Introduction

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- Procurement
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  - This project
- Key innovations and processes
- Enhanced benefits
- Challenges and their resolution
- Conclusion

About the authors

- **G Daniel,** Senior Construction Manager - Aurecon New Zealand Ltd,
- **M Johnson,** Project Management Services Manager – NZTA
- **D Loe,** Contract Manager – HEB Construction Ltd.
- **G Smith**, Executive - Design Manager - Aurecon

Location

- Part of Western Ring Route – alternative to SH1
- Significant addition to Auckland's total motorway network
- 6km of new four-lane motorway
- Expected ADT = 66,000 vpd

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Layout

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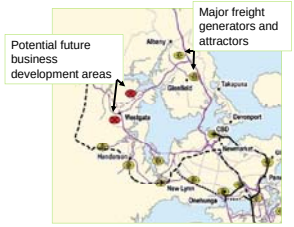
Primary benefits

- Network resilience: alternative north-south route to SH1 and harbour bridge
- Regional strategic freight route connecting Glenfield, Albany, Westgate to elsewhere
- Supports Northern Strategic Growth Area (NorSGA)
- Hobsonville Road congestion relief and revised/improved functions, i.e. access, public transport, cycling, pedestrians, urban amenity
- Facilitate local and regional economic growth and prosperity



Source: RLTS 2010-40, ARC

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D&C brief history - overseas

- Well established in other industries: commercial building, manufacturing and process industries, etc.
- UK highways:
  - Mid 1970s: Kessock bridge (Scotland)
  - 1989: motorway interchange near Glasgow airport
  - 1990s: massive cost overruns on traditionally procured Department of Transport projects forced a rethink and more projects began to be procured via D&C
  - 1990s – present: Design, Build, Finance and Operate (DBFO) contracts
- United States highways from late 1990s onwards
- Australian highways from c. 1990 and now well established

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D&C brief history – New Zealand

Project Name	Timeframe	Value
SH20/SH20A Auckland Airport Link	1995 - 1997	NZ$30 million
SH1 Rangiriri to South of Ohinewai Four-Laning	2001 - 2003	NZ$24 million
Auckland Central Motorway Junction	2003 - 2006	NZ$140 million
SH20-1 Manukau Extension	2006 - 2010	NZ$210 million
SH29 Tauranga Harbour Link Stage 2	2007 - 2010	NZ$137 million
Hobsonville Deviation	2008 - 2011	NZ$200 million
Christchurch Southern Motorway Stage 1	2009 - 2013	NZ$140 million

Table 1 – History of NZTA D&C Highways Projects

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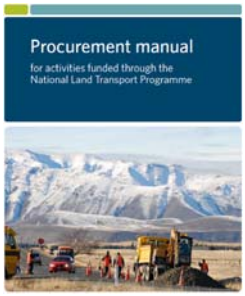
Why use D&C?

- Land Transport Management Act section 25(1) which requires:
  "procurement procedures that are designed to obtain the best value for money spent by approved organisations and persons, having regard to the purpose of this Act."
- Transfund Competitive Pricing Procedures (1997):
  - "tactical"
  - Suite of procedures to chose from with varying emphasis on price/non-price attributes
- NZTA Procurement Manual, 2009:
  - "strategic" procurement
  - Recognises no one size fits all
  - Risk and value are inter-related
  - Appropriate allocation of risk



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Advantages of D&C

Key advantages of D&C over traditional design-bid-build:

- For client, more risk is transferred to contractor giving greater certainty of outturn cost (but note additional risk premium in price)
- Allocate risks to the party best able to manage them, e.g. buildability
- Early involvement of contractor in design => opportunities for innovation and efficiency
- Avoids need to consider and adopt alternative designs (abortive work)
- Overlap construction and design activities for time savings

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Disadvantages of D&C

Key disadvantages of D&C over traditional design-bid-build:

- Client has reduced control and influence over the design process
- Difficulties with reviewing and accepting subjective elements of contractor's design, e.g. road safety, landscaping
- Contractor's tender design typically only 10-20% complete leaving significant uncertainty of final outcomes
- Contractors' high tendering costs: industry overhead
- Small and/or immature construction markets may not be able to manage risks and absorb potential losses

Hobsonville Deviation D&C

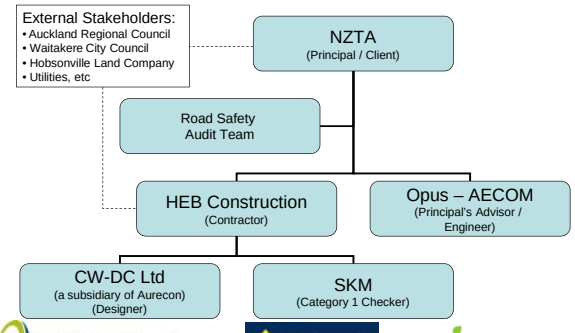
Decision to use D&C based on:

- Adequate scale (c. $200m)
- Not overly complex, mostly green field site with well understood risks
- Opportunities for contractor innovation
- Client and local industry experience since 1995

Procurement steps

1. Specimen design and Principal's Requirements
2. Expressions of interest and shortlist to three tenders
3. Interactive meetings
4. Tender evaluation using PQM (Special) with supplier quality premium and tangible price adjustments
5. Contract awarded April 2008

Project Organisation



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Earthworks

- 1.7 million m^3
- Ground conditions were biggest risk transferred to contractor
- Key success factor: big savings if complete in two seasons instead of client's assumed three seasons
- Detailed ground investigation: 300+ holes
- Bentley MX digital terrain model incorporating geological model: could calculate new earthworks volumes within two hours
- Optimised design to achieve balanced cuts and fills across whole project and within haul zones (between local roads)
- Replaced 800m of bored pile retaining walls with 300m of soil nail walls

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Pavement

- Total area: 350,000 m^2
- Expected significant variability in subgrade CBR strengths
- Developed "drawer of recipes": 16 different pavement specifications to choose from
- Weaker than expected subgrades actually encountered
- Subgrade stabilisation implemented to avoid increasing earthworks quantities
- Cost of improved subgrades offset by cheaper pavement: net outcome is better quality pavement

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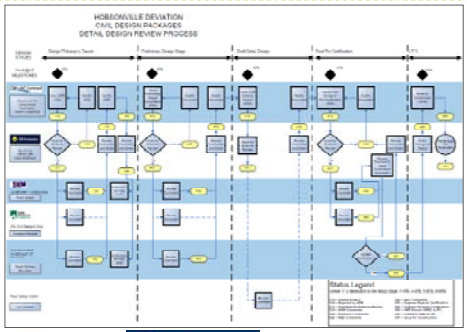
Design review process

5 stages to ensure no surprises

6 organisations reviewing the design



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Design review process

- Risk of client not accepting contractor's design
- Introduced extra submission stages to provide no surprises
- Submission stages: 10%, 40%, 80%, 95% and 100%
- Contractor co-located in designer's office
- Category 1 checker engaged in the process early on, not kept at arms length
- INCITE proprietary web-based system to control submissions

Extra submissions!

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Enhanced benefits

Client's estimate = $201m

Winning tender = $163m

Opportunity for client to provide a more robust whole life outcome.

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Pavement specification

- Original client specified unbound granular flexible pavement
- 66,000 AADT at upper limit
- Revised specification to deep lift asphalt:
  - Improved rut resistance
  - Longer design life
  - Reduced maintenance
  - Reduced road noise

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Additional lanes for SH16

- Specimen design for SH16 Brigham Creek Extension: one lane, future proofed for two, and bus shoulder adequate until 2016
- Added second lanes now:
  - Reduce risk of "undertaking"
  - Cheaper than adding to future operational motorway

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Improved sight distances

- Standard for vertical curve through Hobsonville interchange problematic with horizontal geometry
- All tenderers identified substantial cost savings if vertical curve standard was relaxed so client granted a departure
- Post contract award, safety auditor concerns weren't able to be adequately addressed

- Client elected to "buy back" the departure as a safety enhancement
- Two minimum standards taken together do not necessarily result in the best solution
- D&C model allowed flexibility for parties to work together to resolve the problem without delays

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Urban design

- High quality urban design, amenity and landscaping are now community expectations
- Clark's Lane footbridge a high quality landscape feature

- Rest of project open to interpretation and assessed in tender
- Contractor's response included green walls, wavy keystone walls and extensive planting

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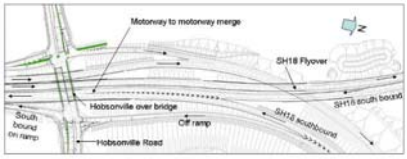
SH18 to SH16 motorway merge



- High speed, four to three lane merge passing over a crest curve
- Challenge to achieve safe inter-visibility between two merging lanes
- Two concepts considered:
  - Left lane drop (would interfere with southbound on ramp so more land required and driver behaviour problems reduces efficiency)
  - Merge two centre lanes (adopted)
- SHDGM doesn't adequately cover and MOTSAM lacks the "tools", e.g. merge arrows
- Differing interpretations of Principal's Requirements by designer, Principal's Advisor and safety auditor. No right or wrong answer
- Need to draft Principal's Requirements to avoid uncertainty and ambiguity

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Rising steel prices

- Tender design included steel flyover bridge, priced late 2007
- Surge in global steel prices after contract award but cost fluctuation provisions insufficient
- Redesigned to post-tensioned concrete structure
- D&C provided contractor flexibility to change

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Team roles and responsibilities

- The team included:
  - Principal
  - Contractor
  - Designer
  - Category 1 Design Checker
  - Road Safety Auditor
  - Engineer to Contract (Principal's Advisor)
- Roles and responsibilities in D&C subtly different to traditional design-bid-build contracts - takes time to get used to
- Checkers checking the checkers!
- Lots of engineers with opinions and preferences!
- Contract mechanisms to manage and resolve:
  - Partnering provisions
  - Project Management Board

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Conclusion

- D&C is a robust method for delivering highway projects economically, depending on specific risks
- Greater cost certainty for client
- Allows appropriate allocation of risk (depending on ability to manage)
- Construction can start early in parallel with design
- Contractor input and ownership of design allows opportunities for innovation and efficiency => increased value
- This project adds to the local industry's body of knowledge, experience and expertise of D&C

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