

Utilizing Software to Accelerate the Adoption of Preventive Maintenance at NYCT

Wesley Thomas, Sentient Science



RAIL TRANSIT SEMINAR • OCTOBER 18, 2021



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Agenda (15 Slides)

- **Challenge:** State of Good Repair Budgeting (1)
- **Opportunity:** NYSERDA Innovation Program (1)
- **Case Study:** Economic Model Insights (7)
- **Case Study:** Grinding Simulation (4)
- **Next Steps:** Enterprise Asset Management (1)
- **Thank You:** Questions and Answers (1)



Challenge: Fund State of Good Repair

In 2018, Sentient Science attended 5 transit conferences to meet 57 end users across 25 transit agencies.

Agencies could not provide evidence to quantify the benefits of preventive maintenance for procurement decision making:

- Request preventive maintenance funding
- Protect existing preventive maintenance budgets
- Differentiate performance of maintenance contractors



Opportunity: NYSERDA PON3914

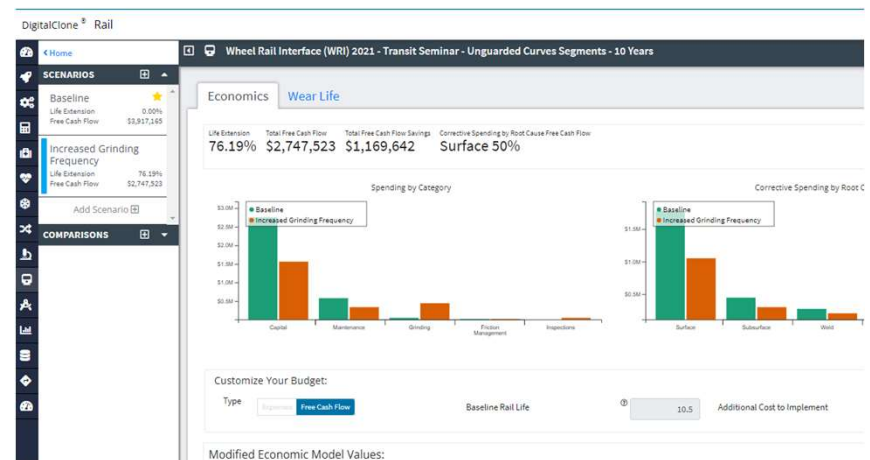
- NYSERDA Public Transit Technology and Innovation Program
- Demonstrate at New York City Transit (NYCT)



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– Support from 5+

DigitalClone[®] for Rail



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ECONOMIC MODELS

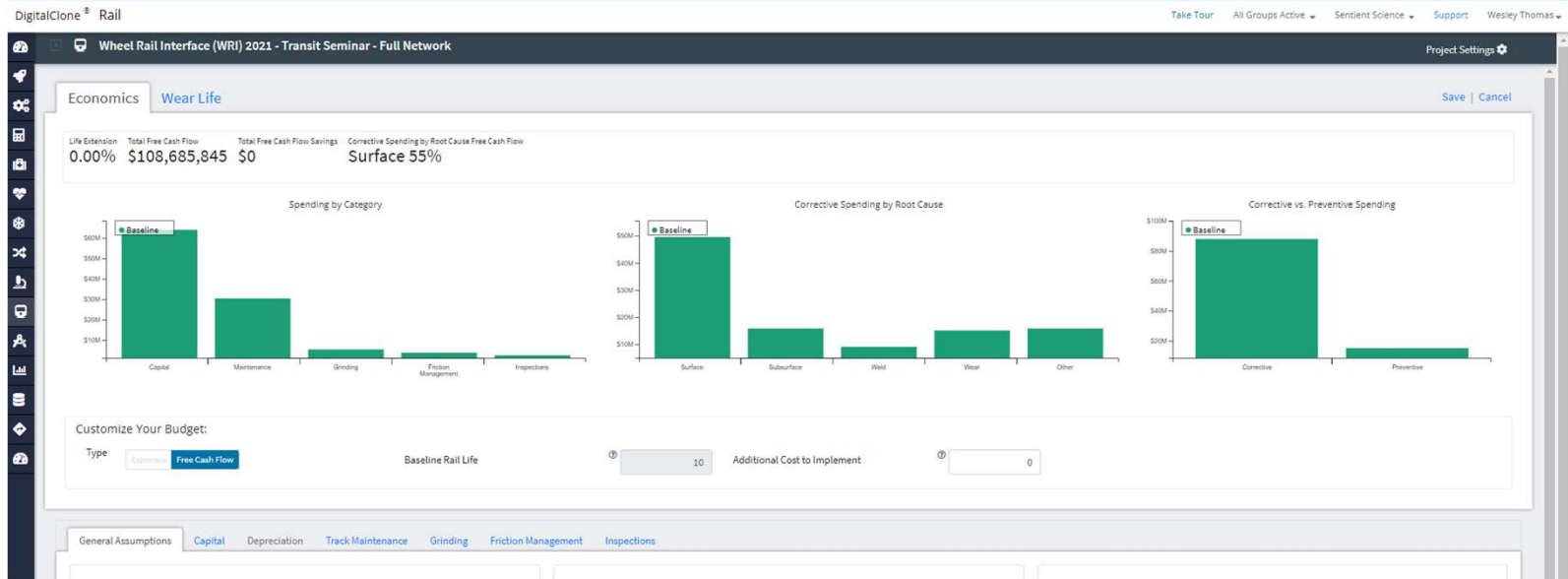
TRACK MODELS

WHEEL-RAIL MODELS

WEAR MODELS

RCF & GRINDING MODELS

ASSET MANAGEMENT



Economic Model – Full Network

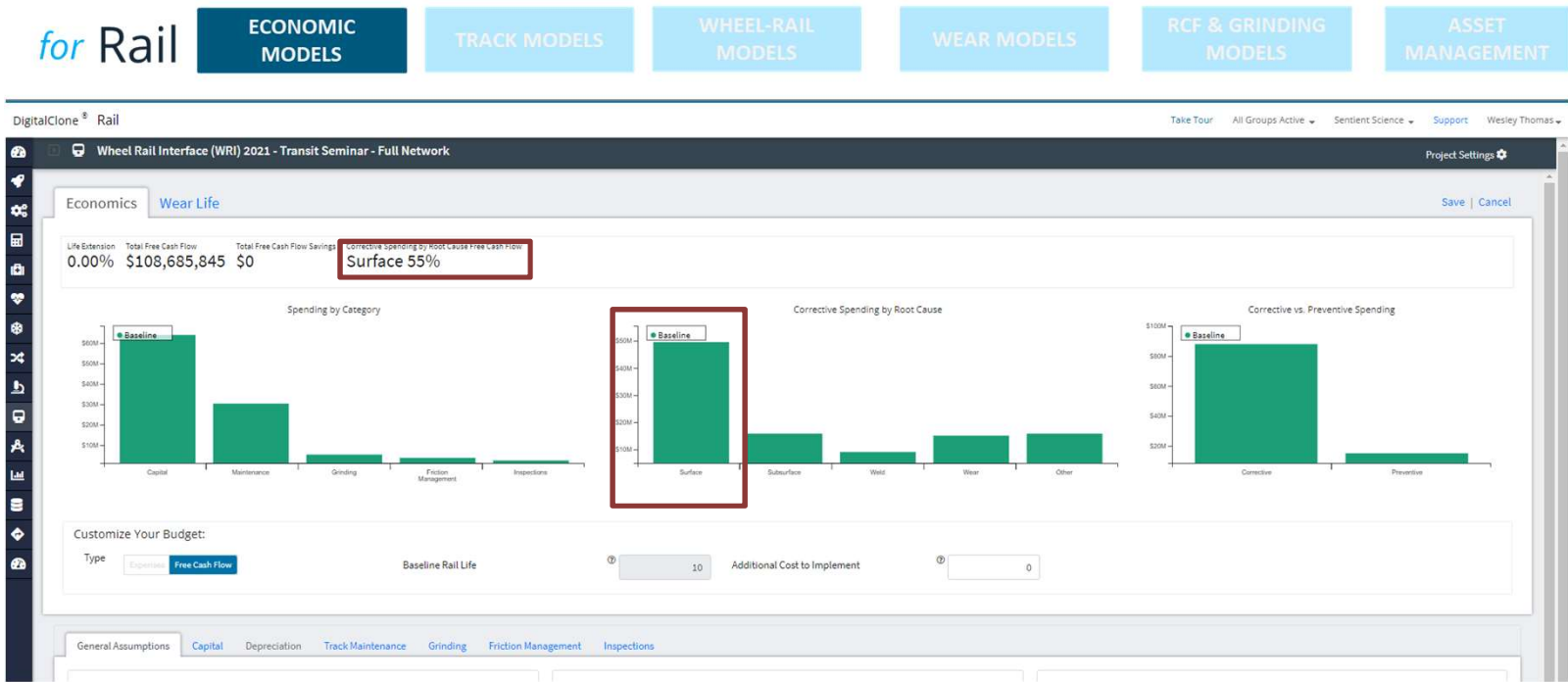
Identify **Total Rail Spending** and **Root Causes**



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Economic Model – Full Network

Surface Related Defects are #1 Root Cause



for Rail

ECONOMIC MODELS

TRACK MODELS

WHEEL-RAIL MODELS

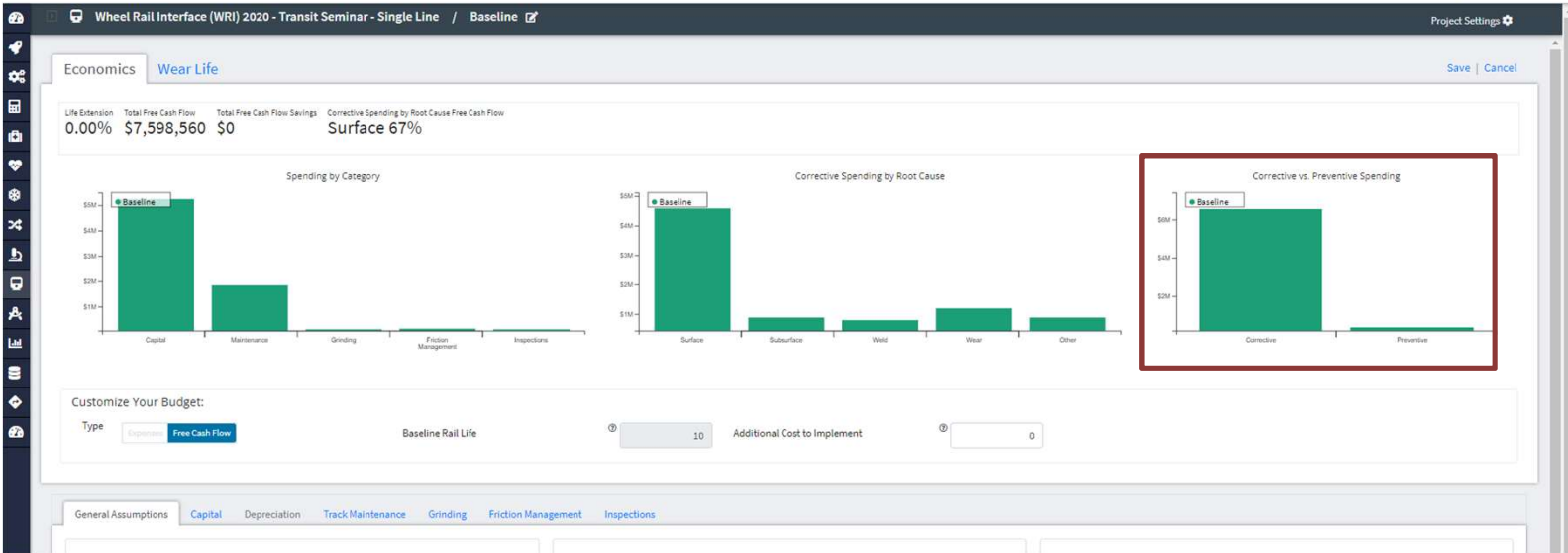
WEAR MODELS

RCF & GRINDING MODELS

ASSET MANAGEMENT

DigitalClone® Rail

Take Tour All Groups Active Sentient Science Support Wesley Thomas



Economic Model – Specific Line

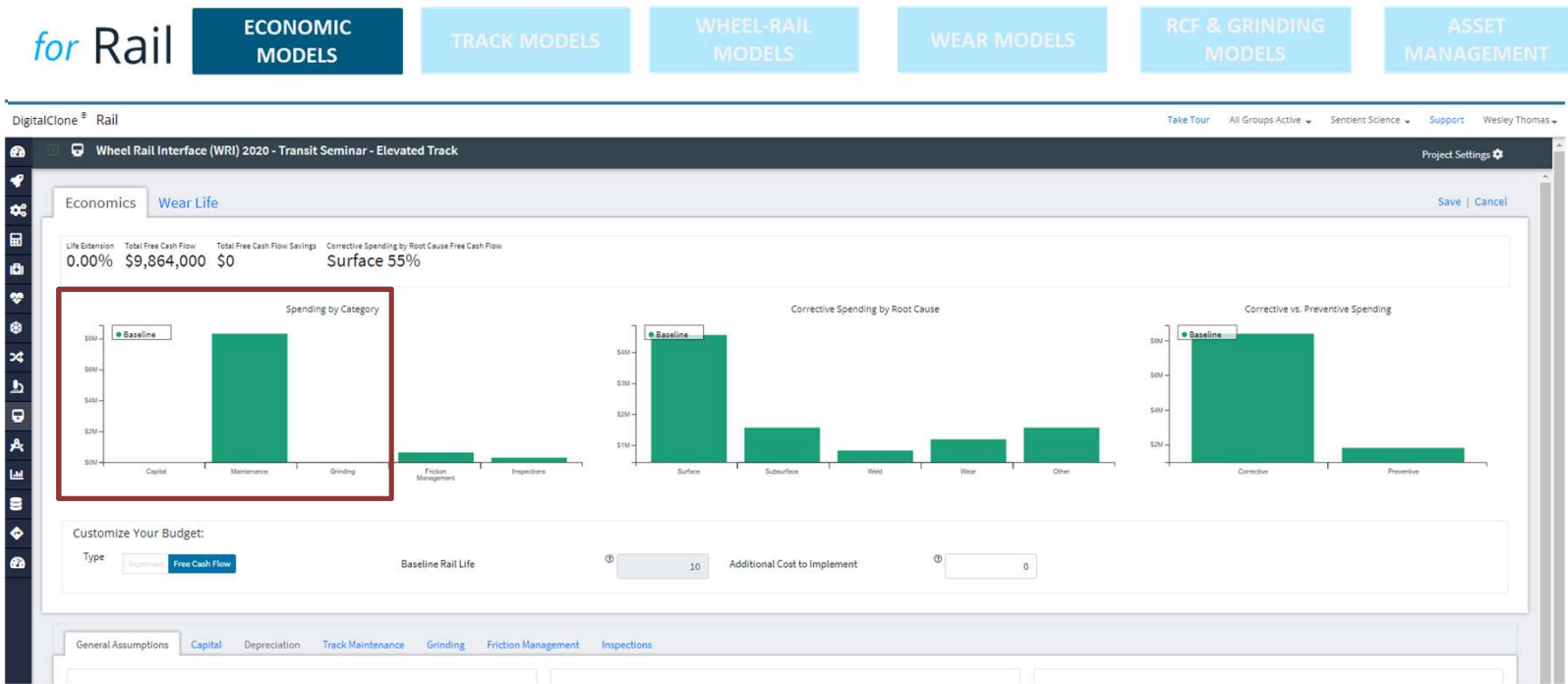
Higher Replacement, **Lower Preventive Funding**



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Economic Model – Elevated Track

No CWR or Grinding Available



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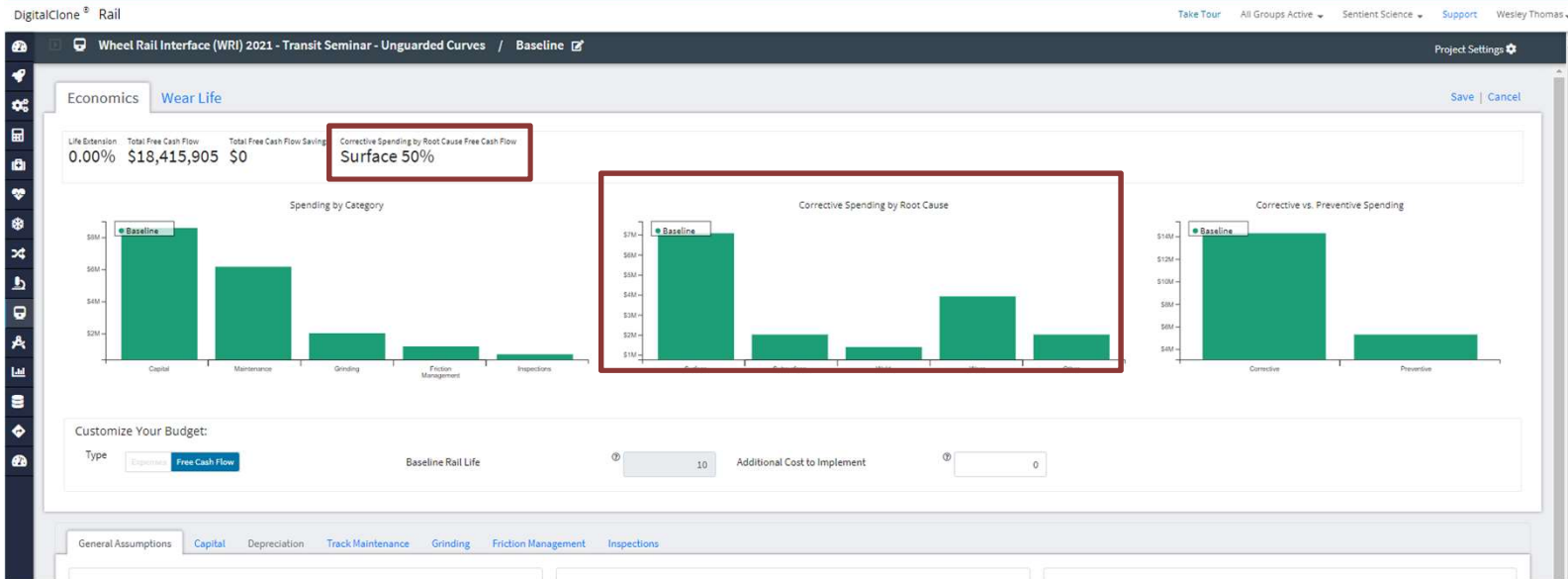
Wheat Rail Interface (WRI) 2021 - Transit Seminar - Full Network / Baseline Project Settings

Equipment Cost	Total Lubricators Ground	0	Production Shift Hours Used by Other Delays	1.88
Lease Cost per Production Shift	Total Miscellaneous Special Track Ground	0	Spark Time Hours per Shift	1.12
Lease Cost per Production Travel Day	Total S&C Curves Ground	0	Total Shifts Required for Production Grinding	179
Lease Cost per Production Pass Mile Ground	Total S&C Tangents Ground	0	Total Production Travel Days	0
Number of Production Grinders Owned	Total S&C Units Ground	0	Total Shifts Required to Execute Production Grind Plan	179
Capital Cost per Production Grinder	Total S&C Passes Ground	0	Average Number of Passes (S&C)	5
Useful Life per Production Grinder (Years)	Does Grinding Require Track Access?	True	S&C Spark Minutes Required per Switch Pass	0.5
Depreciation Cost per Grinder per Year			S&C Spark Minutes Required per Crossing Pass	0.5
Total Equipment Cost of Production Grinding	Labor Costs of Grinding		S&C Spark Minutes Required per Hot Box Detector Pass	1
Total S&C Grinding Equipment Cost	Number of Laborers per Production Shift	7	S&C Spark Minutes Required per Wayside Lubricators Pass	1
Capital Cost per S&C Grinder	Number of Overtime Hours Required per Production Shift	2	S&C Spark Minutes Required per Miscellaneous Special Track Ground Pass	1
Lease Cost per S&C Shift	Ratio of Grinder Maintenance Shifts Required to Grinding Shifts	1	S&C Spark Minutes Required for Curve Pass	1
Lease Cost per S&C Spark Hour Ground	Total Grinder Maintenance Shifts Required	179	S&C Spark Minutes Required for Tangent Pass	1
Lease Cost per S&C Travel Day	Ratio of Grinder Maintenance Labor Cost Compared to Grinding Labor Cost	0	Ratio of S&C Operating Minutes to Spark Minutes	1.5
Useful Life per S&C Grinder (Years)	Total Grinder Maintenance Labor Cost per Shift	\$ 0.00	Spark Hours Required for S&C Plan	0
Depreciation Cost per S&C Grinder per Year	Total Labor Cost of Production Grinding	\$ 833,245.00	Hours per S&C Grinding Shift	8
Number of S&C Grinders Owned			Shifts per S&C Grinding Shift	4

Economic Model – Track Access Required + Costs

Calculate the cost/benefit of additional track time & shift efficiency

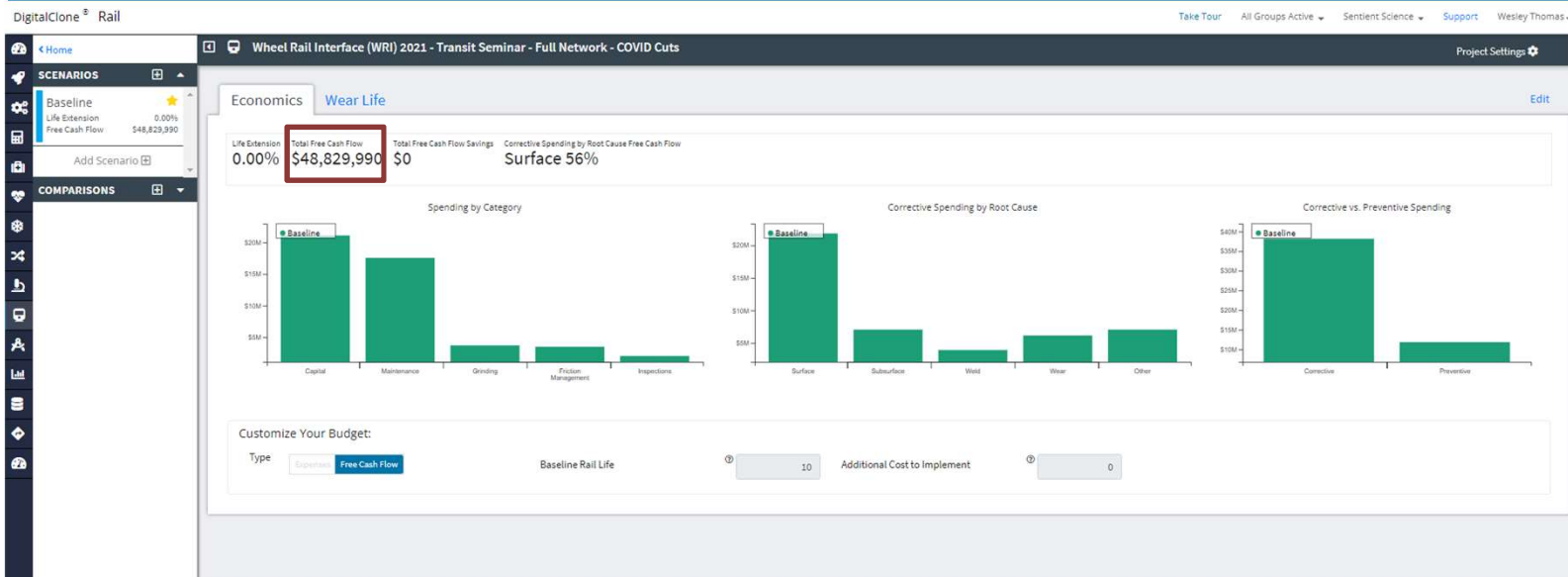




Economic Model – Unguarded Curves

Wear is higher % of root cause, but **Surface** is #1





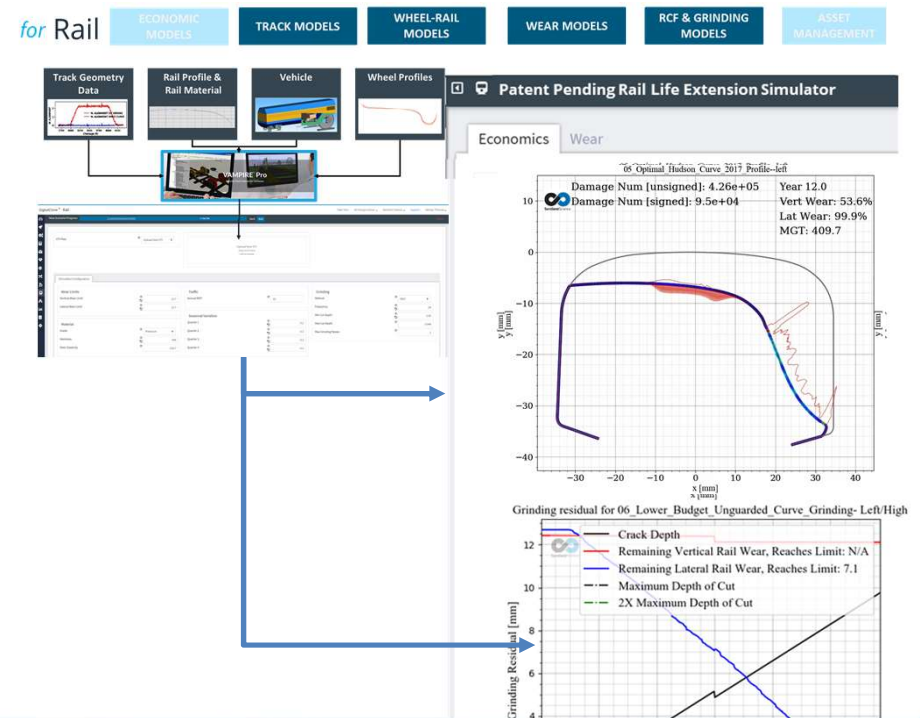
Economic Model – Budget Cuts

33% to 50% Cuts due to COVID-19 challenges



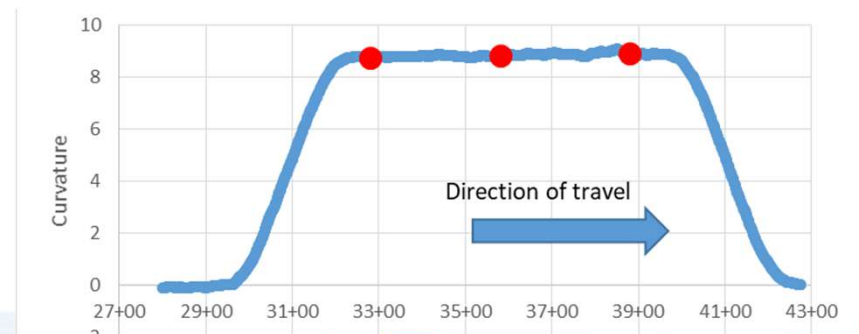
Case Study: Grinding Simulation

- Identified 4 locations
- Identified 8 use cases
- Started by comparing grind freq. and budget



Case Study: Grinding Simulation

- Sharp unguarded curve
- Wear and defects leading to replacement
- Grind for corrugation



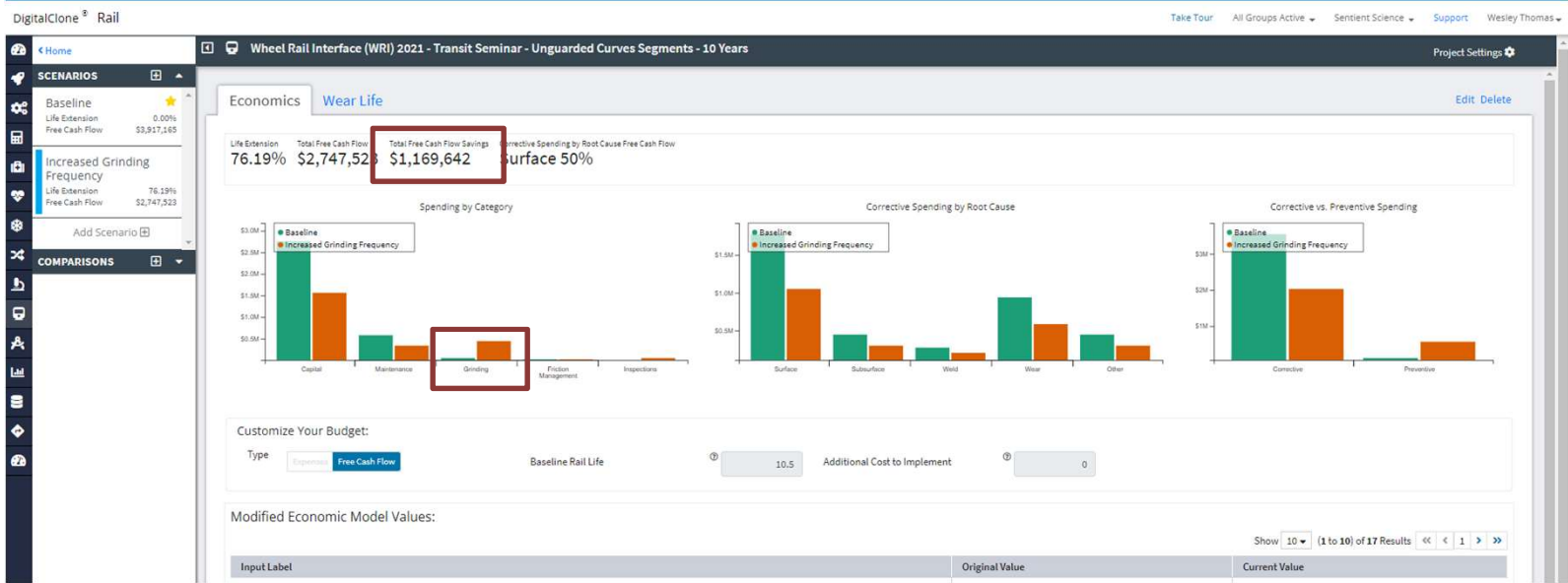
SCENARIOS Case Study – New York City Transit– Grinding Frequency Settings

9	Curve (degree)	9	Wear		Edit Copy Delete																				
5	Super-Elevation (inch)	5	<h3>COVID Cut Reduced Grinding Frequency</h3>																						
34	Annual Traffic (MGT)	34	<h3>Life Data</h3> <table border="1"> <tr> <td>7 / 14 (10.5)</td> <td>Life (Years) High / Low</td> <td>11 / 25 (18)</td> </tr> <tr> <td>241 / 493 (367)</td> <td>Life (MGT) High / Low</td> <td>445 / 865 (665)</td> </tr> <tr> <td>4.7 / 28</td> <td>RCF Damage Number (10⁶)</td> <td>0.4 / 11</td> </tr> <tr> <td>X% / x% (x%)</td> <td>Vertical Wear Remaining</td> <td>X% / x% (x%)</td> </tr> <tr> <td>11 / 49 (30)</td> <td>Wear Limit High / Low</td> <td>12 / 25 (18.5)</td> </tr> <tr> <td>Lateral / Vertical</td> <td>Wear Limit Reached</td> <td>Lateral / Vertical</td> </tr> <tr> <td>7 / 14 (10.5)</td> <td>RCF Crack Limit High / Low</td> <td>11 / 25 (13)</td> </tr> </table>		7 / 14 (10.5)	Life (Years) High / Low	11 / 25 (18)	241 / 493 (367)	Life (MGT) High / Low	445 / 865 (665)	4.7 / 28	RCF Damage Number (10 ⁶)	0.4 / 11	X% / x% (x%)	Vertical Wear Remaining	X% / x% (x%)	11 / 49 (30)	Wear Limit High / Low	12 / 25 (18.5)	Lateral / Vertical	Wear Limit Reached	Lateral / Vertical	7 / 14 (10.5)	RCF Crack Limit High / Low	11 / 25 (13)
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7 / 14 (10.5)	RCF Crack Limit High / Low	11 / 25 (13)																							
14	Timetable Speed (mph)	14	<h3>Current Grinding Frequency</h3>																						
115	Rail Weight (lb)	115																							
Head Hardened	Rail Material	Head Hardened																							
Updated Rail Profile	Grind Profile	Updated Rail Profile																							
204 (1x Each 6 Years)	Grind Frequency (MGT)	17 (2x Each 1 Years)																							
.028 / .024 from 10 Passes	Grind Depth (inches)	.028 / .024 from 10 Passes																							

Case Study: Grinding Simulation - Increased Grind Frequency

75% Life Extension due to 2x per year grinding

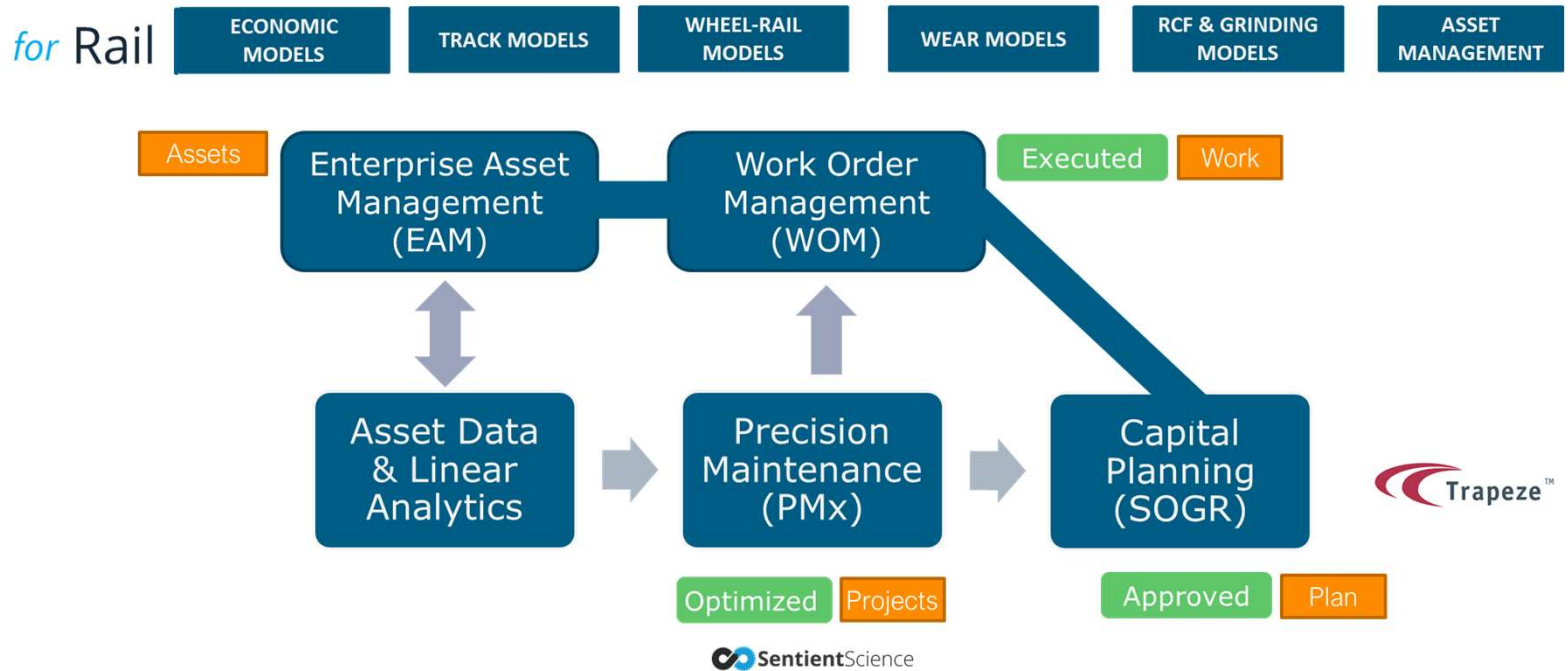




Case Study: Grinding Simulation - Increased Grind Frequency

\$1M Savings over 10 years on single curve due to 2x year grinding





Trapeze Group and Sentient Science Announce EAM Partnership
Get the Rail Maintenance Evidence to Show the Business Case



Thank you!

Reach Out:

- **Free** Economic Tools
- **Data** Quality Guidance
- Program **Updates**

Acknowledgements: Alexandre Woelfle (NRC-C), Eric Magel (NRC-C), Wei Huang (NRC-C), Dr. Ankur Ashtekar (Sentient), Ashkan Darbani (Sentient), Mark Reimer (ARM), Tom Lamb (NYCT), Tony Cabrera (NYCT), Rob Sarno (NYCT) +



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