



# Case Study

## Informing depot design through modelling

### THE CHALLENGE

Our client had a requirement to supply and maintain rolling stock for a metro system. Their strategy included introducing a fleet of new trains onto the network, and re-designing the existing depot to accommodate this new fleet whilst managing the retirement of the existing fleet. Given the complexity of the requirement and the significant investment involved, our client wished to validate that the new depot design was appropriate to maintain operations throughout the extended period of transition. It also wanted to confirm that the capital expenditure required for the depot upgrade work provided value for money. The validation process was required to prove that the migration and deployment plans that underpinned the transition would lead to a successful outcome and result in no operational issues. For example, the use of temporary maintenance facilities, the demolition and rebuild of the original depot, and the successful parallel operation/maintenance of existing and new rolling stock, all had to be proven to be achievable against planned cost and timescales.

### OUR SOLUTION

Frazer-Nash has developed a unique Depot Modelling Software Tool that is capable of comprehensively simulating the distinct activities that occur in a railway depot, and the interdependencies that exist. Simulation of these activities is required to comprehensively analyse, assess and validate the performance of this complex environment under both normal and degraded conditions. The models used to simulate the environment consider fleet type, depot arrivals and departures, layout, required maintenance activities, staff roster, and train movement restrictions. The models' output plots the achieved and desired timetables, and illustrates the completeness of each maintenance activity, with interrogation identifying bottlenecks, depot operations' inefficiencies and areas of over-capacity. The fast running simulation allows for quick and easy amendment of inputs, to trial alternative proposals without large capital expenditure. From a cost perspective, by comparing the output of various models a decision can be made on the most cost effective solution, which provides the required functionality when aligned to budget and timescales.

### RESULTS

A baseline model, established by modelling the existing fleet and depot operations, was analysed to identify current issues prior to commencing work. The model concluded that carriage washing was a bottleneck that delayed depot arrivals, suggesting that the current maintenance regime was difficult to achieve. Subsequent discussions with depot staff confirmed this to be the case, with carriage washes adjusted as required to meet the schedule. This confirmation, and other verified outputs from the baseline model, provided the client with confidence in the software's functionality. Once the baseline was completed, various depot designs containing both the existing and new fleet of trains were modelled. From these models, Frazer-Nash was able to identify areas where capacity could be reduced without hindering depot operations, in turn reducing building costs. Similarly, the depot construction phases were modelled and Frazer-Nash was able to advise where proposed construction plans would result in the depot not being able to provide the operational activities required during that phase, with appropriate mitigations being proposed. On project conclusion, Frazer-Nash was able to provide our client with confidence that the final depot design proposal was appropriate for the new fleet of trains. Furthermore, the models confirmed that both the old and new rolling stock fleet types could be maintained in parallel during the depot demolition and construction phases.

### Business need

A rail client needed validation of its depot design and construction phasing.

### Why Frazer-Nash?

Frazer-Nash was able to quickly and cost effectively produce a bespoke model using its unique depot modelling software, which simulated the depot design and provided evidence that justified the capital expenditure.

### Date project completed

Nov 2018 – May 2019