1 GENERAL OVERVIEW

The Glenfield Junction project forms a critical part of South West Rail Link (SWRL), a New South Wales Government initiative to respond to issues of reliability and passenger growth on the rail network. The project was designed and constructed by the Glenfield Junction Alliance (GJA), comprising Transport for NSW, WSP | Parsons Brinckerhoff, Bouygues Travaux Publics and John Holland.

The GJA delivered:

- the northern flyover: a grade-separated junction for the East Hills Line
- the new Glenfield Station: an additional platform and a new aerial concourse to facilitate interchange between lines and to provide better facilities for passengers and staff
- the southern flyover: a grade-separated junction for the new SWRL to Leppington
- an expanded rail corridor: allowing four tracks through Glenfield.

Glenfield Junction was delivered within a stringent program to ensure the wider SWRL project would be delivered on time and honour commitments made by the NSW Government. Throughout the course of the project GJA consistently met the timetable, handed over sites to interface contractors, and finished planned works during track possessions. One key stakeholder and community milestone was to hand over the new Glenfield Station on 9 September 2012, a date set in early 2009. Over three years later, the GJA met this milestone to the day.

The Glenfield Junction Alliance was formed out of a need to develop and carry out safe construction techniques to build large civil structures within a busy rail corridor. The Alliance has synergised in meeting this challenge and has successfully coordinated closely with RailCorp representatives to deliver safe and innovate construction methods to meet the program of works.

TfNSW is of the opinion that the Alliance has performed to a superior level in safely meeting its original time requirements for its Glenfield Junction civil infrastructure scope, a significant achievement as the scope also included the additional work to build the junction to the new South West Rail Link (representing 50% extra scope), not originally planned for.

Peter Hayes,
Transport for NSW

INNOVATION

The live rail environment and constrained construction area of the Glenfield precinct necessitated world-first innovation. An 'ideas and innovation' register was created to capture out-of-the box thinking of all personnel. It was critical to develop designs that optimised the construction methodology.

The GJA adopted a two-stage approach to innovation.

- Stage 1: first three years of project, 270 opportunities captured on innovation and ideas register, 60% were implemented, mainly driven through design and construction methods.
- Stage 2: final two years, shift to operational opportunities, 125 ideas recorded, 70% implementation.

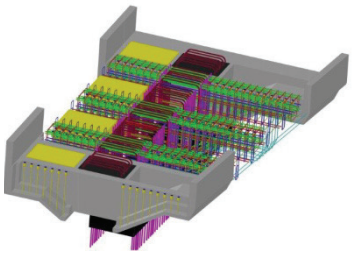
Challenges

Glenfield Junction sits on a critical junction within Sydney's metropolitan passenger rail network and the Sydney-Melbourne freight corridor. There was very limited rail access and only four possessions per year, this dictated the way in which the project was delivered. Any unplanned interruption to rail services would have required careful planning and been extremely disruptive and costly. Innovative strategies to mitigate delays included:

- building as much as possible outside of the danger zone; optimising the scarce possessions
- building to avoid existing services or constraints, eg Glenfield Waste Services and ethane gas pipeline
- adopting new methods to assist in construction speed
- optimising alignment within the physical constraints to minimise works
- integrating design and construction activities to optimise the final layout

BIM with GIS

Delivering the upgrade in a live railway corridor required accurate integration of all aspects of the project and the need to get it right first time. The GJA integrated building information modelling (BIM) and a geographic information system (GIS) to facilitate, design, plan and communicate information. The web-based portal – GJA Map – showed all design and spatial information in a common user interface.



Utilising 3D models as a design medium allowed us to show the relationships between different disciplines in the permanent construction. We established a single-point-of-truth to manage spatial information. This was the first project where this level of design and GIS integration occurred.

Design drawings were fully integrated with key data layers sourced from multiple disciplines and datasets. Innovative scripts were developed to automate the loading of drawings to the GIS – At its peak the system was loading over 140 updated designs each night.

Segregation

The GJA constructed a physical barrier to divide the 'danger zone' from the worksites, allowing construction to continue outside the limited track possessions. With a smaller danger zone and increased daytime working, the GJA achieved reduced safety risks and environmental impacts in addition to the cost savings resulting from more efficient working. Along the length of the site, the team adopted the standard use of a New Jersey concrete barrier system with mesh fencing.

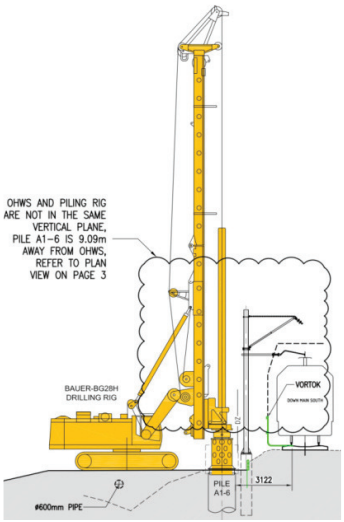
During the four year construction the works caused no impacts or delays on passengers or freight services running through the area.

Optimising design and construct methodology

The GJA eliminated a large section of reinforced earth wall for the northern flyover by adopting a post tensioned precast concrete solution which was constructed almost entirely outside the limited weekend possession windows.

With the tight layout of the southern flyover, innovative permanent precast concrete shells were cantilevered off a supporting blade wall and stitched together with a concrete slab to create a permanent approach viaduct slab above the South Line.

The use of slew restrictors allowed for work adjacent to live overhead wiring to be undertaken outside electrical isolations, and scaled down contingency arrangements allowing for cost-savings. This played a significant part in achieving an 'on-time handback' of all the railway possessions.



QUALITY

Collaboration and continuous improvement were key in maintaining an effective project team and ensuring quality. Key initiatives included:

- Internal – the GJA actively assessed its performance and sought ways for improvement. It introduced the ICAM (Incident/Cause/Analysis/Method) safety investigation process, which systematically considered failures surrounding an incident and recommended system improvements.
- External with the non-owner participants – through regular joint inspections and audits, the GJA received and implemented improvement recommendations.
- External within the other Alliances – the GJA actively communicated with the other railway alliance teams in the Sydney area, sharing best practice and working together to improve delivery performance.

PROFESSIONAL EXCELLENCE

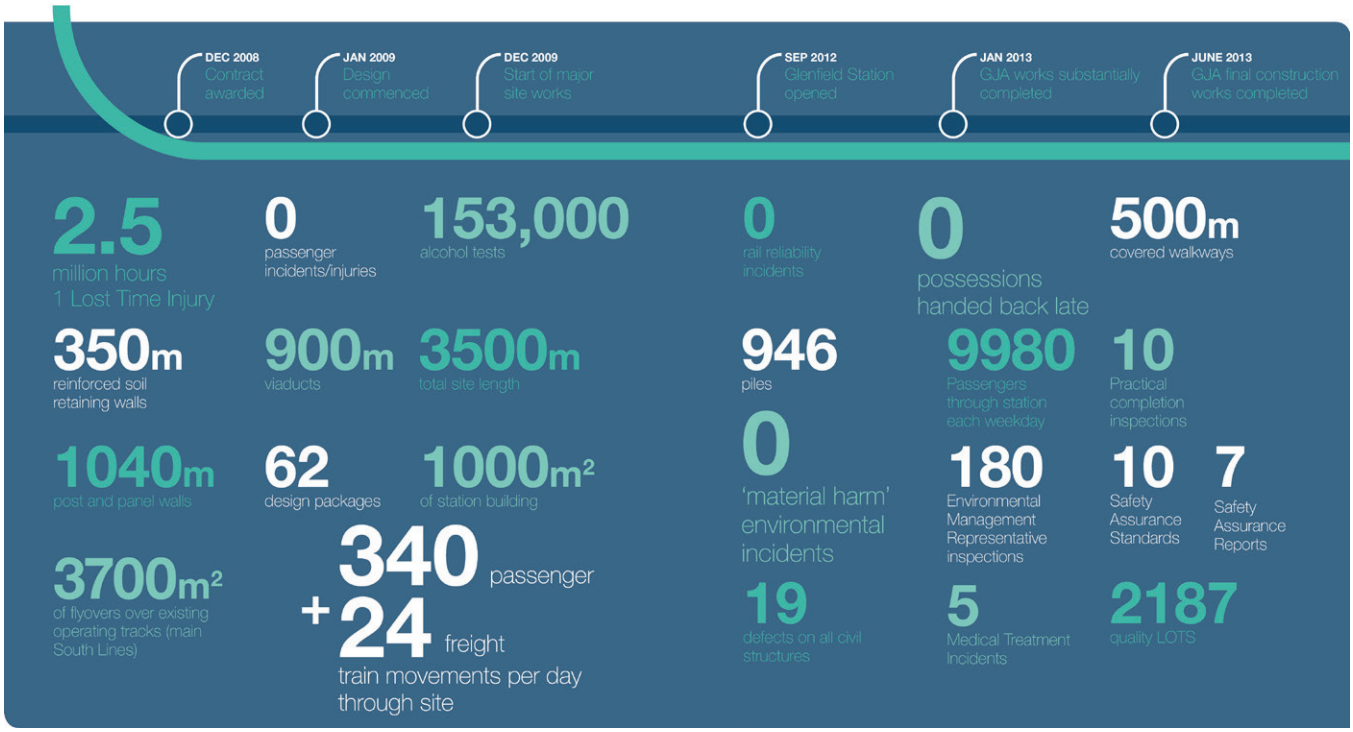
On completion of construction, the GJA achieved a Transport for NSW Contractor Performance Report score of 84 and received a KRA score of +84 (above minimum conditions of satisfaction (MCOS)).

Over the life of the project, the Glenfield Junction Alliance has received widespread industry recognition, locally, nationally and globally. This recognition includes winner of the 2014 Railway Technical Society of Australasia Railway Project Award and 2013 NSW Engineers Australia Excellence Awards, Project Infrastructure category.

Notable professional achievements include:

- exemplary record in community relations, site safety and environmental protection
- confidence of key stakeholders to allow work under live rail conditions in a tightly-regulated system
- proactive cooperation with RailCorp as the end user (in its multiple functions as owner, setter of engineering and safety standards, operator and maintainer)
- completion of works within the program set by the client and the budget agreed during project development phase
- Alliance behaviour that embraced the client and other stakeholders.

GJA Vital statistics



3 PRINCIPLES OF TRANSPARENCY AND INTEGRITY

The GJA worked in full partnership with Transport for NSW, RailCorp, RailCorp Program Alliance and other key stakeholders to deliver the Glenfield Junction project. Achieving a high level of collaboration and transparency was crucial to all stakeholders. The GJA adhered to processes that enabled the right people at all levels to come together and solve complex problems.

The GJA was a true partnership based on integrity and honesty. The Alliance's goal was to work in full transparency with all stakeholders to drive value for money and deliver outstanding performance and safety. This was achieved whilst maintaining rail operations and minimising impact on the travelling public, the community and environment.

Full transparency with the wider community was achieved by establishing a project Community Information Office in the Glenfield shopping precinct, which received over 2,500 visitors from 2009 to 2012

All members of the Alliance Leadership Team were committed to allocating resources on a 'best for project' basis with full transparency. At project inception, all key members of the GJA participated in a series of workshops facilitated by coaching specialists. These aligned the team with common goals and ensured full commitment to agreed outcomes. The workshops focused on creating alliance orientation, earning the commitment of individuals and continuously managing and nurturing the relationships to full effect.

Safety

Safety was embedded in the culture of GJA and all those who worked on the project – in more than 2.5 million hours worked on the project, only one lost time injury occurred. There were many key safety initiatives that contributed to this, including mandatory daily alcohol testing and random drug testing for all staff. This was recognised in the industry and the GJA was a finalist in the 2011 Workcover NSW Safework Awards.

Procedures

The GJA used robust systems and procedures to ensure transparency, these were overseen by the Target Out-turn Cost Manager and provided a framework for the team to build upon and perform effectively.

During project delivery all drawings, documents and photographs were stored on a local server (Aconex). All sub consultants, contractors and stakeholders, including Transport for NSW, used Aconex which ensured transparency of management, control and documentation of all communications between the GJA and suppliers.

Meetings/workshops

Workshops were held to ensure all key stakeholders were involved in the design process. Designs would be submitted to both RailCorp and Transport for NSW, followed by a presentation/workshop to review comments. These presentations were made available to all relevant stakeholders with the aim of addressing all concerns and expediting the review process.

During construction

The close relationship between GJA and other stakeholders led to minimum impact to the travelling public, community and environment. Arrangements were made with RailCorp for major construction works during track possessions. A temporary footbridge across Railway Parade allowed demolition of existing facilities and efficient construction of the new station; while changes to signage made access easier for the public.

The GJA worked closely with RailCorp, Transport for NSW, fire services, and the police for emergency exercises and collaborated on the production of operations and maintenance manuals. GJA ran practical completion inspections and agreed the process for accessing the station. Any defects or other issues that arose as a result of the inspections could then be addressed with the client.

From the GJA inception, the team prepared and implemented an Environmental Management System (EMS) which included the Construction Environment Management Plan (CEMP) and other associated plans. Key environmental challenges included nearby ethane gas pipeline, waste landfill, floodplain and protected forest areas.

The GJA adopted two key objectives; firstly, achieve compliance; and secondly, be more sustainable.

4 SUSTAINABILITY AND RESPECT FOR THE ENVIRONMENT

SUSTAINABILITY

Sustainability was at the forefront of all works, particularly during the design phase. Initiatives included:

- Sustainable design and construction
  - » maximising the use of existing platform to reduce material consumption and construction waste
  - » reducing the absolute quantity of Portland cement in concrete mixes, by substituting it with approved industrial waste products or oversized aggregate
  - » reducing the absolute quantity of virgin steel by substituting it with post-consumer recycled steel
  - » introduction of photovoltaic panels

RESPECT FOR THE ENVIRONMENT

- Resource recycling/re-use
  - » 90% of construction waste generated was diverted from landfill and recycled/re-used
  - » 100% (over 40,000 tonnes) of usable spoil was recovered for beneficial use
  - » GJA used over 3,000 tonnes of recycled crushed concrete on site for erosion and sediment control. Recycled glass was used as a base under the ballast on the top of the NFO.
- Erosion and sediment control
  - » provision of a permanent clean water swale to serve as an approved off-site discharge point for clean water and subsequently as a flood mitigation measure for the new rail infrastructure.
  - » construction of a temporary erosion sediment control pond (ESCP) to avoid adverse environmental impacts of surface water runoff into Bunbury Curran Creek.
- Noise and vibration
  - » Adoption of continuously welded track to manage noise, the use of earth mounds and in one location adjacent to Railway Parade, the construction of 300m long noise wall
- Flora and fauna
  - » Recording vegetation removal to ensure its inclusion in the biodiversity offset strategy that included a replanting program with the local council.

Community

The team went beyond the normal engagement requirements, reaching out to the community by establishing a project community information office which received over 2,500 visitors from 2009 to 2012. The GJA participated in annual Clean up Australia Day activities and worked with Hurlstone Agricultural College to plant trees and participated in the Glenfield Public School's first Gifted and Talented Program; introducing students to safety, rail and civil engineering principles.

The completion of the Glenfield Junction element of the South West Rail Link has provided the community with essential rail infrastructure for the predicted future increases in population in Sydney's south-west, including the South West Growth Centre. Up to 24 trains an hour now travel through Glenfield and the modern, safe and accessible stations provide all commuters with access to city-bound rail services for the first time.