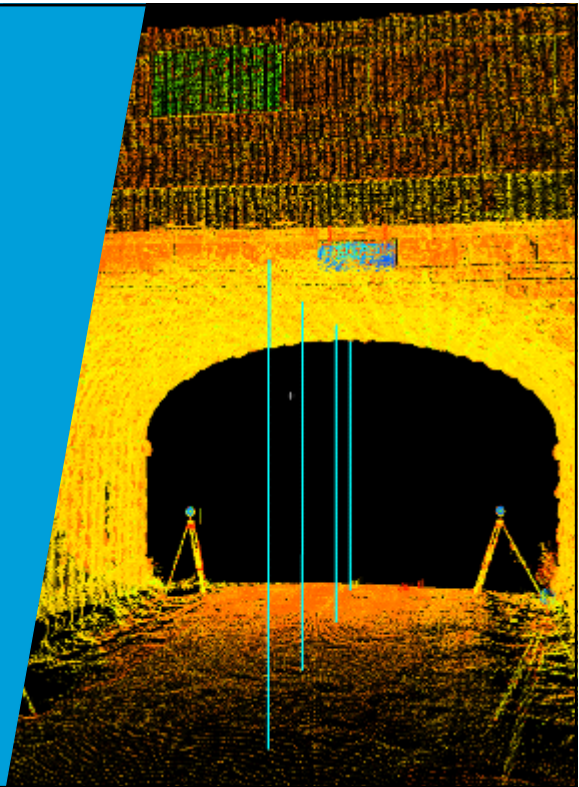The benchmark for survey and spatial solutions

3D Laser Scanning for Masonry Arch Bridges

Thomas Werner

David Morris

VEKTA

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SURVEY 2:1
LAND & ENGINEERING SURVEYORS

Qasco
The spatial data professionals

ASIA-PACIFIC
SPATIAL EXCELLENCE AWARDS
2009 WINNER

VEKTA

FIG Congress 2010
Facing the Challenges – Building the Capacity
Sydney, Australia, 11-16 April 2010

Overview

Introduction

Clientele

Team

Support

Discussion

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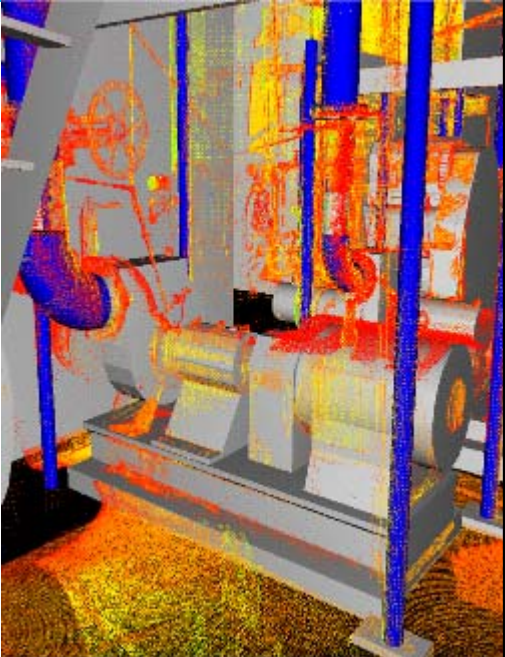## INTRODUCTION

"Technological Push" versus "Applications Pull"

Introduction

Technological Push - TLS

• Developed for Petroleum and Mining Industries
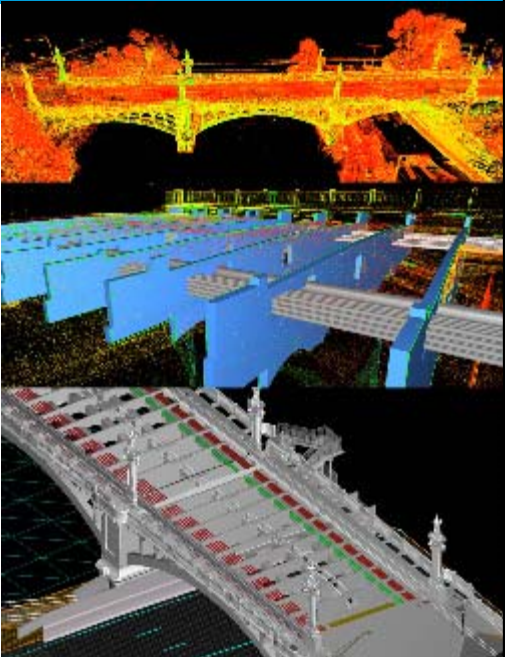
- Volume
- Pipe Run
- Rapid Acquisition

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Introduction

Applications Pull

• Several Applications – purely as a result of initiative

- Civil
- Structural
- Architectural
- Defense

- **Bridges**

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CLIENTELE

"Progressive clients are paramount for successful projects"

VEKTA

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Clientele

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Architects, Engineers and Government

• General Knowledge of Surveying

• Limited Exposure to Laser Scanning

  • Outputs and usability

  • Acquisition Benefits

  • Transition from 2D and Plan Deliverables to 3D

  • Emerging Technology

• Cost vs. Initial Benefit

The Client is taking a Risk each time this new survey "application" is applied

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The Problem

CLEARANCE 4.2 m

>Semi-Elliptical Masonry Arch Bridge from 19th Century

TEAM

"Effective team management promotes project stability, structure and performance"

VEKTA

Team

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Collaboration between GHD Bridges (Vic) and Vekta

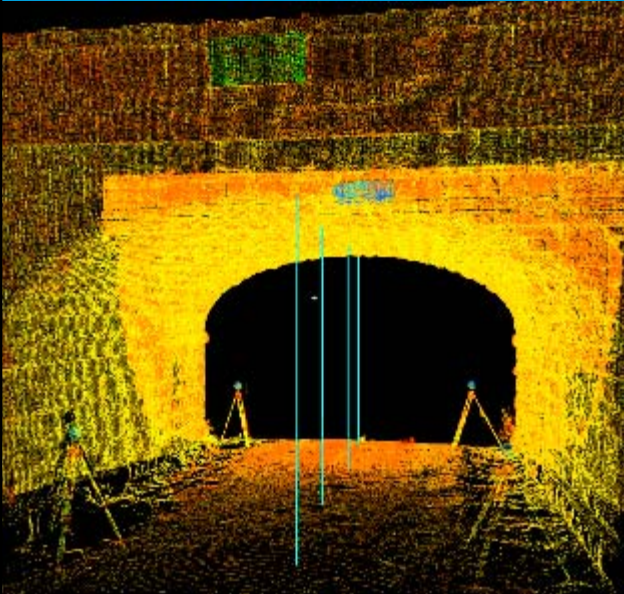Works completed for Department of Transport

Overseen by Heritage Victoria

GHD CLIENTS PEOPLE PERFORMANCE

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Acquisition

12
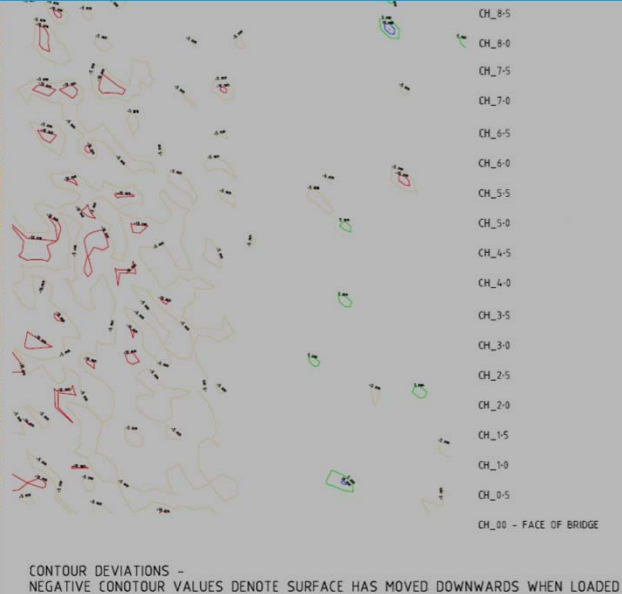
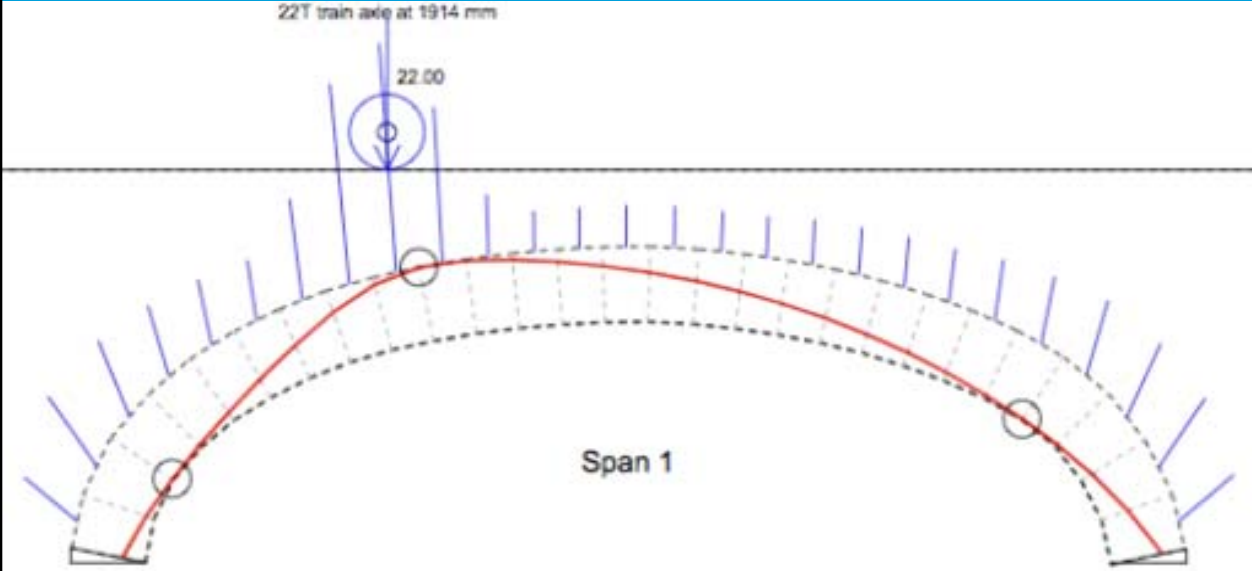>Pre-Loaded and Post Loaded

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Providing Results

13

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>Deviation measurement of the two surfaces – Contour Iso-pach plans

Engineering Analysis

14

Span 1

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>Thrust Line for this bridge – Elliptical (weak) system

Propping the Bridge for Safe (Temporary) Use

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>False-Work and Grout Bags – to meet zero-impact requirements

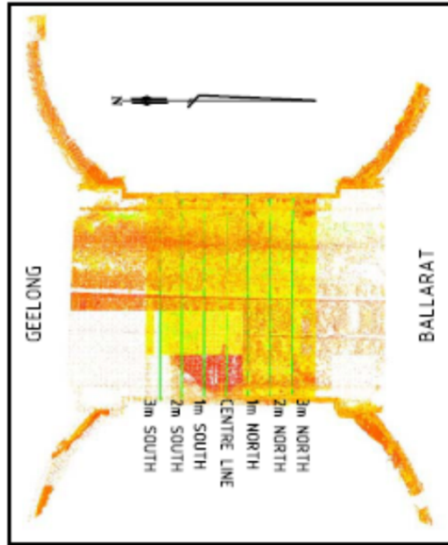## Permanent Reinforcement

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As close to the existing surface as possible

Provided location of Surface at chainages

Point Cloud Sub-Sets

Cost Effective Solution
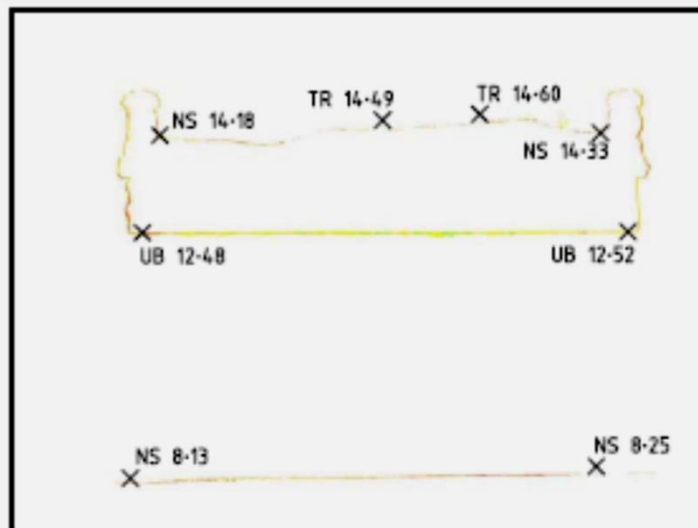
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Data Conversion and Analysis

PLAN VIEW OF SECTION

Data Conversion and Analysis

VIEW NORTH – 2M SOUTH OF CENTER LINE

> Section slice in AutoCAD – for use by Engineering CAD Operators

Installation

Sliding the sleeve into place under the bridge

Completed Strengthening Works

Plastic Membrane between Liner and Bridge protects the Heritage Bridge

VEKTA

SUPPORT

"Service Providers aim to keep us at the leading edge of the market"

VEKTA

Support

VEKTA

Developers and Designers/
Equipment Sales and Service — Tier 1

Service Provider — Tier 2

Client and Consultants — Tier 3

CLIENTS & CONSULTANTS

Tier 3

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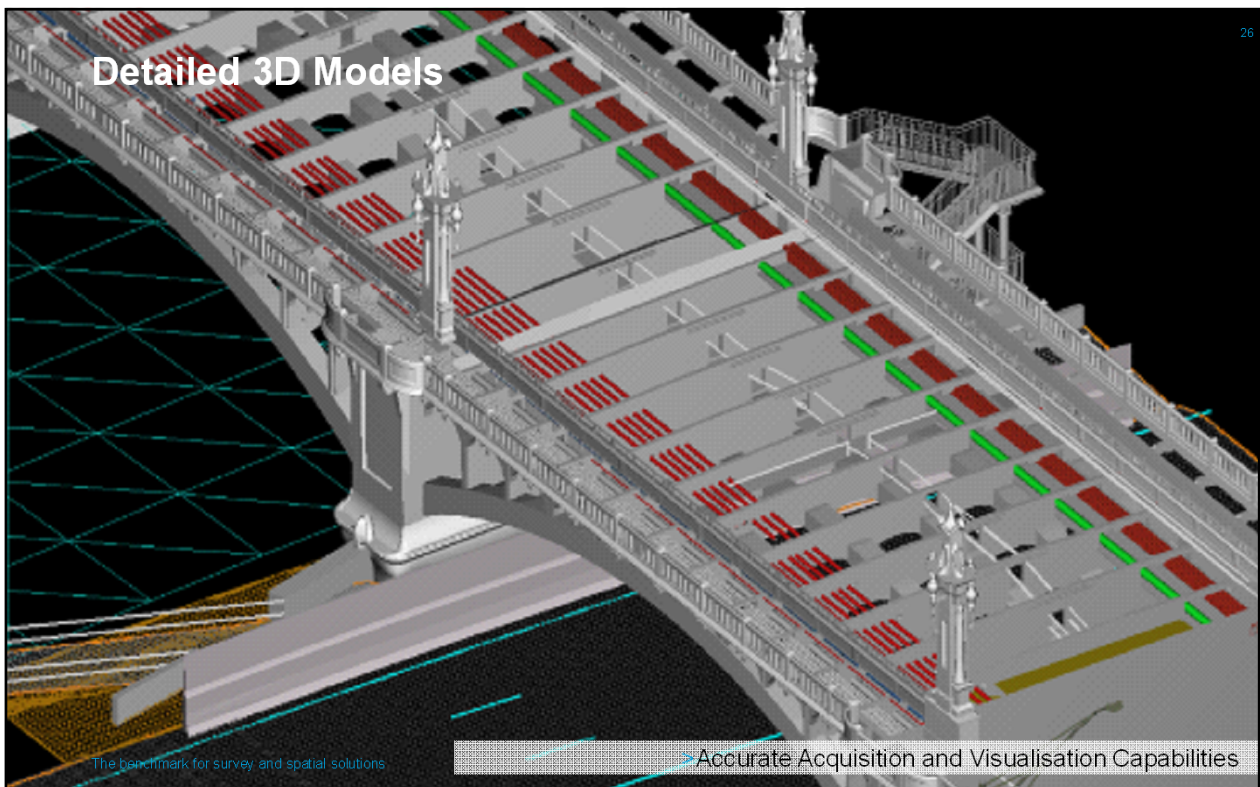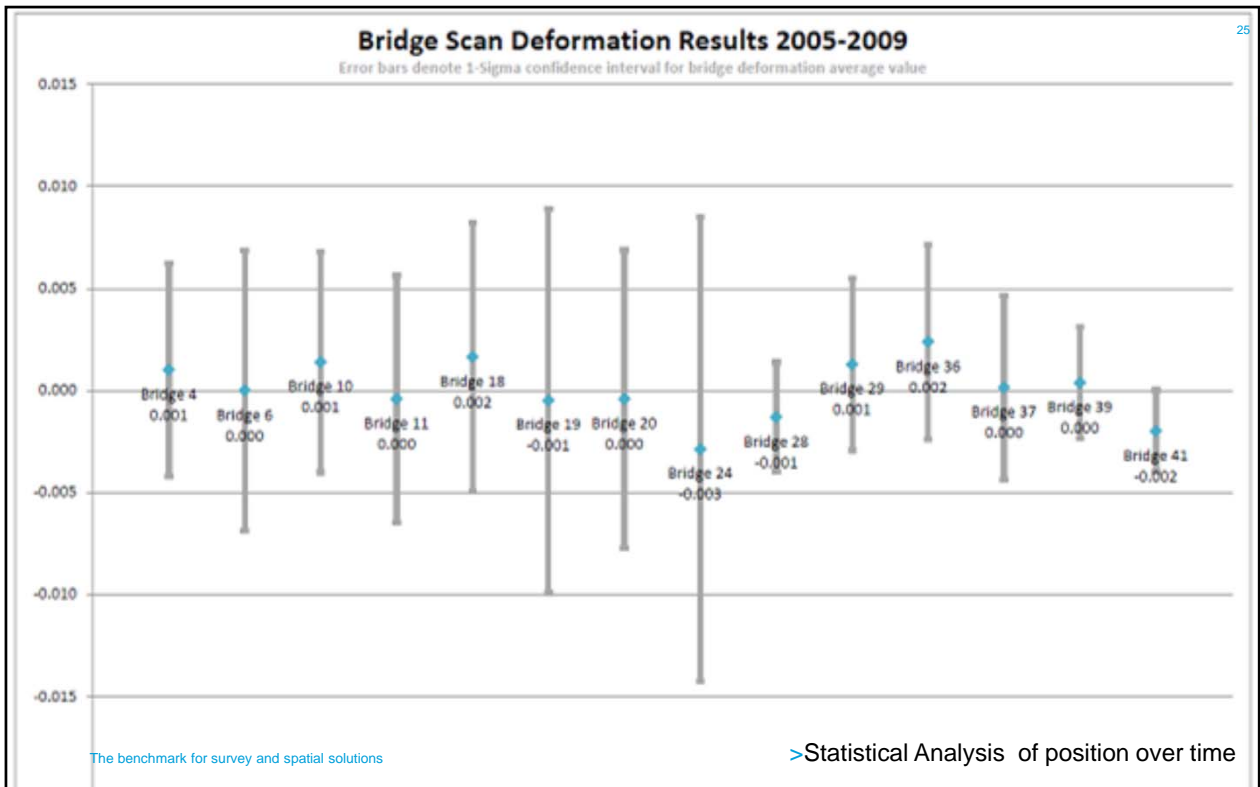

Detailed Analysis
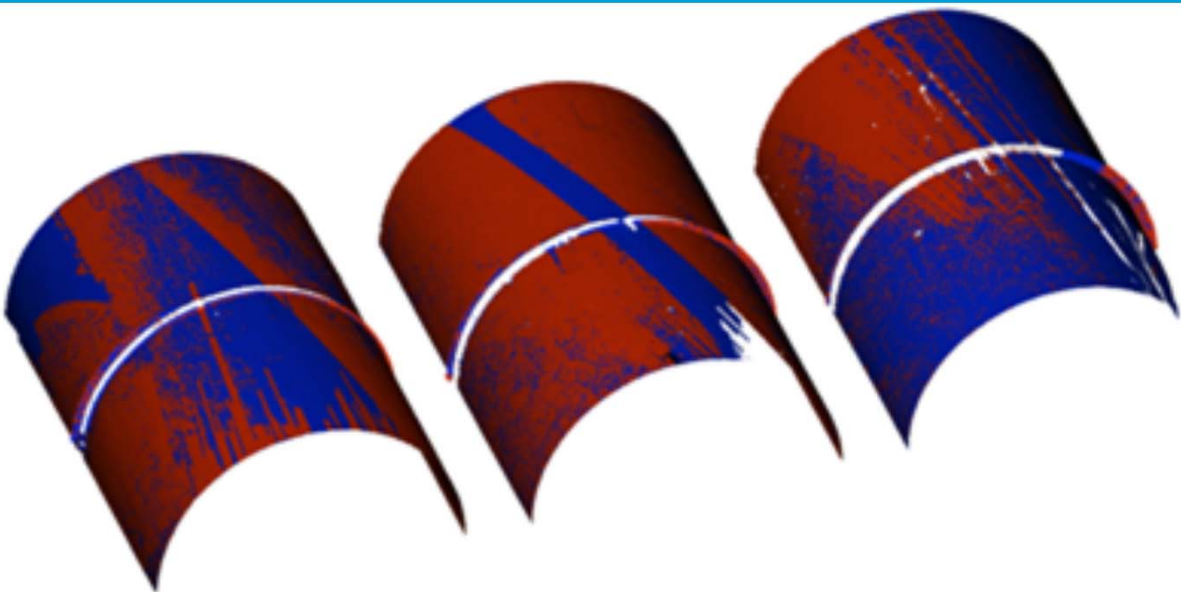
>Temporal Modelling and Analysis

Bridge Scan Deformation Results 2005-2009

>Statistical Analysis of position over time

Detailed 3D Models

>Accurate Acquisition and Visualisation Capabilities

Capabilities and Support
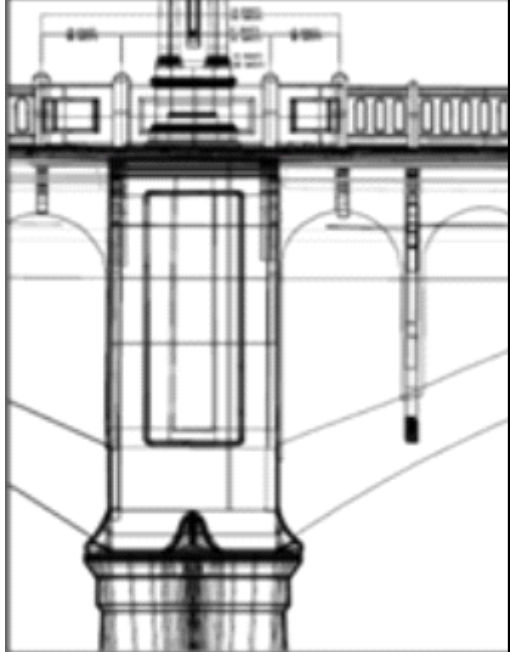
150%-500% Conventional Surveying Cost

Benefits

Timeframe

Usable Data

CAD Plans

SERVICE PROVIDERS

Tier 2

Service Providers

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Competent

Knowledgeable

Modelling Toolbox

Efficient and cost-sensitive

Support Client and Consultants

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DEVELOPERS AND DESIGNERS/ EQUIPMENT SALES AND SERVICE

Tier 1

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Client Delivery

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- Cyclone
  - AutoCAD
  - MicroStation
  - Revit
  - NavisWorks
  - PDMS
  - 12D
  - Rhinoceros
  - Sofistik
  - CivilCAD

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Relational Object-Based
(Cyclone/Rhinoceros)

Non-Relational Object-Based
(AutoCAD)

Relational Object-Based
(Revit, PDMS,
NavisWorks, Sofistik)

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Thank You

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