

COMPANY

Link Alliance

LOCATION

New Zealand

CURRENT PHASE

Design and Construction

COMPLETION DATE

2024

SOFTWARE

Autodesk® AutoCAD®, Autodesk® BIM Collaborate Pro (formerly BIM 360® Design), Autodesk® Civil 3D®, Autodesk® InfraWorks®, Autodesk® Navisworks®, Autodesk® ReCap™, Autodesk® Revit®

“City Rail Link is an ambitious, first-of-its kind project for New Zealand. It will not only make a huge impact on our transportation system, but will also provide new standards and inroads for the use of BIM throughout the country.”

– **Jon Varndell**
Design Director,
Link Alliance

City Rail Link



Image courtesy of Link Alliance

Challenges

City Rail Link is a first in many ways. It is the largest, most complicated transport infrastructure project ever attempted in New Zealand. It is also the country's first completely underground railway line. And it is the first major New Zealand infrastructure project to make an entirely new, comprehensive shift to a digital approach with BIM.

City Rail Link will allow the rail network to double public transportation ridership to Auckland's city center, meeting growing demand. Located in the heart of the city, the rail line is 3.5 kilometers long with a twin tunnel and three stations, including two new stations underground and an existing one above ground marked for

creates further complexity as it is located where City Rail Link connects with the existing system.

Collaboration is key for the project. The Link Alliance is a consortium of seven companies concurrently delivering design and construction of stations and tunnels for City Rail Link Ltd. International team coordination will involve up to 1600 people from 30 countries and 16 disciplines. Not all were skilled in BIM prior to the project, with many participants still in a 2D mindset. This required new training initiatives to execute a complete shift to the delivery of a complex infrastructure project to a BIM delivery method.



Image courtesy of Link Alliance

“Because our team is located around the world, we rely on a common data environment and BIM 360 Design to make collaborative design possible. With COVID, we had minimal downtime and the transition to remote working was seamless.”

– **Dean Burke**
Digital Engineering Lead,
Link Alliance

“Linking the physical and digital worlds is a game changer. With BIM, we can take the data from construction and automatically update the models, allowing a real-time feed to continuously update the design for optimized scheduling, time, and cost.”

– **Brice Gaudin**
BIM Manager,
Link Alliance

Solutions

In order to get every team member on board with BIM, the Link Alliance created intensive training materials and sessions to get everyone skilled in the technical interface and tools and working in the cloud.

The entire project is hosted on BIM 360. A common data environment has been critical for successful global collaboration, especially in light of COVID-19. During the shutdown and since, the project has experienced negligible downtime.

The complexity of the tunnels required Cesare Caoduro (Digital Engineering Manager Tunnels, Link Alliance) and the computational design team to develop a new approach incorporating computational design and generative design. Using Dynamo Studio and Revit, the Link Alliance can continuously update the tunnel design as construction proceeds. For example, when the project scope expanded to accommodate longer, nine-car trains, the team simply ran the computational design scripts again to update the 3D models instead of starting from scratch or making time-consuming manual modifications.

With Project Refinery, the team used generative design to create a model of the Tunnel Boring Machine that optimized segments based on the geometry of the tracks and identified elements to minimize deviations from the design intent.

Key Insights

- The project-specific Revit API tools—“LKA Express Suite”—developed by Roy Qian (Head of Digital Engineering – Building Services, Link Alliance) and his team allowed the project team to create a custom interface for data processing and documentation automation and computational design/modeling such as tunnel services, saving 3000 hours in design time. Its ease-of-use enables anyone—even those with limited BIM experience—to start working with it right away.
- The project team is ambitiously aiming for an Infrastructure Sustainability Council of Australia (ISCA) rating of 15% reduction in embodied carbon, 25% reduction in energy CO2 emissions, and reduced waste to landfill and construction/operational water use. With BIM 360 and Revit, the team adds material information into the 3D model, and monthly changes are communicated via Microsoft Power BI dashboards. The ISCA calculator, BIM model, and dashboard create a cohesive output to track project performance against sustainability targets.
- The Link Alliance benefits from virtual reality for many aspects of the project, from design reviews to site safety and training.