New MetroRail City Project

A Case Study in Risk Management

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Establishing Key Tasks for the City Project

**Format**
- Project Outline
- Evolution of the Project
  - Identifying key issues and constraints
  - Scope definition
- Project Development
  - Risk-based evaluation of procurement models
  - Building the project team
- Current Status

**Focus**
- Using risk management techniques to define the project and guide its development
City Project

- Inner city component of the Southern Suburbs Railway
- 475m of cut-&-cover rail tunnel
- 770m of twin bored rail tunnel
- Two new underground rail stations - William Street and Esplanade
- $334 million design, construct and maintain contract awarded to Leighton Kumagai JV in February 2004
- Commissioned October 2007
Evolution of the Project - Route Selection

- “William Street” option announced as part of Direct (Kwinana Freeway) Route in July 2001
- “PCRAC” formed in November 2001 to investigate CBD alignment options, in response to community concern at project impacts
- First PCRAC report in March 2002 - Eastern, Western and Central routes identified
- Public consultation following elimination of Eastern option due to high cost
Evaluation of Alignment Options

- PCRAC - independent committee appointed by Minister for Planning and Infrastructure
- Expertise in transport, planning, engineering, rail, architecture and property management
- Multi-criteria analysis of alignment options:
  - Public transport use
  - Safe and reliable train services
  - Betterment and economic sustainability of the City
  - Construction impacts
  - Legislative/statutory/policy compliance
  - Cost
Risk Assessment of Alignment Options

- Detailed assessment of risks and opportunities for all alignment options
- Expert risk review panel of risk management, technical, commercial and legal specialists
- “Cost” and “Delay” risk quantified for all options - key input for route selection analysis
- Methodology:
  - Brainstorming of generic risk categories
  - Specialist review of specific project impacts
  - Team review of likelihood and consequence
  - Risk quantification and reporting
Risk Categories

- **Commercial Disruption** - traffic, pedestrian, service, noise and other construction impacts
- **Property Damage/Interference** - damage to infrastructure
- **Personal Injury** - bodily damage, stress, illness etc
- **Land Resumption/Valuation** - land acquisition requirements and impacts on land value
- **Political/Public Relations** - public and stakeholder dissatisfaction
- **Statutory Approvals** - Aboriginal/European heritage, planning, environment
Key Issues & Constraints

- **Key issues from risk review:**
  - Community and business disruption
  - Damage to buildings and infrastructure
  - Statutory approval constraints
  - Public perception

- **Key land and transport planning issues:**
  - Base and future patronage
  - Operational efficiency and capacity for growth
  - Integration with existing and future public transport
  - Development opportunity
  - Civic and urban design amenity
Defining Project Scope

- **Planning Issues**
  - William Street alignment - efficiency and growth
  - Station sites - patronage and transport integration
  - Foreshore tunnels - amenity and development
  - Bored tunnels - CBD disruption

- **Project Risks**
Development of Procurement Model

- Industry input - consistent focus on relationship building and risk sharing
- Research - full range of contracting models
- The common theme - **WHO OWNS RISK?**
- Conclusion - *for large, complex projects, rigorous analysis of project-specific risks is fundamental to selecting the most suitable procurement model. Risk allocation is not generic - contracting strategy must adapt accordingly.*
Risk-Based Evaluation of Procurement Models

- Workshop methodology with high profile team of key Government Agency stakeholders
- Identification of individual project components, related risks and risk treatment plans
- Quantification and allocation of residual risks and risk treatments
- Contracting strategies for individual risks
- Collective assessment of strategies to develop recommended contract model
- Initial “scene setting” workshop followed by series of risk evaluation workshops
Scene Setting - Initial Workshop

- Establishing workshop rules
  - Consensus decision making
  - Real time issue resolution
  - Teamwork and focus
  - Commitment and availability

- Understanding underlying principles (eg Master Plan scope, funding commitments)

- Overview of “contracting continuum” (range of contract models) and risk management principles

- Endorse evaluation methodology
The Risk Analysis Matrix

- Key evaluation tool - used to facilitate the capture, analysis and treatment of risks identified during workshops.
- Based on AS/NZS 4360 “Risk Management”
- Used to:
  - Identify and categorise risks
  - Determine likelihood, consequence, treatment measures and residual risk
  - Quantify and allocate residual risk to appropriate party
  - Identify contracting strategy for each risk
# The Risk Analysis Matrix

**Risk Event** - individual incident or situation

**Time Consequence** - estimate of delay due to risk, quantified to reflect cost impact on project

**Risk Cost** - product of probability and quantified consequence

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>EST TOTAL COST</th>
<th>RISK EVENT</th>
<th>L/P</th>
<th>COST</th>
<th>TIME DELAY Pre Contract Award</th>
<th>TIME DELAY Post Contract Award 1-6 months</th>
<th>TIME DELAY Post Contract Award 7+</th>
<th>COST</th>
<th>Dollar Value of time delay risk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL</td>
<td></td>
<td></td>
<td>50%</td>
<td>1000</td>
<td>6</td>
<td>6</td>
<td></td>
<td>500</td>
<td>6300</td>
<td>6800</td>
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<tr>
<td>LAND ACQUISITION</td>
<td>40000</td>
<td>ACQUISITION NOT COMPLETED ON TIME</td>
<td>100%</td>
<td>1000</td>
<td>3</td>
<td></td>
<td>1000</td>
<td>300</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>CLAIMS / DISPUTES FROM PROPERTY OWNERS</td>
<td></td>
<td></td>
<td>100%</td>
<td>1000</td>
<td>6</td>
<td>6</td>
<td></td>
<td>0</td>
<td>12600</td>
<td>12600</td>
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<tr>
<td>NC FUNDING AVAILABLE FOR ACQUISITION</td>
<td></td>
<td></td>
<td>100%</td>
<td>4000</td>
<td>2</td>
<td></td>
<td></td>
<td>400</td>
<td>20</td>
<td>420</td>
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<td>UNDERESTIMATED COST OF ACQUISITION</td>
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<td></td>
<td>100%</td>
<td>2000</td>
<td>6</td>
<td></td>
<td></td>
<td>2000</td>
<td>600</td>
<td>2600</td>
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<tr>
<td>HERITAGE ISSUES / CONSTRAINTS</td>
<td></td>
<td></td>
<td>100%</td>
<td>2000</td>
<td>6</td>
<td></td>
<td></td>
<td>2000</td>
<td>600</td>
<td>2600</td>
</tr>
</tbody>
</table>
# The Risk Analysis Matrix

**Treatment Plan** - Options for dealing with risk (and cost)

**Degree of Control** - % reduction of risk due to treatment

**Residual Risk** - Remaining risk after treatment

**Allocation** - Responsibility for quantified residual risk and treatment

**Strategy** - Contracting strategies to deal with residual risks

<table>
<thead>
<tr>
<th>TREATMENT PLAN</th>
<th>TREAT COST</th>
<th>DEG. OF CONTROL %</th>
<th>RESIDUAL RISK</th>
<th>RISK ALLOCATION</th>
<th>RESIDUAL RISK</th>
<th>STRATEGIES / NOTES</th>
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<tbody>
<tr>
<td>Dedicated team / resources</td>
<td>1000</td>
<td>90%</td>
<td>680</td>
<td>100%</td>
<td>0%</td>
<td>1680</td>
</tr>
<tr>
<td>Core plan, risk strategy, employ good negotiator</td>
<td>100</td>
<td>50%</td>
<td>650</td>
<td>100%</td>
<td>0%</td>
<td>750</td>
</tr>
<tr>
<td>Secure/defintion/investigate/secure funding / improve funds</td>
<td>100</td>
<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0%</td>
<td>100</td>
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<td>Review process</td>
<td>10</td>
<td>10%</td>
<td>378</td>
<td>100%</td>
<td>0%</td>
<td>368</td>
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<tr>
<td>Heritage disposal / proc and assess all structural data - in parallel, Cost Dept. negotiations</td>
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<td>100%</td>
<td>0</td>
<td>100%</td>
<td>0%</td>
<td>2000</td>
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<tr>
<td>Communication Plan, including public media strategy</td>
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<td>95%</td>
<td>10</td>
<td>100%</td>
<td>0%</td>
<td>10</td>
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Risk Analysis

- Risk Categories:
  - Land acquisition
  - Scope
  - Approvals
  - Preconstruction/tender development
  - Selection process
  - Management of contractors
  - Engineering, design and documentation
  - Construction
  - Commercial and legal risk
  - Project interfaces

- 171 risk events analysed in 6 detailed workshops
Key Risks

- Land acquisition delays
- Scope uncertainty
- Building damage
- Latent (geotechnical) conditions
- Stakeholder/community satisfaction
- Construction disruption
- On-time completion
- Interfaces with other works
- Restricted opportunity for innovation
- Maintainability and durability - whole of life cost
Key Contracting Strategies

- Principal responsibility for land acquisition and planning approvals
- Scope definition to be finalised prior to tender
- Design and construct by single contractor to outcome-based specifications
- Incorporation of long term maintenance for key project elements
- Risk sharing for defined project elements
- Capability based up-front selection process
- Strong emphasis on relationship building
Outcome of Evaluation

- Evaluation Panel’s recommended model: *RELATIONSHIP-BASED DESIGN, CONSTRUCT & MAINTAIN CONTRACT*
- Endorsed by Cabinet on 23 December 2002
- Key features:
  - 2 Proponents selected from capability-based EOI with design fee for unsuccessful proponent
  - Outcome based lump sum D&C - project specific Deed
  - Risk sharing and joint value engineering savings
  - Relationship building initiatives
  - 10 year maintenance and defects liability periods
Risk Allocation

**CONTRACTOR**
- D&C “fit for purpose”
- Licenses, permits etc
- Actual cost of lump sum items
- Geotechnical conditions
- Building protection
- Most extensions of time and delay costs
- On-time completion
- Performance bonds
- Weather, industrial relations

**PTA**
- Land acquisition
- Statutory approvals
- Actual quantity of contaminated material
- Unknown services
- Actual service authority/owner costs
- Unforeseen underground obstructions
- Building repairs to specified level
Building the Project Team - Key Issues

- Limited timeframe to secure resources - time pressure due to late adoption of CBD route
- Diverse range of specialist technical disciplines
- Retention of expertise for project duration - and beyond
- Urgent, complex land acquisition and planning approval requirements
- Community and stakeholder uncertainty - project credibility
- Government supply requirements
Building the Project Team - Strategy

- Team structure responding to risk allocation and treatment plans - for full life of project
- Use of Govt agency resources seconded into integrated team for appropriate functions (planning, land acquisition, project management)
- Consultancy services contracts for specialist technical support - strong emphasis on capability in value for money assessment
- Long term arrangements for key personnel
- Interaction with D&C Contractor’s team facilitated by duplication of team structure
Project Team - Development Phase

**Structure & functions**

- **Project Development**
  - Scope
  - Concept design
  - Investigation

- **Planning**
  - Planning Approvals
  - Heritage Approvals

- **Contract Development**
  - Documentation

- **Land Acquisition**
  - Resumption
  - Development

- **Communication**
  - Public relations
  - Stakeholders

**Risk categories**

- **Scope**
- **Engineering design**
- **Pre-tender development**
- **Approvals**
- **Commercial & legal**
- **Managing contractors**
- **Land requirement**
- **Selection process**
- **Construction**
- **Interfaces**
Project Team - Delivery Phase

Client Management

- Project Director
- Contract Manager
- Rail
- Design
- Geotechnical & Environment

Contractor Management

- Project Director
- Safety
- Construction Manager
- Design Manager
- Environment
- Geotechnical
- Quality
- Community Relations
- Teamwork Facilitator

Relationship Facilitator

Commercial & Quality

Communications
Risk Review Process - Delivery Phase

LKJV

Risk Assessment & Review

Project Plans / Design / Quality & Construction Documentation

PTA

Risk Assessment & Review

Risk Management Plan

PTA Corporate Risk Register

JOINT RISK ASSESSMENT
Methodology - Foreshore Structures
Methodology - Perth Yard Structures
Methodology - Bored Tunnels
Methodology - Building Protection
Management of Key Risks

- **Community and business disruption**: “Business as usual” in the City - public transport trips and car parking increased, minimal claims
- **Damage to buildings and infrastructure**: Few claims with minimal damage recorded
- **Statutory approval constraints**: Planning, heritage and environmental approval prior to contract award - no significant scope impacts
- **Public perception**: Consistent 80-90% unsolicited support for Southern Suburbs Railway from late 2002
Conclusion - Lessons Learned

- Identification of key risks in early project development has guided project scope, processes, program and team structure
- Review of project-specific risk has yielded a procurement model with unique features tailored to the City Project
- Detailed analysis has provided a sound foundation for future risk management
- Active participation by key stakeholders has developed strong understanding and sense of ownership