main roads WESTERN AUSTRALIA

GREAT EASTERN HIGHWAY UPGRADE

KOOYONG TO TONKIN

PROJECT DELIVERY METHOD RISK IDENTIFICATION WORKSHOP BACKGROUND NOTES

GOVERNMENT OF WESTERN AUSTRALIA

CONTENTS

1. INTRODUCTION

Main Roads has a formal set of Guidelines and a Procedure that it uses to identify the delivery methodology for its capital works projects.
This paper contains extracts of those Guidelines and Procedures. The purpose of this paper is to provide some background information for use in the risk identification workshop that forms part of the delivery methodology selection process.

2. PROCEDURE

Many factors determine the success of a project. An important factor is the selection of the most appropriate project delivery method(s), that is, the system that sets the contractual arrangements for design, construction, operations and/or maintenance.

In selecting a suitable project delivery method, project managers must gauge the level of complexity and uniqueness of the project, the appropriate level of control to be maintained and the internal and external environments. This will assist in obtaining the best *value for money* and management of the project risks. It makes effective use of both governmental and private sector resources and balances critical factors such as:

- Scope;
- Cost;
- Time;
- Quality of design and/ or construction;
- Internal environment; and
- External environment.

The selected project delivery method will also reflect the desired allocation of risks between the construction contractor(s), service providers and Main Roads. The selected project delivery method should develop a co-operative relationship between Main Roads and the contractor to assist in achieving Main Roads' objectives. The project delivery method selection framework comprises of:

Stage 1: Project Characteristic Assessment - assesses characteristics and constraints that are specific to the project.

Stage 2: Project Packaging Assessment - identifies other projects that are aligned in funding (by funding year) and may be suitable for packaging.

Stage 3: Project Risks Identification and Assessment – identifies and assesses risks of the project.

Stage 4: Project Delivery Scorecard Assessment – assesses the value drivers and eliminates other project delivery methods.

Stage 5: Delivery Options Assessment - identifies suitable project delivery method(s).

The overall process is shown in Figure 1.

This paper covers Stages 1, 2 and 3.

It also contains information on selected contracting strategies that Main Roads uses to select the delivery methodology for its projects.

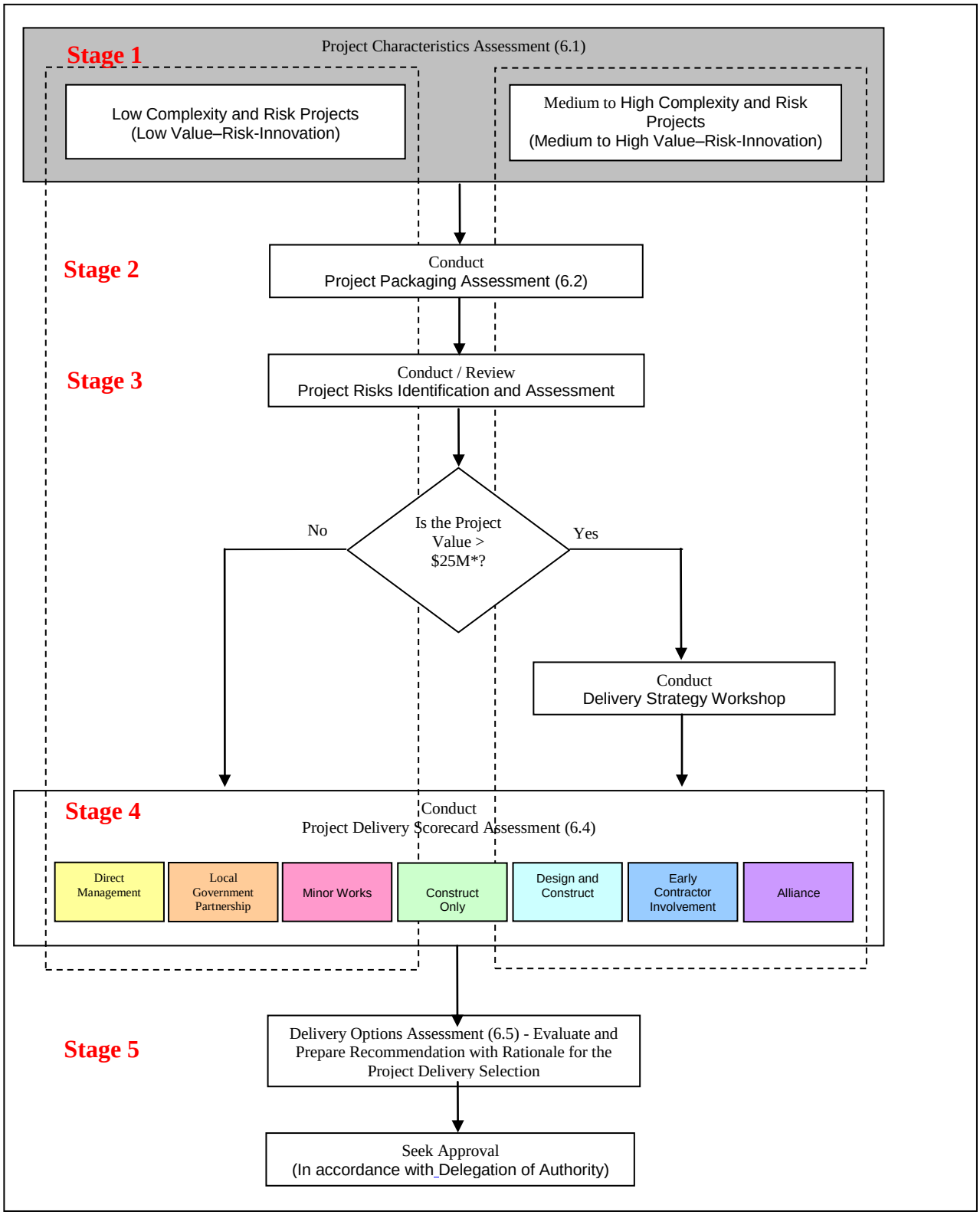


Figure 1 - Project Delivery Method Selection Framework ***(* based on 2008 monetary value)***

APPENDIX 1 – PROJECT CHARACTERISTIC CHECKLIST

Project Characteristic	Level	Comments
Scope Characteristics		
Complexity and Risk Level to Main Roads	High	
Development Phase Stage	Preliminary Design	
Scope Flexibility during construction required	Full	
Cost Characteristics		
Project Value	High (>$25M)	
Budget restrictions	Flexible - Subject to Change	
Funding commitments / constraints	Partial Funding	
Time Characteristics		
Delivery date restrictions (or milestones)	Tight – Guaranteed Time	
Design and Construction Phase Overlapping	Required	
Third party, seasonal, geotechnical, service relations	Required	
Quality Characteristics		
Conformance Quality	Fully Required	
Design Quality	Fully Required	
Innovation and construction technique optimisation	Required	
Internal Environmental Influences		
Resource Availability / Capability	Sufficient	
Design and construction oversight	Shared	
External Environmental Influences		
Market Competitiveness	Available	

APPENDIX 2 – PROJECT PACKAGING CHECKLIST

Packaging Elements	Level	Comments	
Project Size			
Can the Project be combined with a similar work-type project?	No		
Can the Project be combined with a close-by or inter-regional project	No		
Can the Project be separated into smaller components?	Yes	No	
Internal Resource Capacity and Skills			
Are there suitable /available Internal Resources to undertake the project?	No		
Partnerships and Relationships			
Can the Project be delivered with existing Partnerships?	No		
Market Capacity and Skills			
Can the Project be delivered in consideration of Market Conditions?	Yes		
Overall Assessment			
Is the Project suitable for Project Packaging?	No		
Could the project be delivered using existing arrangement (Local Government, TNC, etc.)?	No		
Could Programming of works be considered?	No		

APPENDIX 3 - DESIGN AND CONSTRUCT

Design and Construct combines the design and construction responsibilities by awarding the contract to a single Contractor (contractor, consortium, joint venture) under a lump sum contract, as illustrated in Figure 2. Contractors prepare a proposal with price demonstrating their intent to complete the design and undertake the construction. The Contractor takes responsibility for the design documents such that they are complete and free from error. Main Roads assumes responsibility for the operation and maintenance upon completion of the Project.

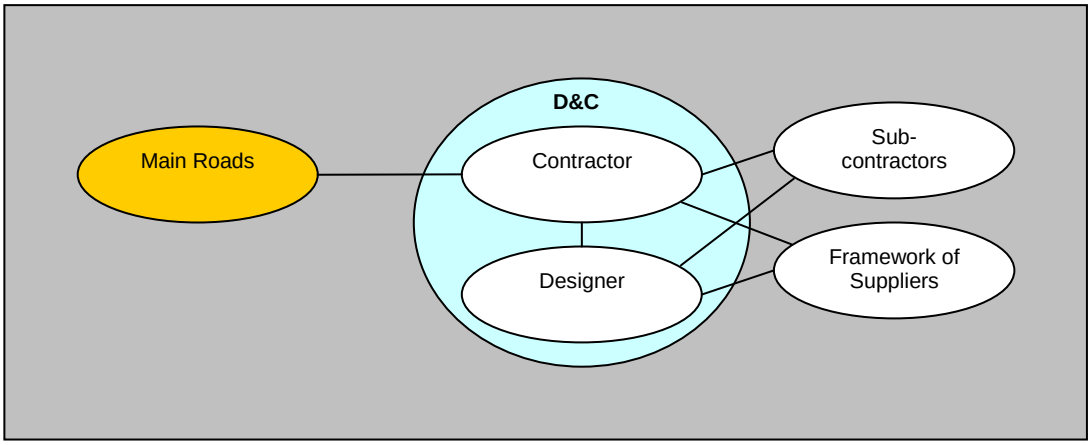


Figure 2 - Relationship between Main Roads and the *Design and Construct* Contractor

The successful implementation of the *Design and Construct* relies on well scoped tender documents, performance criteria and realistic delivery timeframes. The unique characteristics of the *Design and Construct* project method are:

- Single point of accountability for the design and construction phases ;
- Scope can be defined using performance requirements; and
- Performance specifications;

Main Roads has developed template contract documentation using a *Contract Deed* and *Scope of Works Technical Criteria (SWTC)* documentation. All contractors must be pre-qualified prior to tendering, as described in *Pre-qualification of Major Works Contractors*. The contract form is outlined in Table 1.

Contract Form	Description
Contract Documentation	Preliminary design and project definition partially complete. Project objectives known. Use *SWTC* and *Deed*.
Procurement Approach	1. Undertake preliminary design and prepare Evaluation Guidelines and Performance Criteria 2. Seek Expression of Interest from suitably pre-qualified contractors (Stage 1) 3. Sign up 3 proponents to develop Request for Proposal (Stage 2) 4. Assess Proposals 5. Award Construction Contract 6. Monitor Contractor's performance
Tender Evaluation Method	Value for money (technical performance and cost - priced and non-priced)
Payment Mechanism	Lump Sum

Table 1– Contract Form of the *Design and Construct*

The *Design and Construct* is suitable for high *value-risk-innovation* and complex projects, as there is generally:

- Maximisation of innovation from a cohesive design and construction method;
- High costs associated with tendering and tender evaluation; and
- Tight budgets and time restrictions.

Examples of suitable projects include:

- Projects that need to be fast-tracked for public safety, political reasons or where time is critical, however desired outcomes are well defined;
- Greenfield sites to enable innovation, flexibility and cost savings; and
- Projects where in-house resources can not meet project demands.

The benefit of the *Design and Construct* is the Contractor bears majority of the design and all construction responsibilities and phase interface risks for a fixed price. The main disadvantage is that the risks transferred to the contractor result in an increase in the contract value, irrespective of the occurrence of the risk. Other advantages and disadvantages for Main Roads are listed in Table 2.

Enhancements to identify and reduce risk exposure include:

- Encouragement of duplication and prefabrication to develop the market, the product and to reduce production costs;
- Priced Options where one or more project elements (eg: smaller projects) can be embedded into a larger project as an option and forms part of the tender submission or proposal. Contractors can choose to include the optional project elements in their proposal. If the tender submission or proposal exceeds the budget, the optional project elements are not included in the contract.

Design and Construct		
Feature	Advantages	Disadvantages
SCOPE PERFORMANCE		
Scope Change Flexibility for Minimal Cost		*Some flexibility with performance measures*
Accommodation of Scope Creep	Some flexibility prior to scope finalisation	
COST PERFORMANCE		
Commitment to Contract Value	Guaranteed cost and timing	
Timing of Cost Commitment	At RFP Stage	
Contract Value Influence		*Increased by high transfer of risk to Contractor*
Main Roads Involvements Costs (eg: Quality control)	Low level due to performance measures	
Potential Cost Savings / Increases	Through design innovations and constructability techniques	*Increased by high transfer of risk to Contractor*
TIME PERFORMANCE		
Commitment to Delivery Date	At RFP Stage	
Early Commencement	Available	
Fast-tracking (with Minimal Cost Ramifications)	Available via phase concurrency	
Potential for Early Commencement	Construction can commence prior to complete design	
Potential Time Savings / Increases	Through design innovations and constructability techniques	
Pre-construction Activities (eg: service relocations)	Accommodated in works	
QUALITY PERFORMANCE		
Level of Design Quality control by Main Roads		*Low control of Quality*
Level of Control of Quality Conformance		*Low control of Quality*
Innovative Opportunities	Increased to suit project needs and resource skills (and profit)	
Oversight and Quality Review Level	Reduced as risks are transferred to the Contractor	
Cohesive Design and Construction	Integrated approach between the Designer and Contractor	
INTERNAL ENVIRONMENTAL INFLUENCES		
Known roles of all parties	Known, however adversarial role can exist	
Level of Main Roads Capability Development		*Low as performance specification*
Level of Main Roads Oversight Required	Low as performance specification	
Resource Skills, Capacity and Capability		*Experienced and capable resources due to complexity*
EXTERNAL ENVIRONMENTAL INFLUENCES		
Market Availability		*Restricted pool of Contractors to undertake Works*
Market Competitiveness Suitability		*Restricted to large contractors thereby reduce competition*
Industry Perception of Project Delivery Method		*Restricted to large contractors*
Time/cost for Tender or Proposal submission		*High cost and time associated with the proposal*

Table 2 – Advantages and Disadvantages of the *Design and Construct*

APPENDIX 4 - EARLY CONTRACTOR INVOLVEMENT

Two contracts are awarded - an *Early Contractor Involvement (ECI) Agreement* and a *Design and Construct Contract*. Generally, the two contracts are awarded to one Contractor to undertake the design and construction under a lump sum contract. Refer to Figure 3. Main Roads assumes responsibility for the operation and maintenance upon Project completion.

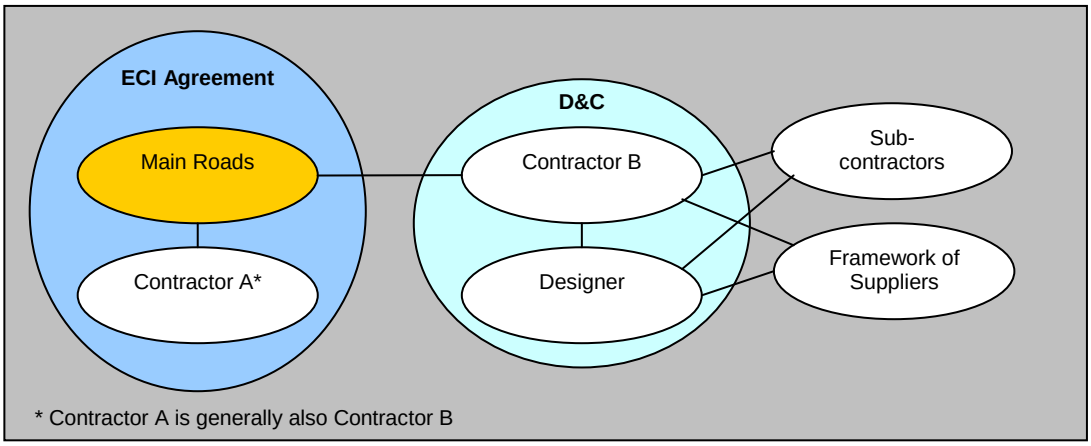


Figure 2 - Relationship between Main Roads and the *Early Contractor Involvement* Contractor

The successful implementation of the *ECI* relies on well scoped tender documents, performance criteria and realistic delivery timeframes. The unique characteristics of the *ECI* are resources are required in the planning phase to maximise benefits during construction, scope can be defined during *ECI* phase and greater client control.

Main Roads has developed template contract documentation using a *Contract Deed* and *Scope of Works Technical Criteria (SWTC)* documentation. All contractors must be pre-qualified prior to tendering, as described in *Pre-qualification of Major Works Contractors.* The project delivery method contract form is outlined in Table 13.

Contract Form	Description
Contract Documentation	Preliminary design and project definition partially complete. Project objectives known. Use *SWTC* and *Deed*.
Procurement Approach	1. Request for Proposal from suitably pre-qualified Contractors (RFP phase) under a value for money tender evaluation 3. Sign up 1 proponent (ECI Agreement) to develop Request for Proposal (finalise the scope, design, document and price). 4. Develop Design and Construct Price (DCP) based on an agreed D&C Project Deed. If suitable, then: 5. Award D&C Contract based on agreed DCP and contract terms. If non-agreement is achieved, then a D&C method is used. 6. ECI Contractor undertakes the design and construction. 7. Monitor Contractor's performance.
Tender Evaluation Method	Value for money (technical and cost - priced and non-priced)
Payment Mechanism	Lump Sum

Table 3 – *Early Contractor Involvement* Contract Form

The *ECI* is suitable for high *value-risk-innovation* and complex projects, as there is generally:

- Maximisation of innovation from a cohesive design and construction method;
- High costs associated with tendering and tender evaluation; and

- Time saving ability due to phase concurrency (overlap).

Examples of suitable projects include projects requiring:

- Efficient use of resources, both by the Contractor and Main Roads (particularly, when there is a relatively low resource supply base);
- Greenfield sites to enable innovation, flexibility and cost savings; and
- Flexibility in scope definition – also could consider using another project delivery method in lieu of the *Design and Construct* project delivery method;

The main benefit of the *Early Contractor Involvement* is the potential to reduce the project risks and enable pre-planning from an early stage. The method promotes partnership and cooperation between Main Roads and the contractor with the resultant synergy providing a more cost effective and better product. Other advantages and disadvantages for Main Roads are listed in Table 4.

This method is currently being trialled and any improvements will be known at the project completion. However, the “early contractor involvement” concept would be useful for low *value-risk-innovation* projects where scope definition is lacking.

Early Contractor Involvement		
Feature	Advantages	Disadvantages
SCOPE PERFORMANCE		
Scope Change Flexibility for Minimal Cost	Considerable as increased planning during ECI phase	
Accommodation of Scope Creep	Reduction due to co-operative planning process	
COST PERFORMANCE		
Commitment to Contract Value	Guaranteed cost and timing	
Timing of Cost Commitment	End of ECI Stage	
Contract Value Influence		*High costs develop to design but less scope changes*
Main Roads Involvements Costs (eg: Quality control)	Medium level due to performance measures	
Potential Cost Savings / Increases	Through design innovations and constructability techniques	*Increase in pre-construction costs if no set completion date*
TIME PERFORMANCE		
Commitment to Delivery Date	End of ECI Stage	
Early Commencement	Available (useful when lead time is lacking)	
Fast-tracking (with Minimal Cost Ramifications)	Available via phase concurrency	
Potential for Early Commencement	Construction can commence prior to complete design	*Early start may inhibit beneficial changes in later documentation*
Potential Time Savings / Increases	Through design innovations and constructability techniques	
Pre-construction Activities (eg: service relocations)	Accommodated in works	
QUALITY PERFORMANCE		
Level of Design Quality control by Main Roads	High control in collaboration with Contractor	
Level of Control of Quality Conformance	Better product due to Partnership with the Contractor	
Innovative Opportunities	Increased to suit project needs and resource skills	
Oversight and Quality Review Level	Reduced as risks are transferred to the Contractor	
Cohesive Design and Construction	Early creation of a delivery team to maximise the benefits	
INTERNAL ENVIRONMENTAL INFLUENCES		
Known roles of all parties		*Delivery method is still under development*
Level of Main Roads Capability Development		*Low as performance specification*
Level of Main Roads Oversight Required	Low as performance specification	
Resource Skills, Capacity and Capability	Earlier dedication of construction resources	*Experienced and capable resources due to complexity*
EXTERNAL ENVIRONMENTAL INFLUENCES		
Market Availability		*Restricted pool of Contractors to undertake Works*
Market Competitiveness Suitability		*Restricted to large contractors thereby reduce competition*
Industry Perception of Project Delivery Method		*Restricted to large contractors*
Time/cost for Tender or Proposal submission		*High cost and time associated with the proposal*

Table 4 – Advantages and Disadvantages for the *Early Contractor Involvement*

APPENDIX 5 - ALLIANCE

The *Alliance* is a form of the *Design and Construct* with special contract conditions designed to align targets and enhance collaboration. Main Roads commissions a contractor to develop the project details based on a concept design. The Alliance Contract is awarded to most suitable proponent and Main Roads with the contractor work collaboratively under a legal agreement. The relationship between Main Roads and the Contractor is illustrated in Figure 4. Main Roads assumes responsibility for the operation and maintenance upon completion of the Project.

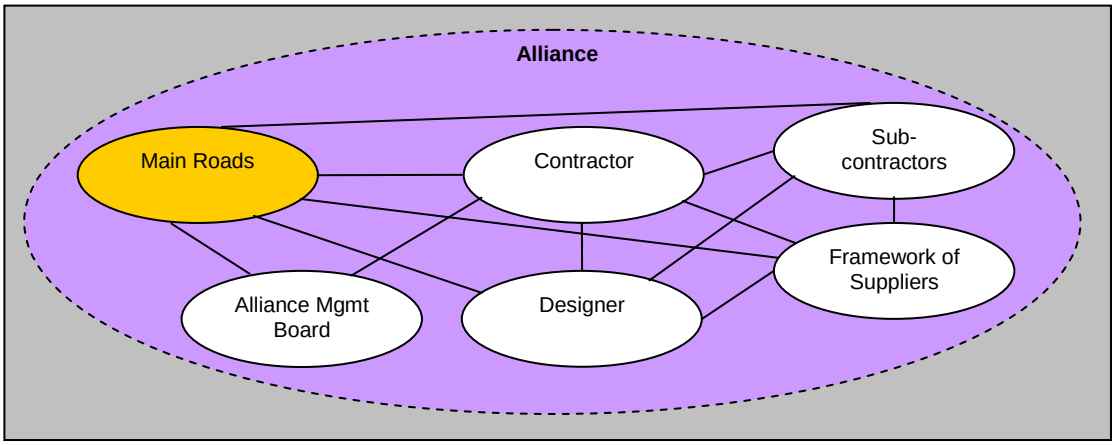


Figure 3 - Relationship between Main Roads and the *Alliance* Contractor

The successful implementation of the *Alliance* relies on well scoped tender documents, performance criteria and realistic delivery timeframes. The unique characteristics of *Alliance* are:

- Targets, performance and commercial interests aligned with outcomes;
- Joint risk/reward arrangements; and
- Releases liability as disputes have to be amicably resolved.

The contract documentation for each *Alliance* is unique, however is based on the *Design and Construct* contract form. All contractors must be pre-qualified prior to tendering, as described in *Pre-qualification of Major Works Contractors*. The project delivery method contract form is summarised in Table 5.

Contract Form	Description
Contract Documentation	Preliminary design and project definition partially complete. Project objectives known. Documentation is unique to project needs.
Procurement Approach	1. Undertake preliminary design and prepare Evaluation Guidelines and Performance Criteria 2. Seek Request for Proposal from suitably pre-qualified contractors (Stage 1) 3. Sign up 2 proponents to prepare a proposal under an Interim Alliance Agreement (Stage 2) 4. Assess Proposals 5. Award Construction Contract 6. Monitor Contractor's performance
Tender Evaluation Method	Value for money (technical performance and cost)
Payment Mechanism	Open book – reimbursed for all costs (including delay, cost overruns and defective design)

Table 5 – *Alliance* Contract Form

The *Alliance* is suitable for high *value-risk-innovation* and complex projects. Examples include projects requiring:

- Uniqueness involving new and/or evolving technology or complex, unpredictable risks;
- Faster integrated decision making and cohesive collaboration; and
- Complex pre-construction, interface and external threats (eg: difficult stakeholder issues).

The main benefit of the *Alliance* is the risks are shared between Main Roads and the Contractor under a contractual framework where the commercial interests are aligned with project outcomes. Other advantages and disadvantages for Main Roads are listed in Table 6.

Variations of the *Alliance* include:

- *Price Competitive Alliance* – two proponents are signed to the Interim Alliance Agreement to develop the project design proposal. The preferred proponent is awarded the Alliance Contract under a Project Alliance Agreement;
- *Pure Alliance* – one proponent is signed to the Interim Alliance Agreement to develop the project design proposal. This proponent, if suitable is awarded the Alliance Contract under a Project Alliance Agreement. This variation reduces the procurement process and achieves faster delivery; and

  Program Alliance – a package of a suite of small projects or a program in lieu of one *Alliance* project to achieve economies of scale (a form of packaging projects). Generally, projects are low to medium risk and complexity. The scope must be well defined as following completion of the first project part, then there is roll-over to the subsequent works with milestones. The method is suitable for projects requiring management of past performance relating to anticipated cost over-runs and quality assurances systems.

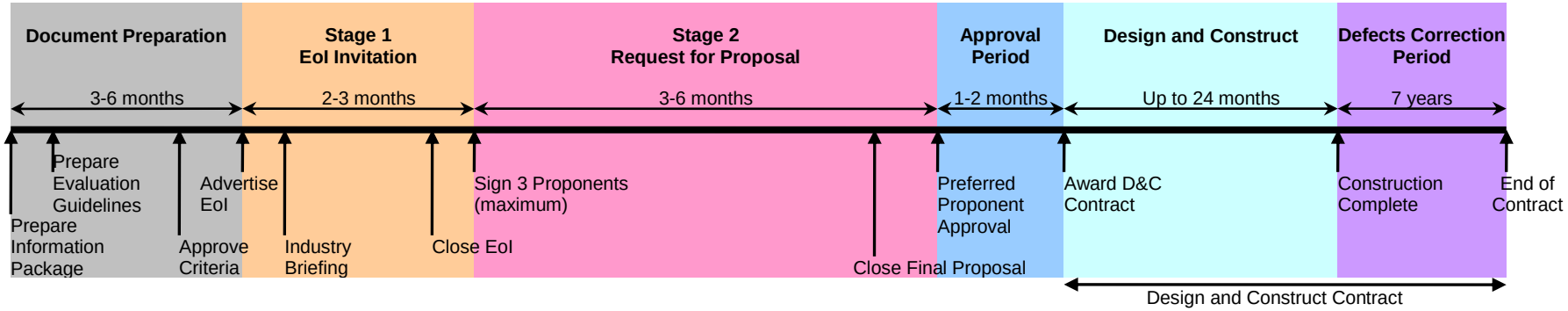
Alliance		
Feature	Advantages	Disadvantages
SCOPE PERFORMANCE		
Scope Change Flexibility for Minimal Cost	High level, however may need to adjust targets	
Accommodation of Scope Creep	Adjusted as required (Target Cost adjusts, too)	
COST PERFORMANCE		
Commitment to Contract Value	Guaranteed delivery cost	
Timing of Cost Commitment	At RFP Stage	
Contract Value Influence		*Negotiated contract, may not be competitive*
Main Roads Involvements Costs (eg: Quality control)	Medium level due to performance measures	
Potential Cost Savings / Increases	Through design innovations and constructability techniques	*Contractor may influence the budget higher to reduce costs*
TIME PERFORMANCE		
Commitment to Delivery Date	At RFP Stage	
Early Commencement	Available	
Fast-tracking (with Minimal Cost Ramifications)	Available via phase concurrency	
Potential for Early Commencement	Construction can commence prior to complete design	
Potential Time Savings / Increases	Through design innovations and constructability techniques	
Pre-construction Activities (eg: service relocations)	Accommodated in works	*Early start may inhibit beneficial changes in later documentation*
QUALITY PERFORMANCE		
Level of Design Quality control by Main Roads	Shared control in with Contractor	*Can result in limited outcomes if unsuitable Alliance partner*
Level of Control of Quality Conformance	High quality of work as collaborative approach	
Innovative Opportunities	Increased as unconstrained by liability issues	
Oversight and Quality Review Level	Shared as risks are shared with the Contractor	
Cohesive Design and Construction	Early creation of a delivery team maximises benefits	
INTERNAL ENVIRONMENTAL INFLUENCES		
Known roles of all parties		*Still relatively new delivery method*
Level of Main Roads Capability Development	High as collaborative relationship	
Level of Main Roads Oversight Required	High as collaborative relationship and phase concurrency	*Can only have a low number of Alliances simultaneously*
Resource Skills, Capacity and Capability	Excellent training opportunity for technical skills and skill transfer	*Experienced and capable resources due to complexity*
EXTERNAL ENVIRONMENTAL INFLUENCES		
Market Availability		*Restricted pool of Contractors to undertake Works*
Market Competitiveness Suitability		*Restricted to large contractors thereby reduce competition*
Industry Perception of Project Delivery Method		*Restricted to large contractors*
Time/cost for Tender or Proposal submission		*High cost and time associated with the proposal*

Table 6- Advantages and Disadvantages of the *Alliance*

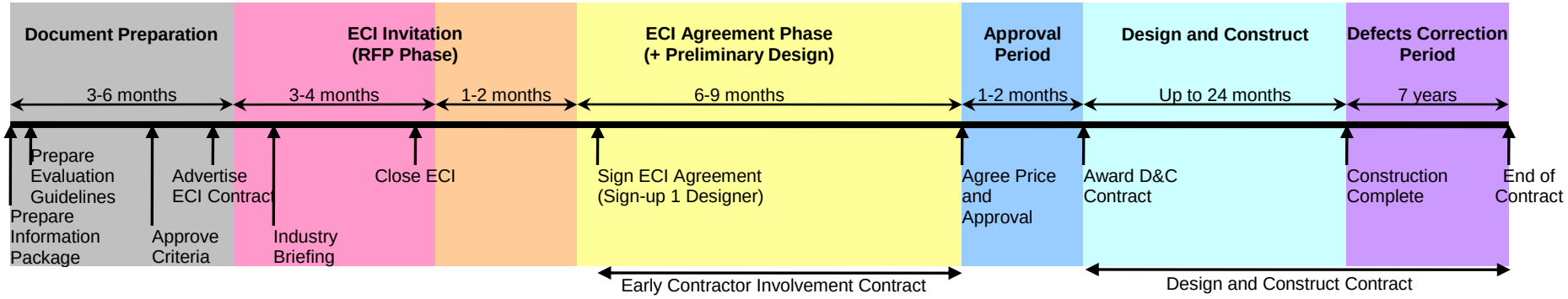
PPENDIX 6 - DELIVERY TIMEFRAMES AND PHASES

The following 4 Charts illustrate the delivery phases, process and possible timelines of the *Design and Construct, Early Contractor Involvement*, *Price Competitive* and *Pure Alliances*.

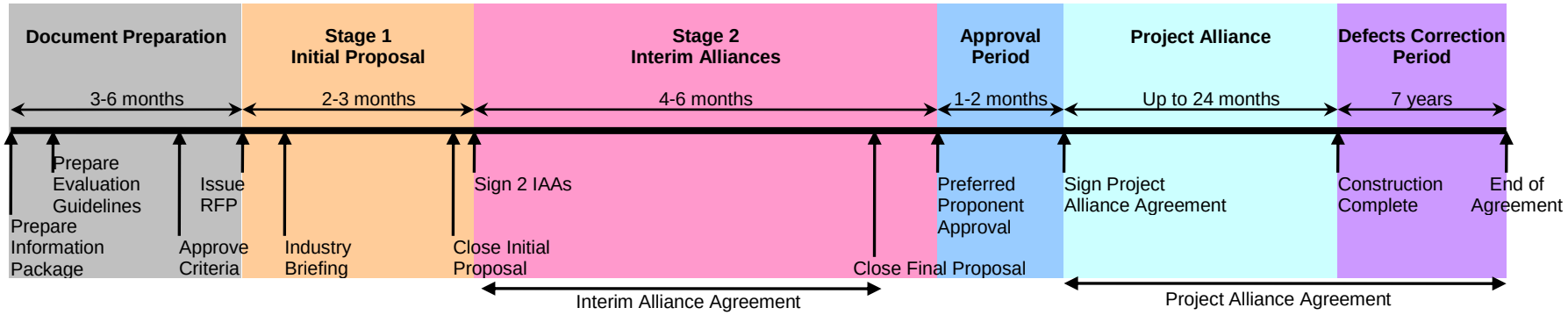
DESIGN AND CONSTRUCT



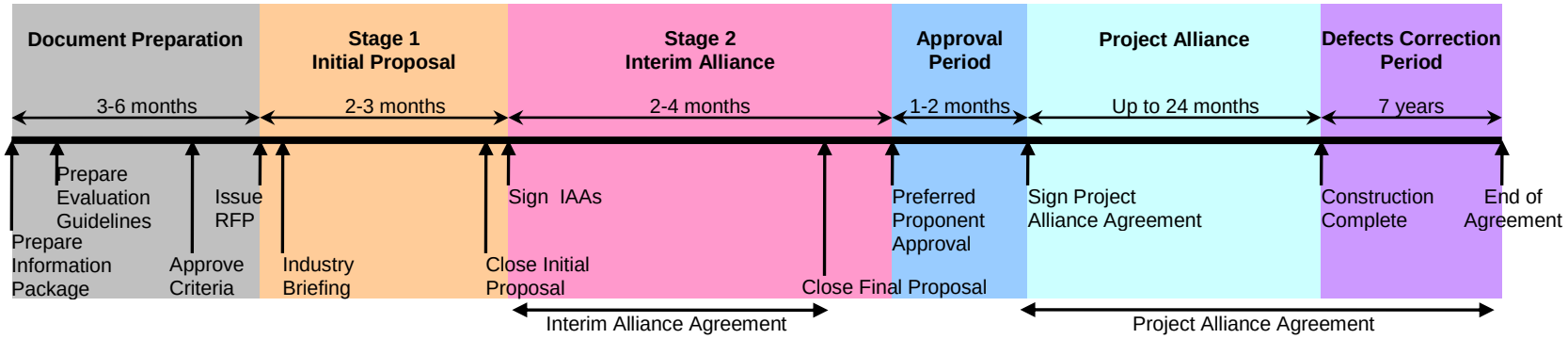
EARLY CONTRACTOR INVOLVEMENT



PRICE COMPETITIVE ALLIANCE



PURE ALLIANCE



APPENDIX 7- PROJECT DELIVERY METHOD ADVANTAGES/DISADVANTAGES

ADVANTAGES AND *DISADVANTAGES* OF PROJECT DELIVERY METHODS			
Feature	**DESIGN AND CONSTRUCT**	**EARLY CONTRACTOR INVOLVEMENT**	**ALLIANCE**
SCOPE PERFORMANCE			
Scope Change Flexibility for Minimal Cost	*Some flexibility with performance measures*	Considerable as increased planning during ECI phase	High level, however may adjust targets
Accommodation of Scope Creep	Some flexibility prior to scope finalisation	Reduction due to co-operative planning process	Adjusted as required (Target Cost adjusts, too)
COST PERFORMANCE			
Commitment to Contract Value	Guaranteed cost and timing	Guaranteed cost and timing	Guaranteed cost and timing
Timing of Cost Commitment	At RFP Stage	End of ECI Stage	At RFP Stage
Contract Value Influence	*Increased by high transfer of risk to Contractor*	*High costs develop to design but less scope changes*	*Negotiated contract, may not be competitive*
Main Roads Involvements Costs (eg: Quality control)	Low level due to performance measures	Medium level due to performance measures	Medium level due to performance measures
Potential Cost Savings / Increases	Through design innovations, constructability techniques	Through design innovations, constructability techniques	Through design innovations, constructability techniques
TIME PERFORMANCE			
Commitment to Delivery Date	At RFP Stage	End of ECI Stage	At RFP Stage
Early Commencement	Available	Available	Available
Fast-tracking (with Minimal Cost Ramifications)	Available via phase concurrency	Available via phase concurrency	Available via phase concurrency
Potential for Early Commencement	Construction can commence prior to complete design	Construction can commence prior to complete design	Construction can commence prior to complete design
Potential Time Savings / Increases	Through design and construction techniques	Through design and construction techniques	Through design and construction techniques
Pre-construction Activities (eg: service relocations)	Accommodated in works	Accommodated in works	Accommodated in works
QUALITY PERFORMANCE			
Level of Design Quality control by Main Roads	*Low control of Quality*	High control in collaboration with Contractor	Shared control in with Contractor
Level of Control of Quality Conformance	*Low control of Quality*	Better product due to Partnership with the Contractor	High quality of work as collaborative approach
Innovative Opportunities	Increased to suit project needs and resource skills	Increased to suit project needs and resource skills	Increased as unconstrained by liability issues
Oversight and Quality Review Level	Reduced as risks are transferred to the Contractor	Reduced as risks are transferred to the Contractor	Shared as risks are shared with the Contractor
Cohesive Design and Construction	Integration between Designer and Contractor	Early creation of a delivery team maximises benefits	Early creation of a delivery team maximises benefits
INTERNAL ENVIRONMENTAL INFLUENCES			
Known roles of all parties	Known, however adversarial role can exist	*Delivery method is still under development*	*Still relatively new delivery method*
Level of Main Roads Capability Development	*Low as performance specification*	*Low as performance specification*	High as collaborative relationship
Level of Main Roads Resources Required	Low as performance specification	Low as performance specification	*High as collaborative relationship*
Resource Experience and Capability	*Experienced and capable resources due to complexity*	*Experienced and capable resources due to complexity*	Opportunity for technical skills and skill transfer

ADVANTAGES AND *DISADVANTAGES* OF PROJECT DELIVERY METHODS			
Feature	**DESIGN AND CONSTRUCT**	**EARLY CONTRACTOR INVOLVEMENT**	**ALLIANCE**
EXTERNAL ENVIRONMENTAL INFLUENCES			
Market Availability	*Restricted pool of Contractors to undertake Works*	*Restricted pool of Contractors to undertake Works*	*Restricted pool of Contractors to undertake Works*
Market Competitiveness Suitability	*Restricted to large contractors thereby reduce competition*	*Restricted to large contractors thereby reduce competition*	*Restricted to large contractors thereby reduce competition*
Industry Perception of Project Delivery Method	*Restricted to large contractors*	*Restricted to large contractors*	*Restricted to large contractors*
Time/cost for Tender or Proposal submission	*High cost and time associated with the proposal*	*High cost and time associated with the proposal*	*High cost and time associated with the proposal*