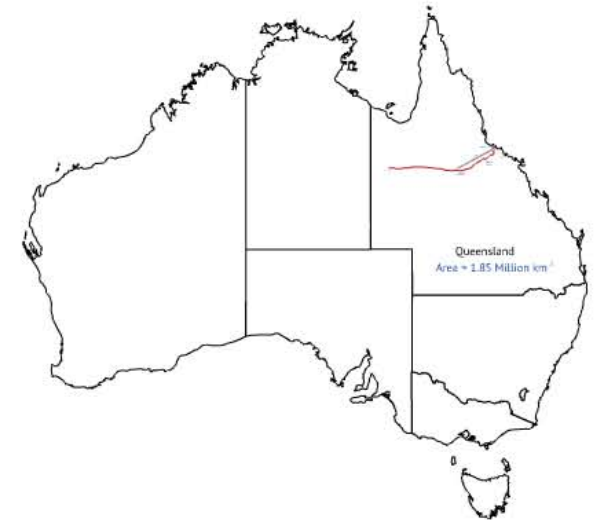


Case Study: Stuart Yard

Rail Yard Capacity Model

Martin van Holten





- Australian based international consulting company

- Part of the Worley Parsons Group



- Project & Business advisory services in the infrastructure & resources sectors

- Australian distributor of AnyLogic



Offices:

- Sydney
- Brisbane
- Melbourne
- Perth
- Hong Kong
- Shanghai

Employees: ~370



QR NATIONAL™

Moving a Nation

- Australia's largest rail freight operator
- Commodities:
 - Coal
 - Iron ore
 - Minerals
 - Agricultural
 - General freight
- World's largest rail transporter of export coal from mine to port

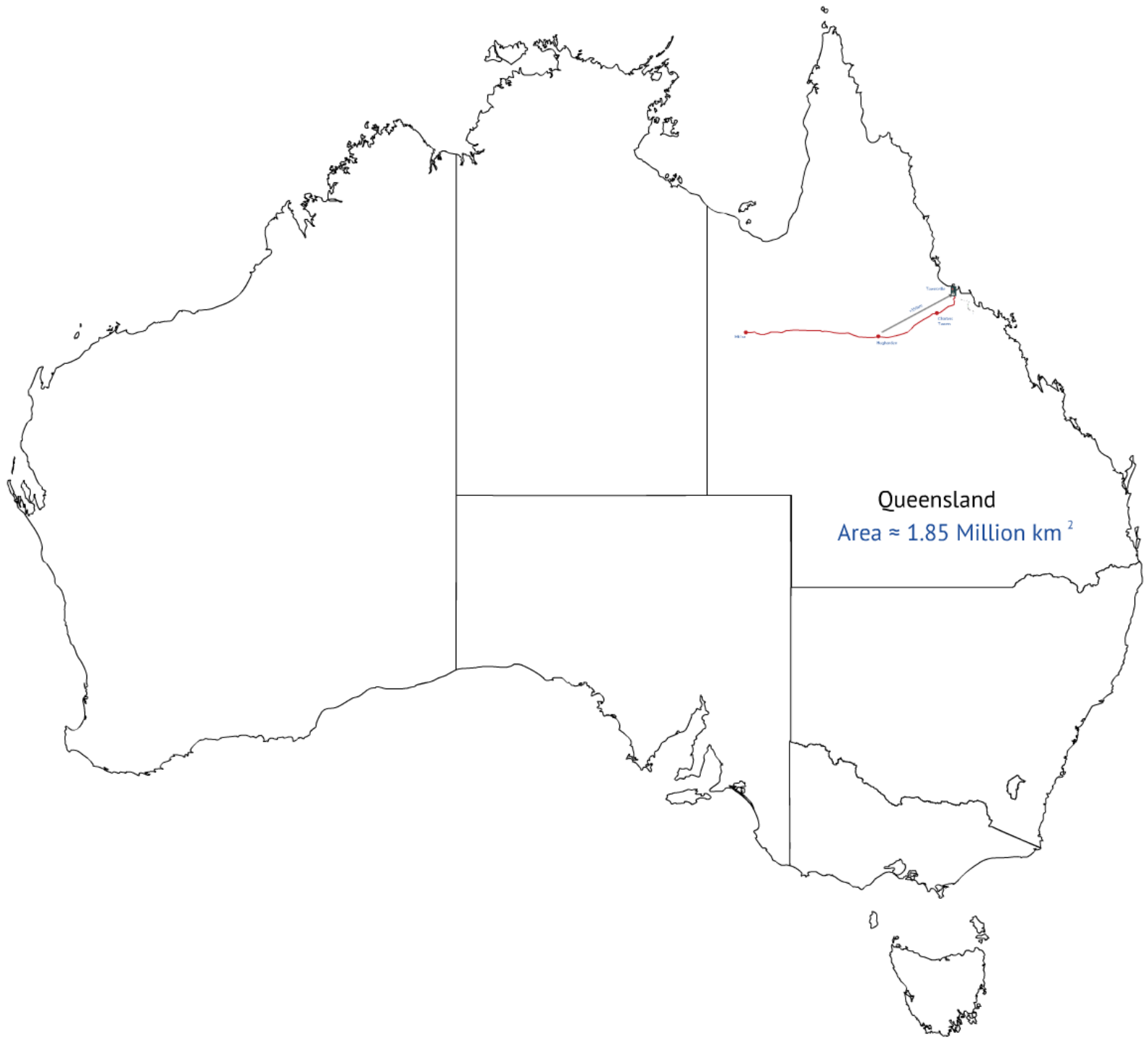
Tonnes hauled: 250 million tonnes pa

Locomotives: 746

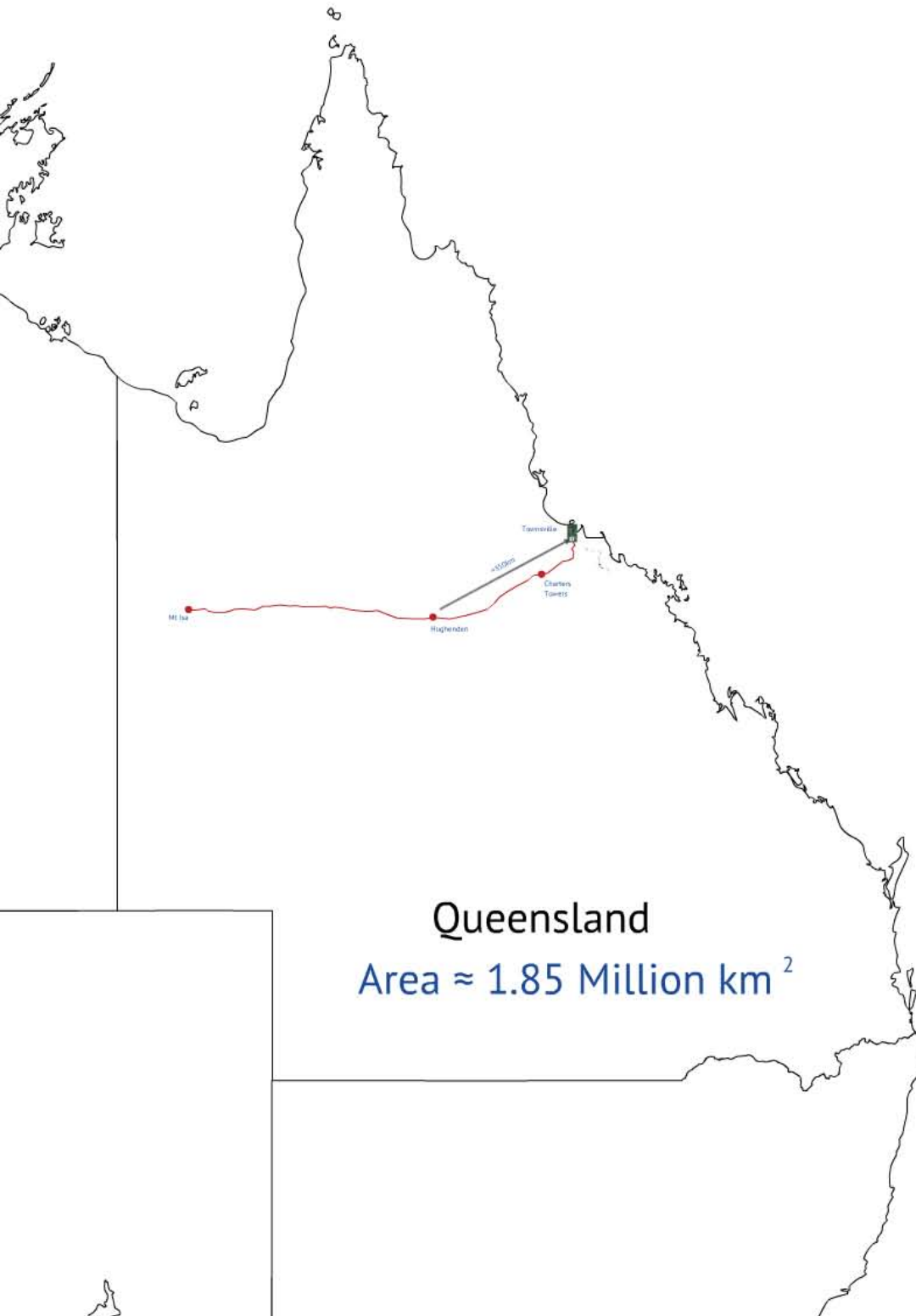
Wagons: 16,800

Employees: 8,000+

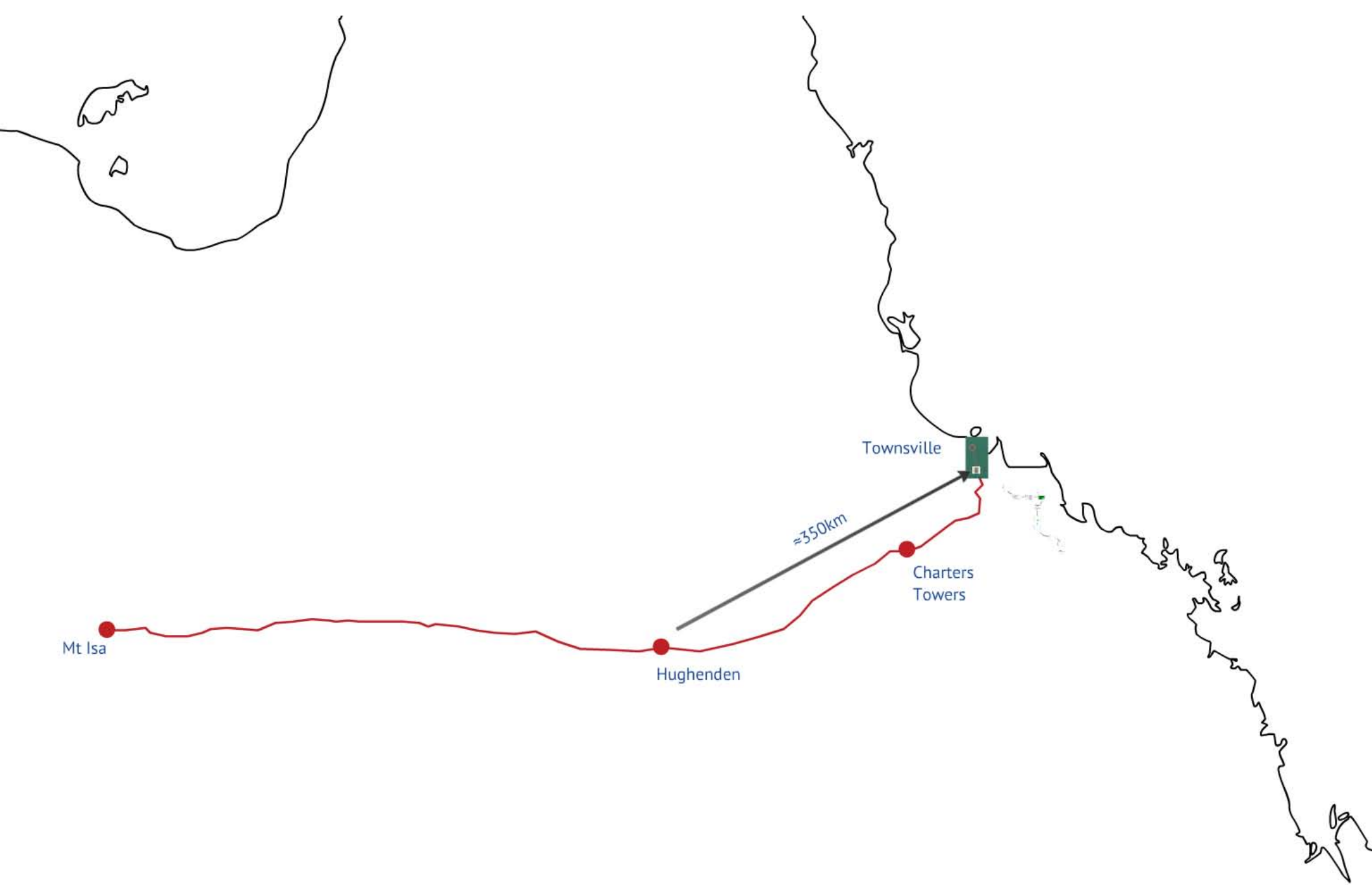
Track managed: 2,600 km



Queensland
Area ≈ 1.85 Million km²



Germany
Area ≈ 0.36 Million km^2



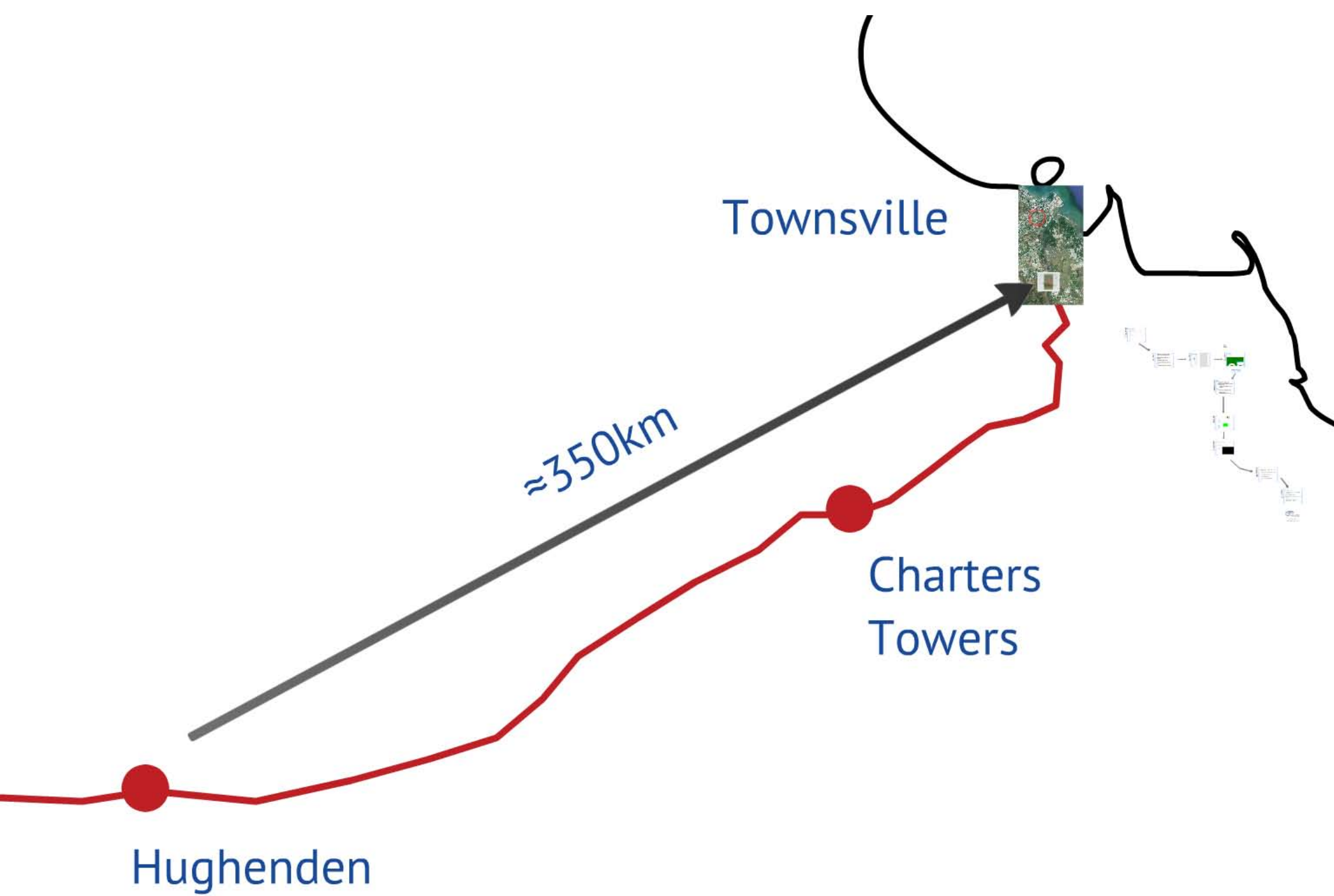
Mt Isa

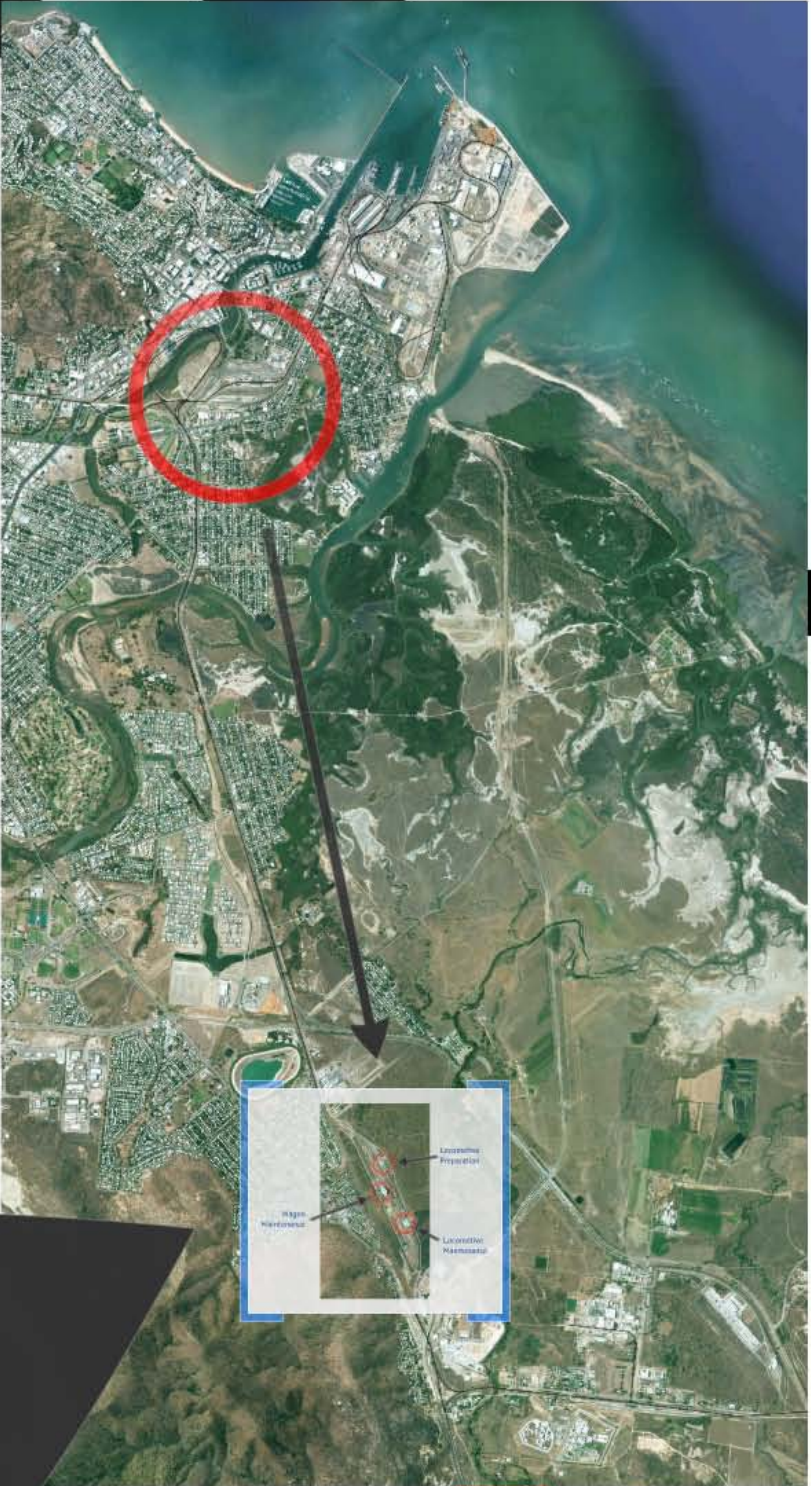
Hughenden

Charters
Towers

Townsville

≈350km





Wagon
Maintenance



Locomotive
Preparation

Locomotive
Maintenance

Challenge

QR National's Challenge

- Understand
 - Capacity of Stuart Yard
 - Whether addition operations could be moved to the yard
 - What additional Infrastructure was required (if any)
- Scalability
 - The model needed to be constructed in a modular fashion to allow it to be
 - easily expanded
 - incorporated into a larger model
- Timing
 - The model needed to be completed in a relatively short period of time

Solution

- Simulate the current operations, using Anylogic's Rail & Enterprise Libraries



- Benchmark the model against current operations
- Determine the current capacity
- Identify what additional operations could occur
- Test additional infrastructure & operations

Solution

Model Overview

Locomotive Preparation



- Provisioning
- Washing
- Brake Testing

Locomotive Maintenance



- Inspections
- Repairs
- Heavy Maintenance

Wagon Maintenance

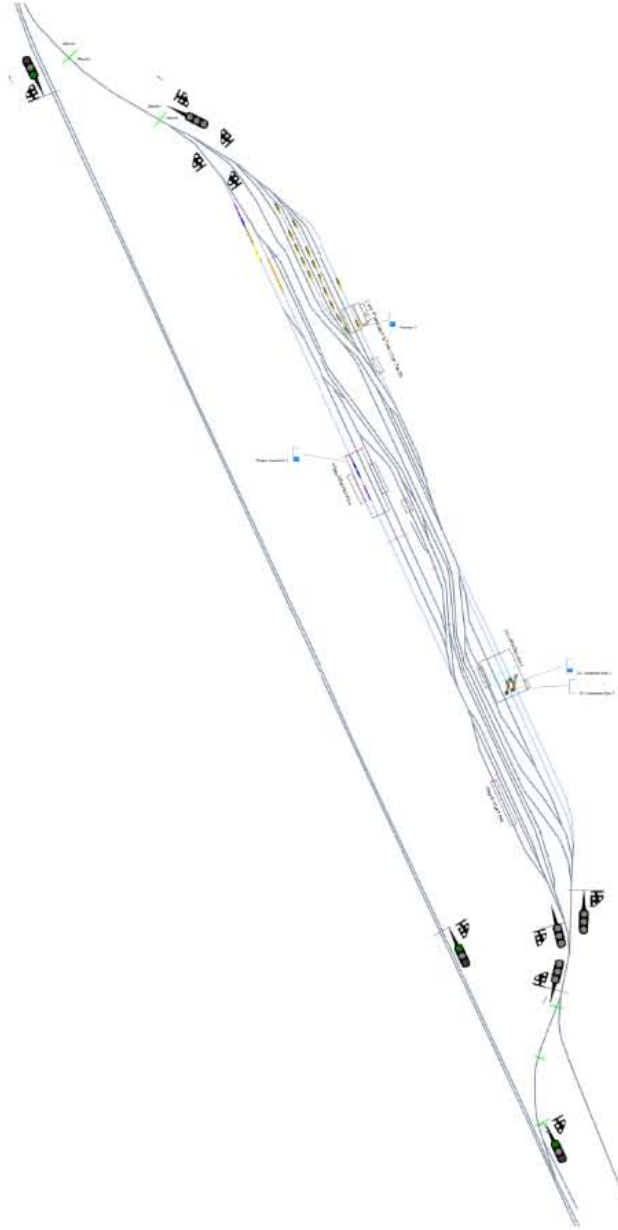


- Inspections
- Wagon Overhaul
- Fuel Car Maintenance

Reliability Examinations



- Train Inspections

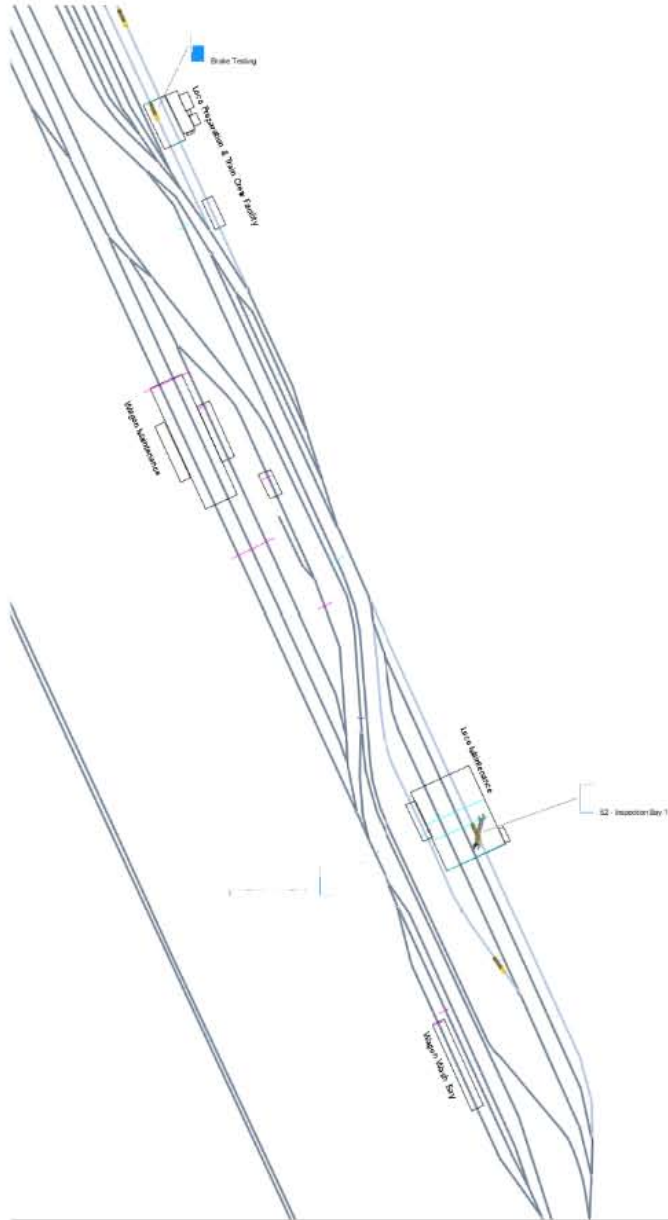


Locomotive Preparation



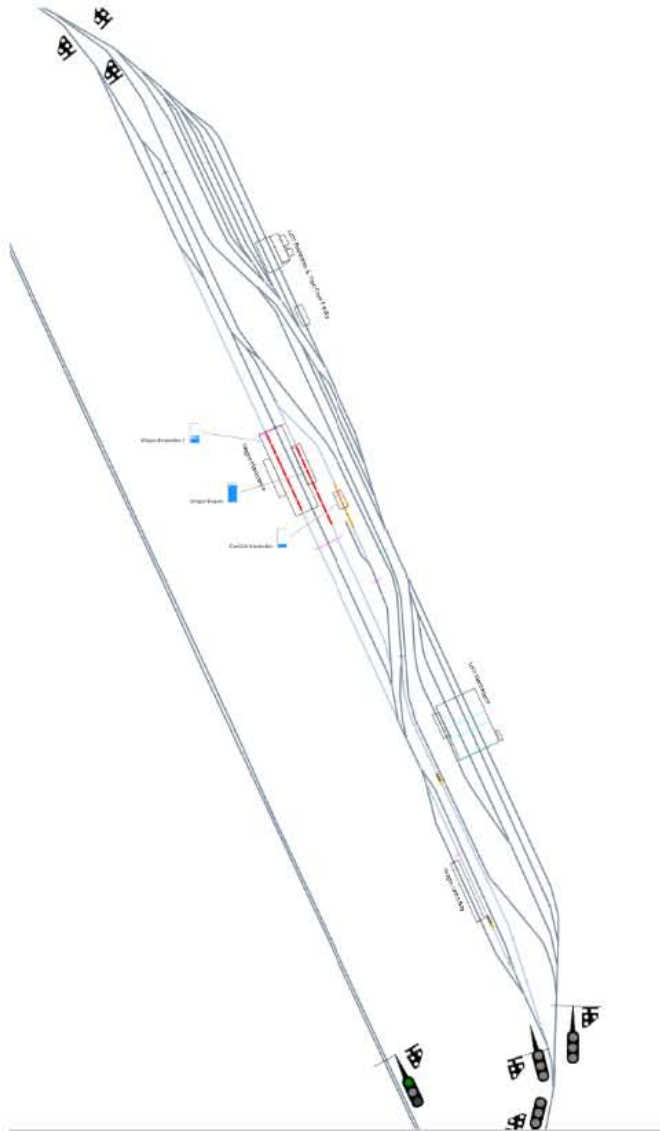
- Provisioning
- Washing
- Brake Testing

Locomotive Maintenance



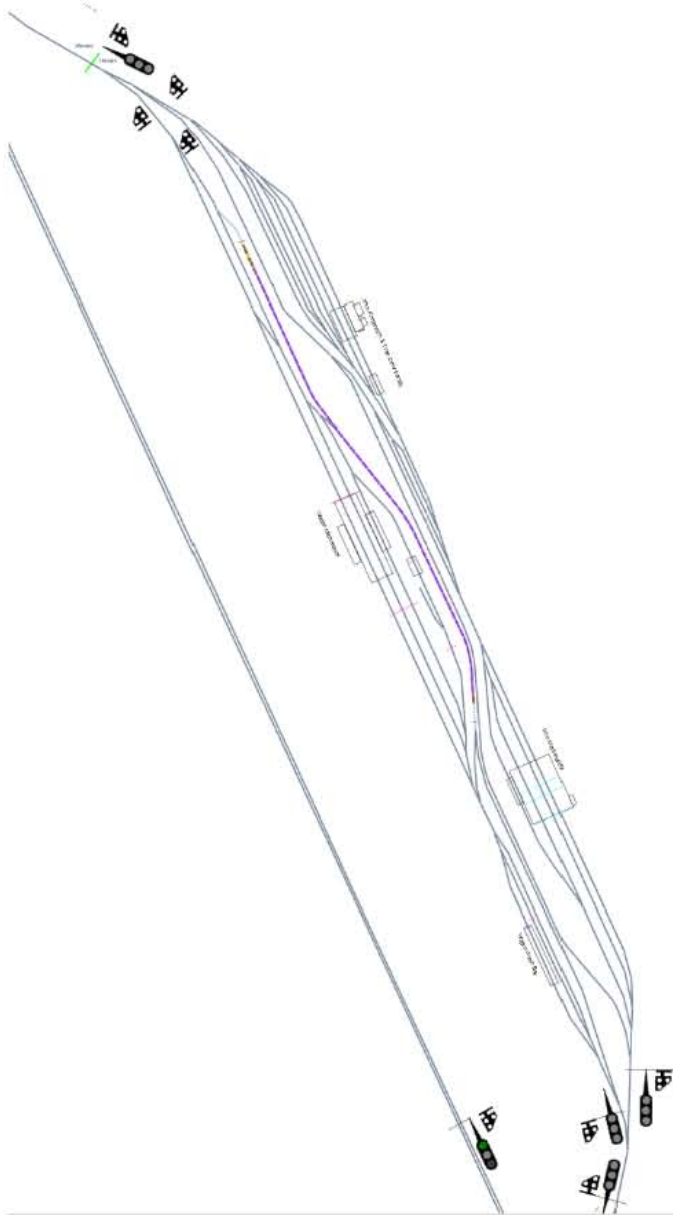
- Inspections
- Repairs
- Heavy Maintenance

Wagon Maintenance



- Inspections
- Wagon Overhaul
- Fuel Car Maintenance

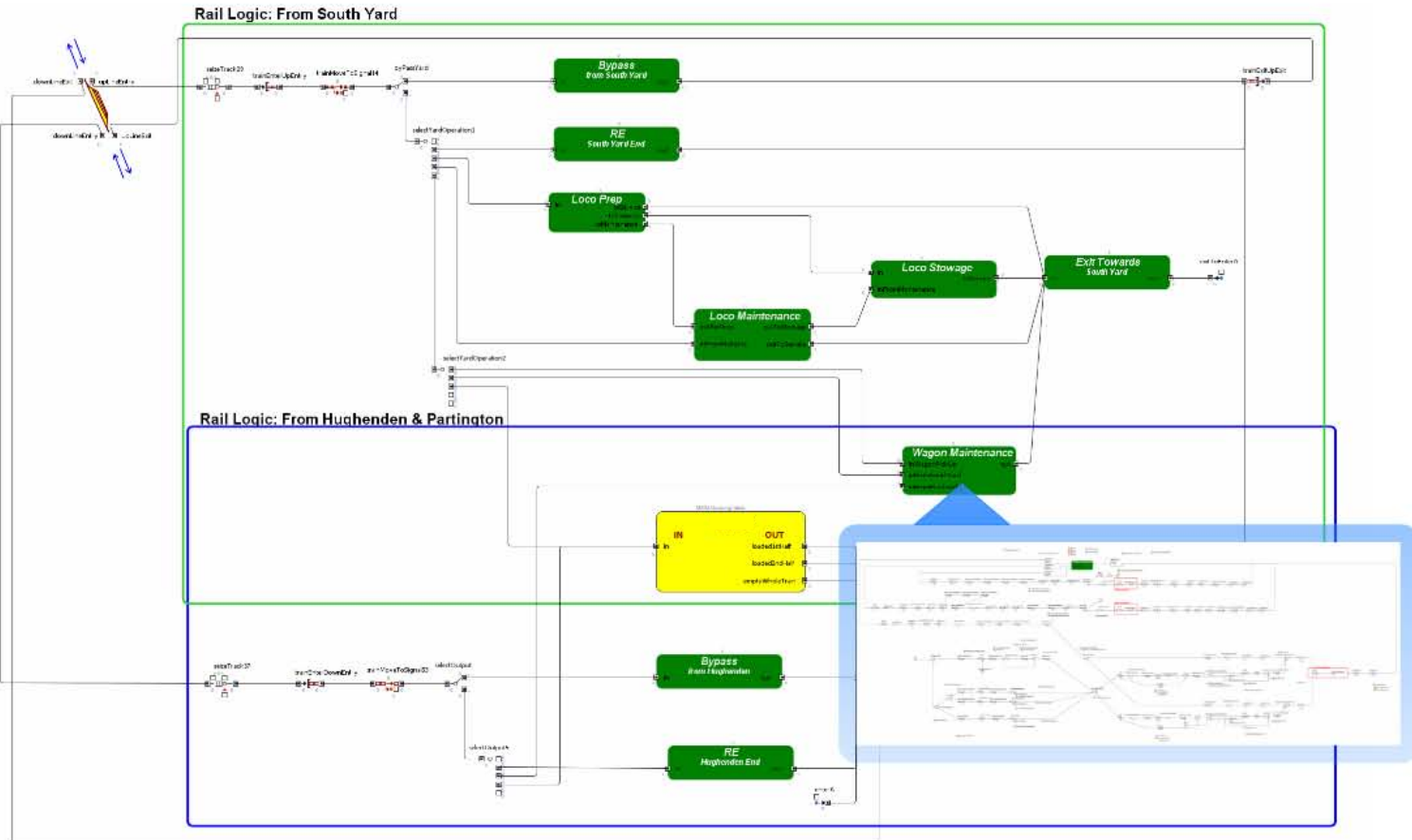
Reliability Examinations



- Train Inspections

Solution

Model Logic



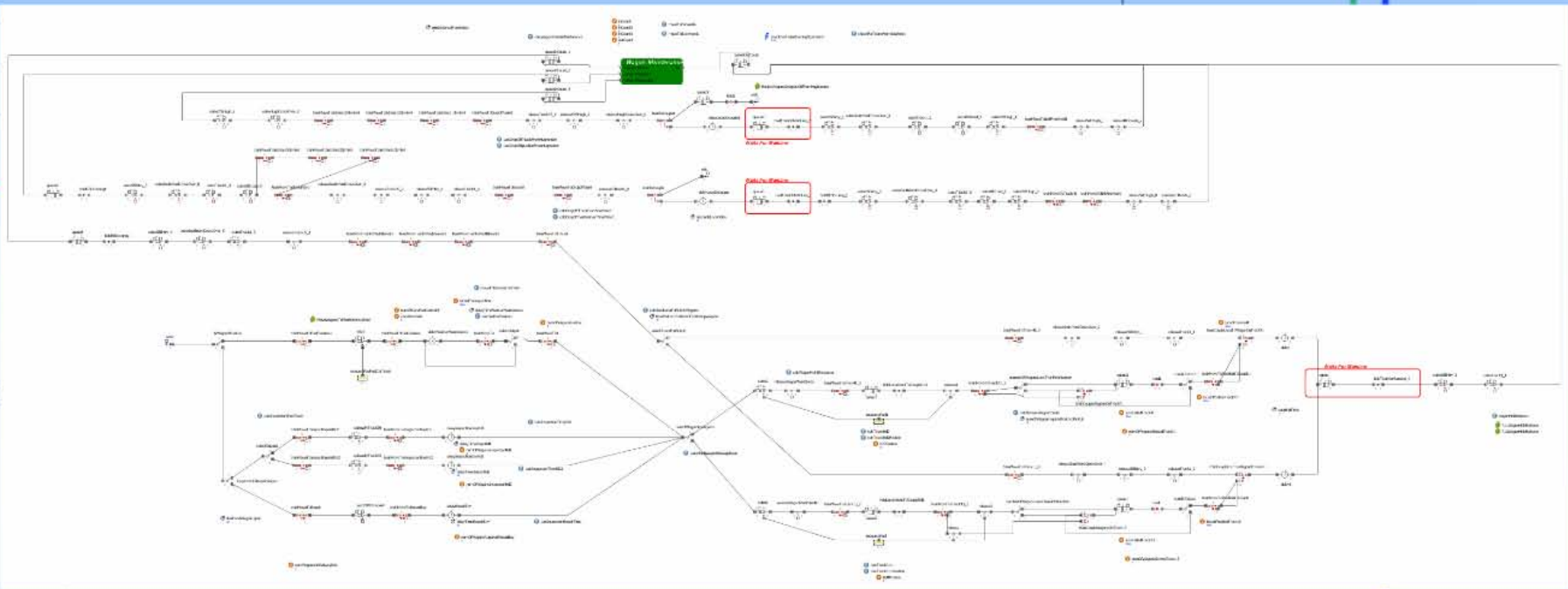
Wagon Maintenance

inWagonPickUp

out

inFromSouthYard

inFromHughend

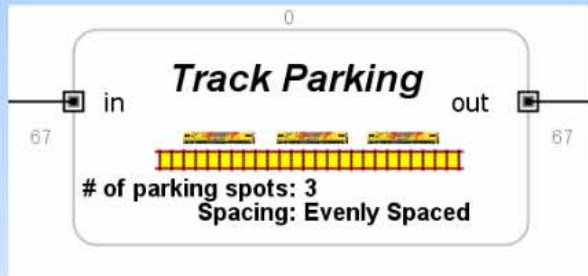


enterA

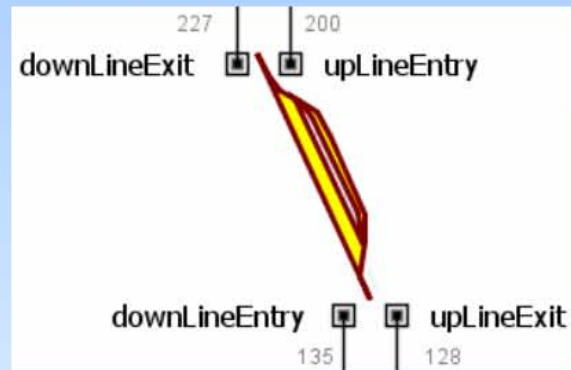


Reusable Components

Track Parking



Stuart Yard



5 Speed Line



Modelling Issues



Logic

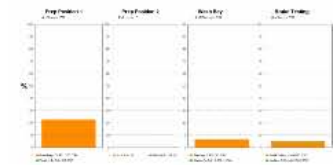
- Avoiding deadlock within the yard
- Giving the main line the priority over exiting traffic from the yard
 - Easily solved using Anylogic's resource components

Data

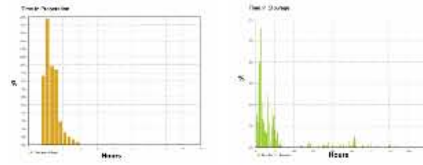
- Collection of data from numerous sources
 - Single spreadsheet
 - Set up in similar format to source data

Results

Capacity



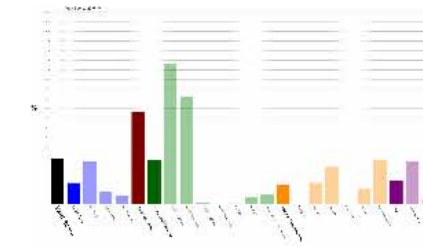
Utilisation & Waiting time



Time Distributions



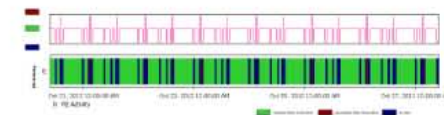
Queue & Stowage



Yard Score



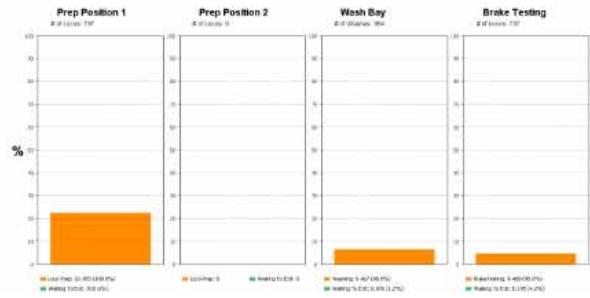
Availability



Usage

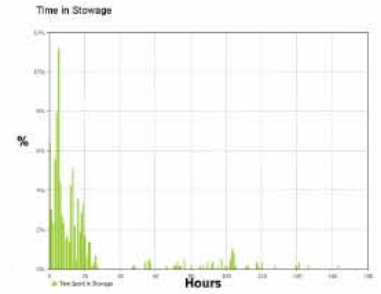
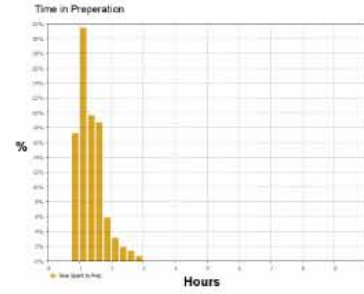
* Example Data Only

Capacity



Utilisation & Waiting time

* Example Data Only



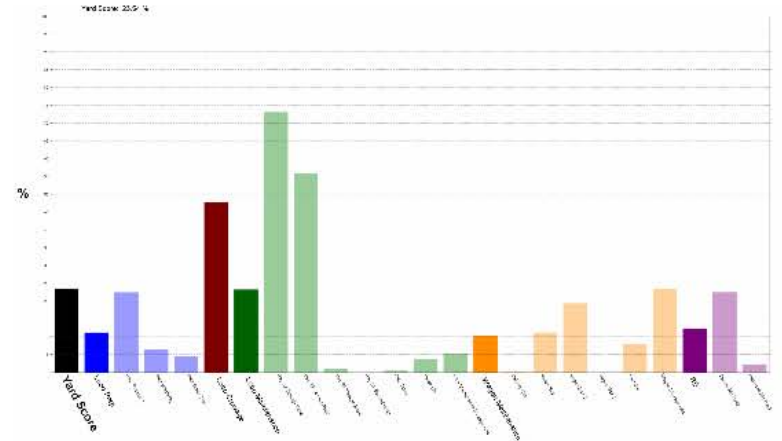
Time Distributions

* Example Data Only



Queue & Stowage

* Example Data Only



Yard Score

* Example Data Only

Availability



Availability

* Example Data Only



Usage

* Example Data Only

Outcomes

Quantify

- Determined the capacity of the yard
- Identified where additional activities could occur
- What additional infrastructure was required

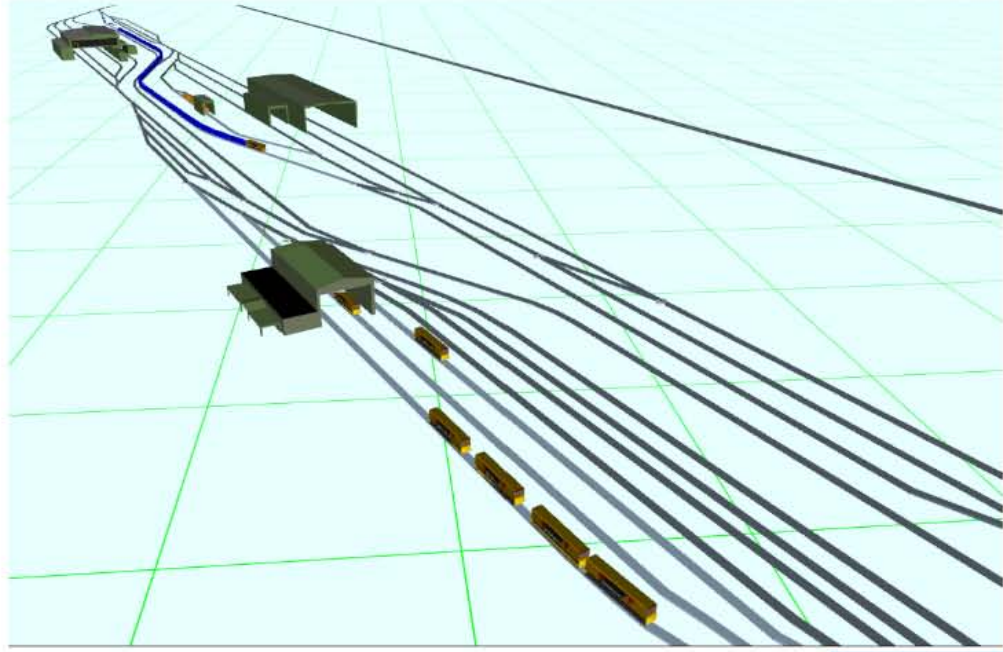
Communicate

- Available options for the yard
- Logic & assumptions to upper management as well as the yard operators

Timing

- Completed 2 weeks ahead of schedule
- Easily expanded

3D View



Next Steps

- Include the yard model within a detailed model of the Mt Isa Line
- Inclusion of Townsville's Jetty & Port operations
- Testing of different operation regimes
- Operational planning tool
- Use model components within other yard models

Summary

The model allowed the:

- Capacity of the yard to be determined within the required time frame
- Proposed options to be evaluated
- Best option to be selected with an increased level of certainty
- Opportunity for the model to expanded & components to be reused in the future



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think through the future

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