



The 17th Australian Network of Structural Health Monitoring
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Prioritising Asset Defects in Transportation Infrastructure Using a Relative Risk Model

Sam Mazaheri
Dean Morison

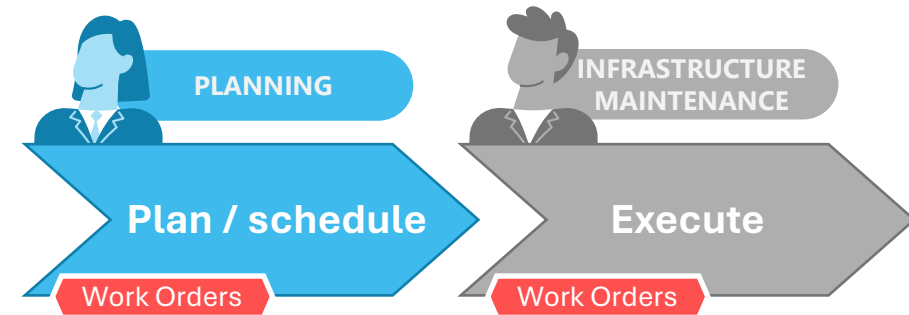
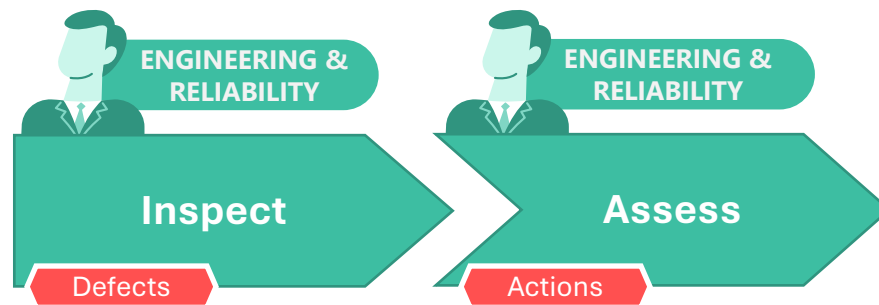
Engineering for Tomorrow



BETA
INTERNATIONAL
ASSOCIATES

Understanding Asset Condition

Previous state.



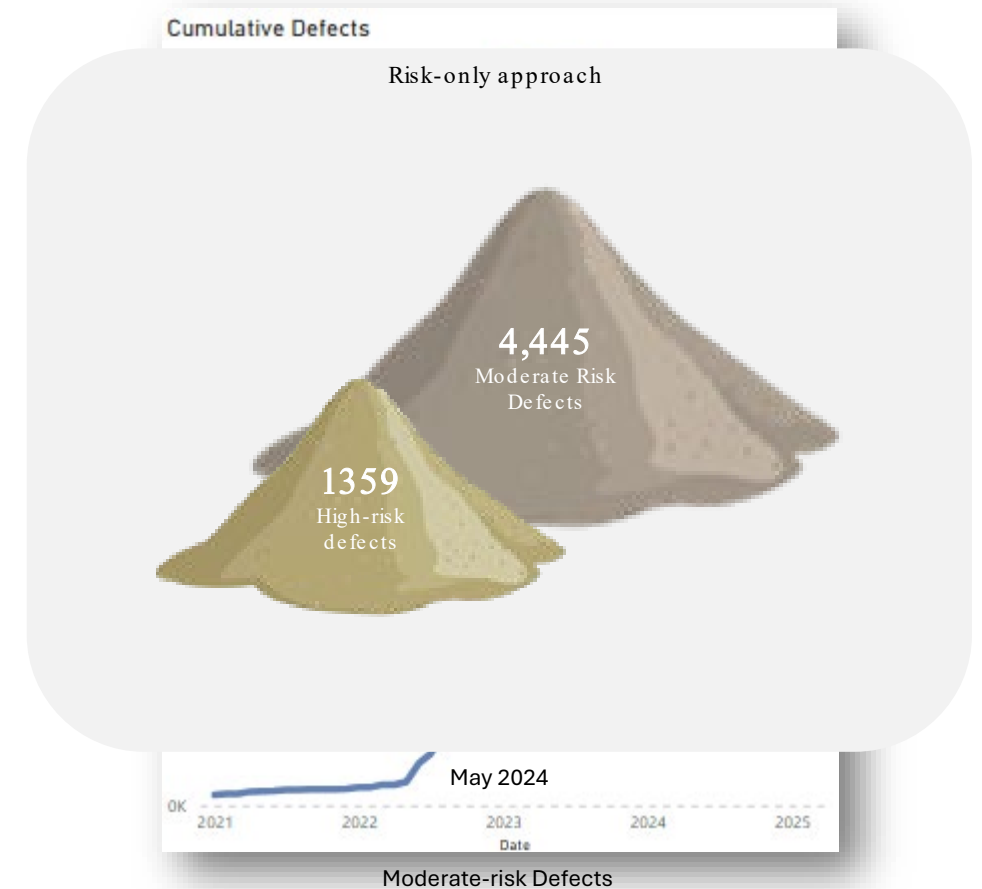
FIVE BY FIVE RISK MATRIX						
		Consequence				
		Insignificant A	Minor B	Moderate C	Major D	Catastrophic E
Likelihood	Almost Certain 5	11	16	20	23	25
	Likely 4	7	12	17	21	24
	Possible 3	4	8	13	18	22
	Unlikely 2	2	5	9	14	19
	Rare 1	1	3	6	10	15
Extreme		Unacceptable Level of Risk				
High		As Low As Reasonably Practicable				
Moderate						
Low		Acceptable Level of Risk				



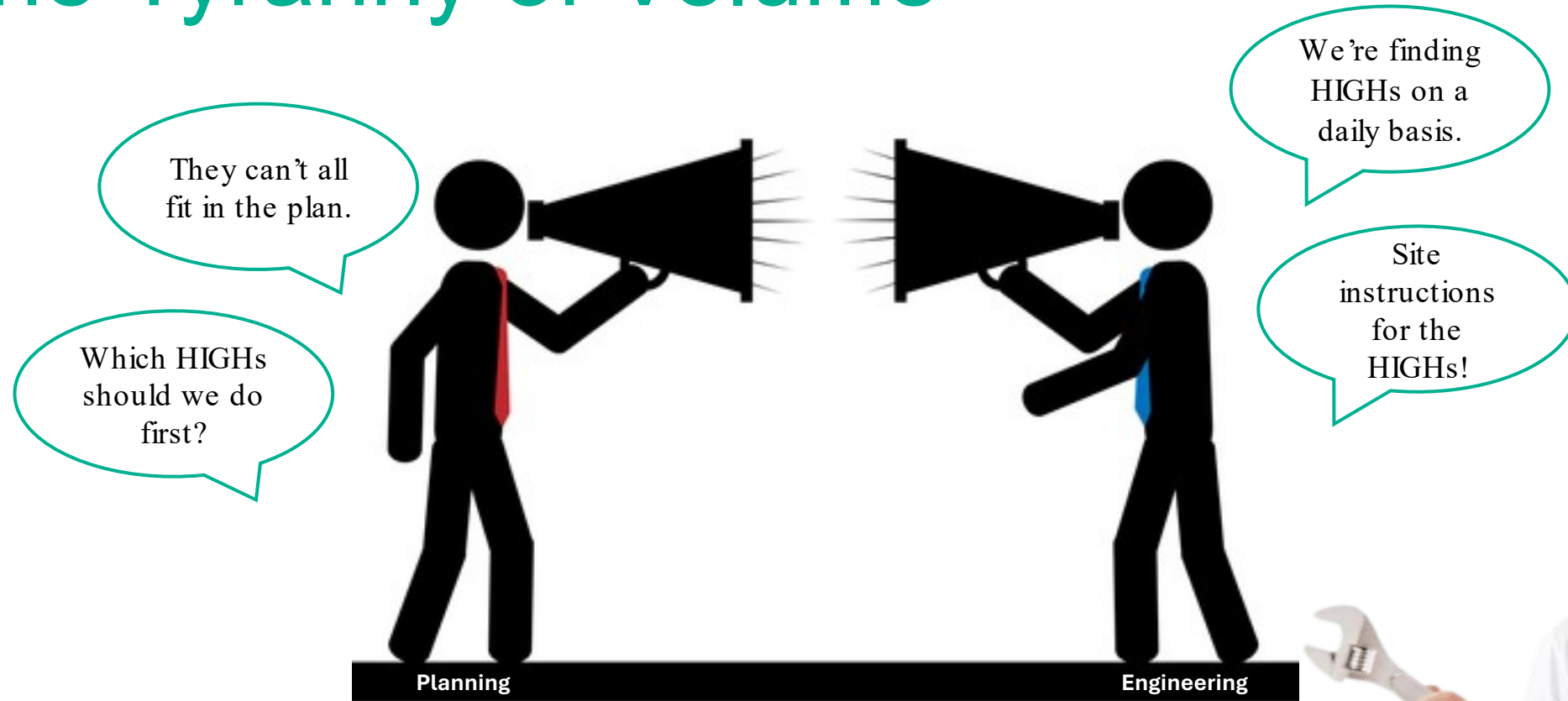
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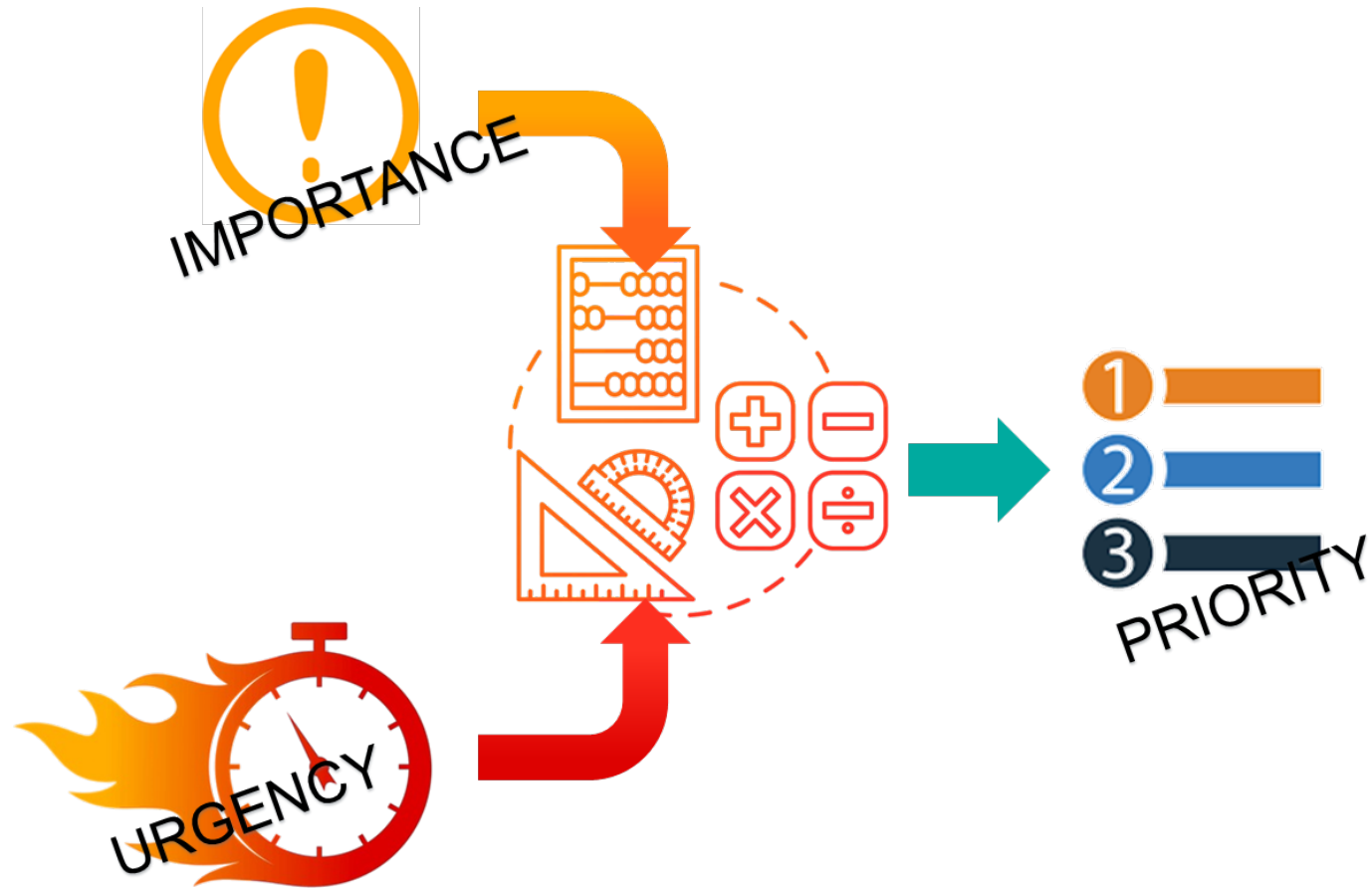
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The Tyranny of Volume

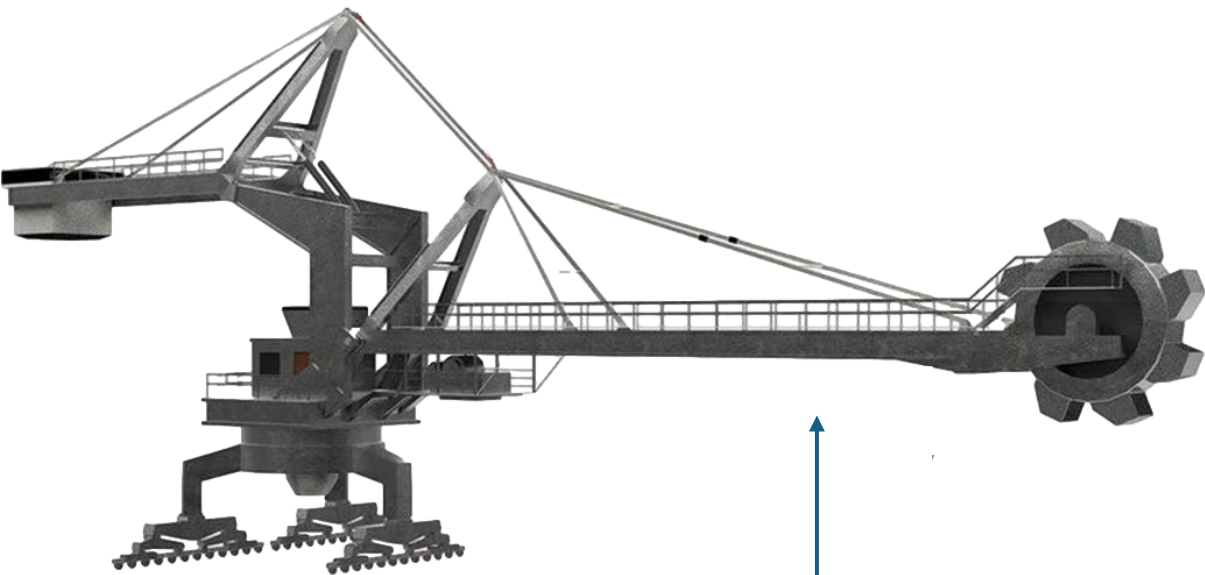


Introducing the model



Importance

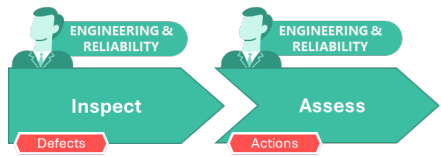
Importance is a measure of business risk.



Equipment Criticality
(EC)

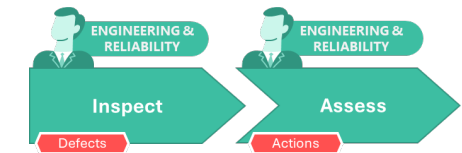
Component Criticality
(CC)

+



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Risk Ranking
(RR)



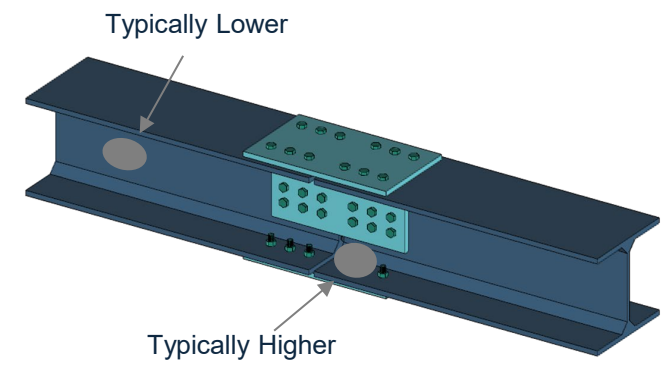
Urgency

Urgency is a measure of structural risk.



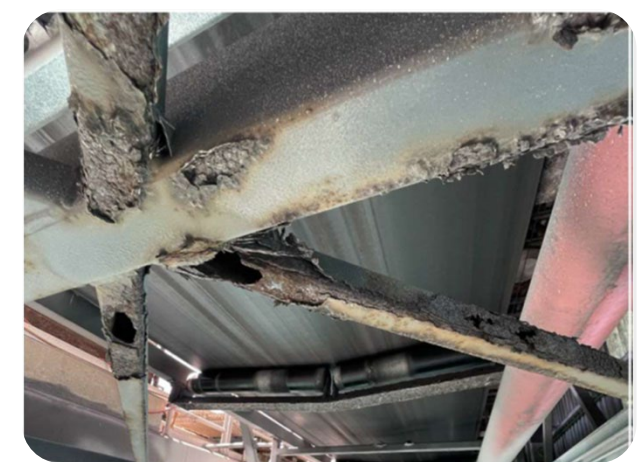
↑
Deterioration Factor
(DF)

Offshore below coal, subject to spillage and build-up. Splash zones / severe marine environment



↑
Defect Impact
(DI)

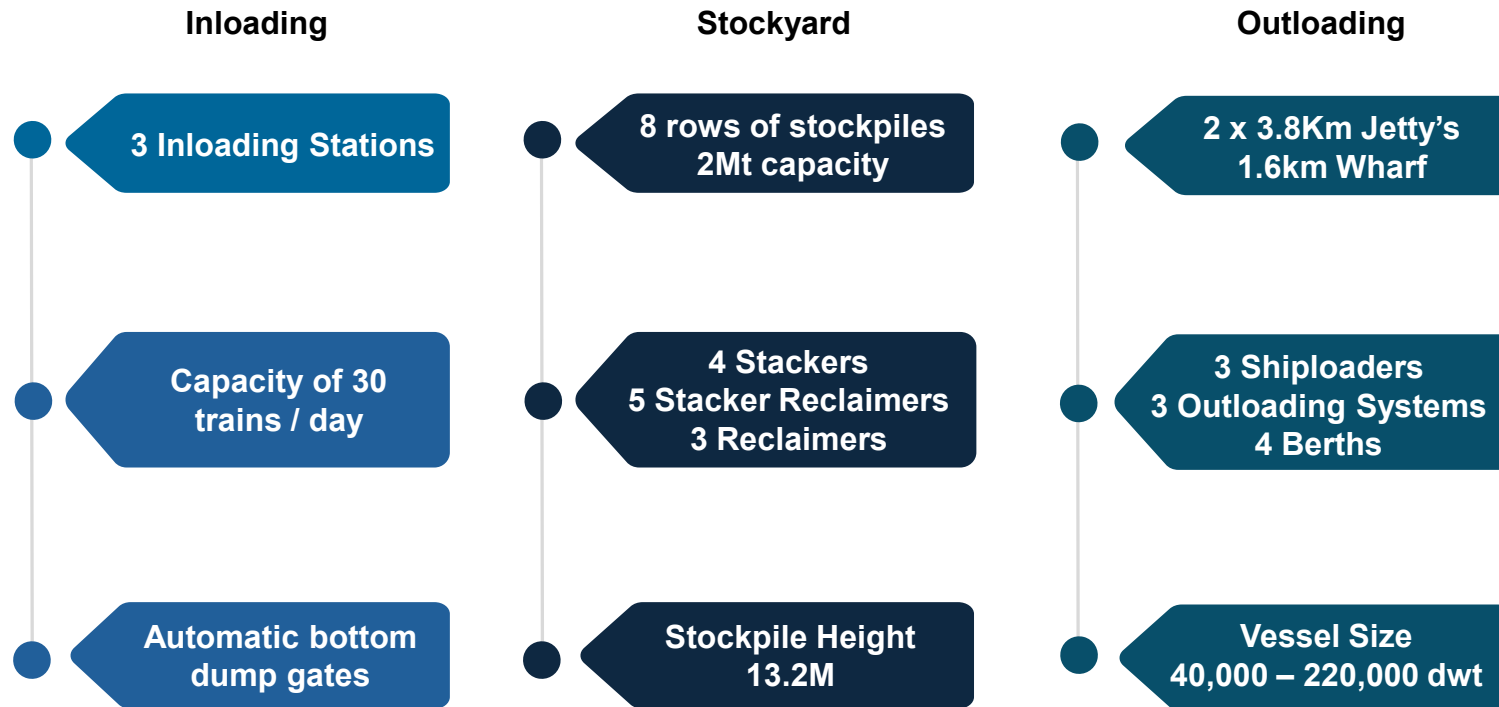
Varies due to stresses on members, utilisation etc.



↑
Defect Rating
(DR)

How bad is the defect?

Case Study - DBT

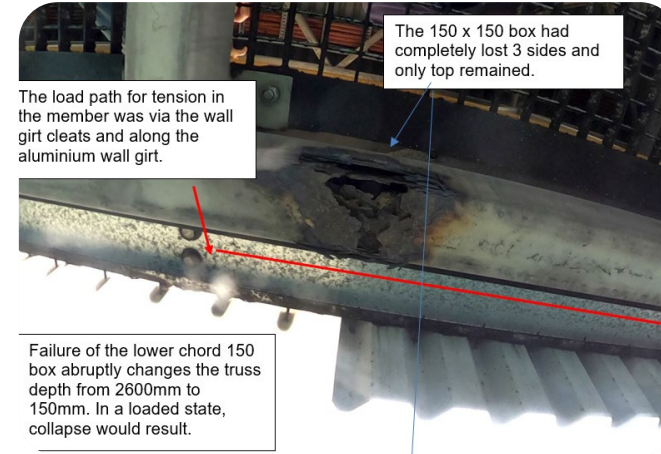


Emergency Interventions

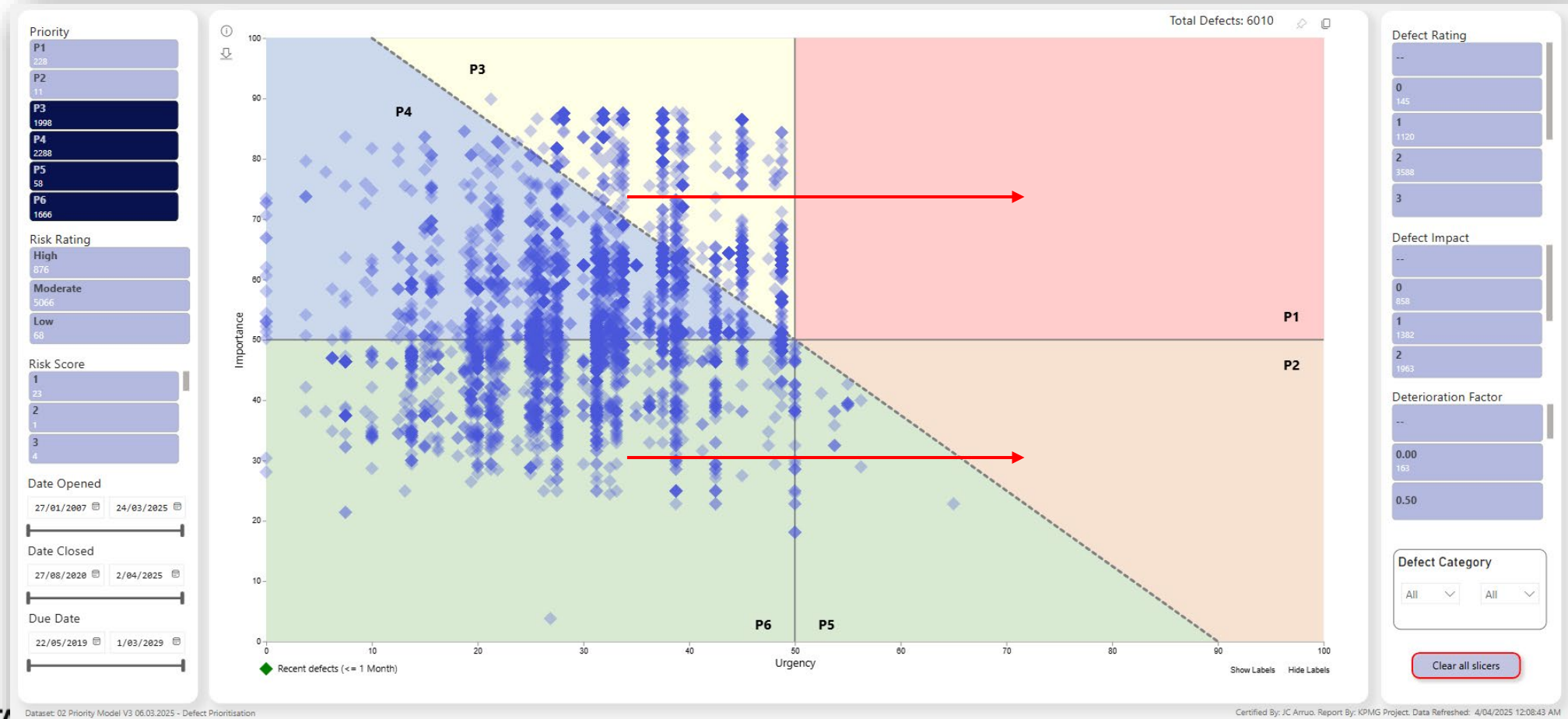
Berth Outage



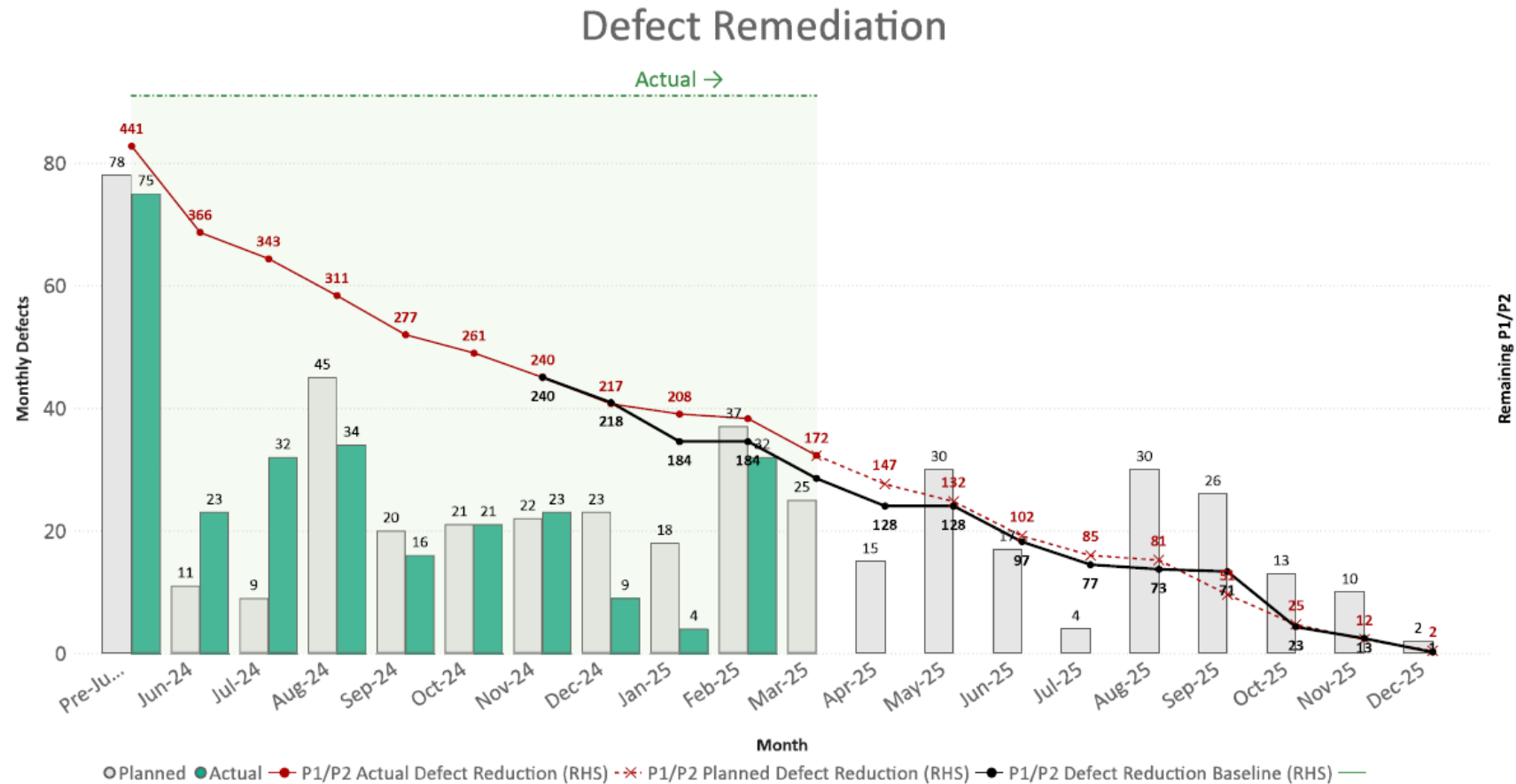
Conveyor Outage



The Matrix



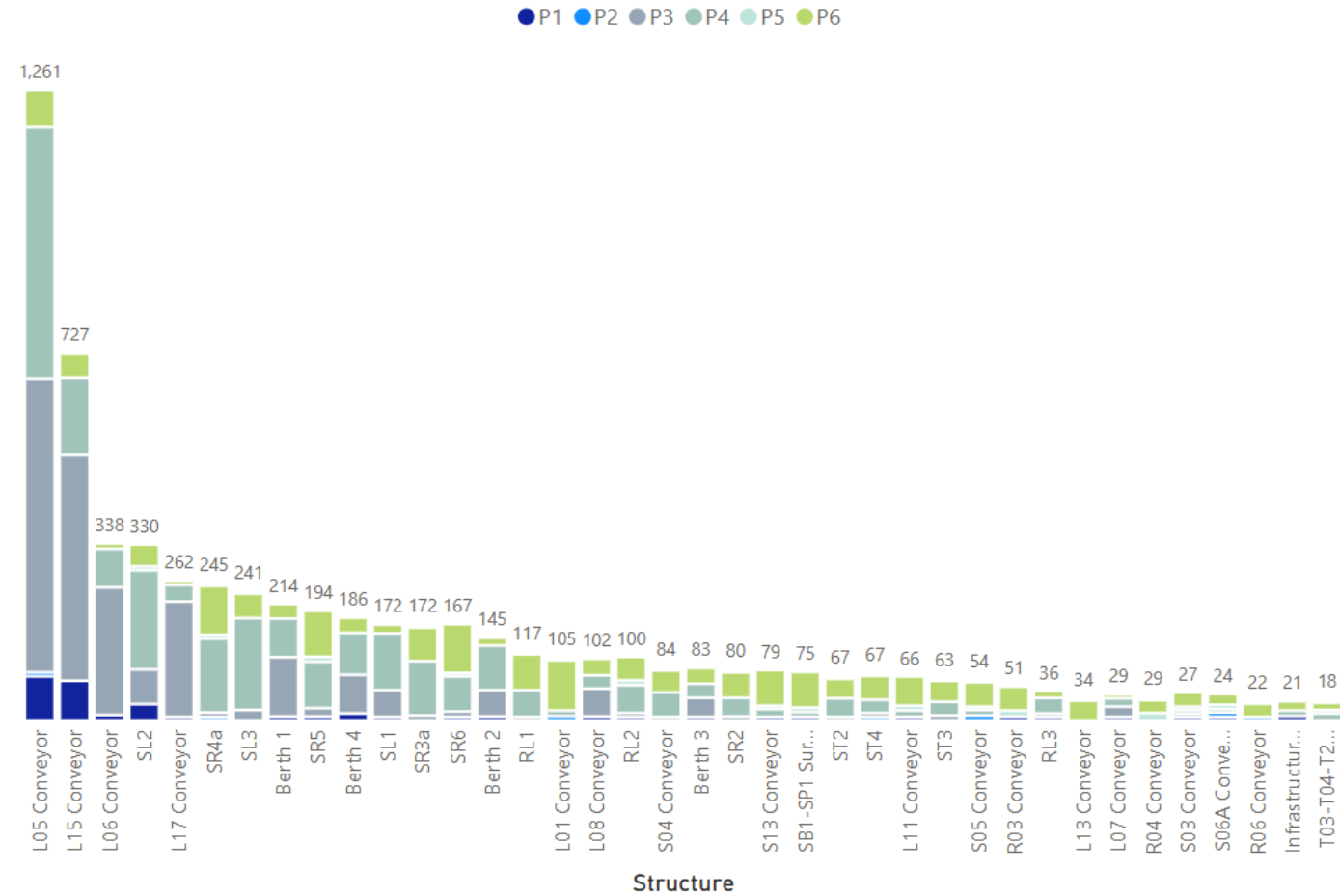
Practical Application



Practical Application



Defects by Structure



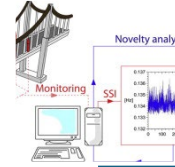
Integrating SHM Data into the Relative Risk Model

Why Integrate



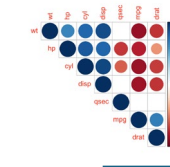
- Inspections provide snapshots
- Sensors provide continuous insight
- Combining both strengthens custodianship

How Monitoring Enhances the RRM:



- Sensor trends quantify deterioration rate
- Detect condition change between inspections
- Calibrate severity using structural response data
- Automated alerts trigger priority reassessment

Outcome – A Dynamic Priority Matrix:



- Real-time urgency updates
- Faster response to emerging risks
- More transparent maintenance decisions

How SHM Data Feeds the Relative Risk Model

Sensor Inputs → Data Processing → RRM Urgency Update

- Sensor Inputs:
 - Strain, vibration, displacement, corrosion rate
 - Threshold events and anomalies
- Data Processing:
 - Trend analysis (rate of change)
 - Event detection and classification
 - Mapping to defect categories
- RRM Integration:
 - Updates Deterioration Factor (DF)
 - Adjusts Defect Impact (DI)
 - Triggers real-time urgency score changes

Future Opportunities for SHM–RRM Integration

Advancing Custodianship with Continuous Risk Intelligence:

- Real-time digital twin alignment with defect priorities
- AI-driven mapping of sensor signatures to defect types
- Automated alerts embedded into maintenance workflows
- Predictive maintenance based on deterioration modelling
- Centralised dashboard for live priority matrix updates
- Integration with enterprise asset and work management systems

Wrap Up



Deeper and richer understanding of structural condition



Refined set of structural priorities for the asset owners /asset management team



Brought people and teams together



Clear and transparent plan for remediation

Thanks for your attention

- Sam.Mazaheri@bia-co.com
- www.bia-co.com.au

- Questions?