



## Northern Gateway Toll Road

The Alliance: Northern Gateway Alliance (NGA)

Client: The New Zealand Transport Agency, Formerly Transit NZ

Contractor: Leighton Contractors and Fulton Hogan

Consultants: URS, Tonkin & Taylor, Boffa Miskell

Sub Alliance Partners: VSL and United Group

Publication Date: November 2008

Region: Orewa to Puhoi

Sector: State Highway, New Road Construction

Total Project Value: \$360m

Project Construction Timescale: Dec 2004 to Early 2009

Defects Period: 24 months

Form of Contract: Alliance – Special Contract

The Northern Gateway Alliance is delivering to time and budget and the team has been continuously innovating since day one.

**Social and environmental measures help drive team wide innovation. The Northern Gateway Alliance (NGA) is delivering ahead of time and within budget thanks to a strong commitment to innovation. From day one, the inclusion of key social and environmental measures has had the unexpected benefit of highlighting the importance of the people working on the project and has encouraged a hotbed of ideas for continuous improvement.**

### Background

The NGA was formed to design and construct the Northern Gateway Toll Road, the last stage of the realignment and extension of the Northern Motorway between Albany and Puhoi. The motorway involves the construction of:

- five culverts
- the 5m x 8m x 13m twin tunnels at Johnstone's Hill
- six bridges along the 7.5km stretch including 3 large viaducts.
- Waiwera twin viaducts (537m span),
- the Nukumea Eco-viaduct (180m)
- the Otanerua Eco-viaduct (256m)

The total earthworks have reached over 4,000,000m<sup>3</sup>.

The Alliance is delivering the project for the New Zealand Transport Agency (NZTA), New Zealand's state highway manager. The high-risk nature of the work, with its potential consent risks and complex engineering challenges, all contributed to the NZTA's decision to select an alliance model for this project.

The difficult geology, steep terrain and sensitive environment within the designation provided not only significant design and construction challenges, but also, opportunities for innovation. Environmental and social measures were deemed to be important to the success of the project.

The choice of adopting the alliance model for the Northern Gateway Toll Road was propelled by the success of the Freeflow Project, the first alliancing project that NZTA (then Transit) had been involved in.

The alliance structure is made up of the Project Alliance Board (PAB) who make governance decisions on a monthly basis and the Alliance Management Team (AMT) who deal with the day-to-day management of the site.

### Successful Outcomes

#### On Time

The construction commenced on time and currently the Alliance is ahead of their proposed programme, even with the challenging wet weather experienced in 2008. Part of the reason or impetus behind this could be attributed to the painshare/gainshare mechanism, as this forms an incentive to complete the works ahead of time and defects free. To date, all significant milestones have been met.

#### Quality

One of the KPI's (Key Performance Indicators) of the Alliance is for the project to be defect free on opening day. This not a typical objective for most road projects, but it has been one that has driven many of the decisions towards reviewing processes, correcting as they go and lifting the overall quality of the work.

## Health & Safety

One of the challenges has been a very tight labour market and a shortage of skilled workers. The NGA decided to overcome this challenge by implementing a rigorous training and development programme for both casual and permanent staff. The programme had positive results, particularly with regard to Health and Safety, as key policies and procedures were inculcated at a very early stage.

## Cost

Costs are managed and communicated exceptionally well. There is a Cost Review Process every month. The budget is divided into different disciplines and into different teams, who also review the risks as well. Each Manager within those teams monitor and report back monthly. This then goes to the PAB.

The initial Target Outturn Cost (TOC) was too high and the Alliance (which included the Client) reworked it to a fair and reasonable level, prior to the signing of the NGA PAA. *“Sceptics could perceive this as a soft target. Yet if someone took the time to understand how these figures were achieved then they would see the rigour that goes into it”* Contractor. It was felt that under a traditional process everyone would compound the risk and the cost would rise as a consequence.

As part of the procurement process, the client employs an independent parallel estimator, during the Interim Project Alliance, who assesses the programme, methodology and costs to ensure that the Alliance estimates are a fair and reasonable price and the process is transparent.

Purchasing rather than hiring the plant equipment for the project has helped make significant savings, as the maintenance of new machinery was less, they were more reliable, efficient and were able to get good return when they came to reselling them. The advantages were particularly apparent with the earthwork machinery, as hiring incurs charges for days that the machinery is unable to be used.

## Summary of Benefits

The teams agree that each member takes ownership and work towards the same goal. Innovation comes from a willingness to listen to each other providing a greater motivation to contribute. *“I have been in the industry for 23 years and this is the best project I have worked on,”* Gavin Hendricks, Deputy Project Director.

An Alliance model encourages people to adjust their behaviours. However, it must be noted, as with Pathfinder Project No. 1, The Hopkirk Research Institute, (September Issue) that many business practices and behaviours can be adopted within a traditional contract environment if the client is willing to take the lead. It is harder, but not impossible. What this project demonstrates is that when the client adopts world class best practice techniques, the team can go beyond the normally expected success measures of time, cost, quality and safety and add value to each other, the community and the environment.



*Construction of the Waiwera Viaducts*

## The Significance of two Key Performance Measures

The scale of the project and sensitivity of the environment requires a social policy that proactively informs key stakeholders and interest groups.

The NGA developed a communications plan to ensure local residents and businesses are kept well-informed of upcoming activities and project milestones. Key aspects of the project communications plan include regular newsletters and monthly meetings with Community Reference Group, which represents the interests of local residents and businesses.

The design of this project was driven by environmental and social considerations because of the sensitivity of the bush and rivers and its near proximity to Auckland. The clearance of native vegetation, the run-off controls, the silt control of the temporary ponds has all been carried out in a manner and to a level that people within the project had not previously experienced.

However, the most surprising result of adopting social and environmental measures has been the internal impact on the people working on the project. A myriad of innovations have resulted, as people felt listened to and valued. This is evident in every aspect of the team's practice.

*“The AMT pushed through the environmental requirements. There was a clear focus that this was going to be one of the most single important factors driving the project”* Subcontractor.

To help reinforce this message, all inductions, prestart workshops and tool box meetings integrate the NGA agreed sustainability and environmental achievements and targets. Managers were trained to continuously address how to improve the environmental and social performance of the Alliance.

Examples of innovation on the project include:

**Increased lifecycle:** The NGA were concerned about the initial pavement design as similar pavements have failed prematurely on other projects. The Alliance decided to increase the value of the road pavement from the initial specification to deep lift asphalt. The pavement was changed to a lower maintenance period than the design, which provided the NZTA with significant cost savings over the life of the project. The additional \$2.5 million cost will be shared by the Alliance as a whole.

**Encouraging Biodiversity:** The design of the fish baffles through the culverts went beyond consent conditions and the team came up with ways of not only providing passage but establishing fish habitat with rock pools within the large culvert.



*Mulching of slopes for planting*

**Reducing the footprint of the road:** Stepping up the batters meant less bush clearing, reducing the impact on a sensitive environment. Due to the steepness of the slopes, and construction constraints, the slopes were cut using GPS guided excavators. In addition, investigation was required to find an innovative solution to enable placement of the mulch and re-vegetate the steeper slopes. This was achieved by importing a mulch blower from the US.

All cleared areas have been re-vegetated. Bridges were designed to mitigate bush clearance and irrigation was installed under the Viaducts to ensure ongoing survival of the vegetation.

**Game Breaking Performance:** The focus on continuous improvement has been helped by the need to undertake regular environmental monitoring as part of the consent process. As a result, teams began to compete with each other to find ways to improve erosion settlement control which is measured weekly by ARC. This stimulated healthy competition and encouraged innovative solutions.

The ARC use a regional scoring matrix, where 1 is excellent and 5 is non compliant with severe adversarial impact. Currently, the average best practice has been 2.0 within roading construction in NZ. The NGA set a stretch target of 1.1 and after nearly 4 years, they currently sit at 1.16, only slightly below their stretch target.

*"We know we have changed the benchmarks in roading. Now other roading projects are trying to beat our target, which ultimately is great for the environment"* Michael Cassidy, Environmental Manager.

**Design Improvements:** The team was able to challenge some standards within the NZTA by investigating alternatives such as roadside barriers. This enabled them to create a safer road environment, save money and ensure that the design enabled minimal environmental disturbance.

**Leaving a Legacy:** The NGA financially contributed to environmental programmes in local schools, by funding 'Trees for Survival' in conjunction with ARC.

**Added Value to the Community:** The NGA built a footpath for DoC through the bush at the Northern end that will form part of the Te Araroa Walkway (extending from Cape Reinga to the Bluff). By widening the existing causeway, they were able to widen the road and put a median down the middle to improve construction and end-user safety creating a win-win situation for everyone.

## Key Client Actions

In a world class project such as this time, cost, quality and safety become hygiene factors, they are the givens. We now look beyond these core measures to see how construction projects can add value to the industry, to our community and to our environment. Some examples of world class best practice adopted by the NGA were:

- **Collective Agreed Principles and Objectives:** Created at the formation of the Alliance and kept alive throughout the project. *"The Project Alliance Board, (PAB) bases its decisions on the project objectives. This is the first time I have seen this hold meaning as a contract on site. This is something that we created together from our vision statement. The vision statement, objectives and the alliancing principles were created through a number of workshops. These are displayed all around the office, with all the Alliance signatures on them."* Gavin Hendricks, Deputy Project Director.  
The PAB continuously challenges the team's decisions to ensure that it meets the vision and objectives which has helped shift the decisions from being primarily driven by cost towards value.
- **Innovation:** One of the KPI's is for the project to be defect free on opening day. On roading projects this not a typical objective but has been one that has driven many of the decisions towards reviewing processes, correcting as they go and lifting the overall quality of the work. The PAB continuously challenged everyone to make decisions in alignment with agreed objectives and principles to find better ways of working. To help people admit mistakes and continuously improve, a formal process called the OFI, (Opportunity For Improvement) was adopted. Anyone can write an OFI. Every OFI receives a response from a manager and where appropriate new procedures are put in place. The response is huge with around **2400** OFI's to date.
- **Selection of team members:** The Alliance team was selected from initially four consortiums. From these four, two were shortlisted to attend separate two day live-in workshops with the client. The workshop allowed the opportunity for the proposed management teams, including the client to come together. The focus was about getting the right people and their ability to work together. Price was not a factor at this stage as this was developed during the design phase.
- **Training:** A strong emphasis on training for those who want to upskill either their inter-personal skills or technical knowledge. Extensive workshops, coaching and mentoring are offered to help change behaviours. Induction, tool box, and prestart workshops are continuously held throughout the project. Team building events are organised on and off site.
- **Workshops & Team Building Events:** Focussed on building a single team culture from the six key organisations. When the team started to work together, limited people had prior experience working in an alliancing agreement. With the help of an independent facilitator, workshops, coaching and mentoring were provided to help change entrenched defensive behaviour patterns. Within a couple of months the change in peoples approach was apparent.
- **Benchmarking:** Teams started to compete with each other in finding ways to continuously improve settlement control. The project has exceeded standard best practice for roading construction.

## Key principles for repetition

- Select the whole team on their experience, skills and quality of work rather than on price alone
- Open book policy
- A combined Risk Register and risk analysis software programme
- Becoming an official Site Safe site
- Sharing work space for both the design and construction phases
- Collective agreement of aligned principles and objectives that stayed 'alive' throughout the project
- Ability for everyone to take ownership by being able to make decisions
- The NGA encouraged feedback and continuous improvement and solutions from the whole team which invited greater participation and contribution
- Commitment towards personal development, upskilling and training. Including Heart and Mind programme.

## Lessons learned

Like all projects there are always areas that can be improved upon. On reflection, key areas identified were the following:

- **Communication:** Whilst every endeavour was made to create open and transparent communication, with a fast-track project, this was sometimes challenging, as not everyone gets the information. It's an area that requires continuous assessment and improvements.
- **Facilitation:** Creating one culture out of 6 different cultures is a big learning curve. It is therefore important to have a facilitator to coach people to learn to work together and develop their inter-personal skills.
- **Learning Curve:** Alliance is a new way of working in NZ, and it will take awhile to gather momentum as more people become exposed to this way of working. It is a process of change and through this process there is a enormous amount of learning.
- **Document Management System:** The single point data system, takes time to adjust to, but has become central to transparent and up-to-date information. With a lot of people working on this project, once the processes were understood it made access to the information easy.
- **Engage the Whole Team:** Ensuring subcontractors feel part of the team and are involved in the decision making for the project where appropriate.

*The southern portals of the Johnstone's Hill twin tunnels*



## Key Client Actions (Continued)

- **A Shared Working Environment:** Established during the design phase and on site during construction. *"The ability to talk to one another so easily has been fantastic and by sharing the work space you walked away with a better knowledge of each other's business, which helped us to better understand one another"* Noel Nancekivell, Design Manager.
- **Transparent and open communication:** Supported by a central 'Communications Team who write weekly Newsletters, lunch room news sheets, progress charts and briefings each week. There are also Management Team meetings and Tool Box Talks on site. The Tool Box meetings and prestart meetings provide an opportunity for the Sub Contractors input in the project. In addition an Electronic Document Management System, (EDMS) has been set up for document control for the whole project.
- **Integration of Design and Construction:** Team members were encouraged to contribute beyond their typical sphere of knowledge *"to the point where the design engineers became project engineers and the client engineers were doing detailed design, there was that much cross pollination"* Brett Gliddon, Client.
- **Health & Safety:** Developing and living a collective safety vision with a designated Safety team, single Safety Charter and a Safety Manager who is on the Alliance Management Team. *"Health and Safety has been very strong, probably the best that we have worked under"* Jeff Roach, Supply Chain.

The NGA team has won several awards to date, including the Auckland Branch of NZ Contractors Federation's Overall Safety Award for All Categories in August 2008. It operates as a Site Safe site. Considering the size and difficulty of the site there have only been a few issues, and the tunnels were completed without any injuries which is a significant achievement.

Many projects are now measuring Health and Safety performance and have adopted indicators such as the Total Injury Frequency Rate (TIFR) and with Loss Time Injuries (LTI). Whilst this is a step in the right direction, the NGA decided to take it further and not only have lag indicators – those which monitor accidents that have already occurred, but introduced lead indicators, which identify areas where accidents may occur and thereby minimise the chance of this becoming a reality.

- **Culture:** The "Hearts and Mind" is one such lead indicator. It is a cultural assessment tool that was adopted from a wider Shell Oil Safety programme where project teams work together to manage risk and increase safety management. It is a quarterly assessment which encourages the different project teams to discuss together the safety in their work and how they can collectively reach the next level of safety performance.
- **Review processes:** Regularly reviewing processes and decisions with the aim towards continuous improvement. As part of this, the Management Team has regular reviews off site, which occasionally include the Governance Board. The team have found these to be very useful.
- **Inductions:** Everyone who works on the project, whether they are there for one day or the whole project has to go through the full induction. At the induction the purpose, values and key objectives of the NGA are discussed.

## Possible improvements

- Whilst those interviewed all strongly agreed around the positives of sharing a working environment, some felt that better processes could be in place to monitor the continuous changes to the design to ensure that all decisions add value to the project and address the whole picture rather than a narrow band of vision.  
This is particularly important as in an Alliance all day-to-day decisions can be made on site without external approval. Processes need to allow for the positive aspect of creating opportunities for improvement and realise that the design process is continuous.
- The Client recognised that this was a great training ground for their own staff and did not miss the opportunity to train and expose more people within the organization to this way of working. Alliancing allows the client to broaden their own skills and knowledge about construction and achieve a greater understanding of whole project. This is invaluable knowledge for future projects.
- Selecting adequate systems to reflect the particular requirements of the project. Realisation that systems which are suitable within the corporate context may not be suitable for an alliancing model.
- Developing systems that combat silos on site and ensure best for project outcomes.
- It was acknowledged that it would have been beneficial to have a greater lag between the start of the design and the start of construction to give adequate time for consideration prior to decisions being made.
- A paper is being created on lessons learned throughout this alliance. These lessons are being recorded as they go and where appropriate are being implemented and monitored.
- To improve the flow of communication and coordination between all project participants – subcontractors and alliance partners and staff.

*Nukumea Eco-viaduct under construction*



## Key Client Actions (Continued)

- **Front End Planning:** Enabled the Board and the team to look at the whole project and continuously check and see whether the decisions made were in alignment with agreed project objectives and values. Significant improvements to the project which saved money at the same time included re-aligning the road to ensure a more efficient balance between the cut and fill of the earthworks with the added advantage of an increase in the design speed of the road from 80km/hr to 100km/hr.
- **Management of Risk:** The Alliance shares the risk. As part of the agreement they waived the right to sue each other. This had the impetus of ensuring that they selected people with experience and with a quality performance record. Risk management was very thorough and included a risk model, Active Risk Manager, (ARM) a software programme which calculates the statistical probability of a situation occurring, plus risk programmes, monthly monitoring and reports and formal quarterly risk reviews. According to the client the risk management on this project is the best they have ever seen.
- **Collaborative culture:** *“We had to identify the right people, one of the principles is a ‘no blame culture’ and it is important the people do not see this as a ‘no responsibility culture’.”* This attitude is key as all the partners in the Alliance share the risk, including the client. All decisions affect the bottom line, and they all share in the profit and the loss.

*“The Alliance process allows you to focus on the project and get the best outcome always, as you are not trying to protect your corner. We are all in this together, the people have been fantastic. Really enjoyable, you felt that this is a much more mature way of working, rather than fighting over variations and claims”* **Consultant.**

*“The Alliance provides a better focus on the outcome. Decisions were made looking at the end picture rather than being caught up in the day-to-day. There is more ownership of your work in the context of the whole project, which provides job satisfaction”* **Subcontractor**

*“The Alliance model is a far superior method of achieving the outcomes for a client such as the NZTA than the older contracting system. Under the Alliance, there is more scope for innovation, and a willingness to listen and therefore a greater willingness on your part to contribute if you see that something could be improved upon”* **Sub contractor.**

*Collaboration was a key factor to achieving all the consents and designations changes. We’d say that if we make this change, it would allow us to make safety improvements at the northern end, so we extended the designation. Generally through a contractual period there would not have been the time to take the risk of going through the consent process. I think that having that team together all around one table allowed us a lot of opportunities to come up with different ideas. It certainly is one of the plusses of the project. It makes me feel good to be able to do this type of work on the project and to achieve good things”* **Consultant.**