Project Scoping Guideline

August 2013

Queensland Government

Forward

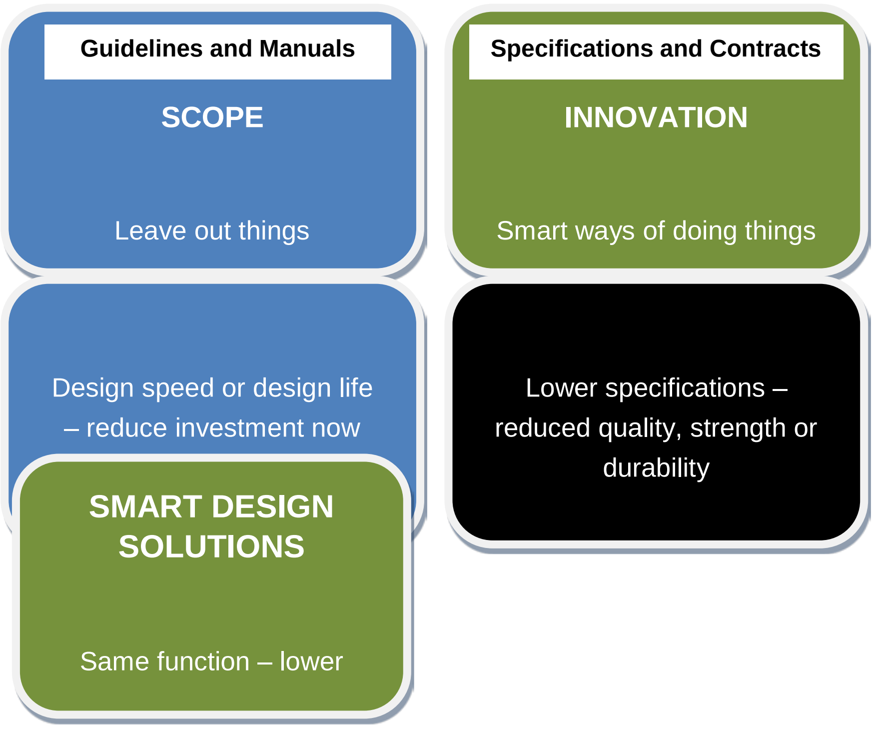
The Department of Transport and Main Roads' role is to provide safe, functional transport infrastructure that is 'value for money'. We have identified principles that will assist in meeting this objective, specifically:

- Determining the scope of projects to ensure functionality is addressed on a 'what is needed?' basis
- Encouraging and using innovative products and processes that provide the required functionality for a safety, cost or durability benefit.

Simply, the Department is focused upon reducing the cost of transport infrastructure by:

- Making sure Transport and Main Roads is easy to do business with
- Listening to industry (inviting feedback on improvements)
- Encouraging and implementing innovation that demonstrably helps us achieve our objective
- Asking our suppliers and staff 'can it be done better/smarter?'
- Using Austroads and Australian Standards to deliver context sensitive solutions
- Implementing cost efficient and competitive processes that are consistent with the community's and industry's expectations
- Compromising in a responsible manner, with a priority being safety and reduction in long term costs.

There are many ways to achieve transport infrastructure that is 'functional' and cost effective. Practically, the Department's technical manuals and specifications are highly influential in determining the quality and cost of projects.



The diagram above shows ways in which we can deliver infrastructure at lower costs. We encourage and support our staff and suppliers to consider solutions in the green boxes: actively pursue smarter ways of doing things to achieve practical and cost-effective outcomes. Refer to the departmental document '*Engineering Innovation within the Department of Transport and Main Roads*' for further information.

Caution should be used when adopting Solutions in the 'black box': lower specifications.

This document '*Project Scoping Guideline*' discusses solutions in the 'blue boxes': fit-for-purpose reduction of project scope.

Contents

1 Purpose

To provide advice on scoping road construction and rehabilitation projects.

2 Addressing the need

All project scoping must address the drivers or need for the project:

- What is the “need” or, what is the problem that must be addressed?
- What are the functionality and safety outcomes that the project must deliver?

The project’s scope should be tailored to:

- meeting the necessary functionality – or the “needs”
- omitting the “nice to include” – or the “wants”.

Chapter 3.6 “*Road design classes”* of *Road Planning and Design Manual, Supplement to Austroads Guide to Road Design, Volume 3, Part 1 Introduction to Road Design* provides guidance on intervention that should be sufficient to address the need for the project.

3 Brownfield sites

3.1 Guiding Principles

Maximise the utilisation of existing infrastructure (road formation, geometry and structures).

On Brownfield sites, a fundamental principle is to maximise use of existing infrastructure (road formation including geometry and other structures):

- that is still serviceable
- where adequate performance and safety standards can be maintained.

This may require using Extended Design Domain (i) (EDD) in many Brownfield projects, particularly where its use can:

- produce significant cost savings, and
- still provide some capacity for safety.

Using Design Exceptions (i) should be seen as a last resort to achieve value for money outcomes. It will usually require extensive compensatory works to produce an outcome that provides some safety/options for road users. These compensatory works reduce the “value” of the benefit.

Note (i) Definitions for “Extended Design Domain” and “Design Exceptions” can be found in Chapter 3.5.2 and 3.5.3 of *Road Planning and Design Manual,* Volume 3, Supplement to *Austroads Guide to Road Design Part 1.*

The use of existing infrastructure may also be improved by modifying the way it is or could be operated as an alternative treatment to an extensive reconstruction.

For existing motorways, operational performance improvements can be achieved by using managed motorways ITS technologies (e.g. coordinated entry-ramp signalling).

This is achieved by:

- better matching traffic flows to the available capacity
- reducing flow breakdown events (and their severity), which cause congestion.

Using this technology potentially reduces the need for additional capacity, as traffic flows can be optimised for existing capacity.

Scope projects to meet the needed functionality

Before scoping the "work tasks", the required functionality and safety outcomes must be determined to guide the scoping.

3.1.1 Rationale

Maximising reuse of the existing infrastructure should reduce the cost of projects. This enables more projects to be undertaken. More projects means higher overall safety and efficiency improvements to the road network than that provided by fewer, high cost projects.

Normal Design Domain (NDD) standards may not be realised by the project. In this case, EDD standards or even Design Exceptions must provide:

- the required functionality
- meet adequate performance, safety and efficiency standards.

Note (ii) Refer "*State Controlled Priority Road Network – Investment Guidelines*".

3.1.2 Planning for Operations

There are competing demands between modes for limited road space. Particularly in urban networks, it is not always possible to provide a desirable level of service for all modes, at all times of the day, across the network. Fiscal and physical constraints mean that better use of the existing road space must be made by prioritising road use on a time and location basis. This means that all road users will still have access to all roads. But, some roads will work better for cars, while others will work better for public transport, cyclists and pedestrians. It seeks to:

- resolve competing interests for road space
- facilitate the identification of more targeted, shorter-term, lower-cost, operational improvements that support the intended priority use across the network.

Note (iii) Refer "*Austroads Guide to Traffic Management, Part 4 Network Management*".

3.1.3 Paradigms, Best Practice – or affordable outcomes?

On Brownfield sites, best practice is desirable, but not mandatory. Some paradigms which are desirable include (but are not limited to):

- Roads that have a flood immunity for an Average Recurrence Interval (iii) (ARI) 50 years or ARI 100 years
- motorways have a posted speed of 100 or 110 km/hr
- access limited roads do not have direct property access
- roads must have a design life of 20 years or more
- intersections must cater for 15 years to 20 years of traffic growth.

Best practice is usually applied in a Greenfield situation. On Brownfield sites, best practice outcomes must not be adopted without:

- analysing whether existing infrastructure can be retained without necessarily achieving best practice

- determining what best practice outcomes deliver above that delivered by maximising use of the existing infrastructure
- calculating the extra cost to meet best practice.

For example, if a current posted speed is too high for most of the existing road geometry, a posted speed lower than 100 km/hr may be appropriate along a motorway in a Brownfield location. The design speed should be determined using the methodologies in the *Road Planning and Design Manual*. The aim should be to retain as much of the existing alignment as possible, rather than meet the requirements for an arbitrary posted speed of 100 or 110 km/hr. The future upgrade of the Centenary Motorway may be a case in point.

Flood immunity to current standards should not be the primary determinant for retaining a significant drainage structure. For example, the existing flood immunity of the Pacific Motorway in Logan City was retained at about ARI 10 years in recent projects (Bulimba Creek and in Slacks Creek). Increasing to a flood immunity of ARI 100 years only delivered marginal improvements. The cost of upgrading the flood immunity far exceeded the ability to fund.

Direct access to an access limited road is not desirable; but the risk posed by the access and the impact (including cost) of removing the access must be evaluated. Direct access can often be removed when properties are redeveloped rather than increasing project costs to remove accesses earlier.

Note (iv) Definitions for "*Average Recurrence Interval*" can be found in Chapter 2 of the *Road Drainage Manual* and Australian Rainfall and Runoff Guidelines 2016, Geoscience Australia.

3.2 Guidelines

Guidance on acceptable standards for scoping of Brownfield sites can be found in the following departmental documents:

- *Guidelines for Road Design on Brownfield Sites*
- *Road Planning and Design Manual*; Queensland Practice – *Road Planning and Design Manual, Supplement to Volume 3, Part 1: Introduction to Road Design*.

3.3 Engineering Innovation

The Department of Transport and Main Roads is interested in engineering innovations that:

- have the potential to deliver significant benefits to the community
- have an acceptable risk profile
- are maintainable.

More information can be found in the following document:

- *Engineering Innovation in the Department of Transport and Main Roads*.

3.4 Formation width

Most road design manuals define the required standards for new construction. Projects on Brownfield sites:

- should be scoped to fit within the existing formation where practical
- should be retain existing structures where practicable

- should provide for adequate safety.

There are cases when the road formation must be widened to achieve the required seal width. The project should normally be scoped to provide NDD standards for formation width in these cases, with EDD adopted in constrained locations. The batters on any widened formation should be as flat as practical to minimise the need for safety barrier. Experience and records demonstrate that flatter batters deliver better safety outcomes. Generally, a road with a wide formation and flat batters is preferred to a road with steeper batters when it can be achieved in a cost-effective manner.
(Batters - 1 on 10 preferred; 1 on 6 acceptable, 1 on 4 maximum.)

3.5 Flood immunity

Retaining the existing structures (and flood immunity) at major crossings is usually acceptable where existing major drainage structures:

- have adequate strength, and
- are in good condition.

Time of submergence and community impact must be evaluated. Increasing the flood immunity by replacing existing major structures is seldom cost effective based on Benefit / Cost Ratio (BCR) considerations alone.

Strengthening existing structures should be investigated and implemented cost effectively where existing major drainage structures:

- do not have adequate strength, but
- are in good condition.

Meeting the target flood immunity is desirable but may not be mandatory where existing infrastructure:

- is in poor condition, or
- requires replacement due to unacceptable rehabilitation costs

Affordability of providing a specific flood immunity (e.g. ARI 50 years or ARI 100 years) rather than an improved context sensitive flood immunity must also be considered. The flood immunity selected for a section of roadway should consider the flood immunity of the road link. There is little benefit of providing ARI 50 immunity on a particular project if the rest of the road link will never be able to be upgraded above an immunity level of ARI 5 years.

3.6 Design horizon for traffic

Similar to flood immunity, pavement life, etc. a major determinant of scope is choice of the design horizon for traffic capacity. Providing a reasonable level of service for 15 to 20 years may be desirable, but 10 years should be acceptable where the traffic conditions will be consistent with the surrounding network. There is little point in having a small section of road or an intersection with high capacity that just makes its faster to join the back of the queue at the next intersection.

The additional cost of providing for an additional 5 to10 years of projected traffic growth can be prohibitive when considering the current affordability of a project.

In any business case, affordability is a separate consideration to benefit cost considerations, and whole of life minimisation considerations.

3.7 Road geometry

The *Road Planning and Design Manual* includes a detailed methodology for determining the operating speed and capacity of a road (i.e. capability). Where the existing available capability is below the standards for normal road design, extended design domain principles (including compensatory treatments) may be included in the scope. There must be adequate cost savings or other factors (e.g. environmental, cultural) to justify its use.

Lowering the operating speed is difficult to achieve but may be necessary at times. Where costs to deliver safety outcomes are prohibitive but action is required, enforcement may allow existing alignments to be retained with reduced operating speeds. For example, fixed speed cameras with warning signage at specific locations may deliver improved safety outcomes where lower standard elements (or a poor accident history) exist on the network.

3.8 Design details

The solutions chosen during the design process can also add unnecessarily to the cost and the maintainability of the infrastructure. To minimise costs, the following issues must be carefully considered rather than automatically included in the scope of projects:

- the need for route lighting and street lighting
- the standard of landscaping and urban design treatments
- pavement types and treatment options
- bridge alignments (minimising or avoiding curves, tapers, and varying crossfalls on bridges)
- bridge details (consistent bridge types and details, designing to ensure the economic replacement of “consumable” items such as bearings is achievable)
- staged implementation of interchanges and grade separations
- bypass routes for over-height vehicles (enabling existing overhead structures to remain)
- signage (quantity and size and retaining existing signage)

3.9 Network upgrades

Upgrading a road link is often implemented through a program of separate projects, sometimes over many years. The overall scope should be determined by distributing the available funding across the projects to deliver a consistent outcome in terms of safety and efficiency including:

- traffic capacity
- level of service, and
- standard of infrastructure.

The scope should seek to deliver the highest benefit / cost items in the menu palate of affordable options.

The scope must be checked to ensure flow on effects to the network is acceptable. For example, will upgrading an arterial road or an entry ramp transfer congestion onto a motorway?

The scope of each individual project should be aimed at delivering the predetermined consistent outcome across the network. Excess funds should not be used to “raise the bar” above the requirements to achieve the predetermined outcome.

In Brownfield areas it is not necessary to fix all deficiencies, especially deficiencies that do not affect safety.

4 Greenfield sites

The standards for new projects on "Greenfield" sites are clearly defined in the various departmental policies and manuals supported by Austroads documents.

5 Transport and Main Roads' policies (all sites)

It is mandatory to consider all Transport and Main Roads' policies and their application to all projects. Policies include but are not limited to:

- *Reduction of Risk from Objects Thrown from Overpass Structures onto Roads*
- Figure 6-4 *Median Safety Barrier Policy, Road Planning and Design Manual Supplement to Austroads Guide to Road Design, Part 6*
- *Cycling Infrastructure Policy*
- *Managed Motorways Policy*
- *Austroads Guide to Traffic Management, Part 4 Network Management.*

6 Services (all sites)

Relocation of Public Utility Plant is expensive and generates risk in terms of cost, time, and existing materials, especially asbestos. Public Utility Plant should only be relocated where it is both necessary and cost effective compared to other options.

7 Environmental requirements (all sites)

Where practical, roads should be located to avoid environmentally sensitive areas.

During the planning, a list of permits that will be required during construction should be prepared.

Any environmental devices that are installed must be maintainable, cost effective and deliver the required outcomes with minimal maintenance costs.

8 Incremental benefit cost ratio (all sites)

While most projects have a Benefit / Cost Ratio (BCR) greater than 1, some include large pieces of expensive infrastructure (e.g. interchanges, ramps, public transport facilities). The incremental BCR of a large piece of infrastructure may be less than 1, even thought the BCR of the entire project exceeds 1.

An incremental BCR should be undertaken to demonstrate if a monetary justification exists for each large piece of infrastructure. Where the incremental BCR is less than 1, the need for the infrastructure must be carefully considered.

9 Scope creep (all projects)

The planning phase must adequately define the scope of the project to minimise the risk of scope creep.

The design class (Refer Chapter 3.6 "*Road design classes*" of *Road Planning and Design Manual Supplement to Austroads Guide to Road Design, Volume 3, Part 1 Introduction to Road Design)* selected to meet the need for the project should generally not be increased (which would normally represent a scope creep). However, a lower design class may be appropriate where funding is not available and a lower level of intervention (possibly including a shorter design life) may be a suitable solution.

Any changes during design and construction should be aimed at meeting the full functionality and safety outcomes of the original project while reducing both the cost and possibly the scope of the work rather than adding in additional requirements, functionality or scope that force up costs.

On Brownfield sites, a major risk for scope creep is the adoption of higher standards than those justified during planning including:

- higher standard road geometry
- increased formation width
- increased carriageway width
- increased clearance to overhead structures
- increased provision for future upgrading
- needing to extend the project to achieve a safe connection to the existing infrastructure
- replacing existing structures that have acceptable remaining design life.

A BCR and safety assessment must be undertaken before an increase in scope is incorporated into a project.

Project Managers must manage the scope within a public consultation environment, rejecting scope creep that does not deliver value. All scope creep must be accepted by an appropriately authorised officer.

10 Project reviews

After the initial scoping of a project is completed, the initial scope should be challenged to check that the “right” project is being pursued. A set of challenging questions should be developed against which the scope should be measured. Typically, questions would include:

- Is the project scope consistent with:
- the roads function in the network?
- the operational intent of the network including the flow on effects across the network?
- Have all operational treatments (such as access control, parking management, lane management, traffic signal operations, managed motorways, etc.) been fully considered as part of the project?
- Have all low cost opportunities to address operational and safety deficiencies been exhausted?
- Is the scope too focused on how the road could operate with low traffic volumes rather than how it will operate during average daytime traffic flow conditions?
- Is there a lower "Level of Service" solution that is still "fit for purpose" and more affordable?

- Will the proposed project scope lower safety?
- Are any components adding cost without proportional (and demonstrable) benefits?
- Are retaining walls more or less expensive than land resumption (long term costs e.g. inspection and maintenance must be considered)?
- What are the flow-on effects for the projects "testing" regime?
- Have learnings from immediate past projects been considered (using local materials, etc)?

As the project is developing, additional reviews are required to check the scope is still relevant and the risks are being managed adequately to minimise the project cost.

- Has sufficient testing been undertaken to balance the cost of testing against the risk allowance that a prudent contractor will add to the tender price? Insufficient information will result in higher tender prices by contractors to manage their risk.
- Has sufficient investigation been undertaken on location of services (x,y z co-ordinates at critical locations)?
- Are the intersection types appropriate considering safety, capacity, etc?