maximum mature trunk diameter of 70-100 mm. (Frangible species are often formed by plants with slender stems, which give way, break or uproot on impact);
- maintain the above standards even if the landscape treatment is to be accomplished by seeding; and
- be applied to the deflection zone of safety barriers.

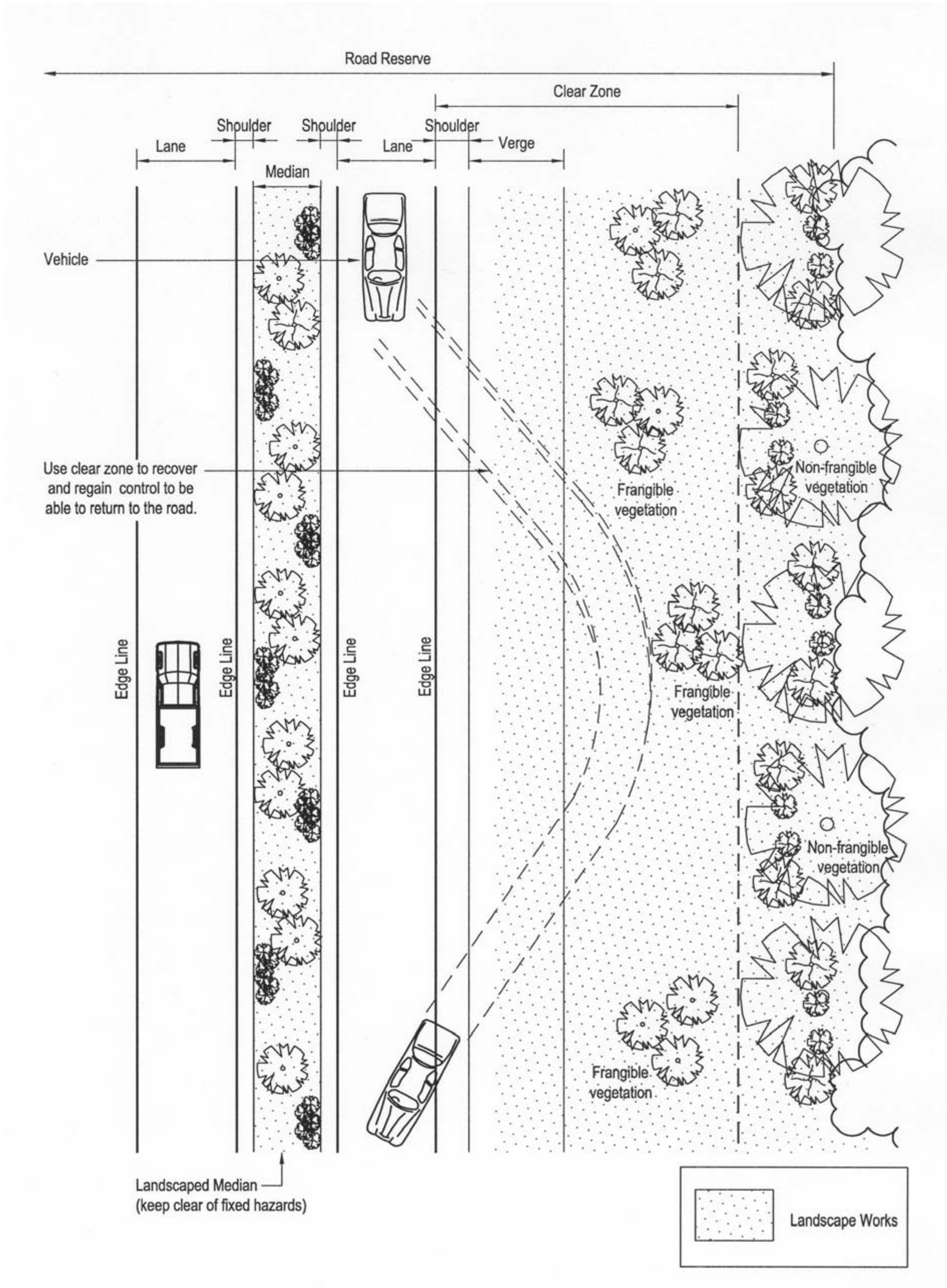

Figure C5-21: Clear Zone –Illustrative Plan

Source: Main Roads 2006

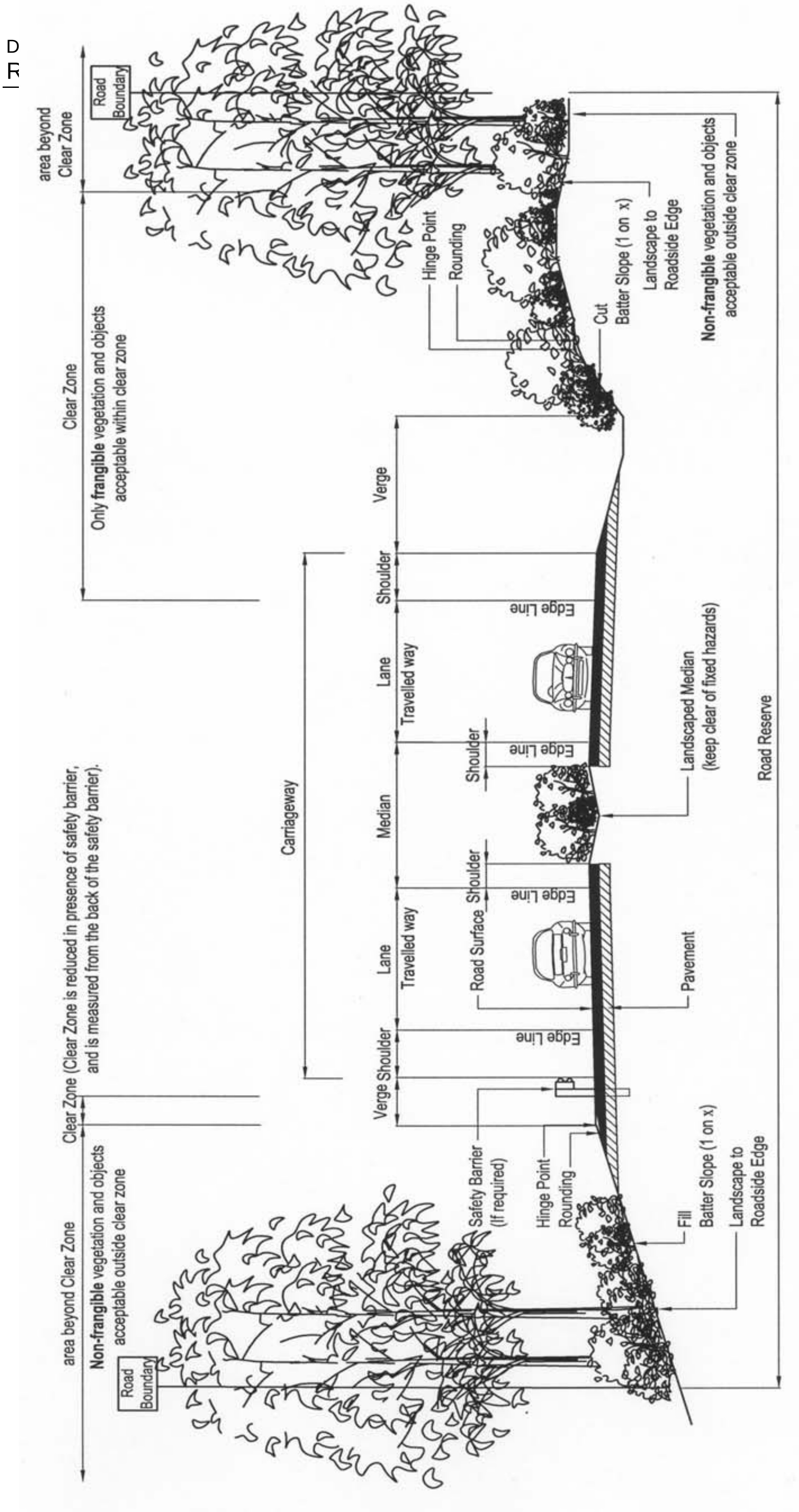

Figure C5-22: Clear Zone – Section

Source: Main Roads 2006

Where a stand of natural vegetation exists with high public amenity, environmental and cultural values *"which may preclude its removal or modification to fit within the clear zone requirements, then it should be treated like any other obstruction that cannot be reasonably removed and provided with a protective safety barrier. Such a decision should only be made after due consideration to the probability of accidents and likely costs".* (National Association of Australian State Road Authorities, 1984:18).

5.6.2 Calculating Clear Zones

To calculate clear zone(s) for a proposed road section refer to the Departments *Road Planning and Design Manual*.

The setbacks for non-frangible landscape works are significantly reduced when a safety barrier system is installed. Further guidance on the minimum setbacks for barrier systems is provided in the Road Planning and Design Manual.

5.6.3 Complex Clear Zones

Clear zones apply to all road sections, including the junctions of these roads or when site conditions are outside the parameters shown in the graphs and tables within the Road Planning and Design Manual. Where clear zones intersect, overlap or join each other, the clear zones simply join. Calculation of these complex clear zones is clarified below:

5.6.3.1 Intersection clear zones

Clear zones are calculated according to the design speed of each leg (road) involved in the intersection. At the intersection of these roads, clear zones (Figure C5-23) will also intersect to form an enclosed area, which is subject to the clear zone requirements. In the case of a tapered lane, the clear zone is determined by the design speed of the through road.

5.6.3.2 Interchange Clear Zones

Clear zones are calculated according to the speed environment of each through road (Figure C5-24), on-ramp and off-ramp as though they were stand alone roads.

5.6.3.3 Roundabout clear zones

Clear zones are calculated according to the design speed of each leg (road) entering the roundabout (Figure C5-25). Where these roads connect at the roundabout the clear zones will also intersect to form an enclosed area which is subject to clear zone requirements. Clear zones are also calculated for the central island using the design speed for the circulating carriageway. Clear zones are highly critical at roundabouts due to the increased number of single vehicle accident rates caused by *"a number of relatively small radius horizontal curves"* (Main Roads, (QLD) 2006:14-49).

5.6.3.4 Clear zones where site–specific features are outside typical parameters

Site-specific data such as the slope of the batter being steeper than 1:3 or the design speed greater than 100km/hr may be outside the typical parameters used to calculate the clear zone.

5.6.3.5 Other rigid objects in the clear zone

Regardless of the existence of other non-frangible objects within the clear zone (such as a power pole), the landscape designer has a duty of care to ensure that the outcomes of landscape treatments do not increase the potential of hazardous objects within the required area.

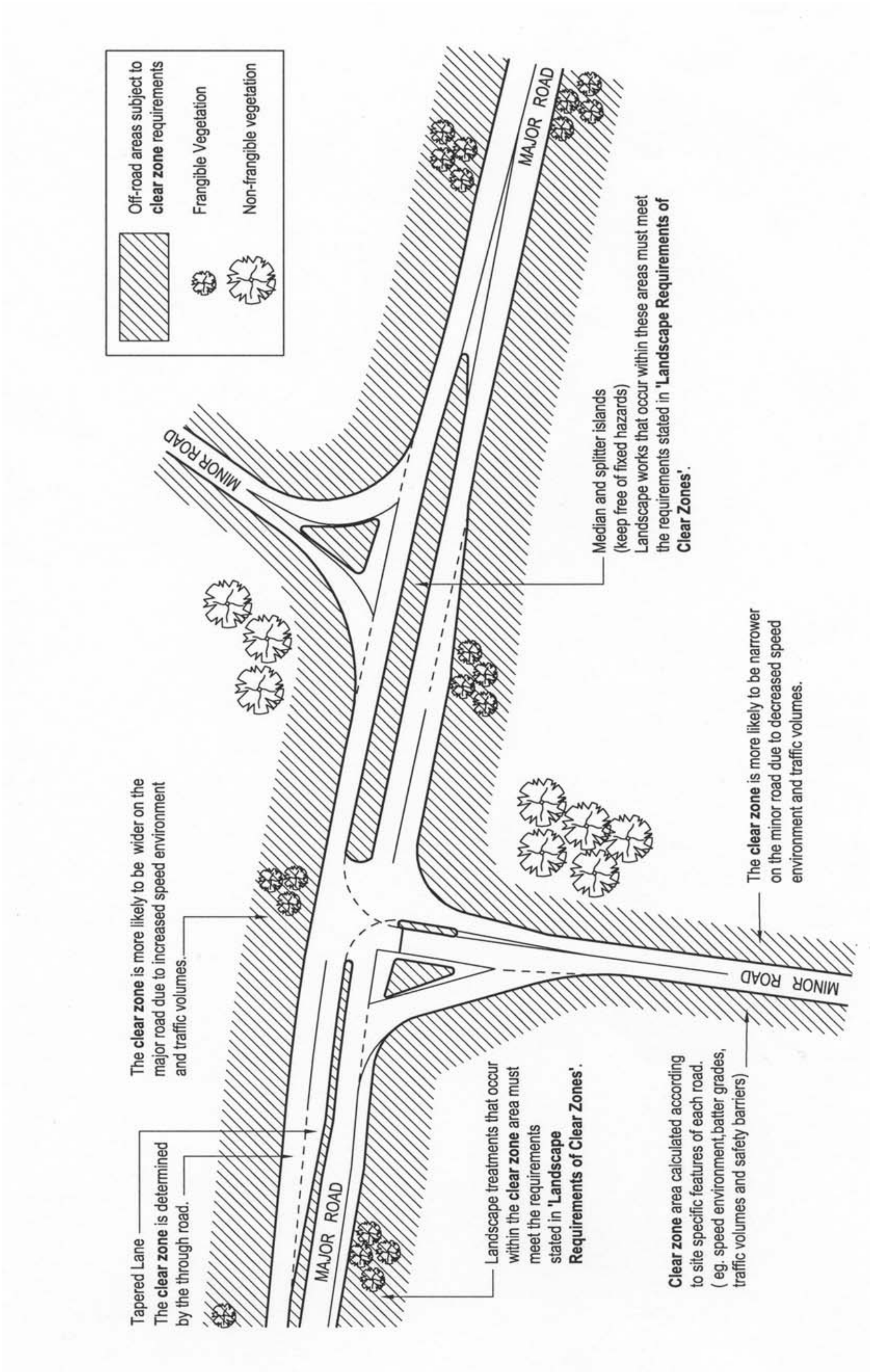

Figure C5-23: Off-road areas subject to clear zone requirements at an intersection – Plan

Source: Main Roads 2006

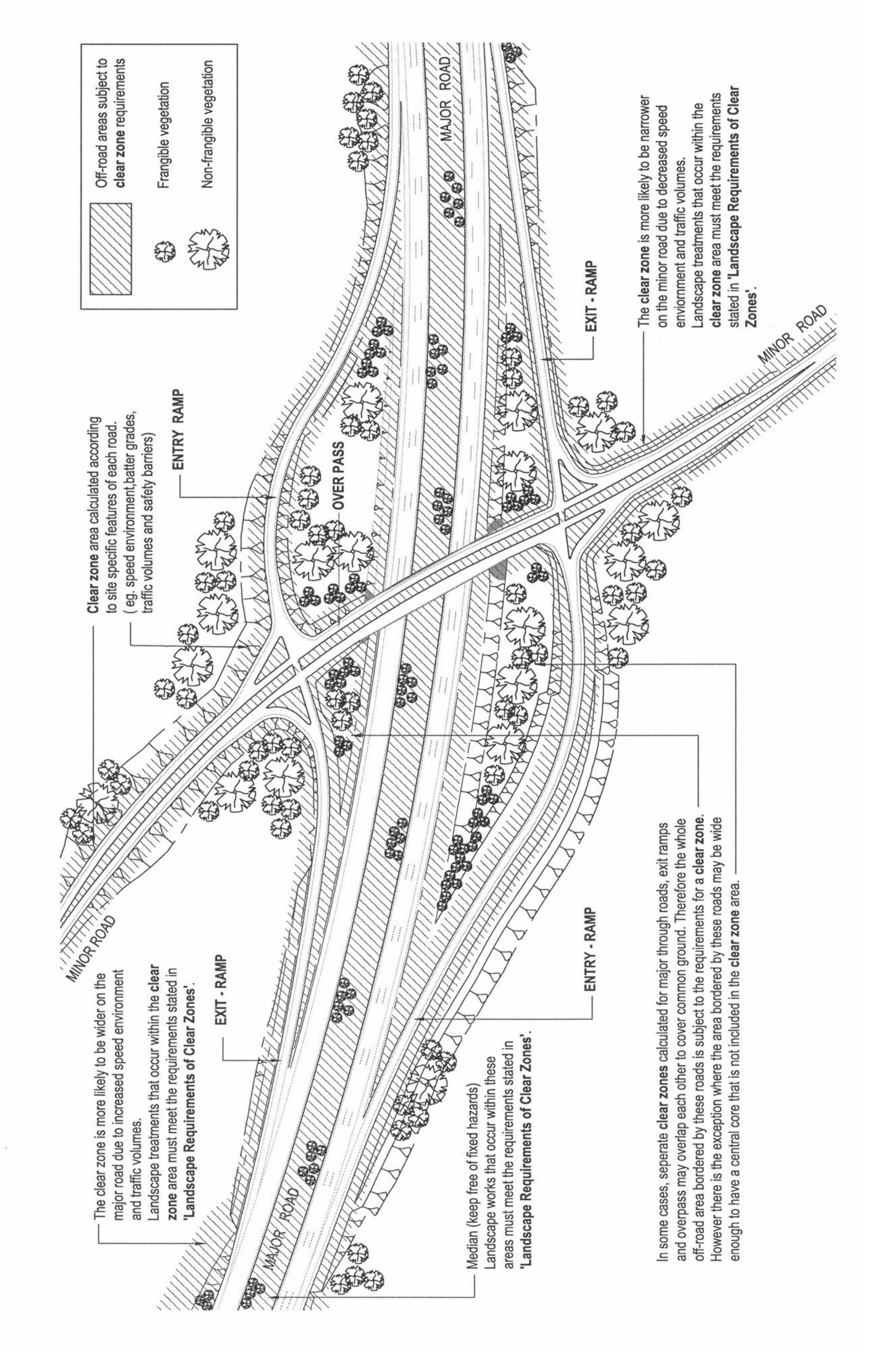

Figure C5-24: Off-road areas subject to clear zone requirements at an interchange – Plan

Source: Main Roads 2006

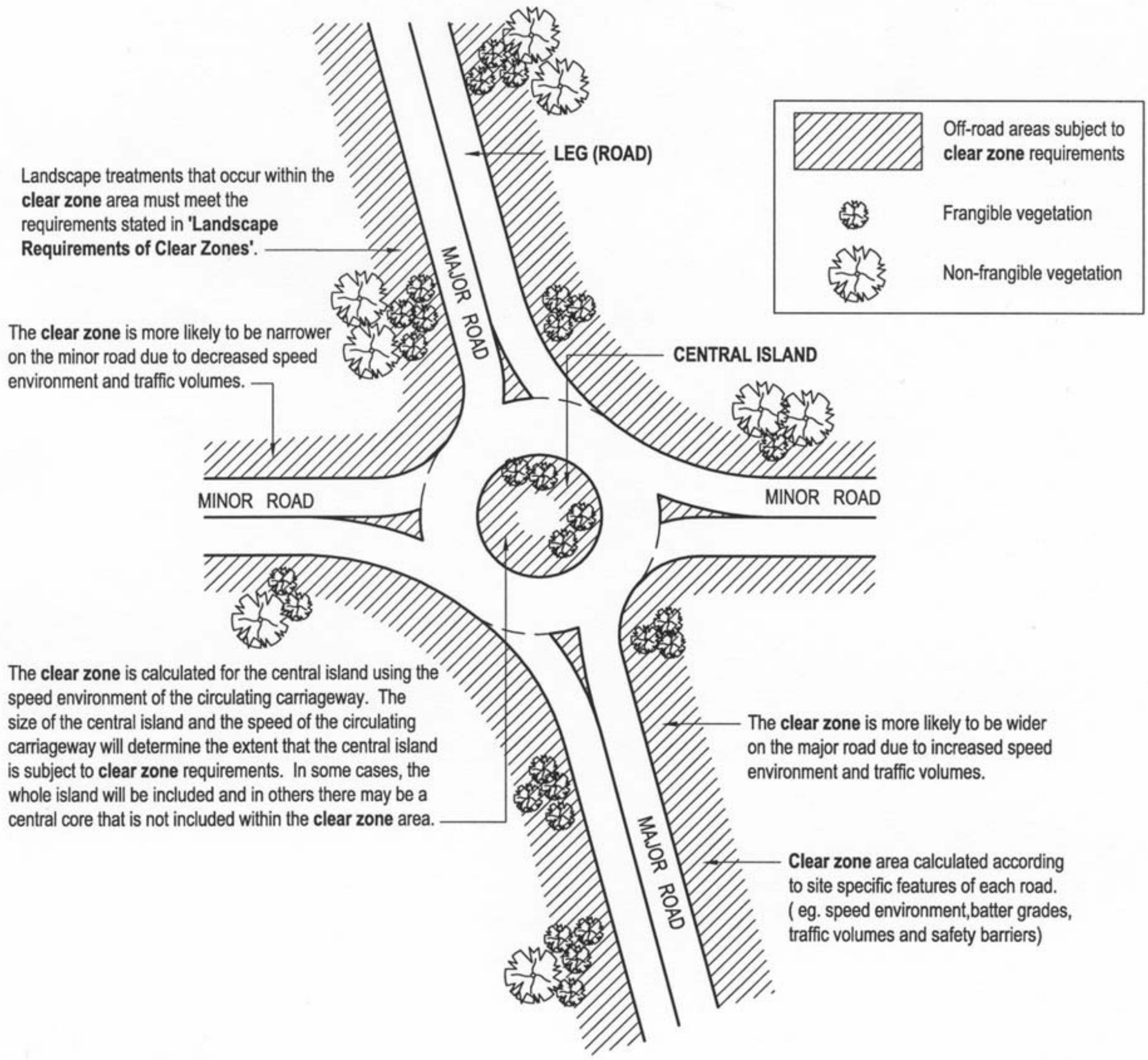

Figure C5-25: Off-road areas subject to clear zone requirements at a roundabout – Plan

Source: Main Roads 2006

5.7 Sight Distance

Sight Distance is the broad term given to all sight related safety issues in road design. *"Sufficient sight distance must be provided to enable drivers to control their vehicles to avoid collisions with other vehicles or objects on the road"* (Main Roads, (QLD) 2002:9.1). The landscape component can be both a vertical and horizontal element within the road corridor and can therefore have a significant impact on sight visibility.

The landscape requirements within sight distance zones (sight triangles) can only be achieved through an understanding of the safety requirements discussed in this section.

5.7.1 Landscape Requirements of Sight Distance

The sight distance triangle should have clear sight visibility across the entire triangle, both horizontally and vertically to allow time for a driver to assess, negotiate, manoeuvre and/or stop to avoid points of conflict with other vehicles or objects.

The landscape works which occur within the sight distance triangle are subject to restrictions. This is to ensure treatments do not obstruct sight visibility.

Landscape requirements within sight distance triangles include:

- landscape treatments and structures should not obstruct any sight line within a sight triangle that is required by for any vehicle or pedestrian moving along a designated pathway of the road network;
- plantings in these zones should provide a clear visibility both horizontally and vertically when the eye height and the target height are considered. This means that proposed mature plantings and landform combination heights should be at least 100mm outside the vertical limits of the sight triangle;
- plant species should be selected and located for their mature growth form and size;
- for sag vertical curves, care should be taken to ensure that canopies of trees planted in the roadside embankment do not block the line of sight . (Figure C5-26);
- in the case of horizontal curves, ensure that a clear line of sight is maintained across the landscape works proposed on the embankment of the roadway; and
- in some cases it is deemed acceptable to allow momentary sightline obstructions of narrow vertical elements such as poles or clear tree trunks within or on the border of a sight distance area. However attention should be paid to the accumulated affect of these elements, as they may form a wall or blind spot for the driver.

5.7.2 Calculating Sight Distance

The sight distance requirements for each design component of the road section (i.e. major road, minor road, intersections, roundabouts, and interchanges) should all be determined and assessed in combination, in accordance with the Departments *Road Planning and Design Manual* by the Civil Designer. The resultant sight triangles for all components of the road section should then be adopted as the basis of the landscape design.

5.7.3 Sight Lines and Road Alignment

The road alignment can restrict sight visibility. *"Restrictions to visibility may occur on vertical curves and on horizontal curves"* to roadways (Main Roads (QLD), 2002:9.2). There are two types of restrictions on the road alignment that landscape works could potentially obstruct; sag vertical curves and horizontal curves

Sag Vertical Curve Restrictions

Visibility may be restricted on sag vertical curves due to an overhead obstruction. *"Care should be taken in the design of landscaping in these circumstances to avoid the creation of a vegetation canopy that restricts sight distance in a similar way to overhead bridges"* (Main Roads (QLD), 2002:9.2.2). This situation is most likely to occur on narrower roadways (single or double carriageways) or where there is design intent to create an effect of tree canopies overhanging the road (Figure C5-26).

Horizontal Curve Restrictions – *"visibility may be restricted on horizontal curves due to an obstruction on the inner side of the curve"* (Main Roads (QLD), 2002:9.2.3), (Figure C5-27).

Horizontal curve sightlines are most likely to affect the landscape treatment, as the clear line of sight required is directly across the embankment of the roadway; the area where landscape treatment is typically applied. In some instances, *"the cut batter in this location can be the obstruction and alternatives such as benching, or a larger curve radius, may have to be applied by the civil designer"* (Main Roads (QLD), 2002:9-5).

The vertical sight line must be considered in combination with the horizontal sight line.

In the case where the intersection is signalised, the sight distance requirements for landscape works should still be achieved to cater for safe conditions when traffic signals are not functioning. However when intersections are signalised there are additional stopping sight distances to consider, such as a clear line of sight to the traffic signal lanterns and the rear end of a vehicle at the back of a queue of stopped vehicles. For more information refer to the Departments *Road Planning and Design Manual*.

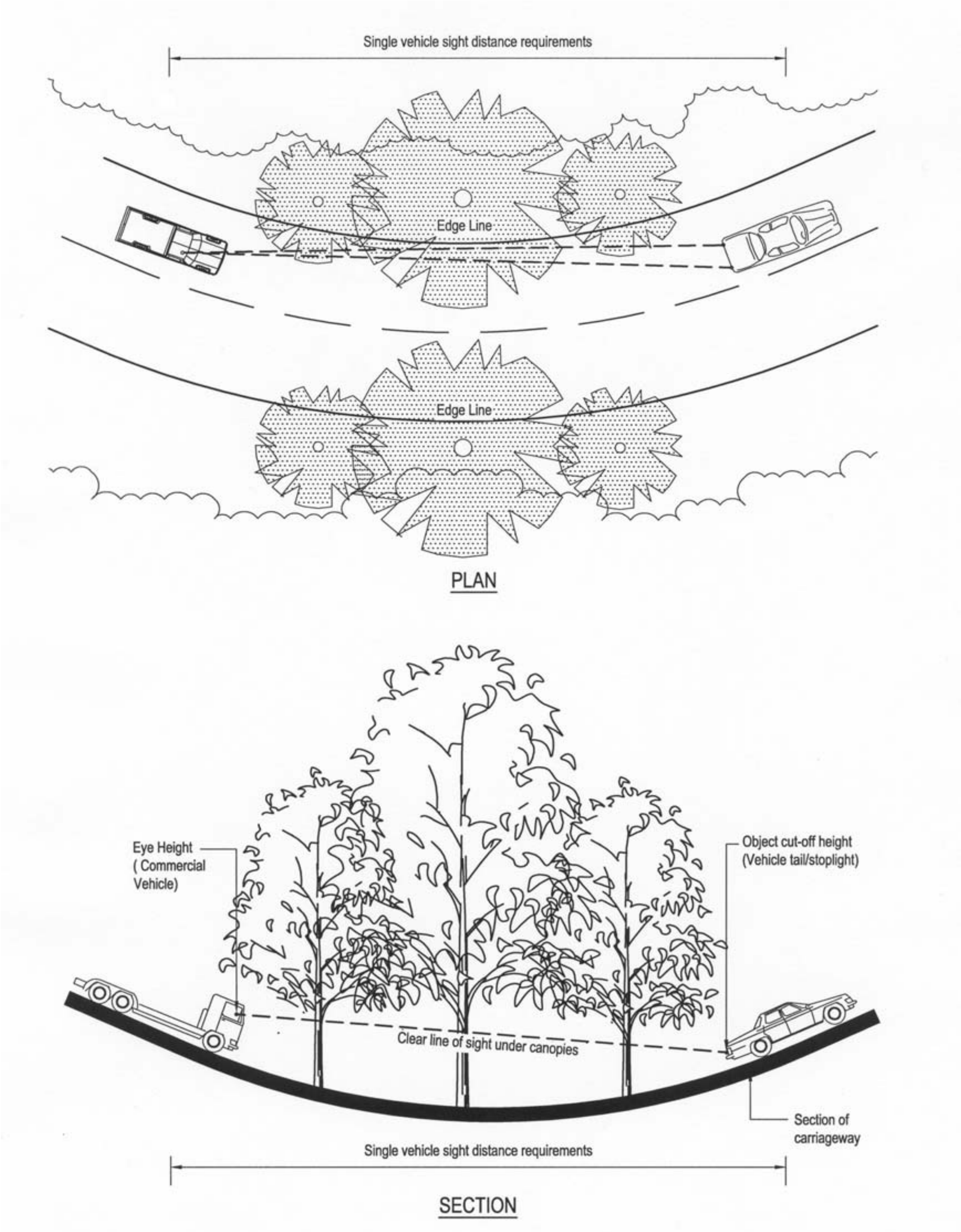

Figure C5-26: Sag vertical curve restrictions on landscape treatments to sight distance

Source: Information in Figure adapted from (Main Roads (QLD), 2002: Figure 9.2)

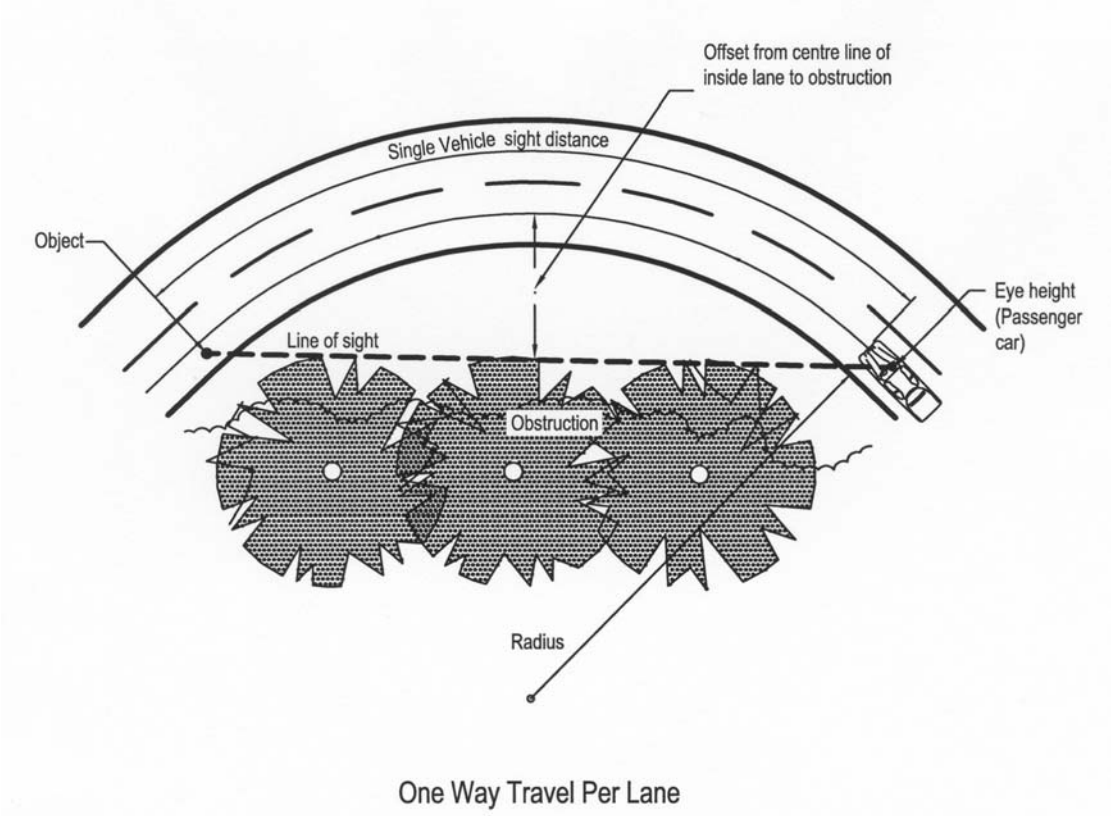

Figure C5-27: Horizontal curve restrictions to sight distance – Plan

Source: Information in Figure adapted from (Main Roads (QLD), 2002: Figure 9.3)

The difference between sight distance requirements for interchanges will be created by the overpass/underpass grade separation of two or more roads. All vertical landscape elements must be considered for roads that make up the interchange. For example, tree canopies that may not have affected the sight visibility at road level may affect an overpass that is above this road.

5.7.4 Sight Lines and Road Signage

Vegetation within the sight line triangle to operational signage shall have a mature height no higher than 500mm below the base of the sign (Figure C5-28).

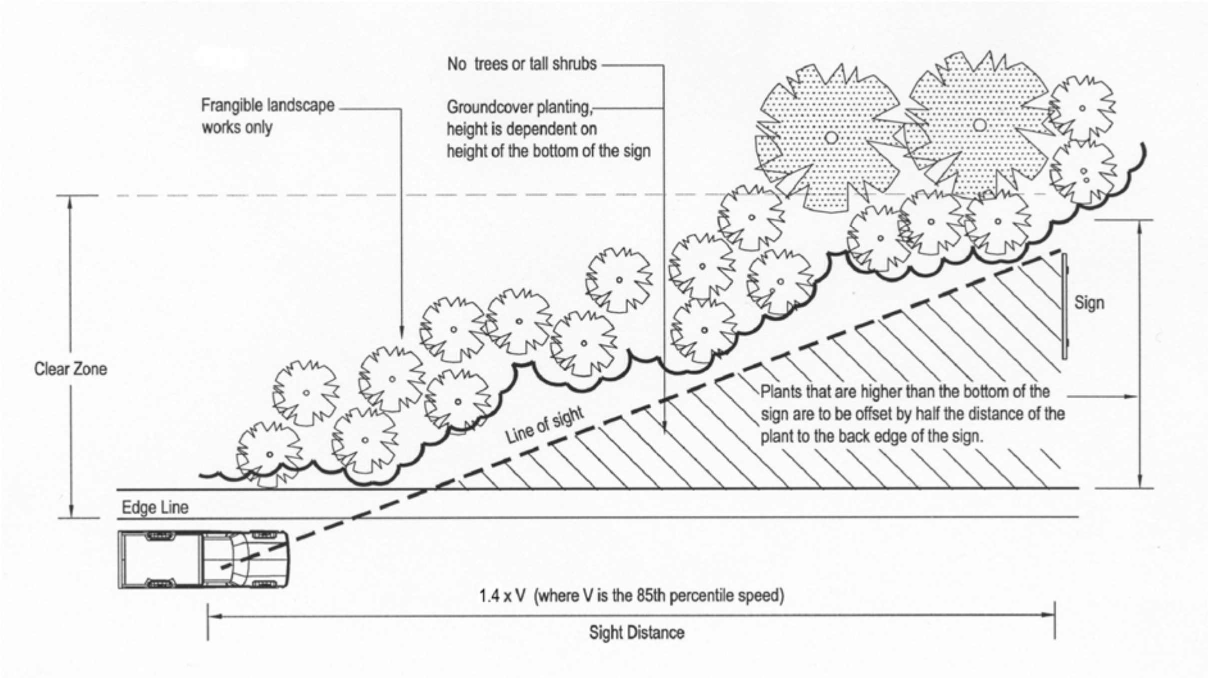

Figure C5-28: Restrictions on planting to allow sight distance to signage – Plan

Source: Information in figure referenced from (RCA, 1987: Technical Bulletin No. 36)

5.8 Vegetation Setbacks and Clearances

In addition to the safety requirements of clear zones and sight distance there are other setbacks and clearances (Appendix 4) to road landscape design components and other road elements that vegetation must comply with to ensure the safety of all users of the road network.

5.9 Pedestrian and Cyclist Safety

Areas and facilities that are developed for pedestrian and cyclist use must also comply with certain design standards so as to assist in the provision and maintenance of a safe road network. These facilities include:

- pedestrian footpaths;
- bicycle paths;
- footbridges and underpasses;
- pedestrian crossings, medians and refuges; and
- rest areas and off-road viewing locations.

The locations and design aspects of pedestrian and cyclist facilities within the road reserve must be developed by the civil designer. However, as with road safety requirements, the landscape designer must ensure that landscape treatments do not impede safety, and where possible, further promote the safety of all users.

The safety considerations and requirements for landscape works associated with pedestrians and cyclists facilities within the road reserve are listed below. For more information refer to the Departments *Road Planning and Design Manual.*

5.9.1 Clearances

Proposed landscape treatments must not impede the required horizontal and vertical clearances for pedestrian and cyclist facilities.

- **Horizontal clearances**
  No vegetation should hinder access and manoeuvrability of users by growing over or encroaching onto pathways. Refer to *the* Departments *Road Planning and Design Manual* for footpaths and cycle path horizontal width and clearance requirements.

- **Vertical clearances**
  No vegetation such as tree canopies and limbs, or landscape structures, should overhang pathways within the specified vertical clearances. For the specified vertical clearances on footpaths, cycle and shared paths, refer to the Departments *Road Planning and Design Manual.*

5.9.2 Sight Distance and Visibility

Landscape treatments such as vegetation, fencing or bollards shall not obstruct the motorist's sight lines and distance requirements to users of pedestrian and cyclist facilities, this includes:

- pedestrian refuges, medians and crossings, and
- junctions of footpaths, cycle paths, underpasses, and overpasses with the road.

Landscape treatments must not obstruct the pedestrian/ cyclist's line of sight and visibility providing and encouraging safety when using these facilities.

- Landscape works shall not block users/cyclists ability to see other users on the facility, allowing enough time for the user to stop or manoeuvre around an obstruction to prevent a collision. (Refer to the Departments *Road Planning and Design Manual*)

- Vegetation adjacent to facilities should be kept at a low height to allow visibility to and on facilities in order to:
  - provide a clear line of sight to signage which might warn users of changes ahead,
  - ensure lighting is not obstructed or creating shadows with the potential for hidden areas for undesirable activities, and
  - provide a perceived sense of safety and deter undesirable activities through encouraged viewer exposure.

5.10 Plant Selection

For planting in areas of high public exposure "*care must be taken to select species that are not poisonous to humans and animals and do not have thorns"* or drop fruit and seeds or large quantities of flowers or leaves (slip risk), (California Transport, 2001:900-5).

5.11 Functional Use of Planting for Safety Factors

Landscape planting can be used to actively enhance safety objectives. Plant species selection must be based upon that species ability to achieve a specific design function.

5.11.1 Headlight Screen Planting

Planting can be an effective method to screen headlight glare from oncoming traffic, benefiting drivers and adjacent properties. The most common and effective application is to the medium strips of dual carriageways, rural roads, roads adjoining railways lines, service roads and on horizontal curves (Figure C5-29). Dense shrubs and groundcovers with foliage to ground level are effective in preventing headlight glare.

5.11.2 Buffer Planting

Planting can be used as a safety buffer zone for "errant vehicles by cushioning the impact of the vehicle before it collides with more hazardous objects or other vehicles" (Grieves and Lloyd, 1984:98). Dense shrubs with trunks less than 70-100mm thick branches would best achieve this function.

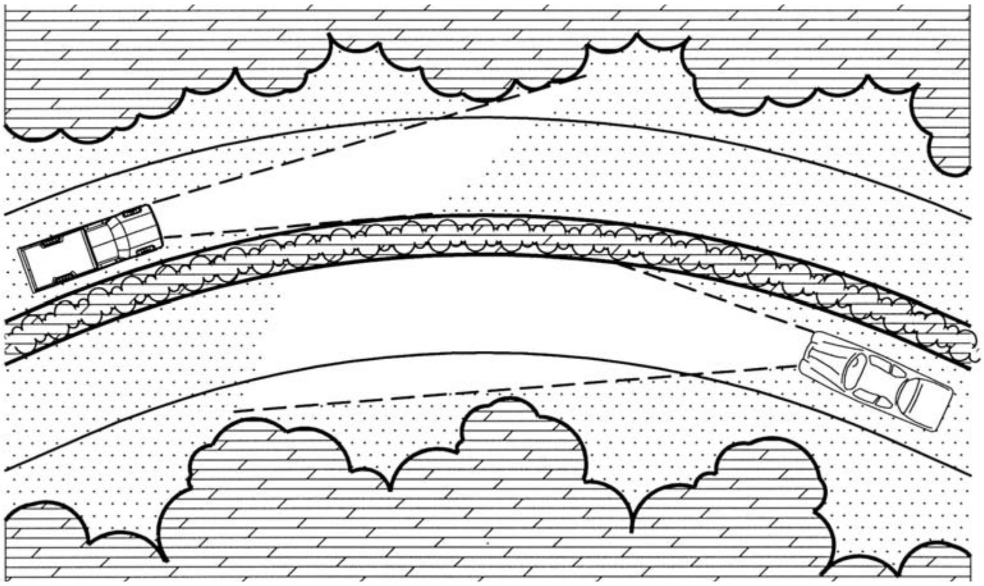

Figure C5-29: Median planting for headlight screening

Source: EDAW Pty Ltd

5.11.3 Visual Screening

Planting can be used to screen undesirable views both to and from the road, depending on the function required. It can prevent drivers from being distracted or be used to reduce driver monotony along stretches of road that do not call for changes of eye focus.

5.11.4 Public Amenity

The provision of public amenity can increase real and perceived safety within the road corridor. Landscape and urban design treatments are primary contributors to the creation of a sense of community and ownership that leads to safety improvements, as detailed in **'Crime Prevention Through Environmental Design (CPTED)'** Section.

5.11.5 Visual Guidance Planting

The road landscape can assist with the visual guidance of the driver *"when they are unfamiliar with the route or the visibility is affected (for example, through rain or heavy shadows)"* (Spooner, 1969:141). Planting can be used to exaggerate or provide these visual cues by:

- *"providing a visual backdrop against which the roadway can more easily be seen;*
- *highlighting an obstruction ahead such as a traffic island, or diverging roadway;*
- *screening disruptive features and views";*

- consistent use of contrasting planting at critical features in the road, such as intersections or roundabouts, to alert the driver of a change of movement;
- contrasting vegetation types, forms, textures and/or colours to help increase driver recognition of road delineation, such as the central island of a roundabout having vegetation that contrasts with the surrounding features;
- using plants, particularly shrubs, on the outside of curves to indicate and provide guidance to the change in alignment of the roadway. This is particularly effective on crests (Figure C5-30); and
- *"spacing of individual trees so that the successive interval between these vertical elements is indicative of the curved radius of the roadway"* (Department of Transport and Works - NT, 1988:68).

No indication of direction or alignment beyond crest of road

Tree planting used to provide indication of alignment beyond crest

Figure C5-30: Visual guidance through planting

Source: Queensland Transport, 1993

5.11.6 User Perceptions of Speed

Trees and other types of planting can play a significant role in safety and traffic management. They contribute towards producing more positive and safer driver behaviour and increasing user perceptions of speed. Current research has also found that *"green roads compared to roads with no greening can assist in mitigating daily stress levels of drivers and their attitude to other drivers"* (Roads and Traffic Authority - NSW ii), 2009:p14).

Appropriate design, placement and spacing between trees and other types of planting within the road landscape, can assist in modifying driver speed; particularly when transitioning to a lower design speed. When trees are spaced in specific arrangements; such as planting trees increasingly closer together on the approach to a lower design speed, this can reduce driver speed through the perceptions created of travelling at a higher speed than actually occurring.

<u>Transitioning to a different operating speed</u>

The design of the road landscape can be useful in visually highlighting a change in the operating speed. It can also accentuate the progression to and transition from a higher operating speed to lower operating speed road section. Distinguishing the speed progression and transition visually warns users well ahead of arrival what is beyond. It allows users to adjust from one situation or experience (such as a higher design speed section) to another (lower design speed section). The road landscape can be used to subtly signal speed progression and transition zones; enhancing user perceptions of an impending slow down point.

Planting design can be an effective visual indicator to control speed and improve safety. Varying plant spacing at set intervals can form a distinct pattern highlighting transitions and accentuating changes ahead in the road environment.

Methods and the means to warn travellers of approaching speed changes through road landscape design include:

- implementing a more ordered and formal planting approach at transitional locations, through changing planting arrangements, layouts, configuration or structure (Figure C5-31);

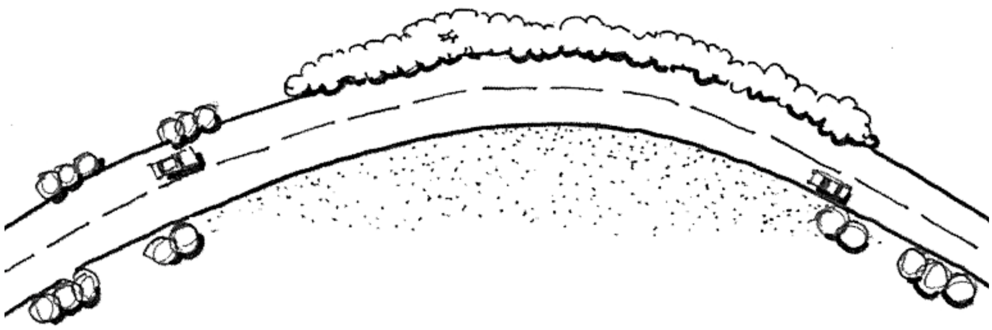

Figure C5-31: Changing planting structure form and species can influence driver behaviour

- changing the overall structural form and layering of the plant species selected for the planting palette (for example, size, scale and height);
- modifying the overall plant theme for the corridor or creating a subtle graduation of the theme (for example, changing from a native informal theme to native formal);
- imposing a direct visual response in the traveller in transition areas by providing breaks in continuity of planting;
- using visual channelling to create a greater sense of enclosure at transitions to low speed areas by framing the roadway with tree species (where frangibility not an issue) or larger shrub species; alerting drivers of upcoming slow speeds, then opening up again (through use of open, low planting) beyond the lower operating speed area, to indicate the higher operating speed transition;
- creating subtle visual differences, which still unite with the landscape theming of corridor through incorporating changes to boundaries/ edge treatments, designing the arrangement of edges to be visually stimulating, attract interest, attention and awareness by the user;
- creating a sequenced build up to a slow point through changing the perceived density or increasing the actual density of planting by using clustered planting arrangements rather than more open scatterings of plants (Figure C5-32);
- differentiating slow down points with visual cues to provide a sense of arrival through changing texture, colour and shapes of plant species; and
- defining slow points with markers, entrance statements and landmarks through using legible tree species (where frangibility is not an issue) as highlights to these markers/ landmarks to gateways.

Figure C5-32: Legible planting layouts can indicate a transition into a slower speed environment

Employing the concepts of the design principle legibility in planting design and planting layouts can also indicate a progression to lower speed areas. Legibility can improve awareness of speed transitions in road users; whilst also assisting in wayfinding. Visual cues within the road landscape heighten user perceptions and provide reinforcement of the behaviours required at transitional and slow down areas.

Some of the concepts of legibility which can be applied at transitional areas within the road landscape are:

- providing distinguished changes in planting layout (for example, distinct patterning or planting compositions with a clear, identifiable and obvious change in arrangement); promoting user comprehension of a transition in operating speed;
- providing unique points of reference for users through the use of clear and recognisable symbols (for example, incorporating symbolic devices such as local signature tree species); and
- providing node like planting arrangements (Figure C5-33), which acts as a focus point for travellers; notifying of slower speeds required.

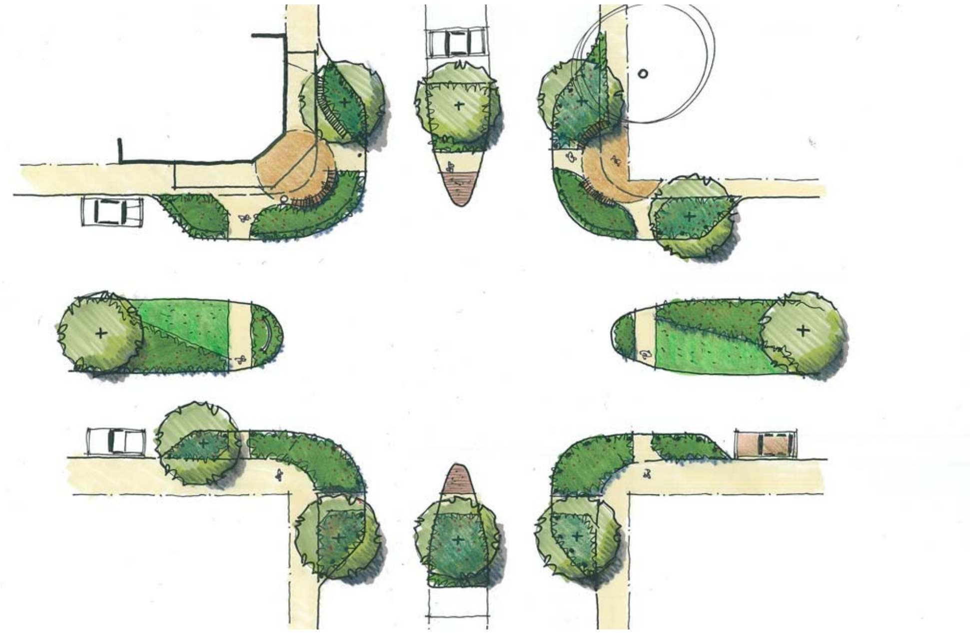

Figure C5-33: Changing planting structure at traffic nodes can influence driver behaviour

5.11.7 Glare Screen Planting

Many roads throughout Queensland experience strong glare due to the setting of the sun. This glare from low-angle sunlight can be reduced through carefully aligned planting. For north-south orientation of roads, the solution is to provide ridgeline screening on the western side of the road. *"When using planting to screen glare care should be taken not to create a strobing effect through transparent foliage, as this could be a bigger problem than the glare"* (Department of Transport and Works - NT, 1988:68).

5.11.8 Wind Break Planting

Wind gusts are often experienced in coastal, cyclonic and other areas where landform can channel winds. Wind can be stronger at the end of cut batters and at locations where wind is channelled across the road and may adversely effect vehicle stability, particularly high vehicles which may create more resistance. In such cases, planting can be used as a windbreak to stop the effect of crosswinds and stabilise loose material to limit the amount of dust blown across the road. Select species with moderately dense, fine foliage that extends to the ground to optimise disruption at channelled winds (Figure C5-34).

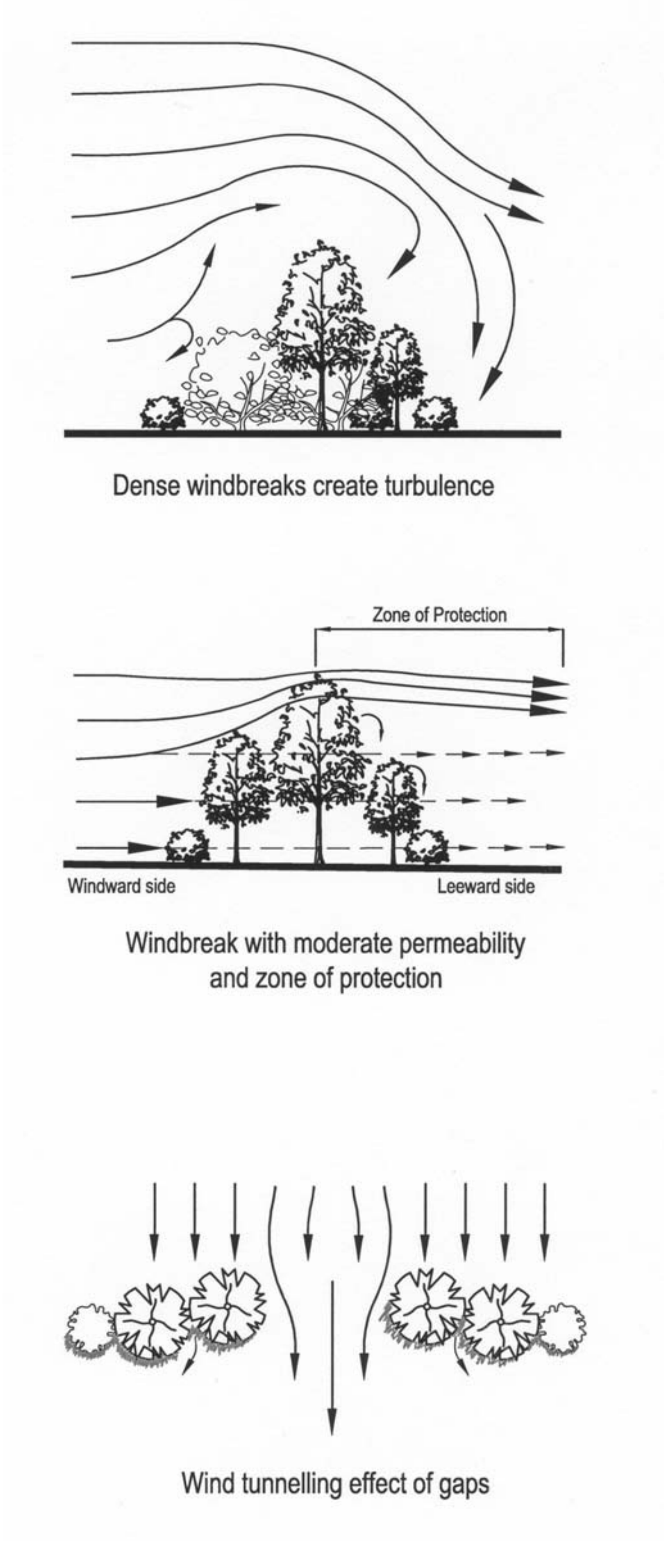

Figure C5-34: Desirable characteristics in planting for windbreaks

Source: Department of Primary Industries, 1995

5.12 Maintenance

The safety requirements calculated for each new roadway must be maintained for the continued safe operation of the roadway. When these safety requirements are addressed and implemented correctly at the design and construction stages, the need to intervene and conduct these maintenance practices should be reduced.

Any vegetation, or portion of vegetation which is within, or encroaches into, safety restricted areas (clear zones, sight distance areas) must comply with safety requirements of that area. Where vegetation is non-complying then the following maintenance practices are recommended:

- **For existing vegetation** - it is recommended that the vegetation be trimmed or removed, dependent on significance of the vegetation. The action taken will be dependant on the whole of life maintenance costs and the significance or protection of the vegetation;
- **For establishing seeded vegetation** - non-complying species must be removed before they are considered a hazard. If this culling has a significant impact on the foliage coverage and/or design intent (in urban environments), an appropriate substitute species may be incorporated; and
- **For proposed vegetation** - container stock specified in areas affected by clear zone and sight visibility constraints must utilise compliant species and/or species which require rare reactive maintenance (species requiring routine maintenance to achieve compliance must not be used).

If needed, conduct general routine maintenance of vegetation in close proximity to areas of public access, (adjacent roads, pedestrian and cyclist facilities) to minimise the potential hazard of aged, deteriorated plants and debris falling in high winds and storms.

In the design stages of landscape works it must be considered that any maintenance regimes needed to ensure plants meet safety requirements (on a regular basis for the life of the plant) be built in to the whole of life design cost.

PART C

Chapter 6 Environment

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 6 Amendments – June 2013

Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part C - Chapter 6
Environment

6.1 Introduction

The road landscape design process must address the strategic objective of environment. Mitigation of environmental impacts associated with transport infrastructure projects and positive contribution to the ecological potential of the corridor, can be achieved through the effective asset management. Considering the environment throughout all stages of the concept, development, implementation and finalisation phases is important for maintaining and enhancing environmental values within the corridor. Environmental considerations to integrate within the road landscape include, yet are not limited to:

- environmentally significant areas;
- water management including water sensitive urban design;
- soil conservation;
- fauna movement; and
- flora conservation.

The Department has a legal duty under the *Environmental Protection Act (1994)* to take all reasonable and practicable measures to minimize or prevent environmental harm. Environmental harm can be defined as *"any adverse effect, or potential adverse effect (whether temporary or permanent) on an environmental value"* (International Erosion Control Association, 2008:pN.5). Similarly, designers have a significant responsibility to:

- protect, consolidate, recover and regenerate existing environmental features, ecosystems and local habitat;
- minimise disturbance to biodiversity values;
- enhance existing natural resources in a sustainable manner;
- reinstate fauna and flora corridors and connections; and
- implement environmentally sustainable solutions.

6.1.1 Environmental Processes and Reporting

There are a variety of different environmental processes that particular regions follow and types of environmental reports used. The choice of process and report selected will largely depend on the region and the type of project involved. Certain projects may require a full Environmental Approval Reports process to be undertaken. Other projects may only require a single Environmental Approval Report completed, or a number of separate reports; for example:

- Review of Environmental Factors;
- Environmental Management Plan; and
- Environmental Design Report.

For further information on environmental processes and reports required, refer to the Department's *Road Project Environmental Processes Manual*.

6.2 Benefits

The benefits of integrating environmental considerations within the road landscape are:

- protection and enhancement of national, regional and local environmental values within the corridor;
- mitigation of ongoing disturbances and potentially negative impacts to existing environmental features;
- prevention of future land degradation through the use of appropriate rehabilitation techniques;
- recognition and adoption of ecologically sensitive design principles and objectives;
- integration of water sensitive urban design principles and practices to improve water quality;
- reflection of natural surrounding landscape patterns by integrating adjacent environmental habitats and inherent landscape character; and
- a healthy and sustainable future for the environment.

6.3 Design Goals

The Environment design goals are:

- **Environmental Values -** conserve and enhance environmental values within the corridor.
- **Disturbance Mitigation -** minimise environmental disturbance and impact on the existing natural environment.
- **Rehabilitation -** develop suitable and effective site specific rehabilitation measures to disturbed and adversely affected areas.

6.3.1 Environmental Values

The primary function of transport networks is to facilitate the movement of people in an efficient and safe manner. There are also important environmental aspects which require conservation. Of fundamental importance is the conservation and enhancement of environment values in areas through which the corridor passes or adjoins.

Environmental values relate to the ecological health, public amenity and safety within the environment. This definition allows for the environment within the road landscape to be considered more holistic and inclusive of all aspects related to humans and their surroundings, including visual, social and economic factors. Environmental values encompass people and places which contribute to achieving public amenity as a whole. This ensures that these values are appropriately preserved within the road landscape.

Preserving or enhancing existing ecological processes is the most important consideration in maintaining environmental values within the road landscape. A thorough understanding of these values, are required to ensure that a sympathetic design is achieved. In the landscape planning stage of a proposal, ecological values need to be assessed, in unison with visual and cultural heritage values, as part of an integrated landscape assessment. This forms the basis for any future landscape design.

Disturbed areas with high environmental values will require a greater level of future rehabilitation. Implementing the principles of integration; including context sensitive design, and sustainability within the road landscape helps ensure design responsiveness to environmental values within the corridor.

The broad greening concepts of urban forest and greenways (Chapter 1 of Part C) are examples of practices incorporating strong environmental values. Reinstating the urban forest and developing greenways within future transport and road infrastructure projects provides opportunities to reduce environmental harm and actively enhance ecological processes. The urban forest and greenways are important in contributing to environmental values within the road landscape by providing:

- enhancement of biodiversity through habitat creation;
- amelioration of the effects of habitat fragmentation through rebuilding of connectivity across wildlife corridors;
- fauna and flora linkages through provision of continuous vegetated corridors and buffers; and
- reinstatement of tree canopies, to provide shade and mitigation of heat island effect in urban areas (Figure C6-1).

Figure C6-1: Highly disturbed areas require reinstatement environmental values through context sensitive landscape design

6.3.1.1 Ecologically Sustainable Development

Applying the principles of ecologically sustainable development aims to assist in the preservation of environmental values. Australia's National Strategy for Ecologically Sustainable Development (1992) has set objectives specific to Urban and Transport Planning which include:

- *"to promote urban forms which minimise transport requirements, and improve the efficiency of land supply and infrastructure provision;*
- *to encourage the future development of urban transport systems which provide opportunities to limit the use of fossil fuels;*
- *to promote road design patterns with provision for and use of public transport modes; and*
- *to improve the amenity of local urban areas."*
- (Australian Government – Capital of, 1992:Part 2 – Sectoral Issues).

These objectives aim to reduce impacts of transport infrastructure construction on the environment through minimising usage of large amounts of natural resources. Sustainable production and consumption methods should also be promoted through the use of environmentally sound technologies. Ways that ecologically sustainable development can be applied within the road landscape are:

- minimise the footprint of structures and minimise clearing;
- recycle products or use alternative construction materials which are of adequate strength and durability;
- use local materials from local suppliers (Figure C6-2);

Figure C6-2: Locally sourced stone used in wall, reduces transportation and haulage requirements

- use rapid and efficient construction techniques and methods to reduce construction program;
- apply site soil and mulch management practices by managing on site resources;
- incorporate hardy, low maintenance and water efficient vegetation (Figure C6-3);

Figure C6-3: Hardy, drought tolerant plant species selected to meet low maintenance requirements

- implement vegetation management principles as a method of improving air, land and water quality; and
- design low maintenance solutions to conserve energy and elongate asset life (Figure C6-4).

Figure C6-4: A simple planting treatment reduces maintenance requirements

6.3.1.2 Minimising Construction Impacts

Construction techniques can significantly impact environmental values. The benefits of minimizing impacts during construction on the environment include:

- improved noise and air (dust) quality;
- a reduction in pollutants;

- pest control;
- weed management;
- sediment control and erosion control; and
- flora and fauna protection and management.

General guidance on mitigating disturbance during construction includes:

- limiting extent of work areas (Figure C6-5) and intrusive access tracks;
- creating no-go zones for construction activities in environmentally sensitive areas;
- ensuring vegetation and trees to be retained are adequately marked and protected prior to clearing and excavation, and during construction;
- fencing off areas to be cleared and excavated before any works commence;
- implementing suitable erosion and sediment control measures for each construction phase (Figure C6-6);
- using machinery with the least impact;
- reuse and managed stockpiling site won resources (Figure C6-7), reducing the need for importing of topsoil, stone and mulch; and
- implementing intermediate landscape and revegetation techniques as soon as practical following bulk earth works, including temporary revegetation with seeding, organics blanket or hydromulch (Figure C6-8); as required to minimise erosion, sedimentation and dust impacts during construction.

Figure C6-5: Protecting environment from disturbance through limiting footprint

Figure C6-6: Erosion and sediment control measures minimizing construction impacts on adjoining residences

Figure C6-7: Removed local vegetation chipped for use as site mulch

Figure C6-8: Grass seeding used as a temporary erosion and sedimentation control measure during construction

6.3.2 Disturbance Mitigation

Mitigating disturbance to the environment within infrastructure corridor and to adjoining areas seeks to prevent and minimise environmental harm. It also ensures that environmental values are better preserved within immediate and surrounding areas.

Applying landscape and revegetation treatments as quickly as possible is an effective method of providing mitigation from disturbance during construction. Other methods include, but are not limited to:

- maintaining existing vegetative ground cover or applying temporary landscape and revegetation cover to mitigate against erosion, sedimentation and dust issues; and
- delaying clearing and grubbing or staging of activities.

Detailed disturbance mitigation techniques and design strategies are outlined in Appendix 5 *Design Guidelines.*

Specific existing aspects relative to the transport infrastructure landscape which require mitigation from disturbance are:

- flora and fauna habitats;
- local landforms and landscape settings;
- soils; and
- waterways.

Environmental processes and reporting; particularly the road infrastructure project's review of environmental factors, will identify specific environmentally sensitive sites and areas which may require special treatment or protection measures. The data and documentation established within the review of environmental factors; or other environmental reports used, should be referred to when implementing site specific disturbance mitigation techniques.

6.3.2.1 Protecting Existing Habitat

Once the environmental values of an area are identified and the initial scale and extent of the transport construction proposal determined, opportunities for the protection of existing flora and fauna habitats can be clearly identified. The protection of habitats which already exist is a far more efficient and cost effective means of conserving existing ecological processes than developing or recreating new habitat. Required considerations during the assessment, planning and design stages of the project specifically for transport infrastructure landscape include:

- identifying highly environmentally sensitive areas requiring preservation;
- protecting of areas of highest habitat values particularly waterways (Figure C6-9);

Figure C6-9: Protecting the habitat values of waterways for future generations

- provide adequate buffers to environmentally sensitive areas of a suitable width to reduce edge effects;
- facilitating seed collection from suitable areas for future rehabilitation works;
- maintaining and establishing linkages to neighbouring sites with habitat value;
- ensuring connectivity between habitat areas, within and beyond the immediate corridor through appropriate fauna movement devices and associated landscape and urban design responses (Figure C6-10);
- restricting fauna access to motorways and facilitating movement to suitable habitat areas or connecting points (Figure C6-11); and
- retaining significant stands of vegetation, particularly older established trees and marine communities.

Figure C6-10: Connecting habitat areas through fauna movement devices integrated within the road landscape

Figure C6-11: Fauna fencing and adjoining landscape treatment limit fauna from accessing roadways

Priority should be given to retaining those habitat trees (individual species or a communities group) with an existing high:

- landscape significance relative to locality, landscape setting and character (Figure C6-12);
- retention value relative to average life expectancy, based on health, condition and longevity;
- habitat value for fauna;
- ability to stabilise soils on cuttings, embankments and along watercourses;
- visual prominence and degree of aesthetic impact and value;
- community and social value in terms of amenity (Figure C6-13);
- regrowth potential, particularly in regional landscapes; and
- level of cultural or heritage significance.

Refer to the Departments *Fauna Sensitive Urban Design Manual* for additional guidelines.

Figure C6-12: Retention of landscape character

Figure C6-13: Retaining significant trees for amenity value to community

6.3.2.2 Retaining Existing Local Landforms and Landscape Settings

Road alignments can modify the existing landscape within a locality. Wherever possible, disturbance to existing local landforms and landscape settings within the corridor should be minimised by:

- minimising extents of earthworks;
- reflecting existing landform as much as possible in earthworks;
- avoiding sensitive areas and of high natural value;
- minimising impacts on local hydrological systems; and
- reducing fragmentation of local and regional flora and fauna corridors.

Road alignments can be used effectively to minimise impacts on different land uses and reinforce or create boundaries (Figure C6-14).

Figure C6-14: Roadways as land use boundaries

Source: Roads and Traffic Authority - NSW (1998)

Roadway alignments should merge into the local setting. Horizontal and vertical alignments and techniques such as warping (rounding) and flattening of batters and embankments (Figure C6-15) can minimise environmental impacts on the existing landform as well as mitigate visual disturbance.

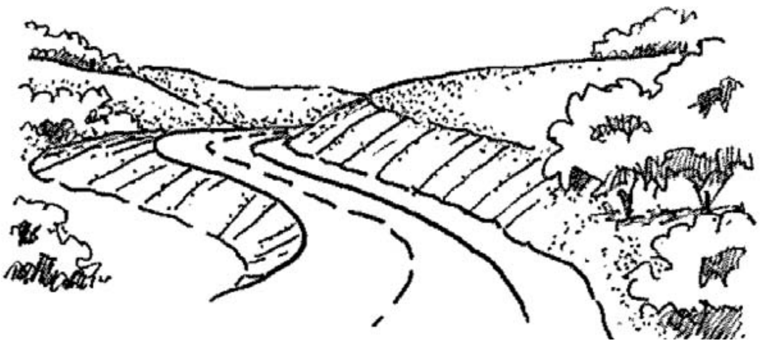

Figure C6-15: Rounding and flattening of batters and embankments

Source: Roads and Traffic Authority - NSW (1998)

Roadway alignments can also respond to vegetation features at a more detailed level (Figure C6-16) with suitable setbacks and road curvature to protect existing significant tree stands.

Figure C6-16: Roadway curvature responding to existing vegetation features

Source: Roads and Traffic Authority - NSW (1998)

Following the contours in road alignment can reduce earthworks, contrast with adjoining areas and minimise disturbance to adjoining land uses (Figure C6-17).

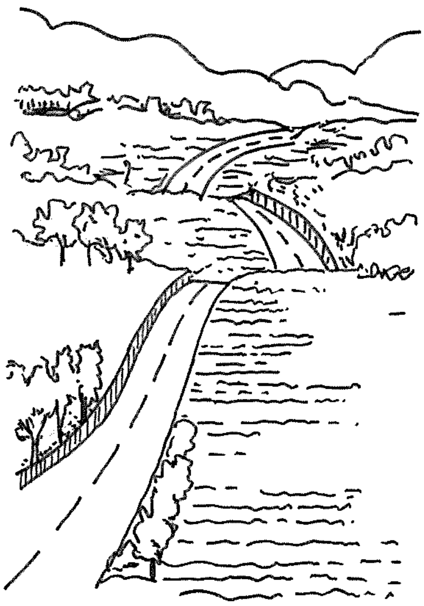

Figure C6-17: Existing landscape features promoted through roadway alignment

Source: Roads and Traffic Authority - NSW (1998)

Efficient use of the road reserve by integrating with multiple modes of transport also mitigates disturbance to local landforms reducing corridor area and associated impacts on adjoining land.

6.3.2.3 Soil Conservation

Soil is a valuable asset, particularly when it can be reused as planting media, and should be conserved where possible within the transport infrastructure corridor. Erosion removes valuable topsoil and produces sediment which in turn silts drains, creeks and rivers, affecting the water quality of waterways. Soil erosion can be accentuated through unnecessary construction and maintenance practices. The risk of soil erosion can be reduced by adopting the following disturbance mitigation principles:

- identification of erosive risk of topsoils and subsoils;

- scheduling earthworks, particularly clearing and grubbing, to expose the smallest possible area for the shortest possible time;
- disturbing soil as little as possible by limiting machinery access to construction areas only;
- maintaining existing vegetative ground cover until needs to be disturbed;
- stripping and stockpiling for later use, potentially as planting media; and
- protecting and stabilising subsoil and surface soils at the earliest opportunity after disturbance, through revegetation; slowing down water runoff, rill potential and assisting in erosion and sedimentation control, as well as providing dust reductions.

Unnecessary disturbance to soil within corridors can also effect existing healthy vegetation by:

- encouraging weed growth and competition with existing vegetation, increasing ongoing maintenance time and costs and fire risks along roadsides; and
- preventing the natural regeneration of native plants.

Development of Soil Management Plans and a Planting Media Management Plan, as described in the Departments *Soil Management Manual,* can assist in soil conservation and management.

6.3.2.4 Protecting Existing Waterways

In most cases, the crossing of waterways is unavoidable within transport infrastructure projects. However appropriate landscape design measures can be implemented to ensure that river and creek crossings are undertaken sensitively with minimal impact on the surrounding environment.

The following design principles should be applied to waterway crossings relative to transport infrastructure landscapes, including to:

- ensure bridge designs have a minimal foot print, through maximising span to minimise frequency of pier structures within waterways;
- promote wide watercourses with shallow margins that allow opportunities for aquatic planting (Figure C6-18);
- establish vegetated linkage areas to assist in the reconnection of wildlife corridors along creek banks and significant riparian habitats interrupted, disturbed or removed by the road crossing;
- retain or re-establishing fauna corridors through the use of suitable fauna movement structures to minimise fauna mortality rates, including integrating appropriate vegetation treatments in support of these structures;
- maximise the use of benches beneath large bridges as wildlife underpasses including integrating suitable plant species for habitat; and
- implement subtle crossings over minor local waterways which are sympathetic to the surrounding landscape setting, rather than making a distinctive statement or creating a feature (Figures C6-19 and C6-20).

Figure C6-18: Planting to shallow margins of watercourse

Figure C6-19: A sympathetic road crossing over a local waterway, using lightweight construction materials

6.3.3 Rehabilitation

Rehabilitation of disturbed and impacted areas is required to preserve environmental values within the transport infrastructure corridor and ensure the long term management of the environment as a whole. Noise quality, air quality and pollutants, pests, weeds, and flora and fauna, are all significant environmental elements which may require rehabilitation within corridors. However, the key aspects relative to the landscape which may be disturbed and require rehabilitation are:

- **site soils**;
- **water systems**; and
- **vegetation**.

The most effective way that rehabilitation of site soils and water systems can be achieved is through landscape and revegetation treatments (Figure C6-20). Implementing these treatments within the transport infrastructure landscape also plays a supporting role in reinstating valuable habitats which may be disturbed, impacted or removed as a result of project works. Vegetation can provide valuable food and shelter for different types of fauna, improve water quality and assist in stabilising site soils to minimise erosion.

Figure C6-20: Effective rehabilitation of disturbed soils and water systems with landscape and revegetation treatments

6.3.3.1 Site Soils

The most common disturbance within transport infrastructure corridors relative to soils is erosion, dispersion and subsequently sediment. A number of preventative measures are available for application to deter and prevent erosion, dispersion and sediment build-up; both temporarily during construction and as long term permanent measures.

Specific measures to assist in mitigating and rehabilitating of erosion and dispersion, and control of sediment are:

- ameliorating soils; and
- establishing vegetation.

6.3.3.2 Site Soil Amelioration

Ameliorating site soils seeks to:

- manage undesirable soils and their characteristics; particularly mitigating erosion and dispersion in high risk soils and disturbed subsoils;
- provide a stable outer zone embankment through using a suitable subsoil material within; and
- ensure successful plant growth.

6.3.3.3 Establishment of Vegetation

Landscape treatments are one of the most effective methods in preventing ongoing soil loss. This is particularly important where soils are high risk (displaying high erosive and dispersive potential). Vegetation prevents erosion through the binding properties of plant root systems which resist the physical effects of wind, rain and sun. The establishment of vegetation also improves the performance of other more structural and hard erosion control devices as well as their aesthetic appearance. Establishment of landscape treatments to site soils plays an important role in:

- providing coverage to disturbed areas as soon as possible after exposure;
- stabilising steep and irregular batter and embankment slopes (Figure C6-21);
- reducing immediate impact of raindrops on ground surface, particularly in areas within high levels of natural rainfall;

Figure C6-21: Landscape treatments assisting in batter stabilisation

- limiting soil exposure to the effects of wind;
- binding surface and subsoils within benches and terraces on high cuttings; and
- reducing long term intensity of overland sheet flows from road pavements.

6.3.3.4 Water Systems

Paved surfaces produce substantial volumes of water runoff which require long term management to achieve positive environmental outcomes. Applying the principles of water sensitive urban design enables an integrated and holistic approach to the management of water systems, particularly storm water within urban areas. The key principles of water sensitive urban design are to:

- *“protect existing natural features and ecological processes;*
- *maintain the natural hydrologic behaviour of catchments;*
- *protect water quality of surface and ground waters;*
- *minimise demand on the reticulated water supply system;*
- *minimise sewage discharges to the natural environment; and*
- *integrate water into the landscape to enhance visual, social, cultural heritage and ecological values”* (Healthy Waterways, 2006:p1-2).

A number of water system treatment devices can be implemented within transport infrastructure projects to manage storm water runoff and improve water quality. These are designed either as water detention or infiltration systems and can perform one or a combination of measures including:

- permanent storage of water;
- temporary storage of influxes of water;
- discharging water where required (to control volumes of stored water within devices);
- conveying and distribute overland sheet flow to outlets;
- filtering runoff (particularly before runoff infiltrates into soils);
- removing pollutants from runoff; and
- transitional filter areas to major downstream drainage systems.

Devices include:

swales (incorporating buffer strips);

- bioretention swales;
- sediment basins;
- bioretention basins;
- constructed wetlands;
- infiltration measures;
- sand filters; and
- aquifer storage and recovery.

Selecting a suitable water system treatment device is determined by its overall designated purpose within a particular project situation and generally requires:

- an assessment of broad scale drainage requirements within the whole corridor;
- data collection on the hydrological regime of the local water catchment, including likely frequency of drought, annual rainfall, intensity and frequency of storms;
- an analysis of existing landscape conditions; for example, topography;
- anticipated water runoff volumes and velocities;
- required water detention time (if a detention system); and
- an assessment of maintenance requirements (including access), cost and proven performance.

The final design of particular devices will depend on factors such as road formation, topography, local landscape conditions, existing utilities and geology. Detailed information on the hydraulic design and technical details regarding water systems is available within the Department’s *Road Drainage Manual* and other current Queensland based Water Sensitive Urban Design documents including:

- Healthy Waterways: *Water Sensitive Urban Design – Technical Design Guidelines for South East Queensland (Version 1, 2006).*

For projects within the proximity of coastal water locations, reference should be made to:

- Queensland Government: Guideline – *EPA Best Practice Urban Storm water Management-Erosion and Sediment Control* (relative to) *State and Regional Coastal Management Plans – Queensland's Coastal Policy* (2008).

The benefits of integrating water sensitive urban design practices into the road landscape include:

- water quality enhancements;
- maintenance of existing natural hydrological processes;
- accommodating drought and flood conditions, ensuring greater resilience and adaptability;
- implementing plant species which successfully respond to water constraints and inconsistent conditions;
- enhancement of biodiversity values through developing habitat corridors and linkages within water systems; and
- improved visual amenity through enhancement with landscape and revegetation treatments.

6.3.3.5 Application of Landscape Treatments

Vegetation treatments within water systems provide a significant role in the conveyance and filtering of storm water run-off within transport infrastructure corridors, to meet required water quality outcomes. Treatments assist in pre-treating run-off before it is transferred for retention, detention, storage or discharge. The use of vegetated buffers serves to trap and filter contaminants before they enter water bodies. Riparian buffers around ponds, pools and streams are particularly effective in improving water quality. Planted areas to water systems can become visually positive and attractive landscape features in themselves, particularly when applied to retention systems designed for permanent water storage. All treatments need to be coordinated with the engineering design to ensure allowances are made for the treatment in the civil/ hydraulic design.

Vegetation can also be applied as perimeter planting to water systems to improve their aesthetics, particularly of hard drainage structures (Figure C6-22).

Figure C6-22: The use of vegetation around drainage structure to improve aesthetics and improve integration

6.3.3.6 Irrigation

In most instances, soil amelioration and selection of appropriate plant species should negate the requirement for permanent and ongoing irrigation systems to be installed. This ensures that water is conserved as a natural resource. The Department's approach is to discourage the use of irrigation systems in most cases, except for:

- specific cases, such as high profile transport stations, where planting will be unsuccessful without a consistent watering regime; and
- on a temporary basis during the establishment and maintenance periods of revegetation programs.

PART C

Chapter 7
Community

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 7 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Community

7.1 Introduction

Community interests and aspirations must be considered to ensure a holistic design response. Communities are a potentially rich information resource, and can provide valuable insights that might otherwise be overlooked throughout the design process. Involving the community through consultation and participation in the design process, allows a sense of pride, respect, ownership, and connection with the road landscape to develop.

People affected by road projects should ideally be consulted as a key stakeholder in the community engagement process (Chapter 1 of Part B) throughout the project concept, design, and implementation phases. This is important to determine community values and collective needs (Figure C7-1). This ensures the design recognises and responds to these values and needs creating a meaningful corridor, which is appreciated, accepted and respected by its users.

Figure C7-1: Vegetated connective links from residential areas to transport and road corridors provides safe access and movement for the community and high amenity value

Community needs are often focused on enhancing or maintaining their existing quality of life, health, wellbeing and experiences. For the communities' values and needs to be taken into account effectively, it is essential that designers take a collaborative approach with the community in which citizens are given the opportunity to actively participate in the planning and design process.

7.1.1 Community Benefits

The benefits of integrating community values and needs within the road landscape are:

- enhanced public amenity for all users through improvements to user comfort, wayfinding and walkability for pedestrians;

- improved travel experiences both for users travelling within the transport infrastructure corridor itself, and the community beyond;
- functional and equitable access to a variety of multi-modal systems;
- reinforcement of local character, identity, cultural heritage and a sense of community;
- improved accessibility, connectivity, and security; and
- active community participation, involvement and consultation as part of transport and road landscape planning and design process.

7.2 Design Goals

Community related design goals are:

- **Involvement -** promote participation and contribution by implementing effective community consultation processes;
- **Values -** identify and address community values and associated interests, perceptions and preferences; and
- **Needs -** meet the needs and aspirations of the community to improve quality of life and live-ability.

7.2.1 Community Involvement

Socially sustainable places are derived from involving the community in decision making processes as *"…people have a right to be involved in deciding how their town or city develops. Real, sustainable change will not be achieved unless local people are in the driving seat right from the start. Successful cities are founded on participative democracy"* (Department of Environment, Transport and the Regions, 2000). A sense of inclusion and belonging also contributes to a healthier community.

There are numerous advantages both to the Department and to the local community associated with collaborative involvement throughout project inception.

The advantages for the Department are:

- generating awareness amongst the community of the wider benefits to their local area as a result of the transport infrastructure project, particularly social and economic value;
- more inclusive and holistic outcomes through accommodation of community interests and aspirations;
- educating the community of challenges typically faced when planning, designing and implementing transport infrastructure projects;
- greater likelihood for community consensus, positive response and support for project proposals;
- improved recognition of government's commitment to maintaining community values and needs;
- strengthening of relationships between the Department and community, and gaining learning experiences from one another;
- reduced likelihood of expensive delays during later stages of the project as a result of ill-consulted communities in the early planning and design stages;
- effective use of resources through ability to tap into local knowledge;
- opportunities to develop awareness and appreciation of indigenous history and culture, and the inherent value of particular places to different people and cultures;
- improved communication channels, coordinated information services and feedback mechanisms;
- learning outcomes associated with improving engagement process within the Department and effectively implementing the inputs of the community;
- educating the community on the benefits of adopting an asset management approach to maintaining transport systems and road infrastructure; and

- greater legitimacy, integrity and accountability for the departments' activities.

The advantages for the community are:

- opportunities to provide open and honest communication and feedback on particular issues and community concerns;
- heightened awareness within the Department of specific community values and needs;
- opportunities to influence decisions and tailor solutions to meet community interests;
- recognition of potential shortfalls in public transport, pedestrian and cyclist facilities particularly in local areas and the need for improved connectivity;
- identification of key areas which need to be visually remediated or community facilities provided (Figure C7-2);

Figure C7-2: Community advantages - pedestrian and cyclist rest facilities located according to community access requirements and in close proximity to key residential streets

- broader community acknowledgement of Departmental transport infrastructure planning and design process;
- improved community understanding and acceptance of potential issues, constraints, decisions and the resulting need for possible alternatives to individual or collective desires;
- enhanced public-private relationships, with potential for greater trust in the decisions made by the Department;
- opportunities to identify significant parts of the local landscape setting which have particular meaning to individuals or groups, or have special natural, scenic (Figure C7-3) or cultural value;

Figure C7-3: Community advantages - involvement with the Department can ensure that significant scenic areas valued by the community, are preserved and enhanced within the road corridor

- transparency and accountability in decision making, planning processes and strategies;
- improved outcomes which reflect community aspirations and needs; and
- transport infrastructure landscapes which have lasting value to the community and meet expectations.

7.2.1.1 Community Consultation Project

Involving the community in transport infrastructure projects occurs through engagement and consultation. Undertaking a formal community consultation process is not always required as part of corridor upgrades. The need for this process depends on the type, scale and intensity of the project.

7.2.1.2 Participation

There are opportunities for the community to actively participate and contribute to the actual design, implementation and management of components within transport infrastructure landscape.

Potential areas for participation opportunities are:

- plant species selection and feedback;
- compiling plant and wildlife inventories through local knowledge
- greening programs such as tree/ planting days (Figure C7-4);

Figure C7-4: The community participating in a greening program; public tree planting day

- implementing participatory bush regeneration programs; and
- involvement in the design process for urban artwork concepts for treatments to retaining wall panels, noise barriers and throw screens.

7.2.1.3 Community Values

Values, and associated interests, perceptions and preferences will differ and potentially conflict amongst individuals and groups within and across communities. Considering and balancing these different values during the planning and design stages of a project is important to ensuring integrated project outcomes are met.

7.2.1.4 Common Values

Some broad values traditionally common to community groups are:

- community health - where *"healthy communities improve the social, economic, and physical well-being of their people, places, and natural environment";*
- collaboration - where *"each individual's unique contribution supports the best outcome…and stakeholders are viewed as members of the larger team who have valuable input and are essential to implementation";*
- transparency - where *"clarity in rules, process, and roles is essential to collaboration. All information relevant to decision making must be made available to the stakeholders";*
- shared learning - where all relevant viewpoints are involved in the decision making process which can *"lead to a change in people's perceptions and positions";* and
- direct, honest and timely communication - where frequent communication and feedback between parties is facilitated so that that there is *"reasoning behind decisions and acknowledgement of how their (stakeholders) input affected the outcome".*(Adapted from Farr, D, 2007, p83)

Undertaking community consultation is an effective way of determining commonly held community values. It promotes gaining a unique perspective on the interests within local neighbourhoods and residential areas adjoining transport infrastructure corridors. Responding to community values also plays an important role in encouraging greater ownership of local areas. Determining the interests that the community has towards local environmental values (Chapter 6 of Part C) can also assist in the retention of fragile environmental areas.

7.2.1.5 Cultural Values

Preservation of existing cultural values is often the most significant value to the community. They define the sense of place, identity, uniqueness and individual character of places. Cultural values may encompass aesthetic, historic, scientific and social perspectives.

These cultural vales should be equally recognised and respectfully responded to if affected by a transport infrastructure project. Conserving and enhancing cultural values within communities has been linked with greater economic prosperity and quality of life, potentially benefiting communities as a whole. Local landscapes (Figure C7-5); with significant cultural heritage values and character are important assets within the community for economic renewal or development.

Figure C7-5: The Glasshouse Mountains providing a high amenity landscape backdrop; with significant cultural heritage values and economic tourism potential

7.2.1.6 Community Needs

All communities will reflect differing individual and collective needs and aspirations. There is often a common set of needs that are identified during the community consultation process. Community needs are related to achieving a desired quality of life and amenity. Within a transport infrastructure context most often community needs focus on safety, liveability, user comfort and equal access to facilities. Facilities need to be functional and of a high quality to meet user expectations and preferences, both now and in the future.

7.2.1.7 Common Needs

Common community needs relative to the transport infrastructure landscape are:

- personal safety and security;
- convenience (through ease of access to facilities);
- legibility (to assist in wayfinding);
- connectivity and linkages to business services and the broader community (Figure C7-6);

Figure C7-6: Connectivity through pedestrian/cyclist access bridges to public transportation systems is a basic community need within transport and road corridors

- accessibility and mobility; and
- recreational opportunities.

Undertaking community consultation is an effective way of determining other common needs of the community relative to the transport infrastructure. This process will often raise concerns amongst the community relative to their current or future needs. During this process, individuals should be encouraged to describe:

- their current movement and use patterns within an existing infrastructure network;
- their frequency and type of transportation system utilised;
- existing transport infrastructure nodes and their quality;
- their perceived amount and quality of public open space and recreational opportunities;
- existing neighbourhood assets;
- prominent landmarks with key significance to community;
- the level of service desired from the transport infrastructure network;
- quality of city or town centre (if applicable); and
- their personal priorities for change in the level of service.

Priority should be given to meeting those needs which are representative of the community as a whole. Design responses should ensure that the basic social needs of residents are integrated and a balance of the community's collective needs are met.

PART C

Chapter 8
Economics

June 2013

Chapter 8 Amendments – June 2013

Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part C - Chapter 8
Economics

8.1 Introduction

Economic considerations are essential in the planning, design, construction and maintenance of effective transport infrastructure. These considerations provide value for money through a reduction in capital and whole of life costs. Implementing transport infrastructure landscapes which minimise or eliminate maintenance requirements and management practices ensures the delivery of cost effective and economically feasible outcomes. Initial installation costs and ongoing maintenance costs should include the role of intangible costs such as social, visual and environmental costs.

Attractive, user friendly and efficient transport infrastructure systems encourage liveability and tourism (Figure C8-1). This in turn contributes to the economic wellbeing of surrounding residential, commercial and industrial areas, as well as the community as a whole.

Figure C8-1: Providing attractive and useable facilities improves tourism potential, particularly in regional areas

Maintenance costs are a significant reoccurring cost factor. Strategies for minimising maintenance should be integrated into the planning and design phase to ensure a sustainable outcome. This is essential in ensuring the long term economic viability of the transport infrastructure corridor.

8.2 Benefits

The benefits of integrating economic considerations within transport infrastructure landscapes are:

- generation of robust, durable and timeless design responses to ensure longevity in public appeal;
- greater business and tourism opportunities through implementation of high quality landscape and urban design treatments;
- environmental benefits through use of recycled and locally won/sourced materials;

- optimisation of economic value through inclusion of landscape and urban design treatments which provide a range of possible functions;
- promotion of self sustaining, low maintenance design outcomes;
- facilitation of appropriate access to ensure minimal and low cost maintenance operations;
- improved worker safety through less exposure to high risk maintenance activities; and
- developing cost effective management and maintenance strategies for vegetation, weeds, litter and graffiti management.

8.3 Design Goals

The Economic design goals are:

- **Value for money -** develop high quality design solutions which provide value and long term economic benefits, gains and returns to the surrounding businesses and the community as a whole.
- **Maintenance Minimisation -** adopt maintenance minimisation strategies to reduce whole of life costs.

8.3.1 Value for Money

It is essential that appropriate treatments and designs are implemented which provide best value for money and minimise ongoing costs. This ensures that the landscape continues to meet community and the Department's asset management expectations. Devising treatments which serve a multitude of purposes is an effective way of minimising costs and ensuring value for money. Economy of scale for selecting treatment types is also particularly important for implementation

8.3.1.1 Economic Community Benefits

The benefits of implementing effective landscape and urban design can produce positive economic outcomes for the community, as well as emerging commercial businesses, industry and residential areas. Long term economic returns far outweigh the initial costs and investment in planning, design and construction. Investing in improving the amenity value of transport infrastructure systems can improve economic growth and provide positive contribution to local economies within communities through:

- greater accessibility and connectivity;
- potential significant residential land development opportunities;
- preservation of adjoining productive land and/ or environmentally sensitive areas; and
- encouraging visitors to stop, explore, and contribute to the local economy.

Tourism Queensland and Queensland Heritage Trails Network, in conjunction with Department, have identified the potential for up to ten themed road corridors in Queensland (Figure C8-2). The purpose of developing a themed route or corridor is threefold:

- to increase visitor numbers and expenditure along each route;
- to maximise driver confidence to allow opportunities to take alternative routes and improve road efficiency and safety; and
- to raise the understanding among road travelers of the heritage and cultural assets that exists along each corridor (National Centre for Studies in Travel and Tourism, 2005:p5).

Vision statements seek to develop and promote these themed routes to:

- increase community ownership and pride;
- increase economic prosperity through higher visitation;
- increase local government engagement;
- encourage cooperative advertising along the entire route; and
- branding (through signs) of the corridor.

As the asset manager for these routes, the Department's role is to support the community and tourism values and promote preservation and enhancement.

Figure C8-2: Tourism Queensland's themed road corridors

Source: Main Roads 2004

Ways that economic community benefits can be achieved are:

- Creating iconic city (or town) gateway entry statements, provided only in strategic locations (and not considered the standard) to emphasize urban or regional town identity (Figure C8-3), enhancing tourism and business potential and associated economic benefits.

Figure C8-3: Unique entries are important in improving tourism identity and potentially stimulate the local economy

- Providing user friendly vehicular, pedestrian, cyclist and public transport networks which incorporate a high level of amenity and offer a high quality experience, to promote increased usage and visitation to local business and services.
- Improving useability of pedestrian networks through the provision of shade (Figure C8-4) or boulevard treatments; increasing pedestrianisation and creating walkable cities and towns, which improve the long term health and wellbeing of communities.

Figure C8-4: Landscape treatments creating shade and improving amenity value for pedestrians and cyclists

8.3.2 Maintenance Minimisation

Landscapes must be designed to promote minimal ongoing maintenance throughout the operational life of the corridor, and ideally this design would evolve into a self-sustaining landscape into the future. Designing a contextually suitable landscape with minimal long term maintenance is critical to its success and sustainability (Figure C8-5). While capital cost may be initially higher, the savings in economic, social and environmental terms over time can pay a significant dividend.

Slashing and mowing is one of the most costly and time intensive maintenance activities currently occurring within the state's controlled road corridor system. In many instances slashing is required to maintain sight visibility requirements. By adopting alternative treatment types; such as low spreading ground covers in preference to grass treatments, and prioritising mulched planting beds in lieu of grassing (particularly within medians and to road verges), traditional slashing and mowing activities are reduced. This also significantly reduces long term maintenance costs within the transport corridor.

A low maintenance landscape will ensure the elimination of a number of intensive maintenance activities over the long term. Safety risks to maintenance personnel and the public are also dramatically reduced through fewer maintenance activities (and less dangerous and resource intensive activities) occurring throughout the life of the asset. Appropriate design will reduce the maintenance input requirements. Less intensive methods or less frequent intervals between interventions will be the main means of reducing operating costs. The goal is to reduce these high cost high frequency activities through effective responsive design, including:

- minimising slashing and mowing by nominating non-turf grass based treatments;
- improving plant layout and layering, densities, and species selection that establish quickly to choke out competing weeds and require no pruning or shaping;
- use of alternative weed control measures such as pre-emergent herbicides;
- reduced clearing out of drains by implementation of appropriate erosion and sediment control measures and landscape treatments.
- integration of effective maintenance access strategies to support easy, time efficient operations: and
- effective graffiti management strategies.

Detailed maintenance minimization design strategies for road landscape components are detailed in Appendix 5.

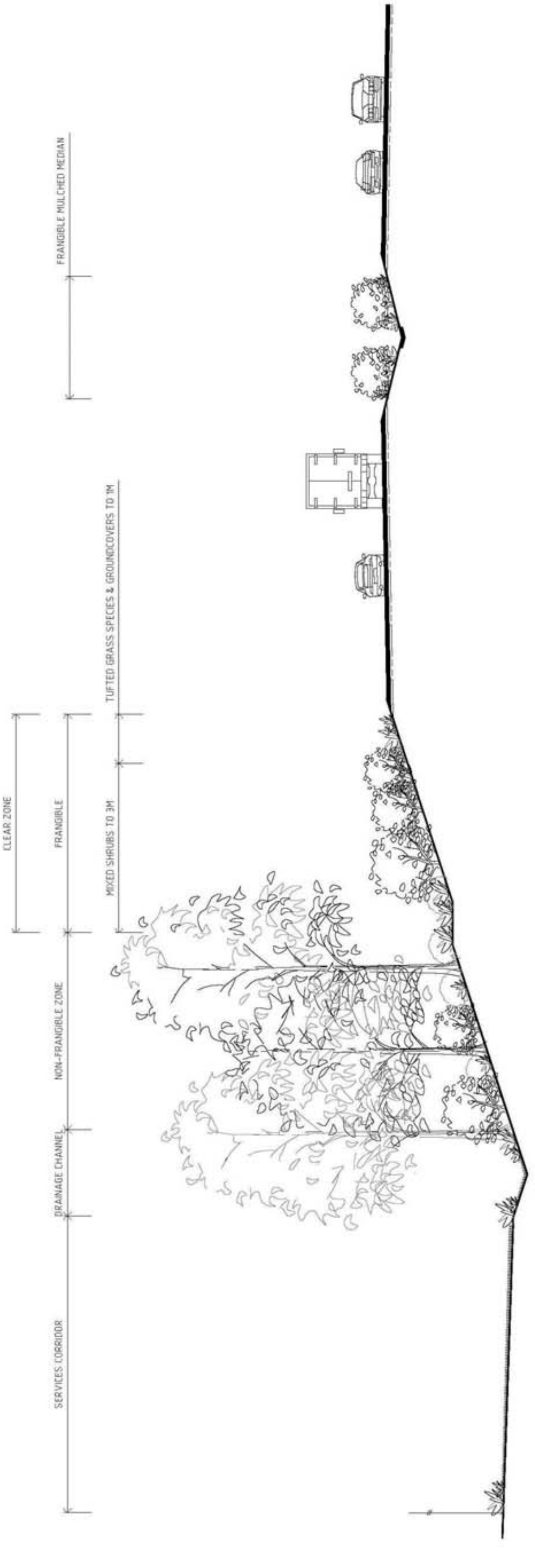

Figure C8-5: Example of an effective landscape design can minimise ongoing maintenance requirements.

PART D

Landscape Construction and Operations

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Part D - Landscape Construction and Operations

Transport and Main Roads

PART D

Chapter 1
Construction and Operations

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Chapter 1 Amendments – June 2013

Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Part D - Chapter 1

Construction and Operations

1.1 Introduction

This chapter focuses on the project management phases of implementation and finalisation. It also provides guidance on how the project will become a part of the regions operational works. Table 16D-1 illustrates key topics that will be discussed as well as other resources that supplement the construction and contract administration activities that occur during these phases.

The processes included here are critical to the success or failure of the landscape and urban design. These processes build upon one another. How soil is managed, handled and ameliorated influences the germination rates of seeds and the health and vigour of container stock. Failure to follow the process invites numerous potential unknowns that may take more time and resources to resolve than the following initial processes. What was thought to be a short-cut to save money may later result in expensive rework and potential dispute.

		PROJECT TYPES There are generally three project types defined by the Department's Project Management Framework. Type 1 – significant transport infrastructure projects that are complex, high risk or expensive. Type 2 – moderate (or medium) scale projects that are relatively straightforward and low risk. Type 3 – minor scale projects that are enhancements or access related which pose the lowest degree of risk.	**Type 1**	**Type 2**	**Type 3**
IMPLEMENTATION PHASE	CONTRACT ADMINISTRATION	**LANDSCAPE AND URBAN DESIGN**			
		Sequencing and coordination			
		• Planting Media Management Plan - Construction (PMMP-C)	☑	☑	☑
		• Vegetation Management Plan	☑		
		• Pest and Disease Management Plan	☑		
		Quality assurance			
		• Request for information	☑	☑	☑
		• Non-conformance reports	☑	☑	☑
		• Contract administration checklists	☑	☑	☑
		Compliance reviews			
		• Establishment Period	☑	☑	☑
		• Monitoring Period	☑	☑	☑
		Final Inspection	☑	☑	☑

IMPLEMENTATION PHASE	FINALISATION	**LANDSCAPE AND URBAN DESIGN** Hand-over to region or local government authority • Landscape Operational Manual As constructed drawings Project Learning's	 ☑ ☑ ☑	 ☑ ☑	 ☑
OPERATIOANL PHASE	MAINTENANCE	**LANDSCAPE AND URBAN DESIGN** Routine Maintenance • Road Maintenance Performance Contract • Vegetation Management Asset Management • Management of the Urban Forest • Renewal and re-lifing	 ☑ ☑ ☑ ☑	 ☑ ☑ ☑ ☑	 ☑ ☑ ☑ ☑

Table D1-1: Landscape and urban design processes in the implementation and operational phases.

1.2 Implementation

1.2.1 Sequencing / Coordination

The Contractor engaged to implement landscape and urban design works should construct, establish and maintain the works to the standard required by the contract documents. The Contract Manager ensures that these requirements are met by the Contractor and all installations are compliant. The Principal may undertake compliance reviews and monitoring on a regular basis throughout the contract period (Figure D1-1).

Figure D1-1: Site inspections are critical to review and monitor compliancy of construction works

An understanding of the relationship between documents of a contract package is essential to contract administration. The order of precedence of documents within departmental Road Construction Contract are (documents higher in the list have a higher priority):

- Formal Instrument of Agreement;
- Letter of Acceptance;
- Notice to Tenderers;
- Any Special Conditions of Contract;
- Supplementary Conditions of Contract;
- General Conditions of Contract;
- Drawings;
- Standard Drawings Roads;
- Project-Specific Supplementary Specifications;
- Standard Specifications Roads;
- Manual of Uniform Traffic Control Devices;
- Conditions of Tendering;
- Completed Tender Form and Tender schedules modified as necessary by post tender correspondence; and
- Other Contract Documents.

A thorough working knowledge of the following documents is essential to administering the landscape works for complying results:

- MRS16 /MRTS16A-E Landscape and Revegetation Works, Appendices and Annexures;
- MRS16 /MRTS16A-E Landscape and Revegetation Works User Guidelines;
- MRS16/MRTS16 Landscape and Revegetation Works: Contract Administration Systems Manual; and
- Soil Management Manual.

These documents are available on the Departments website www.tmr.qld.gov.au. These documents are updated periodically with project learning's.

1.2.2 MRS16 and MRTS16A-E Landscape and Revegetation Works

This specification must be read in conjunction with other technical specifications referenced within the contract documents. The specification provides hold points, witness points and milestones to ensure quality assurance requirements are achieved. The Table D1-2 summarises some of these key elements, refer to specification Clause 4 of each part for a complete list.

Part	Hold Point	Witness Point	Milestone
MRTS16B	Submission of a Planting Media Management Plan (PMMP-C)		
MRTS16B			Submission of samples
MRTS16B		Application of amelioration agents to in situ material – subsoil	
MRTS16B		Application of amelioration agents to in situ material – planting media insitu	
MRTS16C	Submission of seed supply proposal (SSP)		
MRTS16C	Preparation of area to be seeded		
MRTS16C	Seed added to seeding mix		
MRTS16C	Submission of plant supply proposal (PSP)		
MRTS16C		Joint plant nursery inspections	
MRTS16C		Delivery of plants	
MRTS16C	Preparation of area to be planted with container stock		
MRTS16C	Set-out of plants		
MRTS16E	Submission of Pest and Disease Control Proposal (P&DCP)		
MRTS16E	Submission of herbicide distribution permit		
MRTS16E			Commencement of Landscape and Revegetation Works Establishment Period
MRTS16E			Commencement of Landscape and Revegetation Works Monitoring Period
MRTS16E			Finalisation of Landscape and Revegetation Works Monitoring Period

Table D1-2: Hold points, Witness Points and Milestones

1.2.3 Planting Media Management Plan - Construction (PMMP-C)

A mandatory requirement of MRTS16B Vegetation Ground Works is the development of a PMMP-C by the Contractor. The focus of a PMMP-C is to ensure that site soils are compliant with the Department's standards and suitable for reuse as planting media. A testing procedure according to MRTS16B promotes compliance.

1.2.4 Request For Information

Request for information are generated by the Contractor seeking clarification on an issue related to the contract documents. It may relate to an interpretation of a detail, specification or notation on the drawings that is needed to continue work.

The Contract Manager may seek advice from the Principal or Principal's technical specialist to clarify the issue(s) or resolve any conflict. The response may generate a variation and further approval is required. If no cost is involved, works may proceed.

1.2.5 Non-Conformance Reports

A non-conformance report is raised by the Contract Manager where non-compliances to the standards and details of the contract documents are determined. It requires the Contractor to rectify the works to meet the acceptance criteria or tolerances specified. All non-conformance reports must be closed out prior to commencing the maintenance establishment period.

1.2.6 Contract Administration Checklists

The MRTS16 Landscape and Revegetation Works Contract Administration Checklists are part of the departments *Contract Administration System Manual*. The manual provides guidance, tools and techniques for the Contract Manager. The checklists are one tool set up to parallel how the specifications are written and pose questions regarding actions required by the Contractor.

16.2.6.1 Establishment period

The establishment period operations are undertaken by the Contractor immediately following the installation landscape treatments. A *Certificate of Commencement of Landscape and Revegetation Works Establishment Period* is issued when it is deemed that the installation of works is compliant. The operations during the establishment period include weed and pest control, mowing, slashing and brushcutting, watering, replacement of failed vegetation, topping up of mulch, and pruning/ shaping of vegetation. Monthly inspections are required during this period to review the Contractor's program and works completed. The establishment period is finalised when the designated period (minimum 3 months) is completed and where works have met the acceptance criteria of the contract. At the finalisation of the establishment period a certificate commencing the monitoring period is issued.

16.2.6.2 Monitoring Period

The monitoring period operations are undertaken immediately following the completion of the establishment period. A *Certificate of Commencement of the Landscape and Revegetation Works Monitoring Period* is issued after the finalisation of the establishment period. The operations during the monitoring period include weed and pest control, mowing, slashing and brushcutting, watering, replacement of failed vegetation, topping up of mulch, and pruning/ shaping of vegetation. Monthly inspections are required during this period to review the Contractor's program and works completed. The monitoring period is finalised when the designated period (typically 12 months or to end of Defects Liability Period) is completed and where works have met the acceptance criteria of the contract. At the finalisation of the monitoring period a certificate completing the monitoring period is issued.

16.2.6.3 Final Inspection

The *Certificate of Finalisation of the Landscape and Revegetation Works Monitoring Period* is issued after the finalisation of the monitoring period.

1.3 Finalisation

1.3.1 Hand-over to the Region or Local Government Authority

Once the final inspection has been completed and all issues are closed out the project is handed over to the asset owner to maintain and operate. The process involved includes:

- assigning the parties responsible for maintenance, the Department or Local Government Authority or Queensland Rail; and
- delineating extents of responsibility on plans.

This process of agreement is best undertaken throughout the design process to ensure expectations are met. Most projects involving landscape works are covered by this process, only projects undertaken under Element 8 - Road Landscape may require project specific application of this process.

1.3.2 As Constructed Drawings

As constructed drawings are required to support the asset management systems, designers need ensure that they:

- represent surveyed as constructed landscape revegetation and urban design treatments;
- are based on As-Constructed X-reference drawings obtained from the other design disciplines;
- include photographic records (Figure D1-2) of the landscape revegetation and urban design treatments, demonstrating finished quality; and
- are used to form the basis for the Project's *Landscape Operational Manual*.

Figure D1-2: Photographic records reflect the standard of installed treatments.

1.3.3 Project Learning's

For most Type 1 projects, a project learning's paper should be written to capture strengths and weaknesses associated with the project. It should be a broad review of the consultation and contract administration process as well as review the technical improvements or areas for further research and development.

1.4 Operations

1.4.1 Routine Maintenance

Routine maintenance is essential to maintain a safe road corridor. The most frequent and highest cost maintenance activities are the removal of hazards within clear zone and maintaining site distance requirements. While grass is relatively inexpensive to establish through seeding large areas, it is easily invaded by tall colonizing weeds and exotic grasses. This can create conflicts with sight visibility requirements and potential fire hazards, and require considerable reoccurring management. Slashing is the highest cost routine maintenance activity on a state wide basis.

The landscape and urban design process should develop alternative sustainable landscape treatments that improve environmental, safety and economic values for the life of the asset. The preferred outcome should have reduced the maintenance requirements down to the bare essentials. This includes:

- a progressive reduction in the number of interventions over time for planted areas;
- eliminating need for herbicide applications and brush cutting around road furniture such as guardrail posts;
- eliminating turf grass in urban medians; and
- screening noise barriers where space permits to reduce/eliminate graffiti.

Routine maintenance of landscaped areas should be limited to target herbicide spraying and annual pre-emergent herbicide renewal application in mulched areas, topping up of mulch at year five, vegetation management in relation to clear zone requirements and the landscape design should support these limited operations under the *Road Maintenance Performance Contract*.

Maintenance activities pose a unique set of challenges for the personnel undertaking the tasks, particularly where located close to or adjacent to the roadway. Workplace, Health and Safety require that safety precautions and work method statements are in place prior to any activity occurring within the corridor (Figure D1-3). This is to ensure the workers safety and that of the travelling public.

Figure D1-3: Effective traffic control in place to ensure safety of personnel maintaining road landscape

Creating a safe work environment for maintenance crews to operate has a significant impact on budgets. Traffic control and lane closures are significant costs associated with the maintenance of the road landscape. These safety measures can restrict the hours the site is available due to peak hour traffic. Some work activities may only be able to occur at night due to traffic volumes during the daylight hours. In many cases, the cost of traffic control is equal to or more than the cost of the maintenance activity. Bundling routine landscape maintenance with other road safety maintenance is a means to reduce costs, however requires proper planning and co-ordination.

The *Road Maintenance Performance Contract* is the method by which the Department delivers routine maintenance.

1.4.2 Road Maintenance Performance Contract

The *Road Maintenance Performance Contract Manual* has three parts:

- Volume 1 Sole Invitee - outlines the contractual conditions of a sole invitee contract.
- Volume 2 Open Competition - outlines the contractual conditions of an open tender process.
- Volume 3 Activity Standards and Specifications - defines the activities and the work required under that activity.

This manual is available on the department's website www.tmr.qld.gov.au

1.4.3 Element 8 - Road Landscape

Current maintenance practices are reactive. With the adoption of the Road System Manager (RSM) Framework and Maintenance Performance and Operations (MP&O) Programs there will be a transition period to alternative approaches that ensure that the Road Landscape Frameworks (RLF) levels of service are achieved. This may take a number of years as a cultural change is required in developing and adopting new systems to support these outcomes.

The Element 8 - Road Landscape, Element Management Plan, relies on the key principles, strategic objectives, standards and practices of this manual. The plan focuses on landscape and urban design improvements to promote compliance with the level of service on all Queensland roads. This includes:

- Streetscapes and Town Entries: improvements to State-wide tourism opportunities through the upgrade of regional and town 'main street' streetscapes and 'town entry' statements delivered in partnership with the local government authority.
- Urban Forest: creation of opportunities for amenity, air and water quality improvements through the implementation of revegetation of grassland within roundabouts, interchanges and junctions of major and arterial roads to minimise ongoing maintenance.
- Tourism: improvements to road user experience of the scenic and aesthetic amenity of the State-wide road corridor through Themed Tourism route signage, interpretive signage and amenity plantings at primary links to tourism hubs, lookouts, rest areas and/or points of historical/cultural interest.
- Urban Integration: installation of screen planting to front of noise barriers where space is available (>1.5m width) or painting where planting is not feasible (min. barrier longevity 10yrs+).

1.4.4 Management of the Urban Forest

The urban forest is a collective resource; which provides the community with a wide range of safety, social, economic, visual and environmental benefits. Management requires recognition of the role of the urban forest as an essential infrastructure asset. Achieving and maintaining an urban forest is a key outcome the road landscape frameworks levels of service in an urban context.

It involves increasing the extent and quality of the urban forest through coordinated planning, suitable planting and ongoing maintenance practices (Figure D1-4). The urban forest may be impacted by future road upgrades. Where the road upgrade is 10-15 years in the future, an ephemeral, short lived landscape based on Acacia species is preferred. Where a longer period prior to upgrading is probable, then a planting design based upon long lived species is preferred.

Figure D1-4: Management of the existing urban forest and implementing urban forest concepts within the corridor

16.4.4.1 Vegetation Management

Vegetation within the road corridor should be managed utilising the following standards:

- *Australian Standard AS4970-2009: Protection of trees on development sites*- for where maintenance works includes minor construction works;
- *Australian Standard AS4373-2007: Pruning of Amenity Trees* - for best practice pruning techniques;
- *Australian Standard AS4454-2012 Composts, soil conditioners and mulches*; and
- Thayer Tree Valuation Method: for calculating replacement value of trees.

16.4.4.2 Vegetation Management and Maintenance Team Model

To promote vegetation management and ensure maintenance activities are executed to these standards: the team should consist of personnel with:

- A Certificate III in Horticulture;
- An Agricultural Chemicals Distribution Control ground distribution operators license;
- Road Landscape Manual Awareness Training;
- MRTS16 Landscape and Revegetation Works Training;
- Soil Management Manual Training; and
- Manual of Uniform Traffic Control Devices Training.

Appendix 1

Road Landscape Policy - Supporting Framework

June 2013

Appendix 1 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Appendix 1
Road Landscape Policy Supporting Framework

1.1 Policy Context

The relative position of the Road Landscape Policy in the hierarchy of relevant legislative acts, corporate strategic documents and technical governance systems. (Figure APX1-1).

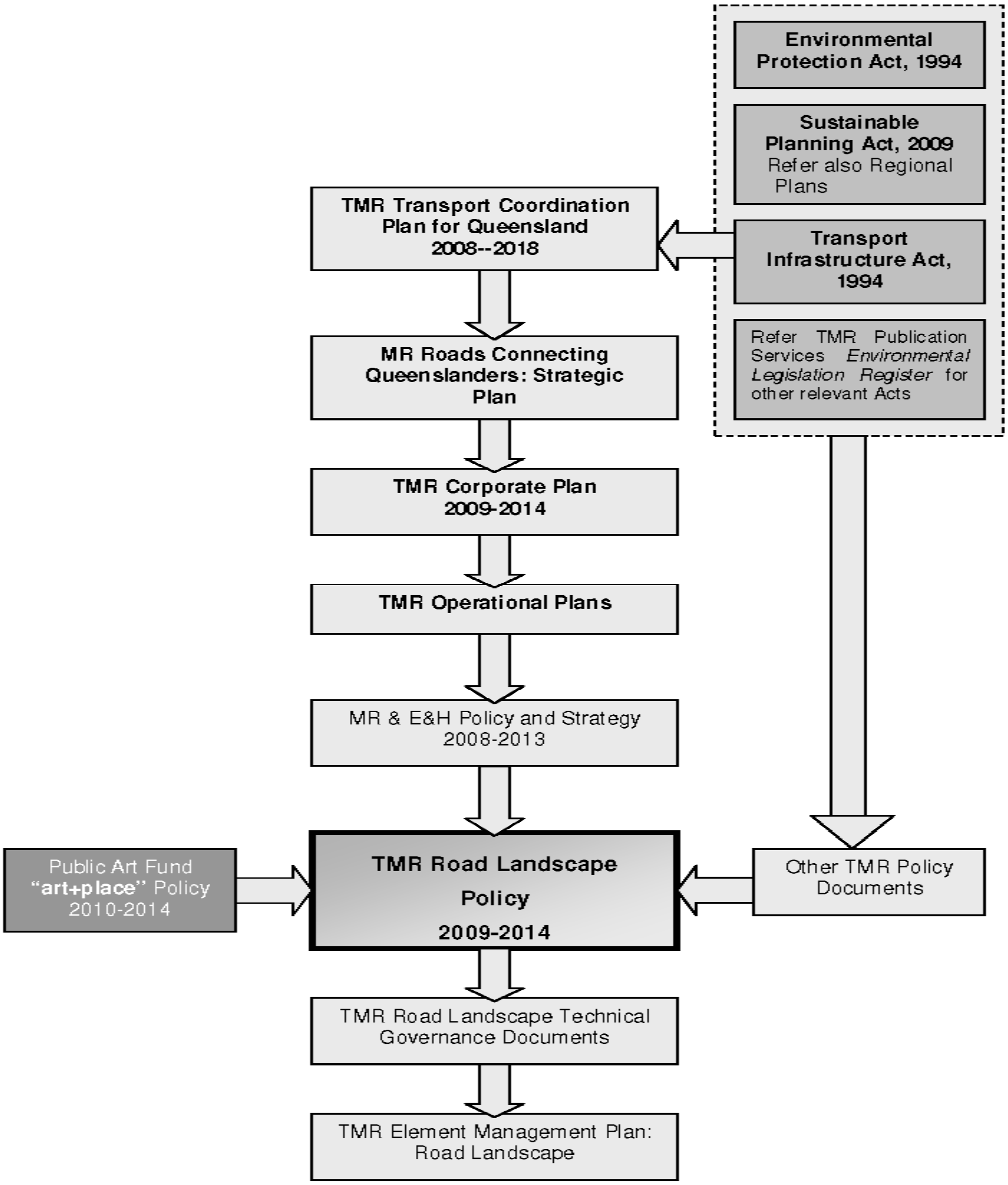

Figure APX1-1: Road landscape policy hierarchy

1.1.1 Legislative Basis and Responsibilities

1.1.1.1 Environmental Protection Act, 1994

The prime legislative basis for the *Road Landscape Policy* is the *Environmental Protection Act* (EPA). The Act provides both the legislative need and justification for Departmental expenditure of public monies in the conservation and enhancement of the environmental values of the state controlled road corridor (SCRC); including transport systems. Environmental value as defined in the EPA as *"a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety".* (EPA , 1994 s9)*.*

Road landscapes provide direct and tangible benefits to the conservation and enhancement of the ecological health and public amenity of the state controlled road corridors. Safety is also proactively addressed by the considered design and application of planting treatments and urban design finishes.

The five strategic objectives of the *Road Landscape Policy* provides an overarching framework for the development of technical governance systems and project specific contract requirements, ensuring transport and road infrastructure project outcomes are aligned to the legislative requirements of the EPA.

1.1.1.2 Sustainable Planning Act, 2009

The *Sustainable Planning Act* provides a framework for the coordination and integration of development and infrastructure planning at local, regional and State levels of Government, in order to manage and support ecological sustainability.

Ecological sustainability is defined under the Act as a balance that integrates:

- *"protection of ecological processes and natural systems at local, State and wider levels;*
- *economic development; and*
- *maintenance of the cultural, economic, physical and social well being of communities".*

(SPA, 2009 [s6].8).

Regional Plans (refer '**Relevant Documents' Section**) have been developed as planning schemes by the Queensland State Government in response to the *Sustainable Planning Act* (and the superseded *Integrated Planning Act, 1997)*. Core matters for consideration in any planning scheme (including transport and road infrastructure planning) include valued features as defined in the *Sustainable Planning Act* such as:

- *"resources or areas that are of ecological significance…;*
- *areas contributing significantly to amenity, including…areas of high scenic value, physical features that form significant visual backdrops or that frame or define places or localities, and attractive built environments);*
- *areas or places of cultural heritage significance (…cultural…aesthetic, architectural, historical, scientific, social or technological significance, to the present…past or future generations)".*

(SPA, 2009 [s89] 2).

Given the extensive reach of the state controlled transport and road asset and the broad scope of attendant scenic amenity factors, the state controlled road corridors must be viewed as a playing a major role in ecologically sustainable development within a regional and state contexts.

As the state agency for the planning management and delivery of transport and road infrastructure, the Department of Transport and Main Roads has statutory obligations to addressing the ecologically sustainable development priorities under the *Sustainable Planning Act* and each of the statutory

Queensland Regional Plans. The *Road Landscape Policy* addresses these priorities by providing a framework of five strategic objectives for conserving maintaining and delivering positive contributions to ecological, amenity and community values throughout Queensland.

1.1.1.3 Transport Infrastructure Act, 1994

The Transport Infrastructure Act's major objective is to provide a regime that promotes effective integrated planning and efficient management of transport infrastructure. The Act requires state transport authorities to regularly develop transport infrastructure strategies. The *Transport Coordination Plan for Queensland* and *Roads Connecting Queenslanders* are the Department of Transport and Main Roads responses to this legislative requirement.

The *Road Landscape Policy* supports the *Roads Connecting Queenslanders* in meeting the *Transport Integration Act's* legislative requirements by providing strategic policy direction for delivering the road landscape component of state transport and road infrastructure.

1.1.2 Corporate Responsibilities

The *Road Landscape Policy* details five road landscape strategic objectives in support of TMR corporate objectives. These include:

- Delivering direct benefits aligned to several of the objectives of the TMR Corporate Plan (TCP) including the provision of:
    - *"A sustainable transport system which promotes economic growth and liveability;*
    - *A safe transport system leading to improved health and wellbeing for Queenslanders;*
    - *Inclusive transport services linking people to employment, education, services and their communities; and*
    - *Transport related impacts on the natural, cultural and built environments managed for the community".*

    (TCP 2011-15).
- Delivering direct benefits aligned to the Main Roads, *Roads Connecting Queenslanders (RCQ)* Strategic Plan (which cascades down from the Transport Coordination Plan as the states leading policy document for road transportation), which commits the Department to achieving state ambitions through the following outcomes:
    - *"safer roads to support safer communities;*
    - *environmental management to support environmental conservation;*
    - *fair access and amenity to support liveable communities; and*
    - *efficient & effective transport to support industry competitiveness & growth".*

    (RCQ 2002-07)
- Providing support to the Roads Connecting Queenslanders in meeting the objectives of the Department's *Transport Coordination Plan for Queensland.*

The table below demonstrates the interrelationships between each of the five strategic objectives in addressing Transport and Main Road's corporate objectives and legislative responsibilities.

Road Landscape Policy	*MR Roads Connecting Queenslanders -*	*TMR Corporate Plan*

Road Landscape Strategic Objective	Priorities	Objectives
SAFETY	*'Safer roads to support safer communities'*	*'A safe transport system leading to improved health and wellbeing for Queenslanders'*
ENVIRONMENT	*'Environmental management to support environmental conservation'*	*'Transport related impacts on the natural, cultural and built environments managed for the community'*
AESTHETICS	*'Fair access and amenity to support liveable communities'*	*'Inclusive transport services linking people to employment, education, services and their communities'*
COMMUNITY		
ECONOMIC	*'Efficient and effective transport to support industry competitiveness and growth'*	*'A sustainable transport system which promotes economic growth and liveability'*

Table APX1-1: Road landscape framework - urban context

1.1.3 Related Departmental Policy

A full list of Departmental policies (Environmental Management) and technical documents (including national and international standards) with interrelationships to the road landscape is provided under '**Relevant Documents'** Section.

1.1.4 Key Non-Departmental Policies and Guidelines

1.1.4.1 art+place Policy, 2010-2014

The Queensland Governments' *Public Art Fund* ***art*****+place** Policy supports the Queensland Governments priority of creating a *'fair, socially cohesive and culturally vibrant society'*.

This policy details expenditure requirements for integrating urban design/public artwork components within new public building works for enhanced public amenity outcomes. While specific to public buildings, the ***art*****+place** Policy provides strong justification for a similar level of dedicated, value adding expenditure for urban design and public artwork outcomes for transport and road infrastructure projects.

The *Road Landscape Policy* strongly supports measured expenditure towards appropriate, high quality urban design outcomes within the scope of its ***Road Landscape Strategic Objective: Aesthetics***.

1.1.4.2 Crime Prevention Through Environmental Design (CPTED), Guidelines for Queensland, 2007

'Safe and secure communities' is a primary outcome of the whole of government approach to transport and road infrastructure planning and delivery. In recognition of TMR responsibilities to all transport and road corridor users, the *Road Landscape Policy* highlights the need to incorporate CPTED principles within the planning and design process (refer ***Road Landscape Strategic Objectives: Safety*** and ***Community***).

1.2 Currency

The *Road Landscape Policy* supports the legislation, Queensland State Government and Departmental strategy documents published as of the commencement of the 2009/2010 financial year. The policy will be regularly updated to align with precedent hierarchy documents as these as are revised and published.

1.3 Consultation

Development of the policy has integrated:

- review of the interim Main Roads, *Road Landscape Policy (1994)* against current departmental and industry best practice;
- review of current, relevant legislation and statutory documents and alignment with statutory requirements;
- integration of emergent Departmental strategic policy following amalgamation of Queensland Transport and Main Roads;
- review of relevant Austroads and departmental policy and technical governance systems;
- review and benchmarking of other state road authority aligned policy and technical governance systems;
- consultation with aligned Departmental transport and road design disciplines;
- consultation with external stakeholders, including landscape and urban design consultancies;
- consultation and work shopping with other state road authority's road landscape representatives; and
- capture of critical performance requirements and learnings of recent successful road landscape projects

Peer review was provided by a number of select internal and external agencies including:

- Department of Transport and Main Roads environmental officers;
- local government authorities landscape offices;
- interstate road authorities landscape architects;
- national and state industry representatives;
- external consultancies (landscape architects and engineers); and
- Queensland University of Technology (Faculty of Built Environment).

1.4 Relevant Documents

1.4.1 Legislation

- Environmental Protection Act, 1994
- Sustainable Planning Act, 2009
- Transport Infrastructure Act, 1994
- Refer also TMR Publication Series – *Environmental Legislation Register* for full list of legislation relevant to transport and road projects

1.4.2 Regional Planning Documents

<u>Statutory</u>

- Connecting SEQ 2031 – An Integrated Regional Transport Plan for South East Queensland
- South East Queensland Regional Plan 2009-2031
- Far North Queensland Regional Plan 2009-2031
- Central West Regional Plan

- South West Regional Plan
- North West Regional Plan
- Maranoa-Balonne Regional Plan
- Mackay, Isaac and Whitsunday Regional Plan
- Wide Bay Burnett Regional Plan 2007-2026

Non-Statutory

- Central Queensland Regional Growth Management Framework
- Gulf Regional Development Plan
- Surat Basin Regional Planning Framework

1.4.3 Austroads Strategy Documents

- Austroads Strategic Plan, 2007-2012

1.4.4 TMR Strategy Documents

- Transport Coordination Plan, 2008-2018
- Roads Connecting Queenslanders, 2002-2007
- TMR Corporate Plan 2011-2015
- TMR Operational Plans

1.4.5 TMR Policy Documents – Road Corridor Management

- Policy – Roadside Conservation
- Policy – Clearing within the Road Boundaries
- Policy – Declared Plants (Noxious Weeds)
- Policy – Fire Threat Management
- Policy – Roadside Advertising
- Policy – Ancillary Works and Encroachments
- Policy – Screening of Overpass Structures
- Policy – Community Engagement
- Policy – Graffiti Management

1.4.6 TMR Technical Documents - Landscape and Urban Design

- MRS16 and MRTS16 Landscape and Revegetation Works: Specification Suite, Contract Administration Systems (Checklists), User Guidelines and Training Packages.

1.4.7 TMR Technical Documents – Environmental Management, Road Planning and Design

- Road Planning and Design Manual – Austroads Practice Notes
- MRS51 and MRTS51: Environmental Management
- Road Planning Environmental Processes Manual
- Fauna Sensitive Road Design Manual
- Road Drainage Design Manual
- Road Traffic Noise Management – Code of Practice
- Guide to the Management of Roadside Advertising

1.4.8 TMR Road System Manager, Corridor Management

- Element Management Plans: E8 Road Landscape

1.4.9 National and International Technical Documents

- DOTARS
- Austroads Publications
- Federal Lands Highway Experience and Initiatives with Context Sensitive Solutions, Federal HighWay Administration, 1995

1.4.10 Other Relevant Policies Documents

- Queensland Public Arts Fund **art+place** Policy (arts Queensland), 2010-2014
- Crime Prevention through Environmental Design (CPTED), Guidelines for Queensland, 2007
- National Strategy for Ecologically Sustainable Development, 1992
- Urban Stormwater: Best Practice Environmental Management Guidelines (CSIRO), 1999
- Water Sensitive Urban Design, Technical Design Guidelines for South East Queensland, 2006
- Australian Runoff Quality: A Guide to Water Sensitive Urban Design, Engineers Australia, 2006
- Queensland Water Recycling Guidelines, 2005

Appendix 2

Visual Assessment

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Appendix 2 Amendments – June 2013 Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Appendix 2
Visual Assessment

2.1 Introduction

This appendix provides a detailed outline of the visual ecological and cultural heritage analysis process for major projects in new corridors where route options are being explored.

2.2 Step 1 – Visual Analysis

All new transport infrastructure proposals will have some visual effect on the landscape through which it passes. The visual analysis functions to determine the types of visual impacts and level of significance to users. The final outcome of a visual analysis is to minimise these impacts and optimise the visual fit of the corridor into its broad regional context and local landscape setting.

There are five main factors that need to be addressed in the visual analysis. These are:

- existing visual setting and visual landscape character units;
- existing visual catchment and visual sensitivity;
- existing views and visual amenity;
- modifications to the visual character and impacts on the visual landscape; and
- visual experience for all users.

A review of these factors will determine the overall level of visual impact. It will also assist in understanding the nature of the visual interaction of the new transport and road proposal with the existing landscape character. This provides a basis for developing appropriate mitigation measures to decrease the overall level of visual impact.

2.2.1 Stages of the Analysis

Visual analysis should be undertaken by suitably qualified landscape architects experienced in undertaking assessments of this kind. A series of defined tasks should be followed when conducting a visual analysis (Figure APX2-01). These are:

Task A - describe visual setting and identify visual landscape character units (and associated landscape sensitivity);

Task B - identify visual catchment (and associated visual locality), visual sensitivity, view types;

Task C - determine predicted modifications to visual character; and

Task D - assess visual experience for all Users.

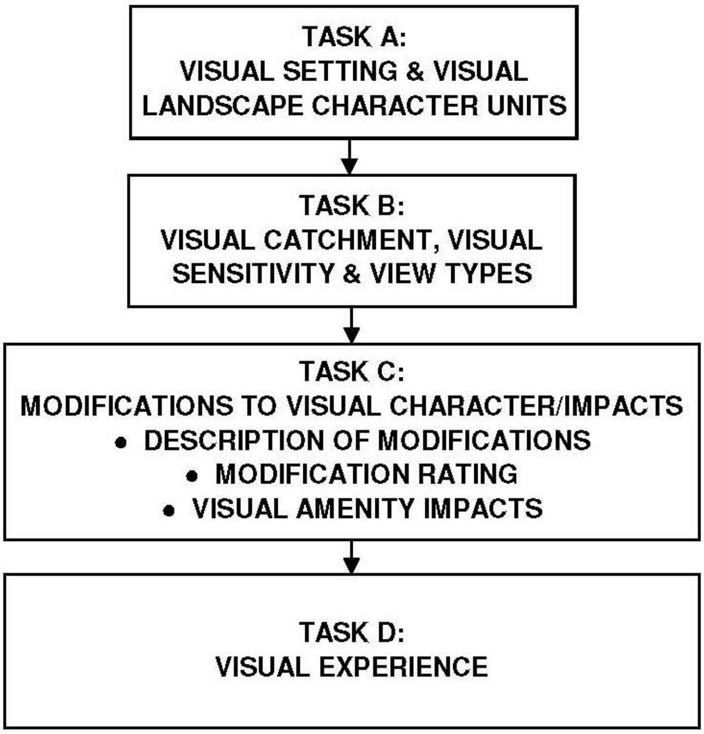

Figure APX2-1: Required tasks when undertaking a visual analysis

2.2.1.1 Task A – Visual Setting and Visual Character Landscape Units

This task requires classifying the overall visual landscape according to a broad setting and character unit.

Visual Setting

Visual settings will have strongly defined visual qualities occurring within broad precincts along the transport and road corridor. A project proposal or site will contain a variety of visual features formed by natural and cultural heritage items which create this visual setting. These features influence how the landscape is viewed and appreciated by users. Examples of these are:

- natural – topography, vegetation and hydrological features; and
- cultural heritage - dominant land use and settlement patterns as well as buildings and infrastructure, such as powerlines.

These features can simply yet effectively be shown on a site plan (Figure APX2-02).

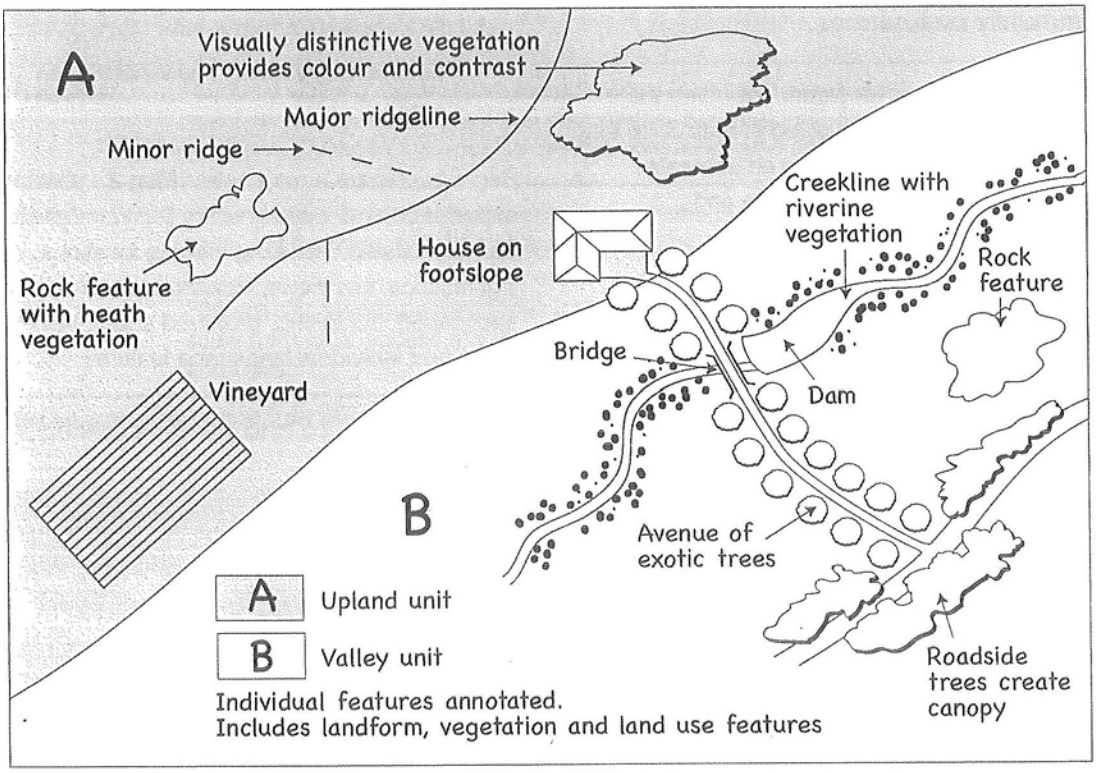

Figure APX2-2: An example plan showing key features of the visual setting

Source: Western Australian Planning Commission, etal, 2007, p27

The site analysis template/ checklist (Appendix 3) is a basis for identifying these elements within the road landscape.

A visual setting should be established at each of the following scales (where applicable relative to the size of a particular project):

- Local (0-1 km);
- Sub-Regional Visual Locality (1-5 km); and
- Regional (>5 km).

This setting is then to be further broken down into character units. A visual setting may comprise one or more visual character units.

Visual Landscape Character Units

The purpose of breaking down the corridor area into character units is to make the visual analysis process more comprehensive and accurate at the project scale. It also ensures that context sensitive designs are delivered during the design stage of projects. Visual character units also help to determine the level of landscape sensitivity within these units.

Visual character units are single identifiable units which can also be referred to as local landscape character zones. These units result from the differing mix of dominant natural and cultural heritage features defined earlier by the broader visual setting.

Local landscape character zones will generally vary along a route, creating a variety of landscapes and experiences. To identify this variety, the corridor study area should be divided into a number of broad homogenous visual landscape character units. These units can generally be identified by being the most visually dominant within the landscape. The character zones should then accordingly be mapped (Figure APX2-03). It should be noted that visual landscape character units will be more significant and potentially easier to identify on larger sized or more complex projects.

Figure APX2-3: Mapping of visual landscape character units along a corridor

Figure APX2-03 provides an example only of mapping visual landscape character units. Often transport and road projects; particularly smaller types, will only have one land use within the corridor. Subsequently, other dominant features within the road landscape can be used as a basis for defining these zones. Potential features may include:

- dominant vegetation community/ies;
- significant topography (for example; landform);
- hydrological features;
- urban development types; and
- land use.

Landscape Sensitivity

Landscape sensitivity refers to the landscapes relative sensitivity to change. As an example, a national park will be more sensitive to change than an industrial area. A landscape's uniqueness within the broader landscape, its continuity and ability to change without obvious alteration to character, all determine the level of landscape sensitivity.

The sensitivity of a zone is dependant on the level of:

- uniqueness within the broader landscape;
- continuity of natural and built features and elements that define or exemplify an areas character; and
- ability to accommodate to change without obvious or significant alteration to character or loss of important elements which define that character.

Landscape sensitivity can be analysed in two perspectives; physical and community. The landscape sensitivity from a ***physical*** perspective relates to the landscapes ability to accommodate change, while landscape sensitivity from a ***community*** perspective relates to the extent of the community at large who will perceive changes in the landscape.

The following criteria describe the levels of landscape sensitivity to change from a ***physical*** perspective:

- ***High landscape sensitivity –*** The landscape has a high level of continuity and uniqueness within the broader landscape, and has a low ability to accommodate change without obvious or significant alteration to existing character, or loss/reduction of key elements which define that character (Figure APX2-04);

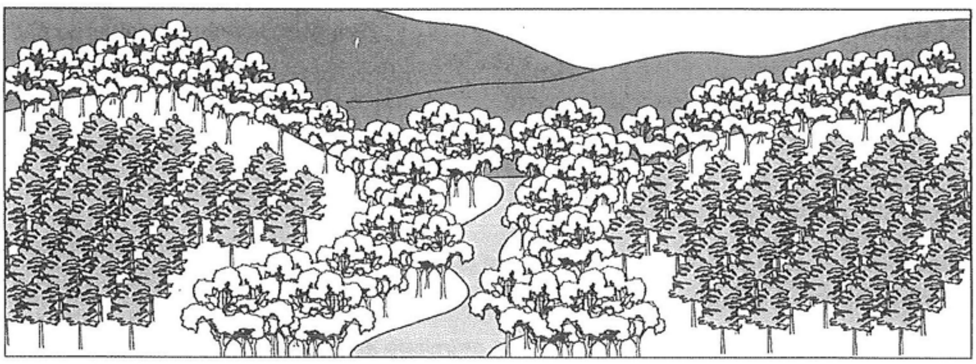

Figure APX2-4: Physical Perspective - This image reflects high landscape sensitivity and a low ability to change, due to the continuity of remnant vegetation and a distinct character defined by creek lines and surrounding topographical features

Source: Western Australian Planning Commission, etal, 2007, p120

- ***Moderate landscape sensitivity -*** The landscape has a moderate level of continuity and uniqueness within the broader landscape, and has the ability to accommodate to change without obvious or significant alteration to existing character, or loss/reduction of key elements which define that character; and
- ***Low landscape sensitivity -*** The landscape has a low level of continuity and uniqueness within the broader landscape, and will accommodate change without obvious or significant alteration to existing character, or loss/reduction of key elements which define that character.

Sensitive landscapes can generally accommodate some level of alteration, although greater emphasis is required in environmental management and formulation of mitigation measures to limit and/or manage the level of alteration.

The following criteria describe the levels of landscape sensitivity to change from a ***community*** perspective:

- ***State level landscape sensitivity -*** the landscape has a high value to the state wide community at large; the proposal has the potential to visibly contrast with the existing landscape character to a degree that would be perceived and experienced by a majority of Queenslanders as a whole;
- ***Regional level landscape sensitivity -*** the landscape has a high value to the community of Brisbane and South East Queensland; the proposal has the potential to visibly contrast with the existing landscape character to a degree that would be perceived and experienced by a majority of South-East Queensland;
- ***Local level landscape sensitivity -*** the landscape is primarily valued by the local community; the proposal has the potential to contrast with the existing landscape character to a degree that would be perceived and experienced by a majority of the local community; and
- ***Less than local level landscape sensitivity -*** the landscape has little value to the local community, and the proposal would have little contrast to the existing landscape character.

Landscapes with high value to the state wide community, and where alteration to that landscape would be perceived by the state wide community can be regarded as having a high level of landscape sensitivity. Landscapes with only local community value and little degree of perceivable alteration can be regarded as having low landscape sensitivity.

2.2.1.2 Task B – Visual Catchment, Visual Sensitivity and View Types

This task requires a more comprehensive analysis of visual aspects within the road landscape from a broader perspective relative to visual catchments. The task then gets more detailed by establishing a level of visual sensitivity within the road landscape.

Determine Visual Catchment

The visual catchment refers to the extent of areas in which a corridor can be viewed from nearby areas or wider surrounding areas by the travelling public. The degree of visual exposure and potential for visibility within the visual catchment extents is influenced primarily by the combination of surrounding landform, built forms and vegetation. The primary visual catchment encompassing all areas from which a new transport and road proposal may be viewed needs to be clearly identified and mapped when undertaking a visual analysis. A potential way of defining and illustrating clearly the visual catchment is to produce a Visual Envelope Map (Figure APX2-05).

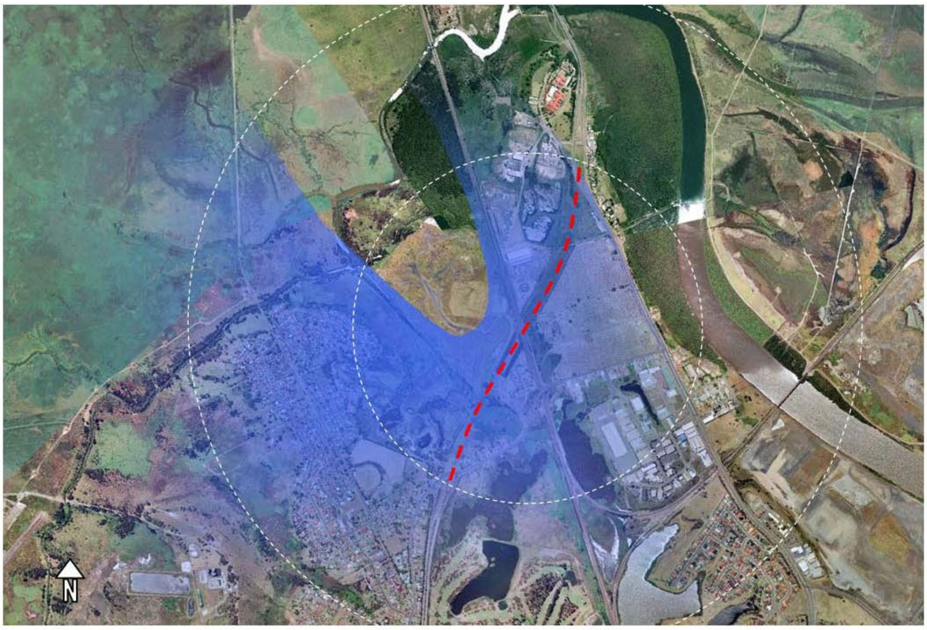

Figure APX2-5: Defining and illustrating the visual catchment

Source: Roads and Traffic Authority of NSW (2009) i), Figure 4-4 'Visual Envelope Map'

Visual Locality

Visual locality prescribes general distance parameters to establish set viewing locations along a proposed corridor alignment. The three general visual locality parameters are:

- Local – the corridor seen from viewing locations less than 1 kilometre away (these locations are often more readily known by the local community).
- Sub-regional visual locality – viewing locations between 1 and 5 kilometres away.
- Regional visual locality – viewing locations further than 5 kilometres away.

In most cases for transport and road corridor projects, the visual catchment is generally limited to the local visual locality only, however, in larger scale projects, it can occur in sub-regional and regional localities.

Determine Visual Sensitivity

Visual Sensitivity refers to the landscapes visual values sensitivity to change. It determines how sensitive the visual character of the landscape setting is to the proposed changes relative to the new transport and road proposal.

The following terms describe the degrees of visual sensitivity possible within state controlled road corridors and transport networks:

- ***High visual sensitivity –*** a highly experienced view to a landscape or feature which is iconic to the state, to a major section of a city/region or a significant view from an area of regional open space (Figure APX2-06);

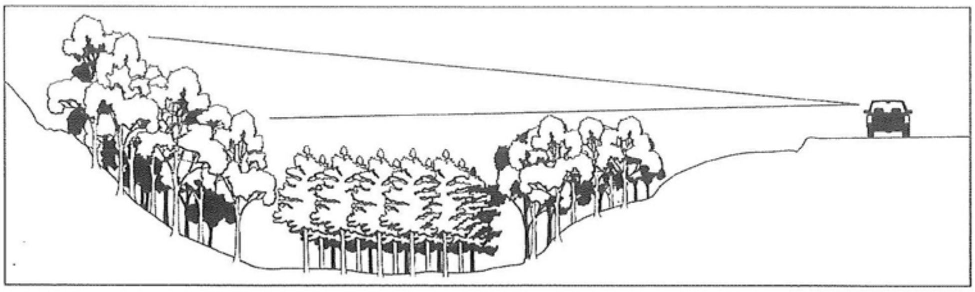

Figure APX2-6: This image reflects high visual sensitivity, due to a significant view to mountainous landscape feature being experienced along a major travel route

Source: Western Australian Planning Commission, etal, 2007, p120

- ***Moderate visual sensitivity -*** high quality views experienced by large numbers of local residents and/or recreational users and/or commuters; and
- ***Low visual sensitivity -*** views where visual amenity's importance is low, (such as views from an industrial area).

Visual sensitivity is also linked to visual quality; that is, the visual condition of the road landscape and how it is perceived, preferred, and valued by the public. Visual sensitivity can be affected by personal viewer perception, particularly within local communities, since individuals will perceive different settings differently.

Because visual sensitivity can be affected by subjectivity, it is difficult to measure quantitatively. However, when assessed in conjunction with visual landscape character units, more quantitative outcomes can be established. The level of visual sensitivity can be estimated by identifying the visual landscape character units and landscape sensitivities mapped as part of Task A. Figure APX2-07 illustrates an example of a Visual Sensitivity Matrix.

TYPICAL VISUAL LANDSCAPE CHARACTER UNIT	VISUAL LOCALITY		
	Local (0-1 km)	Sub-Regional (1-5km)	Regional (>5km)
Urban Residential	H	M	L
Rural Residential	H	H-M	L
Tourist Facility	H	H-M	L
Recreation Facility	H	H-M	L
National Park	H	H	M
Regional Park	H	H-M	L
Local Park	H	M	L
Federal Road (Auslink)	H	L	L
Other State Controlled Roads (OSCR)	M	M	L
Local Roads of Regional Significance (LRRS)	M	M	L
Scenic Roads	H	M	L
Themed Tourist Routes	H	L	L
Commercial Development	H	L	L
Institutional Development	M	L	L
Industrial Area	L	L	L
Rural Area	L	L	L

L = Low Sensitivity
M = Moderate Sensitivity
H = High Sensitivity

Figure APX2-7: Visual sensitivity matrix

Visual sensitivity may also refer to the extent and type of views, frequency and volume of viewers. For example; an industrial area would have lower visual sensitivity than a residential area due to small volumes of viewers.

Highly visually sensitive areas include residential areas, transport systems and main roads with high volumes of viewers, and parklands where visitation is short but a high level of importance is placed on the visual amenity.

Permanent audiences, such as the local community and residents, are likely to have a relatively high sensitivity. This is because they may experience the views on a daily basis and be attached on a personal level (Figure APX2-08). Temporary audiences will have a potentially lower sensitivity since in the viewing areas on a more occasional basis.

Figure APX2-8: Transparent panels on the bridge are used to retain views where high visual sensitivity was an important community issue

Determine View Types

A general assessment of the common view types located throughout the corridor should be undertaken to determine their specific locations and the potential impacts of the road proposals on significant views.

It should be noted that views into existing corridors can be influenced and constrained by a combination of topography, vegetation, existing transport and roadway infrastructure (for example noise barriers) and built forms associated with land use. The combination of these generally limits the extent of visibility of all view types, and restricts expansive and long views of the corridor from areas immediately adjacent.

Types of views apparent within the road landscape can include:

TYPE OF VIEW	DESCRIPTION	ILLUSTRATED EXAMPLE
Vista	*A confined view usually with a terminating point in distance. The terminating point is the main point which viewers focus on and which captures attention.* Vistas are often created by a nodal feature or landmark.	
Viewshed	*Is a contained view (either by land or object) of an area of land, water, or other landscape and or cultural heritage item, visible from a fixed vantage point. Viewsheds are most often areas of particular scenic or historic value that are readily visible from public areas such as from roadways, transport systems or open space. Viewed areas generally have inherent visual or aesthetic qualities as determined by those who view it.*	
Framed	*A view framed by other items within the landscape, either to both sides or to one side; to create visual balance and symmetry.* Framing is often created by vegetation or built structures.	
Sequential	*A series of views experienced while the viewer is in motion that build up and transition progressively over a length of the transport and road corridor.* These views will generally contain: • Visual entry/ exit points; * • Visual transition points; and ** • Visual termination point.	
Panoramic	*A broad view which includes the landscape as a whole viewable area.* Panoramic views are often experienced from existing under and/ or overpassing roads or transport infrastructure within the corridor network.	
Open	*An open view allows viewers to move visual focus from one feature to another; allowing a variety of items to be viewed simultaneously within the road landscape.*	

<table>
<tr><th>TYPE OF VIEW</th><th>DESCRIPTION</th><th>ILLUSTRATED EXAMPLE</th></tr>
<tr><td>Closed</td><td>Closed views limit the amount a viewer can see, prompting viewers to visually focus in on a particular segment within the landscape.</td><td></td></tr>
<tr><td colspan="2">* Visual entry/ exit points are places along the transport and road corridor which visually make people aware of approaching, entering or exiting a sequenced area. These points should not be visually abrupt so as to distract drivers or users of transport facilities, but be gradual.</td><td>** Visual transition points are places along the transport and road corridor where people become aware of moving from one type of landscape to another. Changes in visual character of features located at these points provide visual transition by changing to reflect the character of a landscape setting into which a person is travelling.</td></tr>
</table>

Table APX2-1: View types

Documenting View Types and Viewpoints

Identifying and mapping the main views experienced by users to and from the corridor alignment is an important part of the visual analysis process.

This identification and mapping of view types provides a basis for determining visual amenity, and recording and categorizing information about the visual qualities of an area. An evaluation of the existing view types provides the baseline conditions against which visual amenity and the effects of modifications to the visual character can be considered.

Viewpoints should be selected from:

- within the visual catchment;
- regular intervals along the corridor;
- within a reasonable distance of the project; and
- other various suitable locality points along the length of the corridor.

A schedule of key viewpoints (based on the view types), should be generated by designers.

2.2.1.3 Task C – Modifications and Impacts to Visual Character

Modification refers to the broader alteration to the visual character within the landscape as a consequence of a new transport and road proposal from a specific viewpoint.

By describing and documenting the previous tasks required of the visual analysis process, potential modifications to the visual character can be identified and rated as to their magnitude. This task is particularly important relative to context sensitive design, as it determines how visually compatible the proposal (according to its magnitude) will be with the surrounding landscape setting.

Description of modifications

In the first instance, predicted modifications to the visual character should be described in broad qualitative terms. Using photographs and computer generated imaging as support is also an effective tool of conveying likely effects on visual quality.

Descriptions and illustrations should focus on the potential:

- changes to existing views at key areas and viewpoints, highlighting the nature and scale of the change;
- overall effects to the landscape settings; and
- degrees of modification to the overall visual character.

The degree of modification to the existing visual character should be defined as:

- **Low**;
- **Moderate**; or
- **High**.

The degree of modification should be made according to the overall extent of contrast created by the new transport and road proposal. General criteria for determining the degree of potential modifications imposed on visual character (Figure APX2-9).

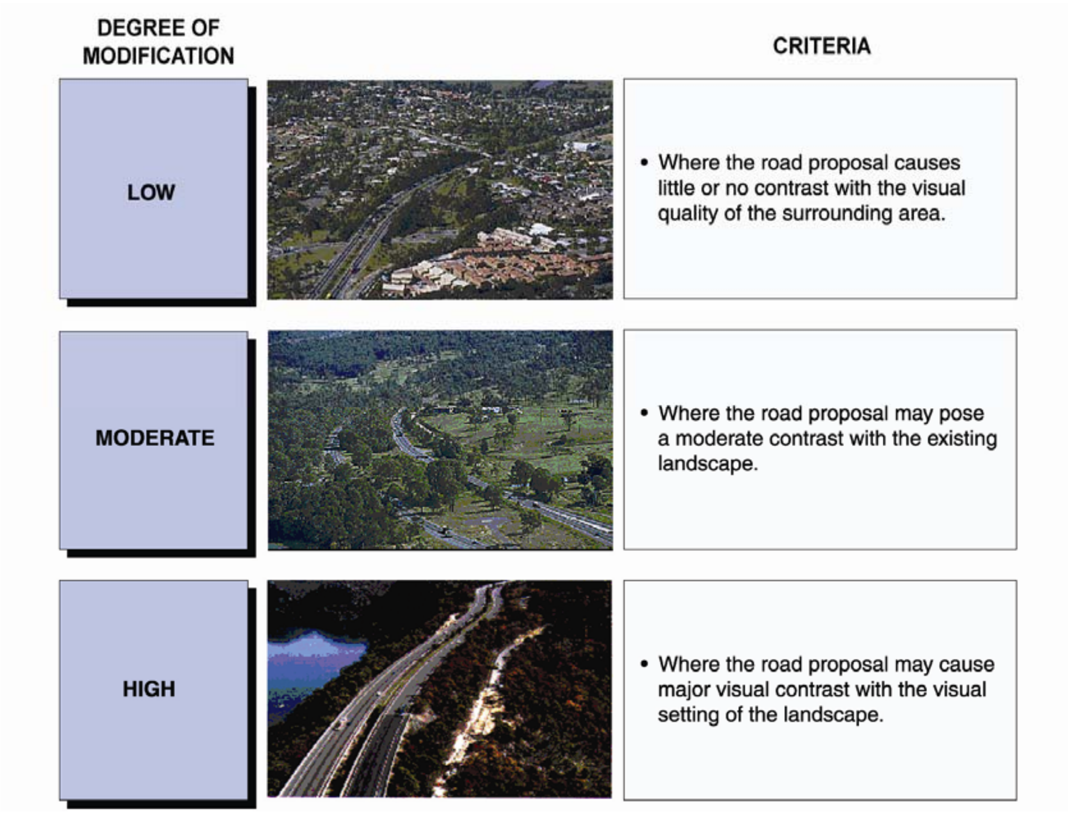

Figure APX4-1: Criteria for assessing degree of modification to visual character

Modification Rating

Assigning a modification rating to the overall visual character of the transport and road proposal is the next stage within this task. Ranking visual sensitivity against the magnitude of the transport and road project provides a clear grading value for the overall changes proposed within the road landscape (Figure APX2-10).

Sensitivity \ Magnitude	High	High to Moderate	Moderate	Moderate to Low	Low	Negligible
High	High impact	High impact	Moderate-high	Moderate-high	Moderate	Negligible
High to Moderate	High impact	Moderate-high	Moderate-high	Moderate	Moderate	Negligible
Moderate	Moderate-high	Moderate-high	Moderate	Moderate	Moderate-low	Negligible
Moderate to Low	Moderate-high	Moderate	Moderate	Moderate-low	Moderate-low	Negligible
Low	Moderate	Moderate	Moderate-low	Moderate-low	Low impact	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Figure APX2-9: A matrix for determining the visual character modification rating

Source: Roads and Traffic Authority of NSW (2009) i), Figure 4-6 'Landscape character and visual impact grading matrix'

Note that the magnitude of the project should be determined by the basic project details; such as its location, form and key features. The outcome of the modification rating is the first step towards determining visual impacts.

2.2.1.4 Task D – Visual Experience

The final task of the visual Analysis process involves assessing the likely visual experience for users of a proposal. This is a qualitative exercise and is best undertaken by describing the perceived visual experience of users in terms of:

- predominant landscape character of the corridor, for example; bushland, urban, rural;
- significant view types and viewpoints;
- unique landscape features, for example; mountains (Figure APX2-11), lakes, built structures;

Figure APX2-10: Unique landforms can enhance the visual experience for users

- any major comparisons identified from existing (pre-proposal) to proposed (post-proposal) conditions; and
- identification of preliminary mitigation measures to protect or enhance visual experience (Figure APX2-12).

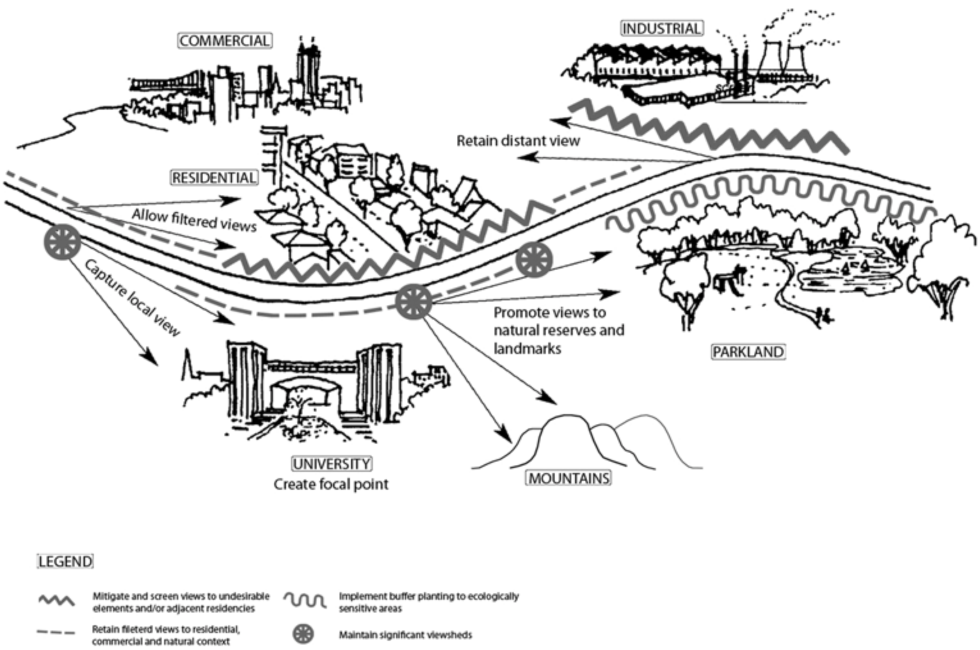

Figure APX2-11: An example preliminary assessment of mitigation measures required to retain or screen different view types

Simple graphic illustrations can be used to depict impacts of the proposal on the visual experience at particular locations, and convey preliminary mitigation requirements. Another useful method for undertaking an assessment of the visual experience is to describe an expected drive through experience for the motorist. This can be effectively captured through a continuous photographic survey of existing views into, from and within the transport and road corridor, and through computer animation of resulting proposed impacts on visual experience (Figure APX2-13).

Vantage Point: WC2

IMAGE VIEW:

INTEGRATED VIEW:

VISUAL PERCEPTION:

VISUAL ASSESSMENT

VANTAGE POINT	VISUAL DISTANCE	VIEW PERIOD	VIEW SENSITIVITY	VIEW IMPACT	MITIGATION
WC2	100 - 200m	Moderate	★★★☆☆	★★☆☆☆	★★★☆☆
Western Freeway heading outbound in a westerly direction with the tunnel portals in view.	Middle-ground focus on the Western freeway with the interface of Portals and signage.	Vehicles in motion, pedestrians, cyclists, heavy regular commuter and transport traffic.	Due to transient views of new western embankment in the middle-ground.	Noticeable deterioration of view due to embankments, transition zone and portals.	Landscape enhancements and stabilisation of western embankment to improve visibility along Western Freeway.

Figure APX2-12: An example photographic depiction of the existing visual experience at a particular vantage point and proposed changes to this experience

Source: Place, etal (2008)

2.3 Step 2 – Ecological Analysis

Ecological values refer to the conservation value of, and relationship between, flora and fauna in an area through which a transport and road corridor passes. The ecological analysis process should be undertaken by suitably qualified environmental specialists experienced in undertaking assessments of this kind, due to the detailed identification and understanding of flora and fauna required. This analysis should be undertaken as part of the overall integrated landscape assessment process, however it may have been completed prior to or during this process, as a separate specialist task. It is critical in either case that the outcomes and reporting of the ecological analysis be incorporated into the integrated landscape assessment process.

Different levels of ecological analysis will also be required according to the scale of the project, and whether a major or minor new transport and road proposal. For example, large projects may require a qualified specialist to undertake assessment at a detailed level. Smaller projects generally require discretion of the designer to determine level of ecological analysis required; for example, small projects may only require simple mapping of existing vegetative communities to determine the significance of species.

Generally, an ecological analysis will require qualified professionals to:

Task A - undertake field assessment, including mapping of species distributions (flora and fauna);

Task B - identify, describe and document ecological values; and

Task C - determine potential new transport infrastructure proposal impacts on ecological values, including flora and fauna habitats.

Task B and ***Task C*** are of importance to the integrated landscape assessment process in order to gain a clear understanding of ecological values and their level of significance. Producing corridor mapping plans through a series of overlaying maps which depict identified ecological values is an effective way of clearly conveying the data. A report should also accompany these maps as supporting documentation of findings.

It is also important to determine predicted impacts of the proposal on these values, as well as to landscape values as a whole. The impact on ecological values can be significant; particularly for large scale projects, and the cumulative effect of all interactions with the local environment should be considered.

Predicted severity of impacts should be clearly ranked as per the ranking system for new transport infrastructure proposal impacts on Visual Values; that is, either:

- **Low;**
- **Medium;** or
- **High.**

Note that the tasks provided above are of a general nature only and different requirements may be suited to the project as determined by a suitably qualified professional experienced in undertaking ecological analyses. For more detailed information on environmental assessment processes, refer to Road Project Environmental Processes Manual.

2.3.1 Existing Urban Forest

Protecting the existing urban forest goes beyond that of protecting individual specimen trees. A much broader perspective should be adopted which assesses the collective value of existing vegetation, to determine its need for retention within the corridor (Figure APX2-14).

Figure APX4-2: The existing urban forest in the background of this transport and road corridor has been protected for its ecological value

Overall aspects which may be assessed are age (and associated ability to regenerate further in future), structure, canopy contribution and amenity value.

More specific aspects of the urban forest to consider during assessment include:

- identifying existing significant species and remnant vegetation of environmental, historical (and/or cultural heritage), horticultural, and aesthetic value;
- providing an assessment of existing vegetation conditions, vegetation retention value (based on useful life expectancy) and risk potential; and
- identifying those species requiring removal: for example dangerous, hazardous, dead, dying or diseased specimens, weed species, poorly performing species and those that are inappropriate for site conditions and subsequent replacement (Figure APX2-15).

Figure APX2-13: The urban forest reinstated within the transport and road corridor

2.3.2 Biodiversity Significance

The Department of Environment and Resource Management (DERM) have developed tools to assess biodiversity values at a landscape scale across Queensland, and determine a level of biodiversity significance (state, regional and local significance and/or other values). These tools are:

- Biodiversity Assessment and Mapping Methodology; and
- Biodiversity Planning Assessments.

A variety of environmental attributes have been assessed and accordingly mapped including plant species, regional ecosystems, bio-condition, fire management constraints, and connectivity throughout the landscape. A final single score of the biodiversity significance of relatively homogeneous road sections is then calculated and displayed on the maps.

DERM's Biodiversity Planning Assessments also identify areas with special biodiversity values. These values are important to include in an ecological analysis, as they often contribute to a unique ecological and often highly bio-diverse environment. An understanding of special biodiversity values also assists in defining special areas within the road landscape to retain and preserve. Areas containing these values can include:

- wildlife refuges (for example, caves, wetlands, gorges, mountain ranges and isolate topographical features);
- those with high species richness (flora and/or fauna);

- those with a high density of hollow-bearing trees (habitat trees for animals); and
- significant breeding or roosting sites populated by many.

Refer to DERM's website (http://www.derm.qld.gov.au) for further information on these Biodiversity Assessment tools.

2.4 Step 3 – Cultural Heritage Analysis

Cultural heritage values refer to the human significance and historical elements of an area through which a new transport and road proposal passes. A detailed process for analysing cultural heritage values is documented within the Department's Cultural Heritage Risk Assessment Form.

It should be recognised that an analysis of cultural heritage is a specialist task that should be undertaken by professionals qualified in anthropology and archaeology. The tasks outlined in this section are intended only to provide simple guidance in ensuring cultural heritage values are integrated into the overall integrated landscape assessment process and is not intended to fulfil the purpose of a stand-alone Cultural Heritage Risk Assessment.

Generally, the main analysis tasks required are:

Task A **-** research context and development;

Task B **-** undertake detailed research;

Task C - identify, describe and document cultural heritage values (encompassing aesthetic, historic, scientific and social value); and

Task D **-** determine potential new transport infrastructure proposal impacts on cultural heritage values.

Task C is of importance to the integrated landscape assessment process in order to gain a clear understanding of the role of cultural heritage values in influencing and shaping the existing landscape setting within the transport and road corridor. Cultural heritage values have a strong relationship with the community since they encompass aesthetic, historic, scientific and social value (Chapter 14). Identifying rare and/or significant cultural heritage areas or features is important for the local community, in order to maintain a sense a place and landscape character (Figure APX2-16).

Figure APX2-14: Historic school in foreground and distant mountain range located adjacent to transport and road corridor combine to form strong cultural heritage value for local communities

Task D is also important to determine predicted impacts of the proposal on cultural heritage values. Recognising these values within the existing corridor early at the assessment and planning stage of a project, is extremely important before any clearing and grubbing occurs. This is vital to protect areas identified as being of cultural heritage significance, as well as retaining their contribution to landscape values as a whole.

The predicted severity of impacts should be clearly ranked as per the ranking system for the proposal impacts on visual values; that is, either:

- **low;**
- **medium;** or
- **high.**

2.5 Step 4 – Combined Analysis of Landscape Context and Landscape Values

The purpose of undertaking a combined analysis is to synthesise the visual, ecological and heritage analyses. This should be a simple process of drawing together data collected and summarising key outcomes. The combined analysis should also establish clear links between landscape context and values, and how they contribute to the landscape character of the area as a whole.

The format of this combined analysis should take the form of a short summary text component within the Integrated Landscape Assessment Report or Opinion. It should clearly provide key conclusions of the analyses as a whole. Illustrated graphics may also be useful to depict key findings. A table listing the overall findings of landscape context, visual, ecological and cultural heritage values is an effective way of capturing links, similarities or conflicts between the data. Developing a priority matrix system may also help to identify one or all of the landscape values which will have the most influence within the transport and road corridor, or be most affected by the proposal. A matrix also assists in establishing priority areas requiring greater or more detailed mitigation strategies.

2.5.1 Impacts on Landscape Values

A preliminary assessment of potential impacts of a proposal on existing landscape values is important during the planning stage and prior to commencing the actual design process. This initial assessment assists with scoping for future design stages as well as devising a strategy for the project. The level of detail associated with this preliminary assessment will be determined by the scale and significance of the project.

Note that impacts need to be described qualitatively in the first instance for inclusion in an integrated landscape assessment opinion or report clearly summarising:

- visual impacts;
- ecological impacts; and
- cultural heritage impacts.

Specific impacts according to these landscape values should then be clearly set out in a comprehensive schedule or table, providing:

- a short description of potential impacts;
- extent of impacts;
- duration of impacts; and
- severity and impacts.

Suitable photographs should also be included in the table to justify all impacts and conclusions on their predicted severity. This table then serves as an overall summary of all potential impacts of the proposal and their interactions with the landscape.

APX2-Table 2 provides an example table useful in describing all impacts relative to the landscape values of visual, ecological and cultural heritage.

EXISTING LANDSCAPE VALUES (and example potential impacts)	DESCRIPTION OF POTENTIAL IMPACTS	EXTENT OF IMPACTS (for example; Chainage References)	DURATION OF IMPACTS				SEVERITY OF IMPACTS			ILLUSTRATION OF IMPACTS (for example; photographs)
			Permanent		Temporary					
			Short Term	Long Term	Short Term	Long Term	Low	Medium	High	
VISUAL VALUES ▪ Changes to the Visual Character ▪ Effects on Visual Amenity ▪ Altered Outlook for Road Users ▪ Built versus Natural Impacts										
ECOLOGICAL VALUES ▪ Loss of existing Flora ▪ Loss of existing Urban Forest ▪ Loss of and Modification to Fauna Habitat ▪ Specific Habitat Loss										
CULTURAL HERITAGE VALUES ▪ Modification of Settings of Cultural Significance ▪ Loss of and Modification to Cultural Heritage Items										

Figure APX2-15: An example table of potential impacts of new transport infrastructure proposal on landscape values as a whole

Where a specific impact is noted as particularly critical and ranked with a high severity rating, a more detailed impact analysis should be undertaken relative to the specific issue. An example where this may be warranted is in the case of a proposal having a highly severe impact on pedestrian and cyclist connectivity within the immediate local community, as well as to surrounding areas (Figure APX2-17).

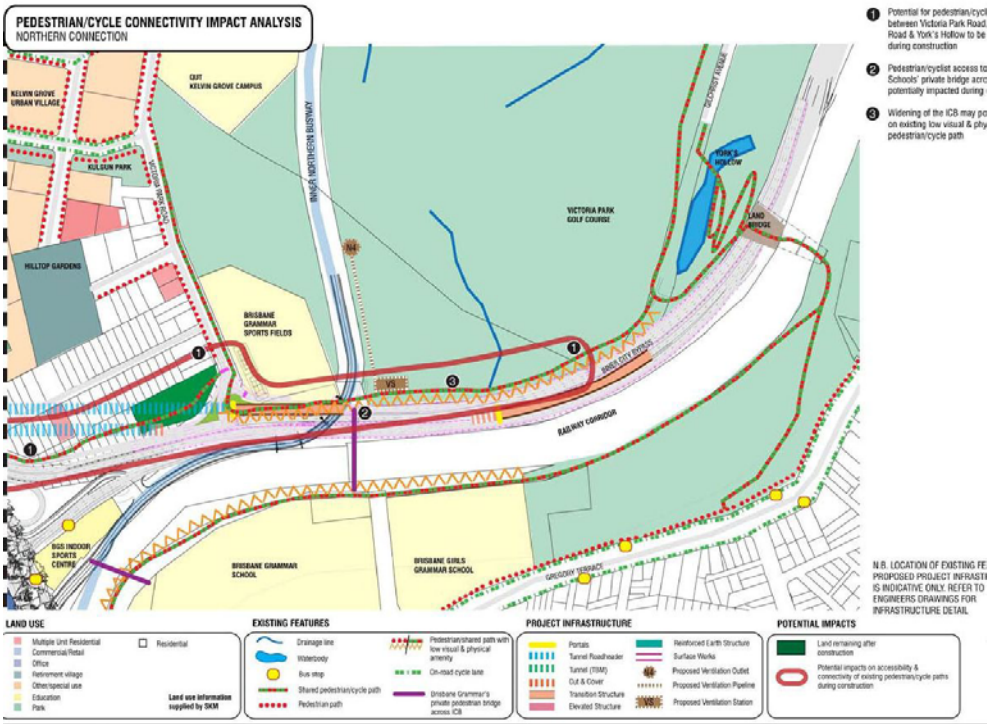

Figure APX2-16: An example pedestrian and cyclist connectivity impact analysis

Source: Place, etal (2008)

It should be noted that a balance between the impacts of visual, ecological and cultural heritage should be sought by designers. Figure APX2-18 shows an example where the impacts of a new road proposal have been appropriately balanced.

Figure APX2-17: Balancing impacts of the road proposal on landscape values through reduced clearing, visual expression of geology and character maintained

The reasons for the differences between rankings should be made clear in the final *Integrated Landscape Assessment Report or Opinion*. Although most impacts will be described qualitatively, where possible, quantitative effects (for example; number of houses with view of road, area of vegetation to be removed and so on) should also be documented.

2.5.2 Mitigation Measures

Nearing the completion of the integrated landscape assessment process, mitigation measures require development to minimise and remediate the potential identified impacts of the proposal. These preliminary measures aim to resolve possible conflicts and mitigate possible effects on landscape values and the character of an area.

It should be noted that mitigation measures are not only designed to avoid, reduce or eliminate adverse or negative effects. They can also be used to enhance or generate positive effects within the road landscape. This task is critical in managing the visual qualities of the corridor and enabling aesthetic outcomes to be achieved. It also assists in guiding the ongoing future design process.

Broad mitigation measures may include:

- best practice, fit for purpose siting and context sensitive design;
- protection and maintenance; and
- restoration and or enhancement.

2.5.2.1 Best Practice, Fit for Purpose Siting and Context Sensitive Design

Complement the existing landscape character. Emphasise tourist routes and high sensitivity areas by being visually expressive of significant surrounding features. Reflect distinctive topography, forms, shapes and patterns of the landscape setting, as well as individual vegetation communities, different stands and unique species (Figure APX2-19).

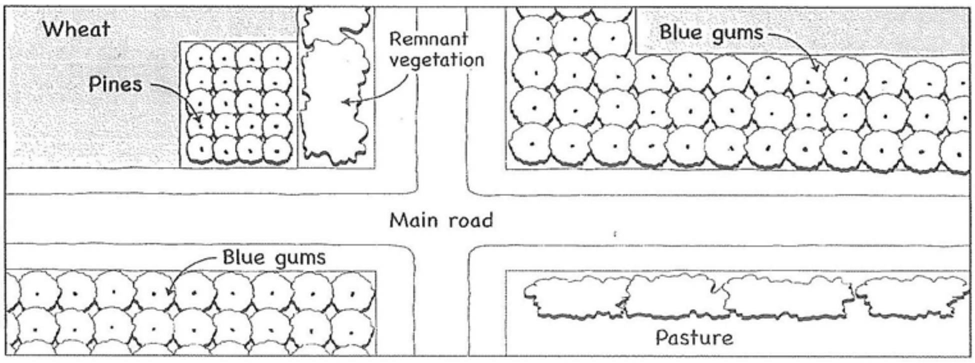

Figure APX2-18: A broad mitigation measure to ensure context sensitive design is implementing vegetation species which complement those in the surrounding landscape

Source: Western Australian Planning Commission, etal, 2007, p120

Capitalise on opportunities to sensitively locate and site design components to reduce visual impacts. Locate landscape works strategically to screen or soften line of sight to undesirable features or activities from a sensitive or significant viewpoint.

2.5.2.2 Protection and Maintenance

Retain existing significant vegetation and wildlife corridors. Minimise the width of clearing of significant vegetation communities with ecological values, particularly through areas with canopy trees. Enhance existing wildlife corridors through the addition of tall native tree species.

Preserve significant views and visual amenity. Emphasise rather than diminish the value of distant and close views, ensuring that built structures do not dominate, distract or diminish the ability to appreciate a view corridor. Where appropriate mitigate, remediate and screen undesirable views. Reduce impact from within the corridor out to adjoining areas, as well as from views into the corridor from adjacent viewers.

2.5.2.3 Restoration and / or Enhancement

Protect and create habitat opportunities. Reinstate cleared areas through selection and planting of wildlife attracting species. Enhance vegetation in waterway areas.

Offset impacts of the proposal by *ensuring* treatments to built structures are designed with appropriate form, materials and detailing (including colour, patterns and textured finishes). Provide consistent, where suitable, within view corridors by integrating design components which are visually appropriate to the local character and setting.

Figure APX2-20 provides a guide to some of the commonly identified mitigation measures required within transport infrastructure corridor projects, and their relationship to the identified impacts.

IMPACTS ON LANDSCAPE VALUES	FACTOR	POSSIBLE MITIGATION MEASURES
VISUAL EFFECTS	Changes to the Visual Character	▪ Minimise width of existing vegetation clearances ▪ Undertake native planting to reflect local character & blend into existing environment ▪ Design batters & embankments with suitable slope grades and/or benching to facilitate planting
	Effects on Visual Amenity	▪ Screen transport & road networks from viewers with planting and/or structures (if required) ▪ Undertake planting outside of transport & road corridor with agreement from landowners ▪ Ensure consistency in design treatments & plant species selection
	Altered Outlook for Road Users	▪ Screen unsightly views with vegetation and/or structures (where possible) ▪ Feature & accentuate attractive views ▪ Provide filtered views outwards to scenic areas
	Built versus Natural Impacts	▪ Minimise 'bulky'/ 'constructed' appearance of overpass structures within natural environment (where possible) ▪ Ensure contextually appropriate urban design treatments to built structures ▪ Integrate 'hard' structures with planting (where space permits)
ECOLOGICAL EFFECTS	Loss of existing Flora	▪ Minimise loss through transport & road design and/or re-alignment ▪ Replace lost flora with similar vegetation types & provide more flora species in new works than those removed (if possible) ▪ Prepare vegetation management plans & ongoing maintenance/ monitoring plans
	Loss of existing Urban Forest	▪ Protect existing urban forest & reinstate new similar plantings ▪ Establish roadside regeneration areas (where feasible) ▪ Minimise disturbance to wetland plant communities & other specialised habitat areas
	Loss of and Modification to Fauna Habitat	▪ Minimise loss through transport & road design and/or re-alignment ▪ Provide fauna crossings (including signs) & culverts ▪ Integrate landscape treatments with fauna movement devices
	Specific Habitat Loss	▪ Provide newly created habitats; for example, detention basins ▪ Integrate habitat trees; for example, koala feeding trees ▪ Prepare ongoing maintenance & monitoring plans
CULTURAL HERITAGE EFFECTS	Modification of Settings of Cultural Significance	▪ Re-align transport & road corridor location (where possible) ▪ Undertake detailed cultural heritage assessment (engage specialist where required) ▪ Ensure landscape design compliments local setting & provide suitable interpretative signage
	Loss of and Modification to Cultural Heritage Items	▪ Recording, preservation and/or relocation of cultural heritage item (engage specialist where required) ▪ Enhancement of retained cultural heritage item with suitable landscape treatment ▪ Provide appropriate interpretative facilities for users/ visitors

Figure APX2-19: Schedule of typical mitigation measures

Mitigation measures should be developed specific to the identified impact they need to mitigate, and relative to the project site and proposal details. These measures serve as a basis for future design stages. Mitigation measures should be prepared in written form as well as graphically depicted through plans, cross sections and illustrations, in order to provide a clear direction for future implementation. They may also require input, consultation and development from other specialist areas and disciplines; such as transport and road planners and designers.

2.6 Step 5 – Integrated Landscape Assessment Strategy

Following the prediction of potential impacts of the proposal, together with an identification of the appropriate mitigation measures to address these, the final step of the assessment process involves the formulation of a landscape integration strategy. The intention of a landscape integration strategy is to provide a proactive statement on how a proposal may best be integrated with its landscape setting. This strategy should generally include the following levels:

- establishing an overall vision;
- developing project specific strategies; and
- master planning.

This strategy should also be integrated into the project's Environmental Management Plan and include recommendations for further action during the design process; particularly at the stages of design, construction, and maintenance.

2.6.1 Overall Vision

The overall vision for the Integrated Landscape Assessment Strategy is a simple statement which captures the intended manner in which the proposal will be both integrated within its landscape setting and proposed treatments. A vision statement might aspire to one or several of the following:

- ***Gateway*** – An arrival point via a roadway or transport system into a specific locality or region (Figure APX2-21);
- ***Parkway*** – A continuous roadway or transport corridor with consistent character and treatments;
- ***Scenic Route*** – A roadway or transport system with scenic outlook to natural, cultural or scenic features;
- ***Environmental Corridor (or Greenway)*** – A corridor linking areas of wildlife habitat or providing selected natural features in an urban setting;
- ***Avenue (or boulevard)*** – A formal roadway or transport corridor with consistent and regular features; and
- ***Feature*** – A distinctive roadway element contrasting with and highlighting adjoining features (Figure APX2-22).

Figure APX2-20: An example of a feature vision implemented through the urban design treatment to the retaining walls of this underpass structure within a new transport and road proposal

2.6.2 Developing Project Specific Strategies

Project specific strategies are developed based on the impacts identified in the combined analysis and the identified mitigation strategies to address these. The strategies are used to guide the development of design outcomes in the Landscape Master Plan and for further action during the design, construction, and maintenance stages.

2.6.3 Master Planning

Landscape Master Plans represent the broadest level of landscape and urban design planning for projects. They provide a coordinated design approach to all components of the road landscape.

Public amenity improvement opportunities should be written in the form of specific recommendations, to provide a clear conclusion to the integrated landscape strategy. Supporting illustrative maps and plans should also be included to clearly capture identified opportunities.

Appendix 3

Site Analysis Checklists

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Appendix 3 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

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Appendix 3
Site Analysis Checklist

3.1 Site Analysis Checklist

The use of the survey will depend on the complexity of the site and scope of project. A selection of some items or all items may require further investigation, depending on scale of the project.

Existing Road Landscape Items	Checklist – Stage of Project	Checklist – Applicability *(R-Rural, U-Urban, N-Natural)*
Landscape Setting: • urban; • rural; and • natural.		
Land Use Zoning: • Local Area Plans; • Development Control Plans; and • Native Title.		
Current/ Previous/ Future Surrounding Primary Land Uses: • public (eg. open space, parks and recreational areas); • private (eg. residential, commercial); • agriculture; • pastoral Land (eg. cropping activities); • site contamination eg. artificial fertilisation; and • degraded land.		
Boundaries: • cadastral; • easement; and • natural (eg. bushland and/or forest boundaries).		
Infrastructure: • rail; • ports and marinas; • power stations and transmission lines; • silos; • airfields; • quarries; • schools; • shopping facilities; • community facilities; and • car parks.		
Settlement Patterns (layers): • historic influences (eg. industry, housing etc.); • cultural influences (eg. Indigenous heritage); • residential (eg. housing) versus commercial (eg. businesses); • public versus private (interfaces); and • State Forests and National Parks.		

Existing Road Landscape Items	**Checklist – Stage of Project**	**Checklist – Applicability** *(R-Rural, U-Urban, N-Natural)*
Building types: • cultural heritage; • historic; • residential; • industrial; and • commercial.		
Built versus Natural: • infrastructure (size of buildings versus amount of green space); and • associated density.		
Structure and Form: • 'horizontal' context (eg. Road Formation and roadside elements); and • 'vertical' context (Urban components, Major Built elements and structures eg. Buildings, homesteads, powerlines).		
Socio-economics		
Visual Cues (permanent, temporary and transitory): • shapes, patterns, clusters, scatterings, graduations and mixtures etc; and • colours and textures. Experiential Cues (temporary and transitory): • air movement; • smell; and • sounds.		
Local Roads and Connections		
General Public Access (including disabled access)		
Pedestrian pathways		
Cyclists - bikeways		
Major nodes and landmarks		
Public transport networks		
Surrounding vegetation status and classification		

Existing Road Landscape Items	Checklist – Stage of Project	Checklist – Applicability *(R-Rural, U-Urban, N-Natural)*
Common/ Dominant species: • significant; • habitat value/ habitat trees; and • potentially used currently as wildlife movement corridors.		
All other species (i.e general vegetation species, groups and communities)		
Vegetation Character/ Themes		
Environmentally sensitive: • rare (locally or nationally); • endangered; • threatened; • remnant; and • protected.		
Weeds (declared and pest)		
Vegetation Distribution (mapping): • extents; • species.		
Vegetation Structure: • layering (i.e emergent's, lower; mid and upper canopy storeys); and • layout (i.e principal coverage species).		
Species (requiring retained): • quality; and • visual appropriateness.		
Urban Forest (mapping): • % canopy cover/ vegetation cover/ ground surface cover, versus; and • % soil exposure.		
SPECIALIST INVESTIGATIONS MAY BE REQUIRED: • Detailed *Botanical Survey;* • Species *Inventory;* • F*lora Assessment Report.*		
Underlying geology, noting the following: • Contamination; • Land degradation; • Artificial fertilisation; • Fill areas.		
Physical Soil characteristics (general only): • texture; • structure; • water holding capacity; and • slaking potential.		

Existing Road Landscape Items	**Checklist – Stage of Project**	**Checklist – Applicability** *(R-Rural, U-Urban, N-Natural)*
Chemical characteristics		
Identification and classification of soil types		
Predominant soil type/s *(NOTE: High risk or medium risk soils should be flagged)*		
Erosive properties / dispersiveness: • Level of Erosivity Risk (identifiable)		
SPECIALIST INVESTIGATIONS MAY BE REQUIRED: • *Geotechnical Report; and/or* • *Soil Suitability Report.*		
Significant fauna: • dominant species		
Transient fauna		
Endangered		
Pests		
Fauna Habitats, Corridors and Linkages (located and mapped)		
SPECIALIST INVESTIGATIONS MAY BE REQUIRED: • *Fauna Assessment Report*		
Broad Bio-geographical elements: • topography; • geology; • water sources; • vegetation; and • fauna.		
Built Structures (eg. historic)		
Indigenous Heritage: • sites; and • artefacts.		
SPECIALIST INVESTIGATIONS MAY BE REQUIRED: • *Cultural Heritage Assessment Report;* • *Archaeology Report; and/ or*		

Existing Road Landscape Items	**Checklist – Stage of Project**	**Checklist – Applicability** *(R-Rural, U-Urban, N-Natural)*
• *Aboriginal History Report.*		
General Overview: • immediate; and • adjoining.		
Landform: • contours; and • slope angles.		
Notable natural landmarks: • creeks, streams and rivers; • mountains; and • batters and embankments.		
General description of catchment characteristics (temporary and permanent): • catchment area; and • boundaries.		
Water table: • level; • depth; and • quality.		
Water courses: • rivers / creeks/ streams		
Notable water bodies/ features		
Drainage Lines: • discharge points/ outlets		
Storm water network		
Ground water sources (eg. aquifers)		
Recycled water sources		
Flood Frequency: • relevant time of year; and • predicted flood levels.		
Salinity		
Tidal influences		

Existing Road Landscape Items	**Checklist – Stage of Project**	**Checklist – Applicability** *(R-Rural, U-Urban, N-Natural)*
Surface Water		
Springs and Seeps		
Floodplains		
Wetlands		
SPECIALIST INVESTIGATIONS MAY BE REQUIRED: • *Water Quality Report; and/or* • *Drainage Report.*		
Average rainfall: • seasonal (monthly) variations in rainfall; • corresponding rainfall frequencies and intensity; and • rainfall distribution.		
Average temperatures		
Average humidity levels		
Average daily sunshine levels		
Frost potential		
Prevailing winds, and associated air quality (pollution levels)		
Coastal proximity, and associated salinity levels		
Immediate (specific impacting sounds): • traffic noise; and • industrial/ commercial/ residential noise.		
Distant (background noise sources): • traffic noise; • industrial/ commercial/ residential noise.		
Temporary sounds/ influences: • sporting/ event facilities.		

Existing Road Landscape Items	**Checklist – Stage of Project**	**Checklist – Applicability** *(R-Rural, U-Urban, N-Natural)*
Permanent sounds/ influences (as per immediate and distant sources noted above)		
Above ground: • electricity; and • lighting.		
Below ground: • electricity; • gas; • telecommunications/ telecom/ telstra; • fibre optics; • sewerage; and • water (eg. stormwater mains, residential/ commercial connections, fire hydrants, rain water).		

Appendix 4

Vegetation Setbacks and Clearances

June 2013

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Appendix 4 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
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Appendix 4
Vegetation Setback and Clearances

4.1 Minimum Vegetation Setbacks and Clearances Schedule

The purpose of this schedule is to provide the required vegetation setbacks and clearances for planting designs. The schedule should be used by designers at the preliminary and detailed design stage of the design process. All setbacks and clearances are based on the Department's and Public Utility Provider (PUP) minimum requirements at the time of publishing. This schedule should be used in conjunction with sight distance and clear zone requirements associated with design speeds; as per the Departments *Road Planning and Design Manual* (RPDM). These safety requirements take precedence and will override all setbacks and clearances where conflicts occur.

Refer to **APX4-*Table 1: Minimum Vegetation Setbacks and Clearances Schedule***

Note:

- *For all projects being documented for construction, at detailed design stage, setbacks and clearances must be included by the designer on the Notes and Legend Sheet within the construction drawings package. This ensures all setbacks and clearances are clearly communicated to the Contractor, and where onsite conditions vary the design, these can be adjusted according to these minimum requirements;*
- *The designer must confirm with all relevant service providers their required clearances and setbacks for each design project, and provide written confirmation to the project manager;*
- *Some PUP setbacks and clearance parameters will be project specific and subject to a case by case project decision; and*
- *Where applicable Local Government Authority (LGA) setbacks and clearances may apply, and are to be provided in writing to the project manager.*

This table should be read in conjunction with the following supporting information:

4.1.1 Design Exceptions

Where designers propose deviation from the Department’s minimum safety clear zone requirements and those included in this schedule, and non-compliance would result, a design exception must be sought. It should be noted that safety is the priority of the Department, and a design exception will not be granted if it directly opposes safety requirements and increase safety risks within the state controlled road corridor. The Department will not accept liability for variances from the TMR’s accepted safety design standards. Any variances to Departmental safety standards will be subject to assessment on a case by case basis relative to the particular situation by the Regional or District Director, who will either grant approval or reject. Detailed design drawings must document and note any design exception. These plans require the signature of a professional registered engineer (that is; with RPEQ status) as registered under the Board of Professional Engineers of Queensland.

Where design exceptions are granted from a PUP (only relevant to the utilities they own), the design exception and any conditions are to be provided to the project manager in writing, and documented by the designer in the Notes and Legend Sheet within the construction drawings package. Design exceptions from a PUP cannot over ride any TMR safety requirements (clear zone and sight visibility) and where conflict exists, safety requirements take precedence.

4.1.2 Terms

For the purposes of this manual, the definitions for the following terms are:

'Frangible' vegetation **-** plants with stems equal to or less than 70-100mm when measured from 300mm above the finished ground level. Groundcovers and shrubs are all generally frangible except for large shrub species exceeding 3.5m in mature height. Trees are not considered frangible.

'Non-Frangible' vegetation - plants with stems larger than 70-100mm when measured from 300mm above the finished ground level. Shrubs species exceeding 3.5m in mature height and trees are considered non-frangible.

'Clear zone' - the area that commences at the edge of the trafficable lane and is available for emergency use by errant vehicles; the distance that the clear zone extends from the carriageway edge is dependant on the traffic volume, road geometry and design speed of the road. This area may consist of a shoulder, parking bays, a recoverable slope and a clear run-out area.

'Setback' – the horizontal distance measured from the '***outer most edge'*** *(refer to definition of term)* of a design component or road element concerned, to the centre of a plant (for example; trunk of tree). Refer to Figure APP2-A for graphic illustration of this term.

Note that this definition does not apply to setbacks relative to Public Utilities.

'Clearance' – the horizontal distance measured from the ***'outer most edge'*** *(refer to definition of term)* of a design component or road element concerned, to the circumference of the expected mature width or diameter of vegetation at maturity (for example; tree canopy).

'Outer most edge' – the edges of design components or road elements from which required vegetation setbacks and clearances are measured from. Outer most edges can include, but are not limited too, the:

- Outer edge line marking of the trafficable lane or carriageway (travelled way);
- Outer face of design components (for example; retaining walls and noise barriers);
- Outer edge of other hardscape elements, for example;
- pathways relative to pedestrian/ cyclist facilities;
- maintenance paths/ tracks;

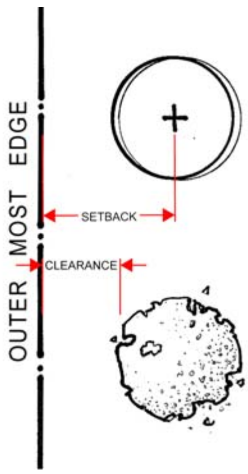

Table APX4-1: Setbacks and Clearances

'Canopy Clearance Height' – Vertical distances measured between the finished ground surface and the underside of a tree canopy (that is; lowest bottom branches). Trees often need to be initially planted with a ***'clear trunk'*** *(refer to definition of term)* to achieve a clear canopy height or promote growth in a particular way. This can be undertaken either at the supplying nursery, during establishment and monitoring periods or as the tree develops. Trees may also require ***'crown lifting'*** *(refer to definition of term)* to attain a required canopy clearance height.

Refer to Figures APP4-2 to APP4-4 for graphic illustration of this term and application in various roadside situations.

'Clear trunk' – Applies to the height above the ground level in which trees have their lower branches removed through appropriate formative pruning methods, to achieve a desired canopy clearance. This process can be undertaken at nurseries prior to trees being supplied or during establishment and monitoring periods.

'Crown lifting' – A formative pruning technique involving the removal of the lower branches (whole or part of) of a tree to a desired height. This process is normally conducted once trees are established or are at maturity to form a clear trunk and retain required canopy clearance heights for safety purposes. Often the required clearances are not attained initially, however are still undertaken so that the tree develops in a desired shape to facilitate clearances in the future. Crown lifting should be carried out using formative pruning techniques as per Australian Standard AS4373 – 2007; *Pruning of amenity trees*. Consideration should also be given when selecting tree species, as to their suitability for formative pruning.

Generally, minimum canopy clearance heights within specific road situations are:

- 2.4m in pedestrian facility environments, for example; footpaths and walkways (Refer to Figure APP4-2);
- 2.7m in cyclist facility environments, for example; cycle paths, cycleways, veloways and shared access paths (Refer to Figure APP4-3); and
- 6.0m where trucks and buses frequently use routes and in designated high and very high clearance routes (Refer to Figure APP4-4).

Note – graphical diagrams shown in Figures APP4-2 to APP4-4 depict anticipated plant growth and shape of trees attained over time (at a minimum of approximately 5 years after planting).

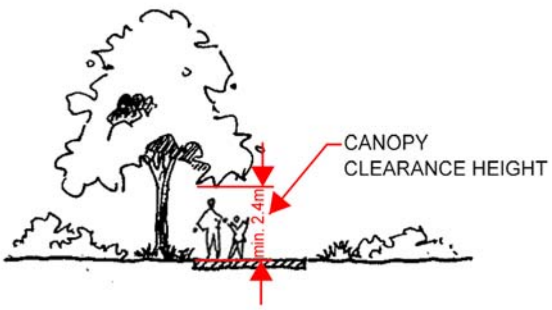

Table APX4-2: Canopy Clearance Height – in standard pedestrian and car park environments

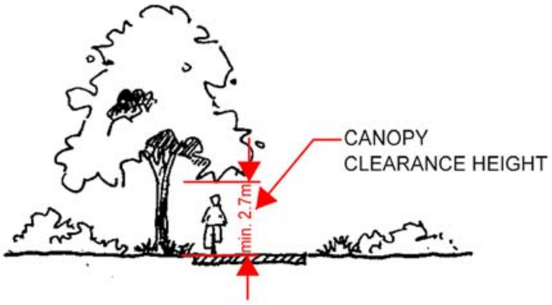

Table APX4-3: Canopy Clearance Height – in standard cyclist/shared access environments

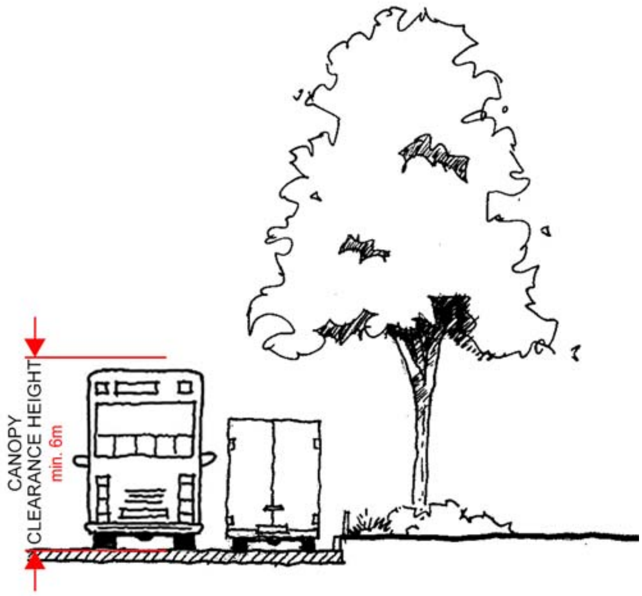

Table APX4-4: Canopy Clearance Height – where trucks and buses frequently use routes and in designated high and very high clearance routes

'Vegetation Height' – Maximum (or minimum) height of vegetation at maturity as measured from finished ground surface.

'Vegetation Width' – Maximum (or minimum) width or diameter of vegetation at maturity as measured from ***'outer most edge'*** *(refer to definition of term).*

4.1.3 Local Government Authorities

Parameters within this Manual are applicable to state owned and operated road corridors only. Where a road/street within a project is not state controlled and owned and is a Local Road, setbacks and clearances should be in accordance with the relevant local government authority requirements, and acknowledge relevant local area plans, unless determined otherwise within the project contract. It must be clearly communicated within documentation where the extents of the state owned and operated road corridors and local government area requirements are.

4.1.4 Public Utilities

The parameters provided within the Schedule relative to Public Utilities, are broad general requirements only, and current at the time of publishing. All setback and clearances must be checked against the concerned Public Utility Provider's (PUPs) guidelines and standards. A Dial Before you Dig (DBYD) must also be undertaken prior to commencing design work to ascertain location and details of above ground and underground pipes and cables.

PUP requirements over-ride both TMR and local government authorities minimum setback and clearance requirements. The list of public utilities and associated setbacks and clearances (where included) provided in the Schedule serve as a prompt for designers to further investigate and consult with relevant PUPs.

Generally the order of priority for determining setbacks and clearances from services is:

1) PUP;

2) TMR; and

3) LGA.

However, design exceptions from a PUP cannot over ride any TMR safety requirements (clear zone and sight visibility) and where conflict exists, safety requirements must take precedence.

Often setbacks and clearances are subject to assessment by the individual local PUP on a case by case basis, and require negotiation by the Designer with the PUP, particularly where public utility relocations are proposed. Where design exceptions are granted from a PUP (only relevant to the utilities they own), the design exception and any conditions are to be provided to the project manager, and documented by the designer in the Notes and Legend Sheet within the construction drawings package.

It should be noted that minor versus major utilities, or setbacks and clearances relative to specific pipe and cable sizes or diameters, have not been included in the Schedule. These require consideration and investigation when consulting with local PUP's. Minor and major utilities need to be differentiated in design documentation so appropriate setbacks and clearances are documented.

4.1.5 Minimum general requirements to be applied

The following should be considered when applying the vegetation setbacks and clearances within **APX4-*Table 1: Minimum Vegetation Setbacks and Clearances Schedule***

Parameters are applicable to all speed zones;

- Frangible vegetation only is permitted within clear zones;
- Non-frangible vegetation is only possible in separated roadway situations where it is of sufficient width to meet clear zone setback requirements for non-frangible vegetation, or where barriers are provided. If not, a design exception is required;
- Non-frangible vegetation is permitted beyond the clear zone in accordance with specific parameter requirements noted. An exception to this is if non-frangible vegetation is protected by safety barriers. If located behind a barrier, the barrier reduces the clear zone requirements. Certain additional setbacks to those in the table may still be required depending on the project specific situation;
- Plantings in sight distance affected areas should provide a clear visibility above the finished level of the road surface, and account for vertical curvature of the road alignment; such as on crests. Considering this, vertical clearances need to take into consideration landform, in addition to anticipated mature plant heights. These two heights combined need to achieve and maintain the required sight visibility in planting areas;
- In general, a minimum 5m clearance (unless noted otherwise) is required from the outer edge line marking of the carriageway for deciduous trees or other tree species that bear large fruit, cones, seed pods or large quantities of flowers. This clearance reduces the chance of vegetation shedding onto traffic lanes and into pedestrian environments, causing potential surface hazards.

4.1.6 Management of vegetation setbacks and clearances

In order for safety to be maintained within the road landscape, vegetation setbacks and clearances need to be maintained throughout the life of the road corridor. Methods to be applied ensuring safety hazards are reduced include:

- Maintaining vegetation in sight visibility affected areas to maximum permissible heights above the finished ground surface level of the adjacent road surface;
- Ensuring trees have clear trunks (to minimum specified canopy clearance height) so that overhanging branches do not impede on pedestrian and cyclist safety;
- Maintaining vegetation within areas of pathways, bikeways, and carparks so it does not encroach on accessibility, circulation and sightlines;
- Ensuring tree branches and canopies less than the minimum required clearance height of 6.0m above road level (in high and very high clearance routes), do not extend into the trafficable lane, both during establishment and at maturity.
- Crown lifting branches through formative pruning techniques (if tree species suitable and able to tolerate process) to a minimum of a 6.0m clearance height above road level to prevent conflict with large vehicles (in high and very high clearance routes); and
- Maintaining vegetation appropriately to ensure public utilities and associated inspection pits are accessible by maintenance personnel.

MINIMUM VEGETATION SETBACK AND CLEARANCES SCHEDULE

Setbacks and clearances relate to horizontal distances only. Where related to vertical distances, these are noted otherwise.

Parameter	**Description:** *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
Roadside areas without barriers	All *non-frangible* vegetation; measured from carriageway edge line to clear zone	✓		As per RPDM	RPDM (in conjunction with Austroads) is a higher order document.
Roadside areas with barriers	*Non-frangible* vegetation; Concrete barriers	✓		1.5m	Provides maintenance free treatment to rear of barrier.
	Frangible vegetation; Concrete barriers	✓		0.5m or ½ Dia*	
	Non-frangible vegetation; Wire rope barriers	✓		2.0m	Allows for deflection/movement of the barrier when impacted.
	Frangible vegetation; Wire rope barriers	✓		0.5m or ½ Dia*	
	Non-frangible vegetation; W-beam & TRS Beam barriers (also includes a 'hazard free zone', which typically extends 6m behind the back of the guardrail and for 22.5m from each end)	✓		1.0m	
	Frangible vegetation; Steel barriers (also includes a 'hazard free zone', which typically extends 6m behind the back of the guardrail and for 22.5m from each end)	✓		1.0m	
Roadside general	*Non-frangible* vegetation (general); from road pavement edge	✓		2.5m **A	Setback required mitigating potential tree root damage and resulting reduction of life to road pavement. Greater offsets are required for species with known invasive root systems (eg., Ficus and Melaleuca species).
	Non-frangible vegetation (general); from road pavement edge		✓	7.0m	The projected/anticipated canopy line of trees should not encroach beyond the outer carriageway line or be capable of providing a canopy within the minimum 7m clearance adjacent to trafficked lanes in the future.
	Non-frangible vegetation (>15m in mature height known to have a reputation of limb drop and/or large seed drop during high wind/storm events); from road pavement edge	✓		10.0m	To mitigate the risk of trees, limbs, branches and large seeds falling and impacting the roadway (eg. Eucalyptus species).
	Frangible vegetation		✓	0.5m or ½ Dia*	To prevent planting overhanging roadway; reducing potential for safety obstructions and increased maintenance requirements.

Parameter	Description: *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
Roadside structures and furniture	*Non-frangible* vegetation; tree canopy from fauna fence (relative to rear/ fauna side of fence)		✓ - species dependent (Refer further to FSRD)	3.0m **B	Eliminates the risk of fauna (koalas in particular) dropping into the fenced road corridor which may be difficult/ impossible for the fauna to escape.
	Non-frangible vegetation; from outer parapet/ rails and piers of bridges	✓		5.0m	Minimises the likelihood of the bridge being impacted by trees; both structurally and from a maintenance perspective (protects from strike). Also reduces likelihood of vegetation encroaching sightlines. NOTE – greater setbacks may be required in those parts of Queensland where intense storms/ cyclones are a regular occurrence.
	Non-frangible vegetation; either side of retaining structures as per RPEQ's determination		✓	As per RPEQ	Requirements of walls vary depending on type and site conditions. RPEQ to ensure trees do not compromise walls integrity, over its required design life.
	Frangible vegetation (general); includes but not limited to fencing, retaining walls, kerbs, garden edging, drainage channels**C		✓	0.5m or ½ Dia*	Maintenance minimisation; retains structure/ furniture function and reduces the likelihood of conflict between the vegetation and adjoining structure or edge.
	Frangible vegetation; from fauna fence (relative to rear/ fauna side of fence)	✓		1.0m (ground covers) and 1.5m (shrubs)	Applies to *wide* corridors only; that is, where space permits for maintenance access. *Narrow* corridors which lack of space behind fauna fence do not apply as an additional setback will further reduce vegetation coverage, compromising corridor effectiveness and habitat connectivity. Similarly, corridors where there is a *guard rail absent* do not apply as have sufficient space available to front/ road side of fence for maintenance access through clear zone and setback requirements and results in no further need for maintenance access on other rear/ fauna side of fence.
Maintenance access paths/ tracks	*Non-frangible* vegetation	✓		1.0m	Allows for maintenance track to remain operational. NOTE - crown lifting may be required to facilitate.

Parameter	**Description:** *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
	Frangible vegetation		✓	0.5m or ½ Dia*	Maintenance minimisation and reduces conflicts with safety hazards for operational staff.
Noise barriers (where maintenance access is required)	*Non-frangible* vegetation		✓	1.5m	Also allows for maintenance access. Clearance eliminates conflict between tree and wall and beyond.
	Frangible vegetation		✓	1.0m	Allows for maintenance access.
Road Signage	Approach side *1. Vegetation within sightline triangle – clearance as indicated* *2. Vegetation within sightline triangle having maximum mature height of 500mm below bottom edge of sign – No requirements necessary.* *3. In addition to notes 1 & 2 all vegetation to comply with RP & D manual and/or clear zone and sight visibility requirements where present..*	✓		• Ensure sight distance triangles across road landscapes (with horizontal curvature) are achieved so that the driver has time to recognise and react to the sign. • Vegetation that will block sightline, longitudinal sight distance triangle start point to be minimum of 1.4V m in advance of the sign (where V is the 85th percentile speed) and sighted to far outside edge of sign. Eye measurement to be taken to centre of traffic lane. • For sight-distance calculations refer to RP & D manual • For sign location/placement refer to MUTCD	Ensures sign is not obstructed by any vegetation enabling drivers to have sufficient time to observe, read, and react accordingly also minimising maintenance and ensuring sightlines are retained**D
	Departure side 1. Single-sided signs with frangible vegetation – maintenance area requirements apply as indicated. 2. Double-sided signs need to comply with notes 1 & 2 for approach situations. 3. *In addition to notes 1 & 2 all vegetation to comply with RP & D manual and/or clear zone and sight visibility requirements where present.*	✓		Single-sided signs:- 10.0m (Min) • Double-sided signs • As per approach side above	Ensures sign is not obstructed by any vegetation and assists with maintenance operations. Sightlines are retained **D

Parameter	Description: *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
Sight Distance	Vegetation sight distance triangle; Plantings in these zones should provide a clear visibility both horizontally and vertically when the eye height and the target height are considered.		✓	• Sight distance as per RPDM • Proposed mature plantings and landform combination heights should be at least 100mm outside the vertical limits of the sight triangle	RPDM (in conjunction with Austroads) is a higher order document. Ensures sight distance is not obstructed by vegetation enabling drivers to have sufficient time to observe and react accordingly, also minimising maintenance and ensuring sightlines are retained
Pedestrian and Cyclist Environments	*Non-frangible* vegetation (general); from pavement edge – pathway, cycleway or other	✓		1.0m	Setback ensures trees still provide shade to pedestrian/ cyclist areas and nodes**E
	Non-frangible vegetation (>15m in mature height known to fall or have a reputation of limb drop and/or large seed drop during high wind/storm events; or plants with aggressive/ spreading root system); from pavement edge – pathway, cycleway or other	✓		10.0m	To mitigate the risk of trees, limbs, branches and large seeds falling and impacting on pedestrian/ cyclist areas and nodes (eg. Eucalyptus species). To mitigate potential tree root damage and resulting reduction of life to pavement surface, for species with known invasive root systems (eg., Ficus and Melaleuca species).
	Frangible vegetation		✓	0.5m or ½ Dia*	To prevent planting overhanging pathways, cycleways or other; reducing potential for safety obstructions and increased maintenance requirements.
Lighting (Roadway Lighting only) – For Street Lighting/ Public Lighting; refer directly to Local Authority requirements	*Non-frangible* vegetation and *Frangible* vegetation (greater than 4m in height)	✓		10.0m	Indicative only**F
	Frangible vegetation (all other)	✓		1.0m	To retain a clear surround for maintenance access.
CCTV view-shed	Vegetation below view-shed		✓	Maximum mature height of 1.0m below bottom edge of view-shed	To prevent planting encroaching view-shed; reducing potential for obstructions and maintenance requirements
	Vegetation beside view-shed	✓		½ mature diameter	

Parameter	**Description:** *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
Above ground Electrical Services (relative to Energex, Ergon Energy and Energy Australia requirements ONLY) - For Powerlink (High Voltage Transmission Lines) setbacks and clearances; refer directly to Powerlink requirements	≤ 33kV (low voltage line) – Below powerlines: *Frangible* vegetation or 'Energex's Safe Tree plants' (3.5m maximum mature height for min. 7.0m either side of alignment – Refer further to below requirement)	n/a –mature height will be below actual line	n/a –mature height will be below actual line	n/a –mature height will be below actual line	To ensure conflict does not occur between vegetation and power infrastructure (lines, conductors, poles and so on) and minimise potential ongoing maintenance required to retain clearances as per PUP owners' requirements.
	≤ 33kV (low voltage line) – Near powerlines, including poles: *Non-frangible* vegetation (45º rule; as per 'Energex's Safe Tree Program').		✓	To equal at least mature height, or min. 7.0m (that which is greater)	
	≤ 33kV (low voltage line) – Around poles: *Frangible* vegetation		✓	4.0m	
	> 33kV (high voltage line) – Below powerlines: *Frangible* vegetation or 'Energex's Safe Tree plants' (3.5m maximum mature height for min. 10.0m either side of alignment – Refer further to below requirement)	n/a –mature height will be below actual line	n/a –mature height will be below actual line	n/a –mature height will be below actual line	
	> 33kV (high voltage line) – Near powerlines, including poles: *Non-frangible* vegetation (45º rule; as per 'Energex's Vegetation Management Standard').		✓	To equal at least mature height, or min. 10.0m (that which is greater)	
	> 33kV (high voltage line) – Around poles: *Frangible* vegetation		✓	6.0m	
	Substations, tower structures and any other facilities (generally 2.0m standard however often by negotiation with owner): *Frangible*		✓	Min. 1.0m or diameter as required by owner (that which is greater)	
Underground water (including drainage and sewerage), electrical or any other underground services; telecommunications and fibre optics**G	All vegetation with a mature height ≤ 3.5m	✓		2.0m	To allow future access and minimise impacts to underground services from root systems.
	All vegetation with a mature height > 3.5m (general underground services and piping)	✓		As per arborist advice or min. 4.0m (that which is greater)	To ensure tree roots do not impact on underground infrastructure – setback will vary with species characteristics; that is, greater setbacks required for species with vigorous or known to be invasive root systems.
	All vegetation with a mature height > 3.5m (drainage sump)	✓		As per arborist advice or min. 6.0m (that which is greater)	
Gas Services	All vegetation with a mature height ≤ 3.5m	✓		2.0m	To allow future access and minimise impacts from root systems.

Parameter	**Description:** *Non-frangible* versus *frangible* vegetation	Setback	Clearance	Value	Rationale
	All vegetation with a mature height > 3.5m	✓		As per arborist advice or min. 3.5m (that which is greater)	To ensure tree roots do not impact on underground infrastructure – setback will vary with species characteristics; that is, greater setbacks required for species with vigorous or known to be invasive root systems.
Service pits and inspection points**G	All vegetation with a mature height ≤ 3.5m	✓		1.0m	To ensure maintenance access to pits and inspection points.

NOTE:
*A **setback** is measured from the outer edge of a design component, road element, object or carriageway line to the centre of the vegetation's (tree, shrub or groundcover) trunk.*

*A **clearance** is measured from the outer edge of a design component, road element, object or carriageway line to the perimeter of the vegetation's (tree, shrub or groundcover) mature canopy.*

*Setbacks and Clearances from **PUPs** are measured form the outer most point of object, line or pipe.*

***'Non-Frangible'** vegetation - plants with stems larger than 100mm when measured from 300mm above the finished ground level. Shrubs species exceeding 3.5m in mature height and trees are considered non-frangible.*

***'Frangible'** vegetation - plants with stems equal to or less than 100mm when measured from 300mm above the finished ground level. Groundcovers and shrubs are all generally frangible except for large shrub species exceeding 3.5m in mature height. Trees are not considered frangible.*

**0.5m or ½ mature Diameter – whichever is greatest.*

REFERENCES:
**A = Where it is proposed that tree species be used within 2.5m of the road pavement edge (appropriate crash barrier system required), mitigation measures (that is, root barrier system) must be implemented that guarantee pavement life and that services will not be impacted in the future.

**B = Birds such as cassowaries will not cross fence through tree canopies into roadway. However, koalas may drop out of tree canopies over a fence. In these cases, 3.0m applies (guide only – Refer further to FSRD).

**C = Requires coordination with Civil, Structural and/or Drainage Engineer requirements.

**D = Horizontal setback - triangle measured from a single point on carriageway line, perpendicular to sign, to the value on the relevant side, to the outermost point of sign. Vertical clearance - where low planting is proposed to approach (front) side of sign, mature height needs to be less than the height of the base of the sign (that is, where meets sign post - if applicable) to ensure signage is not obscured by vegetation, maintaining sight visibility and safety.

**E = Tree species selection is to be of a type that accommodates a minimum 2.4m vertical clearance at maturity over the full pathway width (2.7m where cyclists also use facility) and does not have large seeds, fruit, blooms or excessive foliage fall that may impact on pathway/ cycleway user safety or become a slip/ trip hazard (particularly in wet weather). Non-frangible trees known to exhibit invasive root system should not be planted this close to pathways/ cycleways; greater setbacks are required.

**F = Requires coordination with Lighting/ Electrical Engineer requirements. Illumination zone will be the determinant for the setback requirements since will vary depending on light post dimensions. Final setbacks need to ensure that trees do not interfere with the lighting illumination requirements.

**G = Grass, tufting grasses or low groundcovers/ spreading shrubs with shallow root systems only are to be utilised over underground service corridors.

Table APX4-1: Minimum vegegetion setback and clearances schedule

Appendix 5

Road Landscape & Urban Design Guidelines

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Appendix 5 Amendments – June 2013
Revision Register

Issue / Revision No	Reference Section	Description of Revision	Authorised by	Date
1	-	Initial Release of 2nd Edition of Manual	Steering Committee	Jun 2013

Table of Contents

Tables

Appendix 5

Road Landscape and Urban Design Guidelines

5.1 Introduction

The Road Landscape and Urban Design Guidelines are divided into three category; road formation (RF), landscape and revegetation (LR) and urban design (UD) see (Figure APX1-1). Each category is divided into a road component such as a cutting, seeding and safety barriers where design criteria and minimum technical requirements are provided.

Please note: the Guidelines are currently being updated and will be available in 2014

ID Number	Design Guidelines Category | Component	Release Date
RF	**Road Formation (RF)**	
RF-01	Verges	2014
RF-02	Cuttings	2014
RF-03	Fill Embankments	2014
RF-04	Mounding	2014
RF-05	Drainage – Channels (Interim)	2014
RF-06	Drainage – Sediment Basins (Interim)	2014
RF-07	Medians and Splitter Isles	2014
RF-08	Roundabout Islands	2014
RF-09	Local Roads	2014
LR	**Landscape and Revegetation (LR)**	
LR-01	General LR Requirements	2014
LR-02	Structured Planting Approach	2014
LR-03	Naturalistic Planting Approach	2014
LR-04	Water Sensitive Planting Approach	2014
LR-05	Grass Seeding	2014
LR-06	Turfing	2014
UD	**Urban Design (UD)**	
UD-01	General UD Requirements	2014
UD-02	Vehicular Bridges and Overpasses	2014
UD-03	Tunnels	2014
UD-04	Noise Attenuation Structures	2014
UD-05	Retaining Systems	2014
UD-06	Safety Barriers	2014

UD-07	Fencing	2014
UD-08	Road Lighting	2014
UD-09	Road Signs	2014
UD-10	General Road Furniture and Structures	2014
UD-11	Fauna Movement Devices	2014
UD-12	Rest Areas and Amenity Blocks	2014
UD-13	Pedestrian / Cyclist Facilities	2014
UD-14	Roadside Interpretation and Advertising Signs	2014

Table APX5-1: Schedule of the Road Landscape & Urban Design Guidelines

Transport and Main Roads

Abbreviations

June 2013

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Abbreviations

Abbreviations used throughout this Manual.

AADT	Annual Average Daily Traffic
AS	Australian Standard
CCTV	Close Circuit Television
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CAS	Contract Administration Systems Manual
CPTED	Crime Prevention Through Environmental Design
DERM	Department of Environment and Resource Management
DOTARS	Department of Transport and Regional Services
DBYD	Dial Before You Dig (1100)
DDA	Disability Discrimination Act
DDPSM	Drafting and Design Presentation Standards Manual
EPA	Environmental Protection Act
IAS	Impact Assessment Statement
ITS	Intelligent Transport System
LR	Landscape and Revegetation
LGA	Local Government Authority
MR	Main Roads
MRS	Main Roads Specification
MRTS	Main Roads Technical Standard
MRS04	Main Roads Specification – General Earthworks
MRTS04	Main Roads Technical Standard - General Earthworks Annexure
MRS16 A-E	Main Roads Specification -General Requirements Landscape and Revegetation Works
MRTS16 A-E	Main Roads Technical Standard - General Requirements Landscape and Revegetation Works
MRS51	Main Roads Specification – Environmental Management
MRTS51	Main Roads Technical Standard – Environmental Management Annexure
MP&O	Maintenance, Performance and Operations
P&DCP	Pest & Disease Control Proposal
PSP	Plant Supply Proposal
PMMP	Planting Media Management Plan
PMMP-C	Planting Media Management Plan – Construction
PUP	Public Utility Provider
QTRIP	Queensland Transport and Roads Implementation Plan
RPEQ	Registered Practicing Engineer Queensland
RE	Regional Ecosystem types (vegetation)
REF	Review of Environmental Factors
RLF	Road Landscape Frameworks
SSP	Seed Supply Proposal
SMM	Soil Management Manual
SMP	Soil Management Plan
SMP-P	Soil Management Plan - Planning
SMP-D	Soil Management Plan - Design
SEQ	South East Queensland
SCRC	State Controlled Road Corridor
TMR	Transport and Main Roads
UD	Urban Design
VMP	Vegetation Management Plan
V:H	Vertical : Height Ratio
WSUD	Water Sensitive Urban Design

Transport and Main Roads

Glossary

June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

Glossary

The following definitions for terms should be applied in the interpretation of this Manual.

Advanced Plants: Trees and large shrubs in 25 litre or larger containers.

Amelioration (of soil): Material additives mixed with soil (site soil or imported) to alter the chemical or physical properties. Refer also to **Amelioration Agents** definition.

Amelioration Agents: Additives such as lime, dolomite, gypsum, fertilizer, soil conditioner or wetting agents mixed into soil (site soil or imported) in order to improve undesirable soils and their characteristics, making suitable for successful and sustainable plant growth. Some amelioration agents can be used to mitigate dispersion risks associated with disturbed subsoils, stabilising outer zone embankments and minimising the risk of erosion.

Amenity: A general term to describe the level of comfort, pleasantness and character of places and facilities. Amenity can be derived from either natural or man-made origins. Amenity can also be associated with public, scenic and visual amenity.

Amenity Block: A built structure constructed from a variety of materials which contains generally a minimum of toilet and hand washing basin facilities. In larger structures, shower facilities are also accommodated. These amenity facilities are provided for use by the general public and may be implemented at Rest Stop Areas. Refer also to **Rest Stop Areas** definition**.**

Annual Average Daily Traffic: Calculated by dividing the total; real or projected, yearly traffic volume in both directions by 365 (the number of days in the year).

Approach Sight Distance: Stopping Sight Distance on the approaches to an at-grade intersection. The approaching driver must be able to sight and appreciate the intersection geometry and pavement markings to be able to either negotiate the intersection or stop, whichever is required.

Batter: The uniform side slope of a cutting or embankment, expressed as a ratio of 1 unit vertical on 'x' units horizontal. Refer also to **Cutting** definition.

Benching: A ledge cut or formed in a batter to provide greater security against slips and to segment the slope length to reduce erosion potential.

Biodiversity: The variety of plants, animals and micro-organisms and the ecosystems of which they are a part. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. Refer also to **Ecosystem** definition.

Bioretention Basin: A constructed basin with a vegetated bed of filter material, designed to capture storm water runoff and filter and remove pollutants.

Bioretention Swale: A swale which includes a vegetated infiltration trench within the invert of a swale, which is designed to enhance the removal of both particles and nutrients. Refer also to **Swale** definition.

Borrowed Landscapes: A design technique used to bring ('borrow') distant or surrounding parts of the existing environment into the immediate road landscape. This is achieved largely through incorporating existing views and vistas to extend the borders of the road landscape. Through appropriate design measures, parts of the immediate landscape can blend naturally into background environment.

Breakaway: A device that allows an object such as a sheer bolt fixing plate on a sign, or luminary, to yield or separate upon impact.

Broadcast Seeding: Involves seed being broadcast on the ground surface by small hand spinners or agricultural spinners, combined with a tractor or truck. Subsequent passes are required to be broadcasted at 90 degrees to the first pass.

Buffer Strips: Vegetation planted at a density to achieve visual or environmental buffering from adjoining areas. Buffer strips can also be used for storm water management, assisting storm water flows and infiltration into soils when placed on vegetated slopes.

Carbon Sequestration: The capture and long-term storage of carbon with the potential to mitigate the effects of global warming and climate change. Collections, communities or groups of vegetation such as existing forests or street tree planting may provide opportunities to sequestrate carbon (subject to further research).

Carriageway: The portion of the road formation, including lanes, auxiliary lanes and shoulders that are set aside for the use of vehicles.

Capping:

> ***Median Capping:*** Concrete slab placed on top of road formation bounded by concrete kerbing to form splitter islands between carriageways or direct and/or separate traffic through turning movements. Median capping is utilised in narrower medians and splitter islands to permit errant vehicle recovery and minimise road worker risk in maintaining areas of limited accessibility. Special finishes are typically applied to delineate the surface and contribute to the sense of place within the streetscape.
>
> ***Wall Capping:*** An element of wall construction that tops the wall facing material and assists in sealing the joint between wall facing and structural backing or the wall structure. The capping can be of the same or contrasting material to the wall facing and assist in directing water away from the face of the wall.

Catch Bank (syn. Diversion Bank): An earth bank constructed across the top of a slope for the purpose of intercepting and diverting water.

Catch Drain: Surface channel constructed along the high side of the road to intercept surface water flowing towards the road cuttings or embankments to prevent scouring. The drain also redirects water to a drain inlet or culvert.

Catchment Area: An area determined by topographical features which funnels, collects and channels water downhill into a waterway; for example, a river, lake or wetland. A catchment area includes both the streams and rivers that convey the water as well as the actual land surface from which water drains into those channels.

Channelised Intersection: An intersection provided with medians and/or islands for defining the trafficable area and to control specific movement.

Check Dam: An element built up above the finished surface placed perpendicular to the water flow, typically used in channels conveying concentrated flows to control flow velocity and minor gully erosion. They may be constructed from semi-pervious or impervious materials such as medium-size rock or sand and gravel filled bags.

Chemical Mowing: A method used to reduce the frequency of mowing activities by applying specific herbicides to burn off or 'knock down' selected vegetation, without actually killing the vegetation.

Clear Trunk: Applies to the height above ground level in which trees have their lower branches removed through appropriate formative pruning methods, to achieve a desired canopy clearance. This process can be undertaken at nurseries prior to trees being supplied or during establishment and monitoring periods. Refer also to **Crown Lifting** definition.

Clear Zone: The area that commences at the outer most edge-line marking of the carriageway and is available for emergency use by errant vehicles. The distance that the clear zone extends from the carriageway edge is dependant on the traffic volume, road geometry and design speed of the road. This area may consist of a shoulder, parking bays, a recoverable slope and a clear run-out area. The clear zone should be kept free from features potentially hazardous to errant vehicles.

Container Stock (syn. Pot Sized Plants): Trees, shrubs, groundcovers and tufted grass species that are supplied in plant containers such as virocells, virotubes, half and full native tubes and containers sized from 140mm to 200 litres and larger. Containerised plants range from immature to semi-mature specimens.

Cover Crop: A blend of annuals, often sterile grass species applied as seed to temporarily stabilise stockpiles, batters and broadacre areas; often (seed) deadheaded or sprayed with herbicide and left to form a green compost for perennial plants.

Crest Vertical Curve: A vertical curve in the road where the apex is at the highest point on the curve.

Crime Prevention Through Environmental Design (CPTED): The practice of applying a range of site specific principles into the planning, design and management of a physical environment; in order to discourage the incidence and fear of criminal behaviour, increase an individual's perception of personal safety, and improve the quality of life for users.

Cross Section: A vertical view drawn at right angles to the control line, showing the existing ground and the various elements that make up the road composition.

Crown Lifting: A formative pruning technique involving the removal of the lower branches (whole or part of) of a tree to a desired height. This process is normally conducted once trees are established or are at maturity to form a clear trunk and retain required canopy clearance heights for safety purposes. Crown lifting should be carried out using formative pruning techniques as per *Australian Standard AS4373 – 2007; 'Pruning of amenity trees'*. Refer also to **Clear Trunk** definition.

Cultural Heritage: A derivative of the cultural values associated with places and/or events of human and community significance and can include/be related to aesthetic, historical, scientific, geographical or social factors. These factors collectively contribute to environmental values and are an integral part of public amenity.

Culvert: One or more adjacent pipes or enclosed channels for conveying a watercourse or stream below road formation level.

Cut and Cover Tunnel: A construction method used to create tunnels (minimum length of 90m). Concrete piers are constructed along the length of the tunnel creating a structural framework to support the walls and roof of the tunnel. The void of the tunnel can then be excavated. Concrete beams are placed to span the void and create the roof of the tunnel. This allows the “cover” (in the form of soil and/or pavement) to be placed over the roof. Cut and Cover is a more cost-effective and economical method of boring tunnels in certain types of situations. The type and density of the underlying geology will be a determining factor in the selection of this option.

Cutting: An excavation through a road corridor that creates a batter on one or both sides of the road alignment. Cuttings are at a specified grade or slope according to the contour/cut lines shown on the construction drawings.

Cycleway: A separate path or a portion of the road (either shared or exclusive) allotted to the use of cyclists.

Declared Plant: Plants listed under three different classes that reflect the level of control required by legislation - refer to the Land Protection (Pest and Stock Route Management) Act 2002 and the Land Protection (Pest and Stock Route Management) Regulation 2003 for requirements at http://www.dpi.qld.gov.au

Design Exception: A variance to the Department’s accepted design standards. The Department’s Regional Director is responsible for assessing the exception on a case by case basis and granting approval or rejection. Detailed design drawing plans must document and note any design exception. These plans require the signature of a professional engineer registered under the Board of Professional Engineers of Queensland (RPEQ).

Design Speed: Operating speed of individual elements of a road, including straights, horizontal curves and vertical curves, i.e. a nominal speed adopted for the design of the geometric features of the road.

Design Team: Design professionals involved in the planning and design of the road corridor. The design team can include design consultants, alliances, partnerships, peer reviewers, Departmental personnel and any other specialist design discipline areas. It should be noted that these disciplines extend beyond Landscape Architecture and Urban Design.

Dial Before you Dig (DBYD): A free service which locates and provides information on underground pipes and cables.

Direct Seeding: The mechanical placement of seed in specific locations within the ground.

Diversion Bank: Refer to **Catch Bank** definition.

Drainage Channel: A hydraulically designed open channel constructed from either natural or an artificial material that intercepts, captures and diverts surface water from its natural flow to a designated drainage point/s.

Drill Seeding: An available method of direct seeding. This method is similar to broadcasting in that conventional agricultural tractors are coupled with combined seeders or drills. The drill, through either a disk or tine and tube, delivers the seed and fertiliser evenly in the soil in a single pass operation.

Dripline: The outline formed by the outer tips of the branches of a plant. This outline, projected to the ground below, indicates the extent of (in a majority of cases), a plant's root system.

Ecological Restoration: The process of returning a site to a desired state through intentional activity to initiate or accelerate the recovery of an ecosystem with respect to its health, integrity and sustainability. The process assists recovery of an ecosystem that has been degraded, damaged or destroyed.

Ecologically Sustainable Development: Development that meets present needs without significant compromise to ecological processes and the environment's potential to provide quality of life for future generations.

Ecosystem: A dynamic and complex system formed by the interaction of a community of organisms, including plants, animals, fungal and micro-organisms, with their associated physical non-living environment. These communities interact as unique ecological units.

Edge Effects: Relates to ecology, in that it is the effect of the juxtaposition of contrasting environments which adjoin each other, on an ecosystem. Edge effects may be the result of a change in species composition, physical site or habitat conditions, or other ecological factors at the boundary between (or near to) two ecosystems. Refer also to **Ecosystem** definition.

Embankment (syn. Fill Embankment): Earthworks constructed above natural and/or existing ground level from fill material. Material is placed to the grade, shape and dimensions shown on the construction drawings.

Endemic: A native plant species prevalent in or peculiar to a particular locality or region and often further confined to a specific habitat.

End Treatment: The designed modification at the end of a roadside or median safety barrier.

Eighty-Fifth Percentile Speed: The speed at, or below which eighty-five percent of cars are observed to travel past a nominated point under free flowing conditions.

Entering Sight Distance: The sight distance needed for a vehicle to enter from a side street and accelerate such that it would not impede traffic on a non-terminating approach travelling in the same direction.

Environmental Matting: A range of environmental matting products are commercially available and vary from synthetic blankets acting as root protective layers, to organic mats of jute mesh or coir which assist vegetation establishment and protect soil from erosion. All matting products are generally used in conjunction with a revegetation technique.

Erosion Control Blankets: Refer to **Environmental Mating** definition.

Exotic: Plant species of foreign origin or character, introduced from another country, and not native to Australia.

Ex-ground Stock: Advanced plants grown in the ground, rather than in containers, then later excavated for use within a landscape. They are often transplanted from off-site locations and require root pruning preparations prior to planting on site. Refer also to **Advanced Plants** definition.

Fauna: Refers to animals, both individually and collectively.

Fauna Movement Device: A structural device designed to create the safer and more secure movement of fauna, including fish, under or over a roadway.

Fencing: A freestanding structure and/or barrier designed to partition an area and prevent or restrict pedestrian and/or fauna movement across a boundary, particularly in hazardous situations.

Finished Ground Surface/ Level: The finished surface/ level attained after construction works have been carried out under the Contract.

Fill Material: Material used to construct an embankment and form up to the subgrade level. Material can be composed of either existing earth matter and/ or existing material extracted from site which is structurally suitable for use in embankments, or from material imported onto site to meet fill requirements.

Flora: Refers to plants, both individually and collectively.

Footpath: This area is located between the face of the kerb and the property boundary for use by pedestrian traffic, possible bicycle traffic and also for the placement of utility services. Footpaths typically share the same longitudinal gradient as the adjoining roadway.

Footway: A pedestrian facility on a bridge.

Footprint: The physical ground surface area occupied by a building or structure (whether existing or planned).

Formal Planting: Planting design with structured and consistent patterns or shapes that are used to create a sense of identity within the streetscape or landscape.

Framed View: A view framed by other items within the landscape, either to both sides or to one side; to create visual balance and symmetry.

Frangible: A type of structure that is readily or easily broken up or collapsible on impact.

Frangible Vegetation: Plants with slender stems (equal to or less than 70-100mm – when measured from 300mm above finished ground surface level), which give way, break or uproot on impact. Groundcovers and shrubs are all generally frangible except for large shrub species exceeding 3.5m in mature height. Trees are not considered frangible.

Gabion: A steel wire mesh cage which is filled with rock particles and used to construct a retaining system. Refer also to **Retaining System** definition.

Grassing: The broad scale application of a chosen singular or combined specific grass seed specie/s suitable to establish the growth of grass within a defined area, over a period of time.

Grassland: A vegetation alliance dominated by native or indigenous grasses, with few, if any shrubs.

Hard Landscape: Manufactured or built structures and urban design elements including but not limited to bridges, tunnels, noise barriers, retaining walls, garden edging and pedestrian facilities.

Heat Island Effect: Refers to an increase in the ambient air and surface temperatures in urban areas relative to surrounding rural areas. This is largely attributed to increased reflected and radiated sunlight, reduced evapo-transpiration and shade due to buildings, other built structures and paved surfaces.

High Profile Areas: Off road areas that are highly visible to the public. These areas are often associated with key components of the road system, including interchanges and intersections.

Hinge Point: The point where the extended cross-fall of the verge area meets with the batter slope. This point is associated with rounding where it is applied.

Holding Line: A broken traverse pavement marking which shows motorists the safe position for the vehicle to be held at give-way signs or roundabouts.

Horizontal Curve: A curve in the roadway along the horizontal plane.

Horizontal Curve Adjustment Factor: A factor that is used to adjust/calculate the clear zone on a road with horizontal curvature.

Hydromulching: A hydraulic spray operation (generally pumped through a long hose) which applies a slurry mix of water, fibre, binder, seed, fertiliser and other soil amelioration agents directly onto cuttings and embankments;. The fibre material may include hay/straw, sugar cane, industrial hemp, wood or paper.

Hydroseeding: Involves seed and fertiliser being sprayed hydraulically onto relatively flat slopes through a purpose built hydroseeder.

Informal Planting: Planting with organic shapes and species mixing without regular geometric patterning. May be used to simulate a natural landscape pattern or as a contrast to formal planting.

Inner Lane: The lane adjacent to the median in multi-lane divided roads.

Integration: The assimilation of an element with its environment, usually with minimum contrast and maximum compatibility.

Integrity: A measure of holism within areas.

Interchange: A grade separation of two or more roads with one or more interconnecting roadways.

Interpretive Sign: Non-operational (regulatory, warning and guide) signs including tourism, public service announcements and interpretive elements, designed to be highly visible and convey a clear message to the public. Signs can have an interactive purpose and often include a combination of text and symbols to communicate the intended meaning to the audience.

Intersection: A place where two roads cross paths.

Interface: A surface regarded as the common boundary of two bodies, spaces, or phases.

Junction: The meeting of two or more roadways; term given to the combined group of interchanges, intersections and roundabouts.

Land Bridge: A bridge spanning a roadway that is designed to carry a load consisting of soil, vegetation and typically pedestrian walkways. The width of the Land Bridge can be a little as 15m and up to 90m. Construction methods may utilise similar approaches to Cut and Cover Tunnels such as cutting through a landform, or utilise traditional fill embankment construction methods. The purpose of constructing a Land Bridge may be to link wildlife corridors, connect open space by providing pedestrian connectivity and/or compensate for loss of open space due to the road construction. Refer also to **Cut and Cover** definition.

Landscape: A holistic term that encompasses visual, ecological and cultural values of the physical environment.

Landscape Sensitivity: Refers to the landscapes relative sensitivity to change. It determines how sensitive the landscape character of the setting is to the proposed changes relative to the road proposal. A landscape's uniqueness within the broader landscape, its continuity and ability to change without obvious alteration to character, all determine the level of landscape sensitivity.

Landscape Structures: Any constructed or installed structures associated with landscape works including roadside furniture, retaining walls, and fencing.

Lane: Part of the roadway set aside for the normal movement of a single stream of vehicles.

Local Road: Local road/street and combined pedestrian/cyclist networks which lie under the jurisdiction of local authorities. Local Roads also include any other associated infrastructure and landscape areas that interface and connect with the Department's road corridors.

Longitudinal Barrier: Refer to **Safety Barrier** definition.

Monitoring Period: The period from the completion of the LR establishment period and extends for the duration specified in *MRS16 and MRTS16 Landscape and Revegetation Works Specification Suite*.

Landscape Treatment: Landscape Treatment (LR) – a generic term for the design and treatment of all 'soft' components of a project works, for example, application of various planting treatments and work items that collectively result in the vegetation of an area.

Macrophyte Plant: An aquatic or marginal aquatic plant which aids in the removal of particulates from turbid water; often used in wetlands, sediment basins, detention ponds, and retention ponds.

Manoeuvre Sight Distance: The distance needed for a driver to react to a hazard and manoeuvre around the obstruction.

Median: The central strip of road not intended for use by traffic, which separates opposing traffic flows. Median width includes both adjacent shoulders.

Median Barrier: Refer to **Safety Barrier** definition.

Microclimate: The climate within a confined space or small geographic area.

Minimum Gap Sight Distance: The sight distance needed for the driver of an entering vehicle to see a gap in the conflicting streams sufficient to safely start their desired manoeuvre.

Mounding (syn. Earthen Mounding): Localised areas of earth/ landform raised above the typical finished ground level. Preferable surface covering is buffer planting, yet can also contain a surface treatment of grass or turf.

Mulch: Any inorganic or organic material placed over planting media or soil to conserve moisture, suppress weeds, hold the soil in place, aid in establishing plant cover, increase filtration and minimise soil temperature fluctuation.

Native: Plants native to Australia. They can occur as endemic, and may include hybrid varieties (or forms).

Natural Ground Surface/ Level: The ground surface/ level that exist prior to any construction work being carried out under the Contract.

Naturalistic Approach: Involve the application of native plant seed and/or tube stock. Seed is broadcasted, hydroseeded, hydromulched, or drilled and tube stock may be planted independently or in combination with the seeding application. Planting setout is random (seeding) to semi-random (tube stock) in order to achieve a natural appearance. It may require the selective removal of non-complying plant material (from seed) from sight visibility areas and clear zones during the first 1-2 years of growth.

Noise Attenuation Structures: Include earth mounds, barriers and fences (or a combination of both); designed primarily to mitigate traffic noise levels generated by the roadway to adjoining residences and community facilities, such as schools. They are aligned along required sections of the road corridor to set standards and reflect or absorb road traffic noise from use areas. These structures also perform a secondary role in preventing trespassing into the road corridor. Refer also to **Noise Barrier** definition.

Noise Barrier: Wall structures or lengths of panels affixed to posts, designed to attenuate noise.

Non-frangible: An unyielding object that is not readily or easily broken upon impact.

Non-frangible Vegetation: Plants which are not readily or easily broken on impact (plants with trunks greater than 70-100mm when measured from 300mm above finished ground surface level). Non-frangible vegetation generally refers to plants exceeding 3.5m in mature height. Trees (and large shrubs) are considered non-frangible.

Organics Blanket: Generally consists of compost material and a binder. It may also comprise soil ameliorant agents if required. Its main purpose is preventing erosion, particularly on steep slopes and embankments, and filtering out silt from sheet flow erosion. It can be used as an organic blanket alone, yet most often includes plant or grass seed mixes also. The chosen mix is blown on as a surface blanket. Whilst largely assisting in preventing disturbed soils against erosion, the blanket also provides many of the other benefits provided by mulch. Refer also to **Mulch** definition.

Outer Lane: The lane adjacent to the left hand shoulder on multi-lane divided roads.

Outlet: The point at which water discharges from a stream, river, lake, tidewater artificial dam or drainage structure.

Overtaking Sight Distance: The distance needed for one vehicle to overtake another vehicle, without interfering with the speed of an oncoming vehicle.

Panoramic View: A broad view which includes the landscape as a whole viewable area.

Pavement (syn. Road Pavement): The structural component that supports traffic on the road.

Planting Media: Stripped site soil (topsoil or subsoil) or imported soil that complies with *MRS16 and*

MRTS16 Landscape and Revegetation Works Specification Suite requirements.

Point of Conflict: The road space required by one vehicle or traffic movement, which is simultaneously needed by another vehicle or traffic movement.

Pot Sized Plants: Pot sized plants are specimens that are in an immature state and have been grown to a pot size measured in millimetres.

Prospect and Refuge (theory): A theory developed by geographer Jay Appleton which describes a space as having a sense of openness and paramount view, without the user feeling exposed, or unprotected. Prospect and refuge seeks to provide both retreat and perspective; key components for the basis of Crime Prevention Through Environmental Design (CPTED) principles. Refer also to **Crime Prevention Through Environmental Design (CPTED)** definition.

Public Amenity: The desirable, valued and convenient aspects of a public place or location which contribute to its overall character and its enjoyment by residents or visitors. Features which enhance community value and desirability, the level of attractiveness and user satisfaction, all contribute to achieving public amenity. Refer also to **Amenity** definition.

Remnant Vegetation: Under the *Vegetation Management Act 1999* remnant vegetation means –

vegetation, part of which forms the predominant canopy of the vegetation –

a) covering more than 50% of the undisturbed predominant canopy; and
b) averaging more than 70% of the vegetation’s undisturbed height; and
c) composed of species characteristic of the vegetation’s undisturbed predominant canopy.

Reinforced Turf: Consists of turf type grass being grown in conjunction with an environmental mat as a root protective layer.

Rest Areas (syn. Rest Stop Areas): Refer to **Rest Stop Areas** definition.

Rest Stop Areas: Off road areas designed to improve road safety and mitigate driver fatigue by providing rest and recuperation opportunities at suitable locations. Amenity blocks are also readily located at Rest Stop Areas.

Restoration: The manipulation of a disturbed habitat or landscape to a desired condition. Refer also to **Ecological Restoration** definition.

Retaining System: A structure and/or wall constructed from either natural or manufactured materials, designed to resist lateral pressure (especially when built to prevent the advance of a mass of earth or water). They are also used to retain an excavation of cut and/or fill material, particularly where there is an insufficient area available to accommodate a suitable slope to a graded embankment.

Revegetation: The process of assisting the re-establishment and development of vegetation, on cleared land and areas disturbed during construction. Revegetation seeks to reinstate and restore vegetation cover to highly modified areas. The vegetation can also assist in soil stabilisation, particularly when pioneering species are used, such as grasses and legumes. Most often native plants are used in revegetation. Revegetation can be achieved by applying either a Naturalistic Planting Approach or a Structured Planting Approach, or a combination of both. Refer also to **Native Plants** definition.

Riparian: Vegetation naturally associated with a body of water such as a river, creek, stream, estuary, lake or wetland system.

Roadside Barrier: Refer to **Safety Barrier** definition.

Road Pavement: The structural component that supports traffic on the road.

Road Landscape: Includes all physical surroundings and components (whether natural or constructed) within (or with a contextual relationship) to the SCRC.

Road Furniture: Consists of any general road furniture, usually manufactured off site and constructed from man-made materials. Furniture items can include, though are not limited to the following – gantries, Closed Circuit Television (CCTV) towers, emergency telephones, guide posts, anti-glare screens, grids and drainage structures.

Road Reserve: Part of the land designated by the Department for a State Controlled Road Corridor (whether constructed or not) which extends from the property boundary on one side to property boundary on the other side. Refer also to **State Controlled Road Corridor** definition.

Road Signs: Signs designed to inform (information signs), regulate (regulatory signs) and advise road/freeway users; with considerable advance warning, of directions, distances, destinations, routes, hazards, service locations, points of interest and other required traffic information.

Road Surface: The finished level of the road; the visible and navigable plane of the road.

Roundabout: A channelised intersection at which all traffic moves clockwise around a central traffic island.

Roundabout Island: An island of circular shape that is situated centrally within a channelised intersection around which all traffic moves clockwise. Traffic volumes and number of entries into the roundabout influence the size and shape of the roundabout and central island.

Safety Barrier (syn. Longitudinal Barrier, Median Barrier and Roadside Barrier): A longitudinal, median or roadside barrier whose primary function is to prevent penetration and to thereby safely redirect an errant vehicle away from a roadside hazard or from crossing the road median.

Safe Intersection Sight Distance: The distance needed for the driver of a vehicle on the non-terminating approach to observe a vehicle entering from a side street, decelerate and stop prior to a point of conflict.

Sag vertical curve: A vertical curve in the road where the apex is at the lowest point on the curve.

Sand Filters: A sand layer implemented within water system treatment devices designed to filter fine particulates from stormwater before discharge into a downstream drainage system.

Scenic Amenity: A measure of the level of scenic value to the viewer (as perceived by the local community or immediate residents) of particular places or individual scenes within the landscape. It also measures the 'relative contribution of each place in the landscape to the collective appreciation of open space as viewed from places that are important to the public' (Queensland Government, 2009). The relative value of the scene is measured from places that are recognised as being important to the viewer. The level of scenic value is also often associated with the degree of attractiveness to users, visual interest and perceptions. Refer also to **Amenity** definition.

Screen Planting: Plants selected for dense foliage habit and suitable mature size to visually screen adjoining land uses and/or structures with the intent of reducing the visual impact of these elements.

Sediment Basin: A purpose built drainage device (dam or pond) designed to trap, retain and allow settling of a wide range of sediment particle sizes (particularly course to medium sized); by means of gravity or filtration of a part of the suspended matter. The basin settles and reduces both the coarse sediment concentration and turbidity levels within the discharged storm water fluid. The settling process of suspended particles finalises the water treatment process.

Setback: Horizontal distance measured from the outer most edge of the outside carriageway lane to the centre of roadside object or feature. Refer also to **Setback (Vegetation specific)** definition.

Setback (Vegetation specific): The horizontal distance measured from the outer most edge of a design component or road element concerned, to the centre of a plant (for example; trunk of tree).

Sequential Views: A series of views experienced while the viewer is in motion that build up and transition progressively over a length of the road corridor.

Shoulder: The portion of the carriageway measured from the outside edge of the outer traffic lane, adjacent to and flush with the surface of the traffic lane. The shoulder excludes any berm, verge, rounding or extra width that is provided for the installation of sign posts, guide posts or safety barriers.

Sight Distance: The distance required to provide the motorist adequate time for assessing the road layout and reacting to any potential conflicts in sufficient time, through negotiation, manoeuvring or stopping, if necessary.

Simulation: The artistic re-creation of a visual image used to demonstrate the likely appearance of a proposal. These can be prepared manually or by computer software.

Slope:

> ***Recoverable Slope:*** A slope on which a motorist will probably retain control of a vehicle. Slopes 1 on 4 or flatter are generally considered recoverable.
>
> ***Traversable Slope:*** A slope that is considered traversable as the errant vehicle will continue on to the bottom. Embankment slopes between 1 on 3 and 1 on 4 may be considered traversable if they are smooth and free of fixed objects.
>
> ***Non-recoverable Slope:*** A non-recoverable slope is one on which a vehicle is likely to overturn and can be considered as a hazard in itself. Embankment slopes steeper than 1 on 3 are considered non-recoverable.

Soft Landscape: Manufactured landscape design component or landscape treatments including but not limited to median planting, vegetated fill embankment, cuttings and drainage device treatments, roadside buffer planting, structured planting design compositions, naturalistic planting, street tree and boulevard treatments. Although manufactured through design, most soft landscapes include items that are of natural origins, or produced from the earth which are then utilized to create a landscape. Examples are soil, plants, turf, seeds, mulch and so on.

Speed Analysis: A site-specific analysis of a roadway to determine the speed environment of that roadway.

Speed Limit: The maximum speed at which a motor vehicle is legally permitted to travel on a particular section of road.

Spill Through: Transverse slope (from the point where bridge meets the supporting abutment) down to the level of the carriageway the bridge is overpassing.

Splitter Island/Isles: The island placed within a leg of the roundabout or intersection, separating entering and exiting traffic and designed to deflect entering traffic.

State Controlled Road Corridor: Land designated and administered as road by the Department for the purpose of public use either in the present or future. Areas of the land dedicated (whether surveyed or un-surveyed) may or may not be usable by vehicles or pedestrians and can also include bridges, causeways, culverts or other works in, on, over or under a road.

Stop Line: An unbroken traverse pavement marking requiring motorists to stop before entering an intersection and showing where the front of the stopped vehicle should be.

Stopping Sight Distance: The distance needed for a driver to react to a hazard and completely stop prior to the hazard.

Street Tree: A tree located within the road reserve, either on the road shoulder or within a median, typically within a structured environment.

Streetscape: All the visual parts of a street within an urban area or rural township, including the pavement surface, adjoining buildings, structures, road furniture, vegetation, open spaces, artwork and so on, that combine to form and define the street's appearance, character, identity and functionality.

Structured Planting Approach: Involve the application of container stock in mass mulched areas. Planting setout is based on a planting plan or module arranged in a structured composition. It provides a higher degree of control over planting outcomes, and is beneficial in ensuring sight visibility areas and clear zones.

Subgrade: The material below a structure or pavement, which has been compacted to support the above structure.

Subsoil: The material below the planting media or topsoil layer, the outer embankment material and exposed soil areas that have been stripped of topsoil.

Succession: The process through which communities of plant and animal species in a particular area are replaced over time by a series of different and usually more complex communities. Succession provides a framework for the change in species composition and associated substrate changes over time, and enhances restoration efficiency. Refer also to **Restoration** definition.

Swale: An open constructed drainage channel, often grass-lined or vegetated, which is designed to carry, detain and filtrate storm water runoff. Swales are generally characterised by a shallow trough like form with a broad top width to depth ratio and gentle grades, in which water flows along. They are often used as an alternative to a kerb and channel system and can also partly treat storm water runoff when vegetated. Refer also **Bioretention Swale** definition.

Table Drain: A longitudinal open channel, constructed parallel to the road, to intercept and redirect runoff to a drain inlet or culvert. Table drains are often grass-lined or vegetated, and used as an alternative to a kerb and channel system.

'Transparent' Bridge: A bridge with minimal visual impact within the landscape context through the incorporation of recessive design features and simplistic treatments to elements of the bridge structure as well as to the immediate surrounds.

Travelled Way: The trafficable lane within the carriageway that is assigned to moving traffic and excludes shoulders and parking lanes.

Tube Stock: Plant seedlings supplied in a small tube which is generally less than 50 mm in diameter.

Tufted Grass: Grass species (preferably native) which form dense clumps at base, and are characterized by elongated strappy leaves. Tufted grasses are best used in mass planting situations.

Tunnel: A closed or roofed structure carrying a road through, or under an obstacle. This obstacle may be anything in the path of a preferred road alignment such as a significant landform, mountain, a body of water, a building or a complete development. Typically, covered roadways exceeding a length of 90m are classified as tunnels; smaller sections are generally termed as underpasses.

Turfing: Cultivated grass species grown to a particular thickness, cut into and installed as rolls at designed locations. Designed to achieve a denser, thicker and more immediate effect on installation, as compared to grassing. Refer also to **Grassing** definition.

Understorey: Includes all plant species occurring between the ground and the canopy layer. It includes low grasses and ground covers through to large shrubs up to 4 meters in height.

Upperstorey: Includes plant species occurring in the top strata of a vegetation alliance. This strata contains predominantly self supporting trees which are plants with a main stem and woody branches.

Vegetation Height: Expected mature heights of species, achieved under average growing conditions, measured from the ground surface to the top of the canopy.

Vegetation Management Plan: A structured plan or program to protect and manage existing vegetation within a given area.

Vegetation Width: Expected mature widths or diameters of species, achieved under average growing conditions.

Veloway: A dedicated bikeway for cyclists generally designed as a very high standard facility with a wider width and straighter direct alignment (where possible) than a typical cycle path, allowing for high speed travel by a larger number of cyclists.

Verge: The area located between the outer edge of the road shoulder and the batter hinge point, designed primarily to facilitate the recovery of errant vehicles within the clear zone and secondly, to accommodate drainage systems. They can also accommodate safety barriers.

View: The landscape as seen from a given point. Views change when looked at from different angles and when changing directions.

View-shed: Is a contained view (either by land or object) of an area of land, water, or other landscape and or cultural heritage item, visible from a fixed vantage point. View-sheds are most often areas of particular scenic or historic value that are readily visible from public areas such as from roadways, transport systems or open space. Viewed areas generally have inherent visual or aesthetic qualities as determined by those who view it.

Vista: A confined view usually with a terminating point in distance. The terminating point is the main point which viewers focus on and which captures attention.

Visual Amenity: A measure of the degree of visual quality, appropriateness and personal satisfaction of an area or specific site as experienced by the viewer (inclusive of local community, tourists and visitors). The degree of visual appreciation of a particular road proposal is associated with its contextual relationship to the surrounding physical environment. Refer also to **Amenity** definition.

Visual Catchment: Refers to the extent of areas in which a roadway can be viewed from nearby areas or wider surrounding areas by the travelling public. The degree of visual exposure and potential for visibility within the visual catchment extents is influenced primarily by the combination of surrounding landform, built forms and vegetation.

Visual Cues: A signal or reminder that stimulates visual interest, anticipation and provides information to viewers about what to expect and how to respond. The visual prompt may be of a natural or constructed physical form.

Visual Experience: The visual impression as perceived by the viewer of the roadway and adjoining landscape created by a sequencing of visual elements. It is the interplay of particular visual elements which generates how a landscape is ‘read’ and remembered by the traveller, as well as contributes to the level of interest and enjoyment experienced.

Visual Quality: The visual condition of the road landscape and how it is perceived, preferred, and valued by the public.

Visual Sensitivity: A key component of the visual landscape and refers to the landscapes relative sensitivity to change. It determines how sensitive the visual character of the setting is to the proposed changes relative to the road proposal. Visual sensitivity is based on the visual prominence or importance of features and conditions within the visual setting. This can be determined by the visual presence of valued features and the combination of those features in a distinct pattern. A landscape’s uniqueness within the broader landscape, its continuity and ability to change without obvious alteration to character, all determine the level of landscape sensitivity.

Water Sensitive Urban Design: A planning and design approach to minimise negative impacts on natural water cycles, maintain water quality, minimise demand on reticulated water supply and integrate water into the landscape to enhance visual, social, cultural and ecological values.

Weed: A plant which poses a threat to other vegetation and the environment, usually by way of its invasive habitat, to the detriment of natural or constructed habitats.

Wetlands (Constructed): Shallow, vegetated water bodies which use sedimentation, filtration and biological uptake processes to remove pollutants from storm water.

Wildlife Corridor: A strip or linear section of land in which plants and animals are afforded both habitat and linkages to other areas.

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June 2013

Feedback: Please send your feedback regarding this document to: mr.techdocs@tmr.qld.gov.au

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