Downer Model

2022

CHALLENGE

Traditionally New Zealand has been using a predictive model setup that is designed to optimise at a network or strategic level and heavily reliant on high speed data inputs.

In addition, Waka Kotahi's shift to the Network Outcomes Contract (NOC) procurement model, required suppliers to deliver a target level of network asset renewals, with the associated routine maintenance delivered as a lump sum.

Downer saw a need for a model that is designed to optimise at a tactical level without the need for high speed data (if not available). This provided an opportunity to develop a model that more accurately predicts and optimises the maintenance need given a constrained investment strategy. In addition it gave an opportunity to incorporate the influence of surface water channel deterioration and renewal into the tactical pavement and surface predictive model.

SOLUTION

Modelling is important for all road networks to help managers understand their long-term investment need. Therefore, Downer wanted to the make a model that didn't rely on large data sets, available accessible for everyone. The model needed to:

• Look at improving routine maintenance efficiency - reducing the symptoms or be able to treat more of the symptoms with same or less resources

• Assisted in fulfilling the required network outcomes or agreed level of service, but also one that accounts for routine maintenance effort – i.e. combining the short and the long game

The Downer NZ Model was developed to model different 'family' of roads using associated historical 'all faults' data to predict the likelihood and quantum of maintenance required for a particular road. By using the 'family' of roads approach, the model allows for flexibility to customise the model to any network regardless of data availability. The added benefit from integrating the influence of pavement drainage condition, is well documented in numerous papers to have major influence on pavement performance.

OUTCOMES

As a result, this maintenance model performs well for NOC contracts and local authority networks that do not have complex condition data (such as high speed data) equally. The long-term benefit of integrating the pavement, surface and drainage deterioration model into road asset renewal planning extends the life of the roading asset by preventing premature pavement deterioration when funded and delivered.

Another recent benefit is recognising the opportunity for carbon reduction as an outcome of the optimisation function. Although not yet explicitly calculated, by virtue of being able to develop a more efficient and integrated renewals programme and by extending the life of pavement and surface assets, there is naturally a benefit through reduced vehicle trip cycles resulting in both the delivery of the maintenance and renewals activities.

This can reduce the number of temporary traffic management setup's resulting in less travel time disruption and time spent by vehicles idling in queues. Calculating and incorporating the cost of carbon into future model outputs is a future development project for the team. The implementation of the Downer Model is now incorporated in all Downer lead contracts, including those as joint ventures with other industry suppliers.
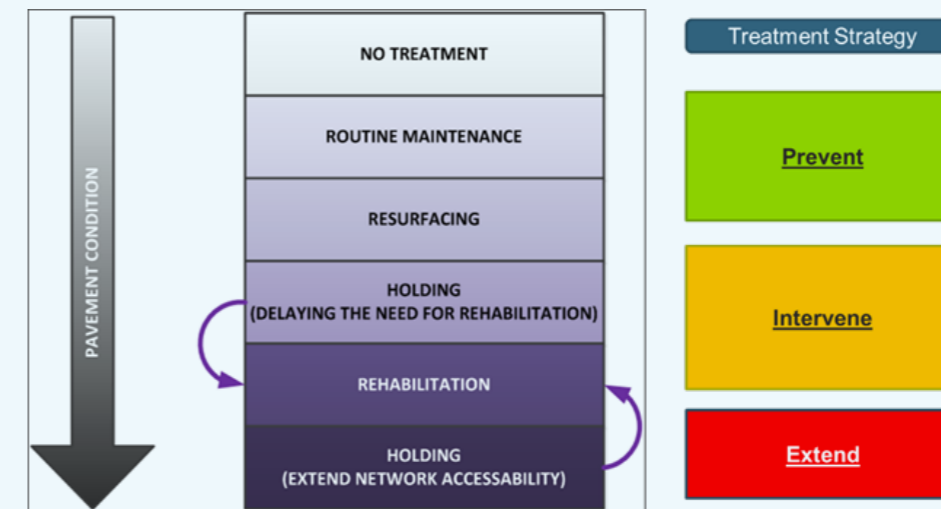
PHILLIPA O'SHEA

Phillipa.o'shea@downer.co.nz
027 5115728

EXAMPLE OF HOW VARIOUS STRATEGY SCENARIOS AFFECT BENEFIT
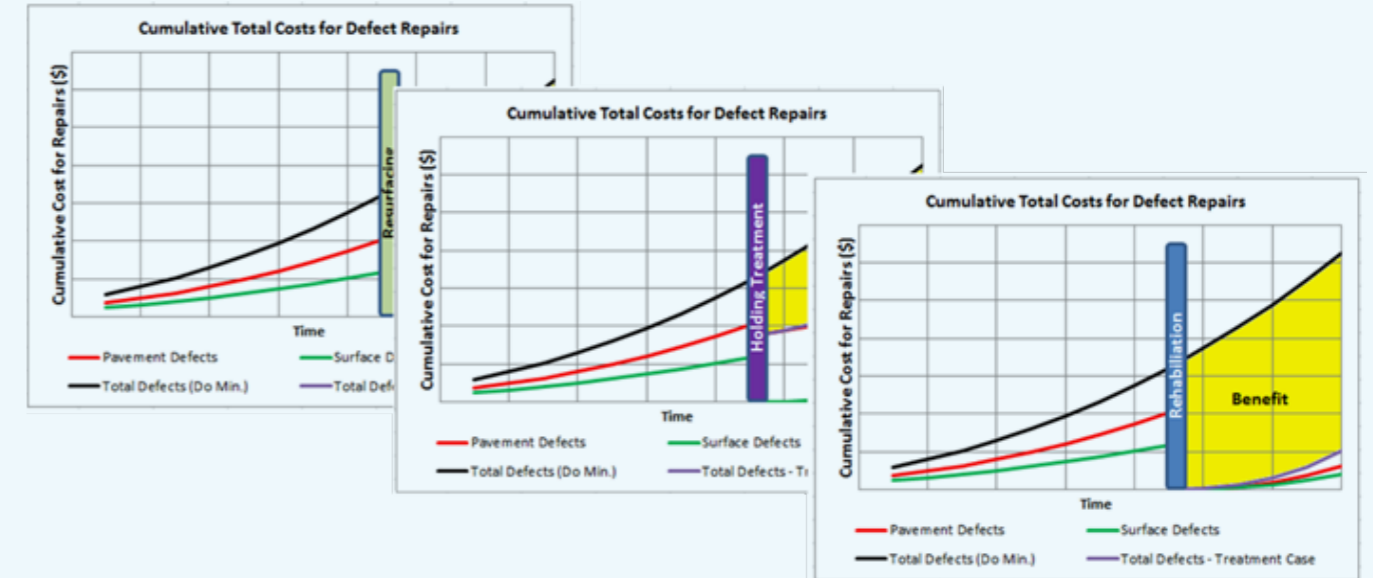
VARIOUS TREATMENTS ARE TRIGGERED WITH DECREASING CONDITION

BENEFIT OF DRAINAGE INTERVENTION ON PAVEMENT DETERIORATION

Pavement Defects Area

$y = 0.0277x + 0.511$
$R^2 = 0.8845$

$y = 0.0054x + 0.0295$
$R^2 = 0.7758$