



Intelligent O&M Canada Line Case Study

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Director, Asset Management



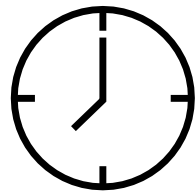
The Canada Line



since operation began in 2009

99.90%

System availability



99.72%

Punctuality



>500 million

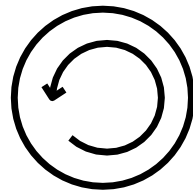
passengers since 2009

Average weekday ridership

>120000

\$1.9 billion

P3 project (2003 Dollars)



Delivered over

3 months

ahead of schedule

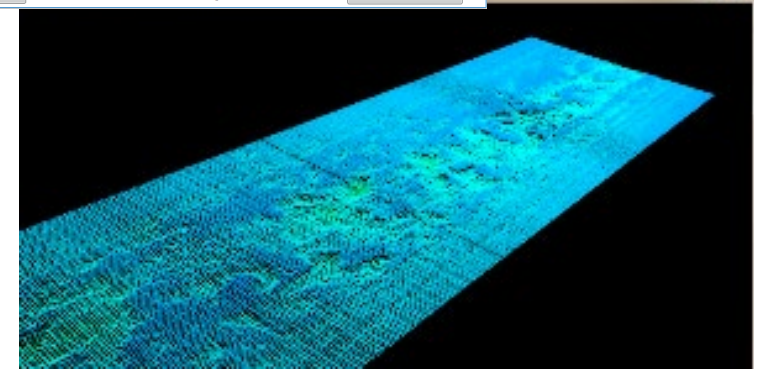
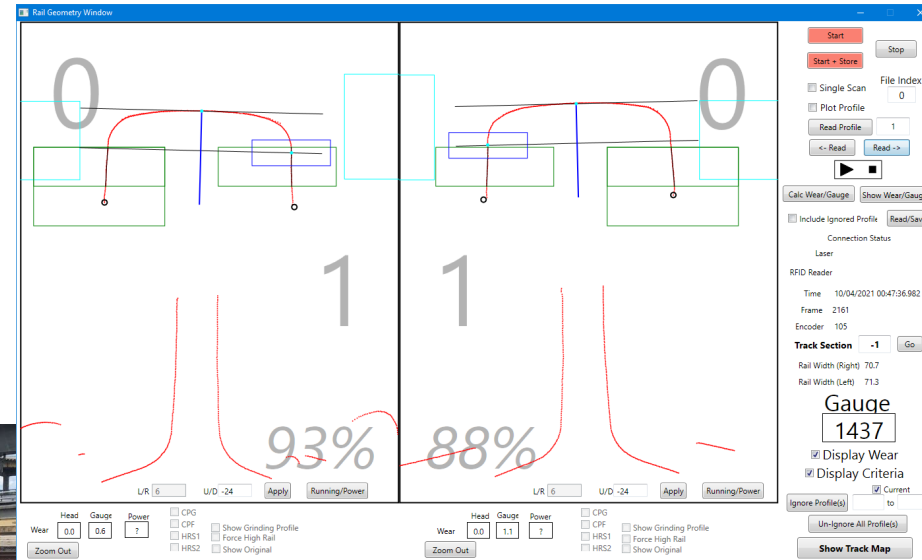
31 years

of O&M

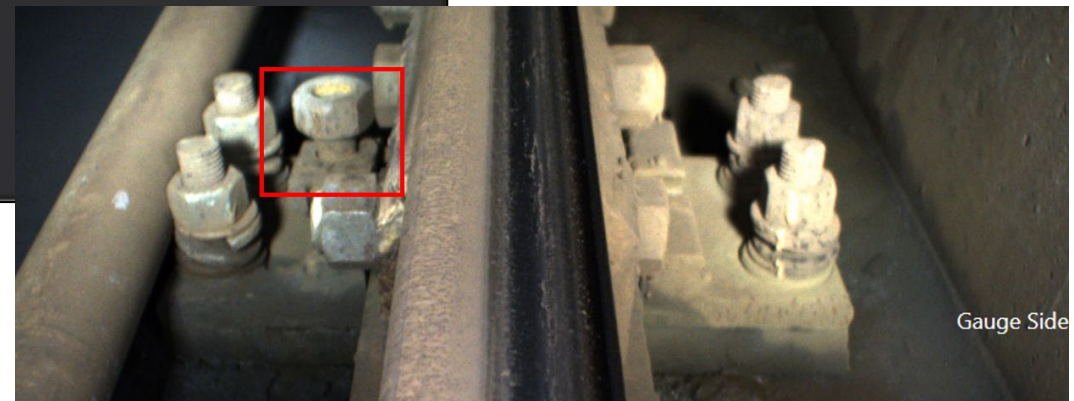
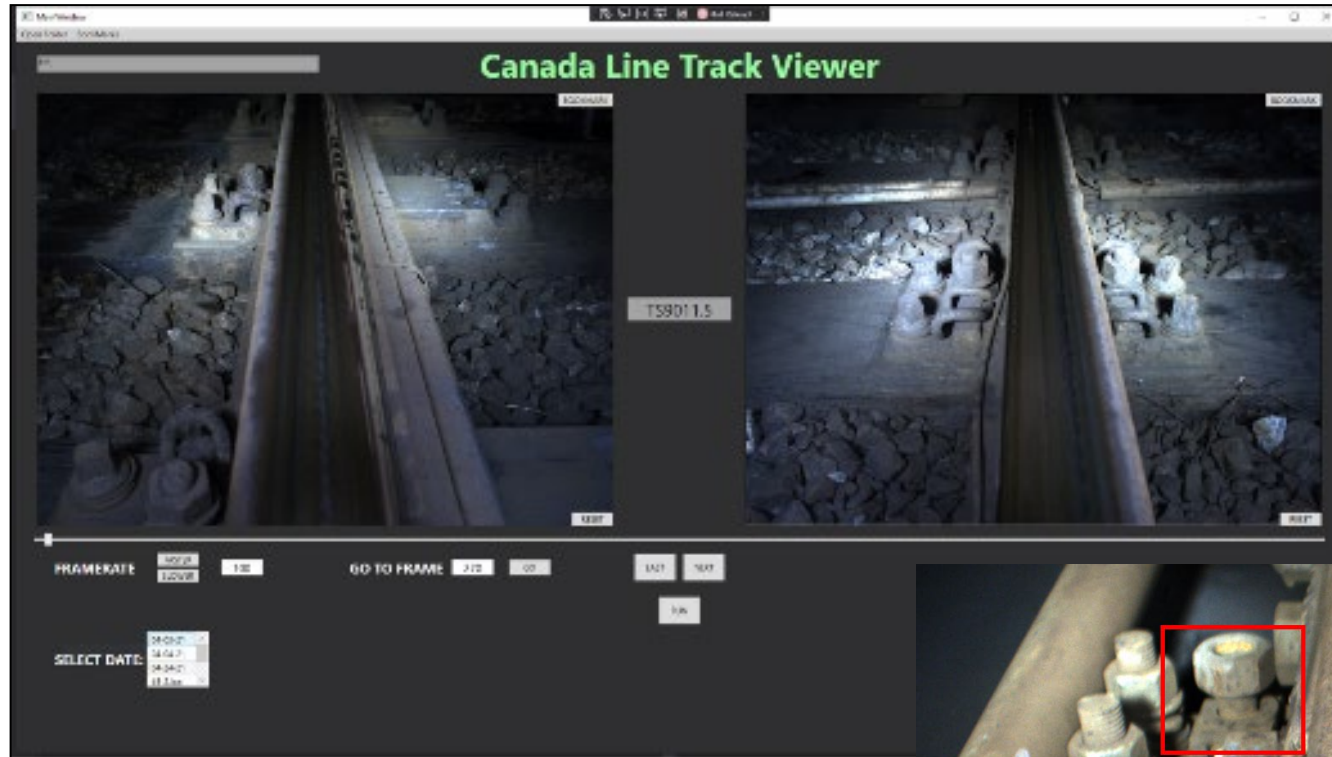
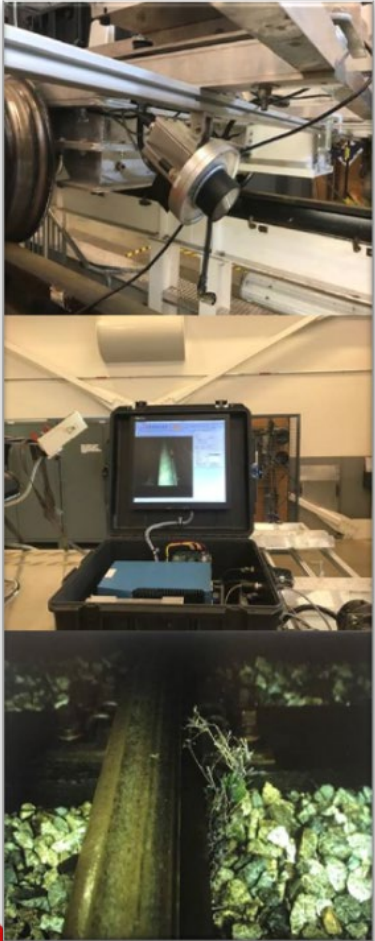


What is Intelligent Operations & Maintenance?

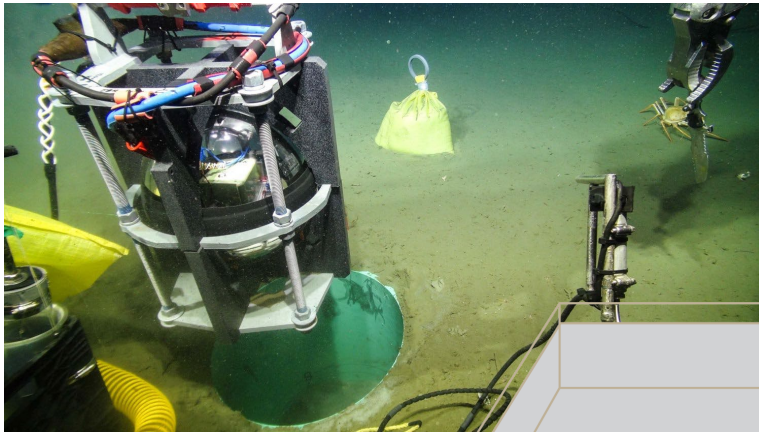
A Culture of Innovation: Rail Drone & Profile/Geometry Sensor Suite



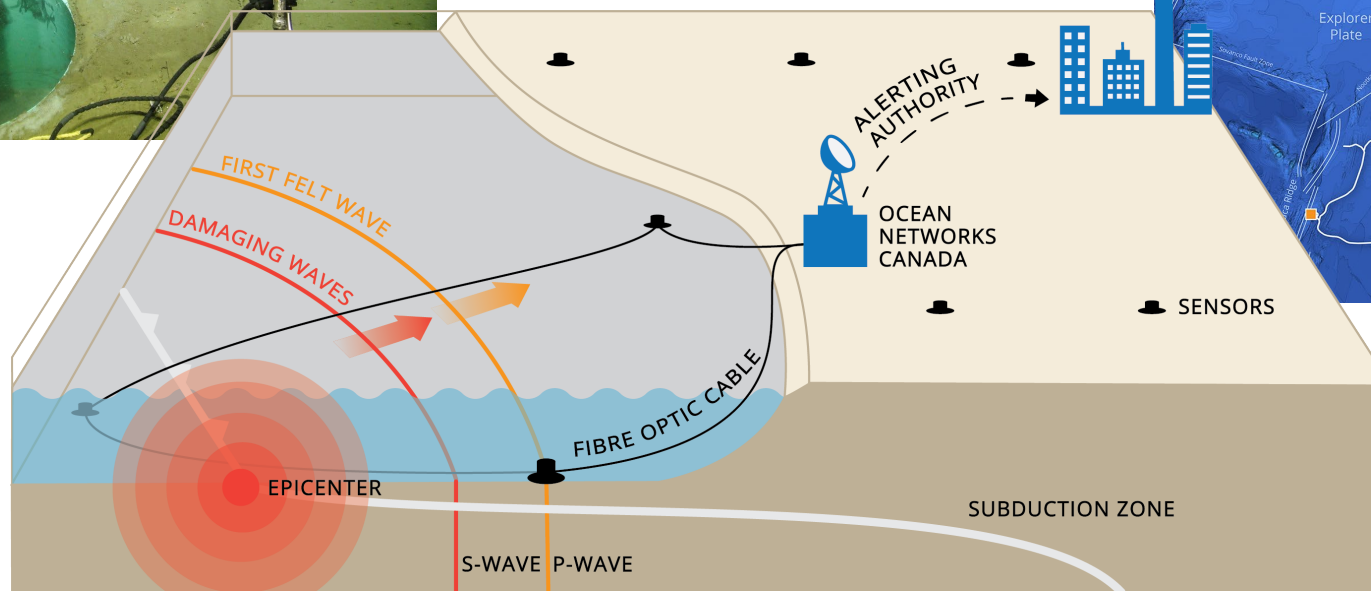
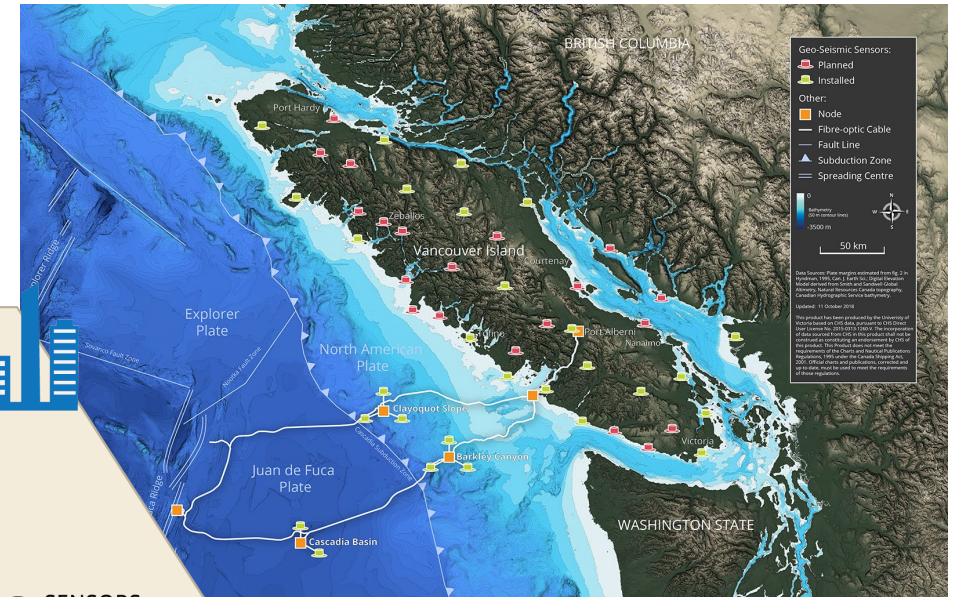
A Culture of Innovation: Guideway Visualization & Machine Vision



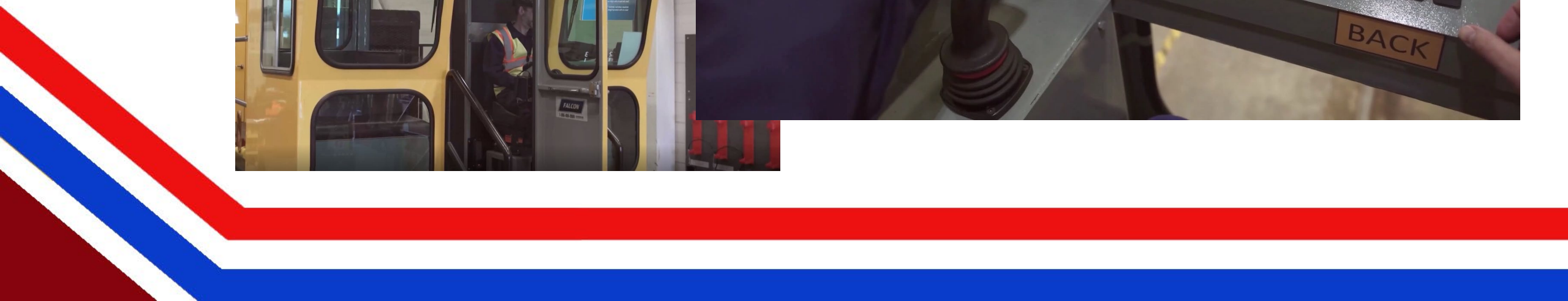
A Culture of Innovation: Early Earthquake Warning



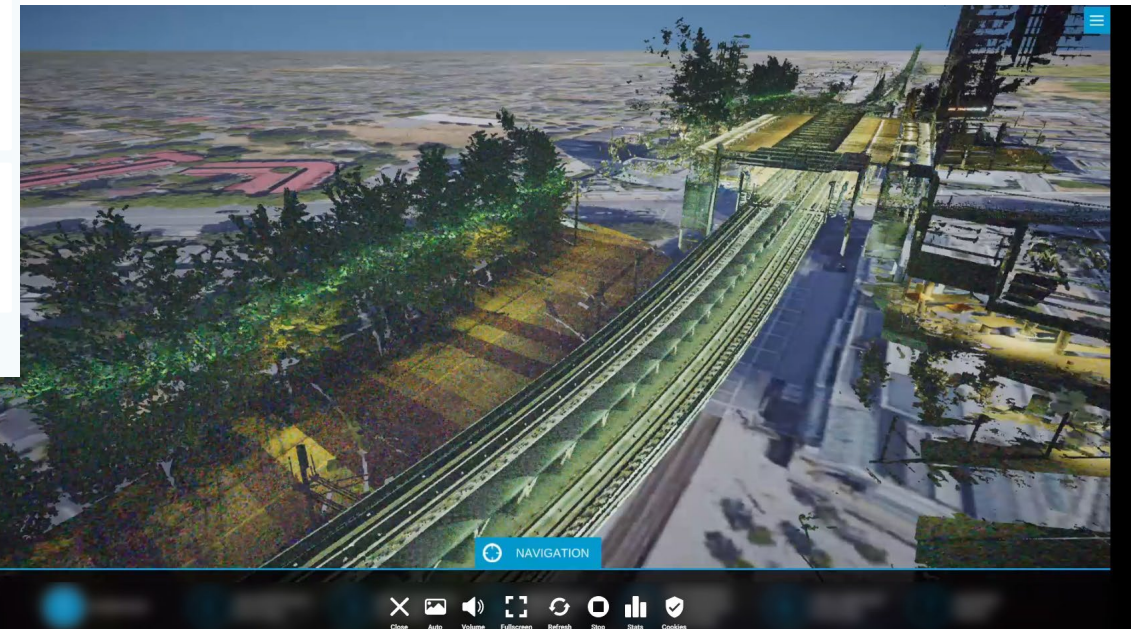
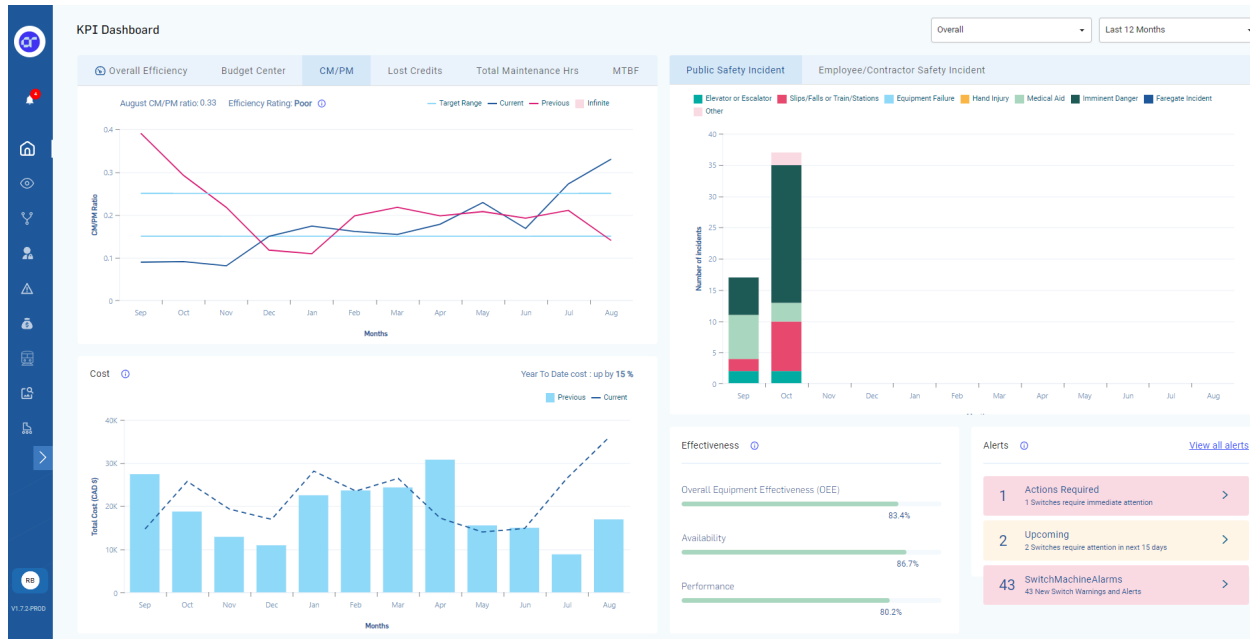
EARTHQUAKE
Mag 7.8 40s



A Culture of Innovation: AR Training and Competency



A Culture of Innovation: The Canada Line Digital Twin

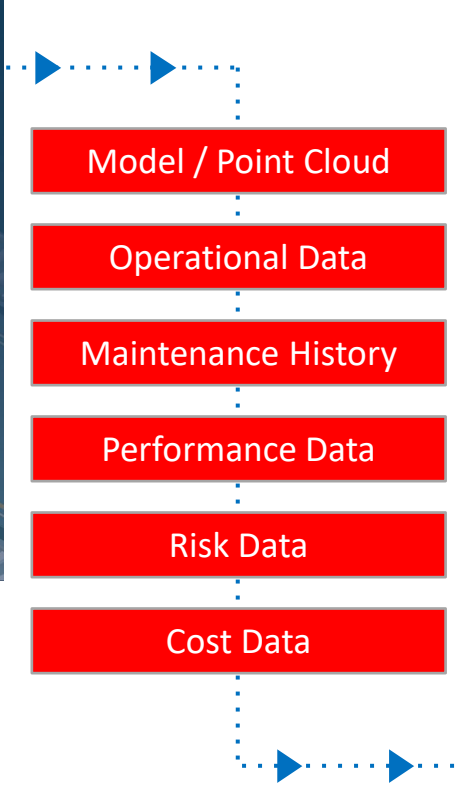




What is a Digital Twin?

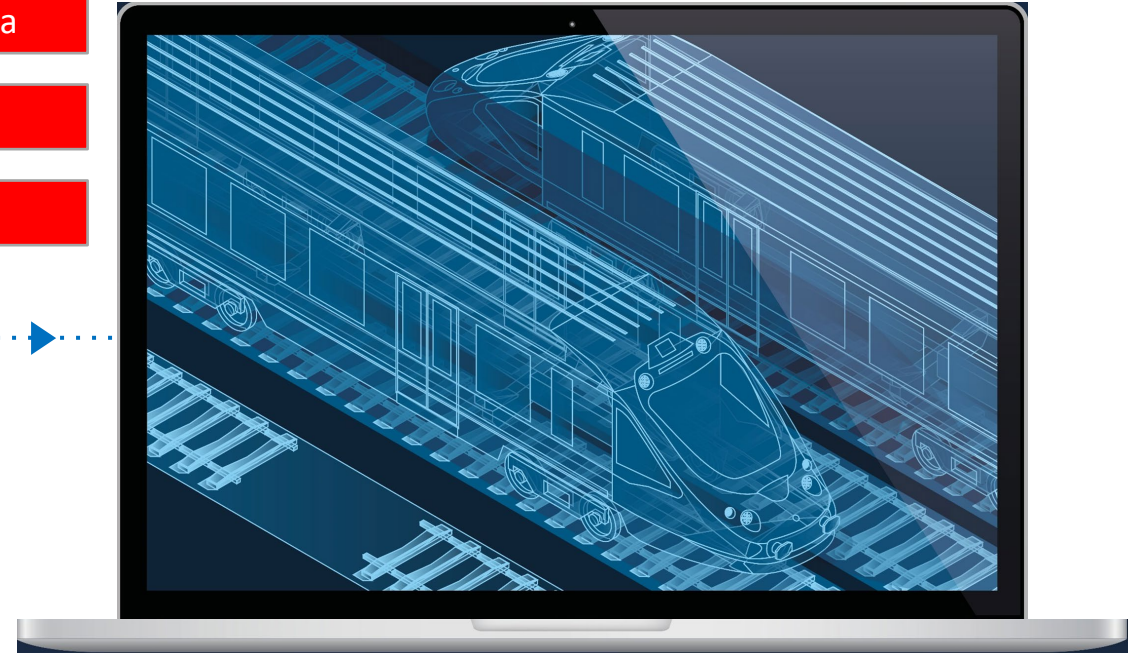


Physical Asset



Digital Twin

Physical Based Models
+ Statistical Models



Brownfield



Document "Library"

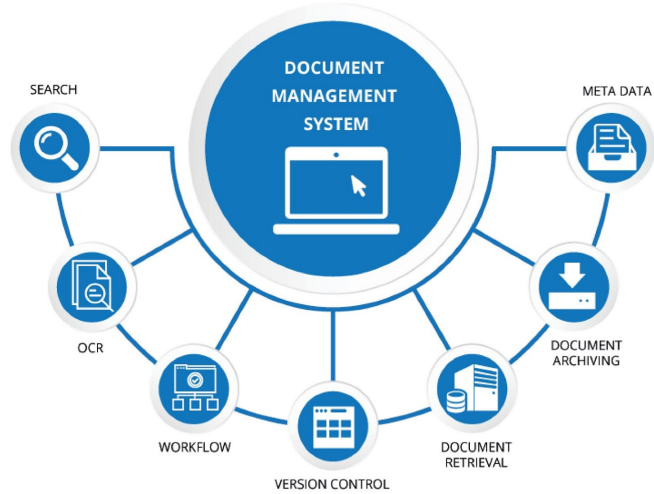


Infrastructure As-is

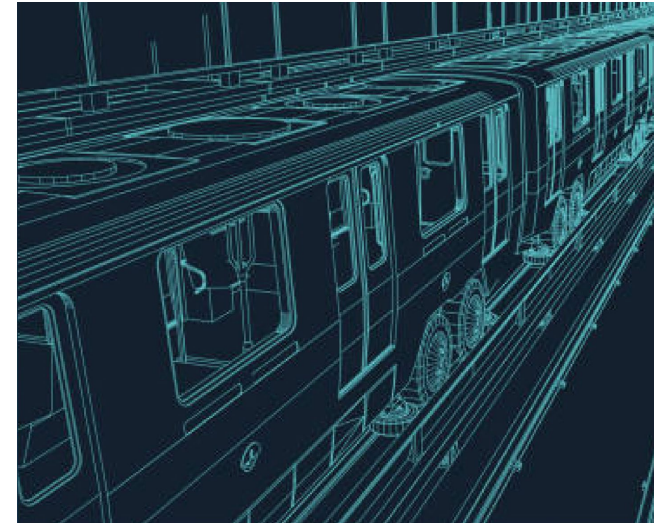


VS

Greenfield

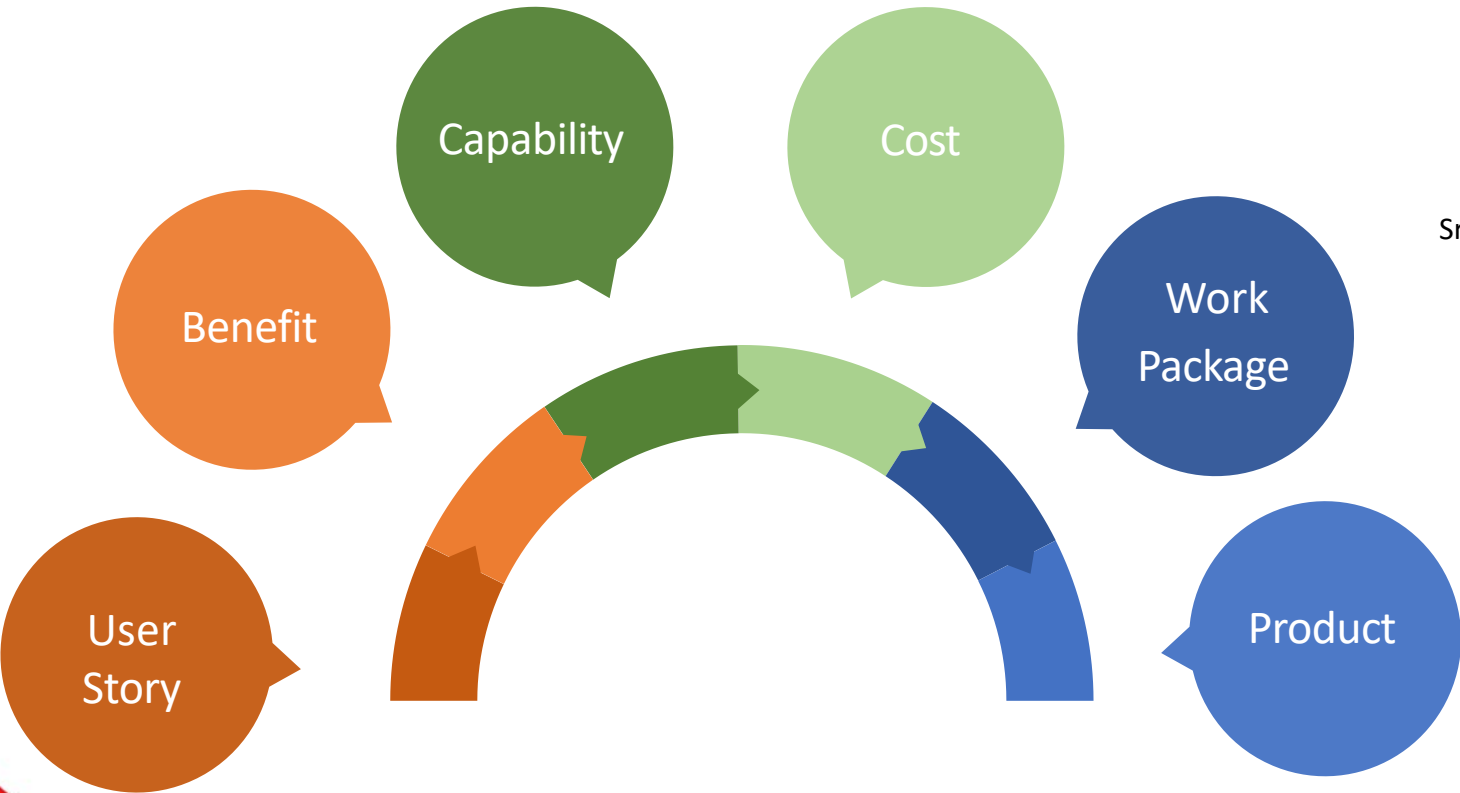


Intelligent Data Management System



Integrated 3D Models

User Driven Development



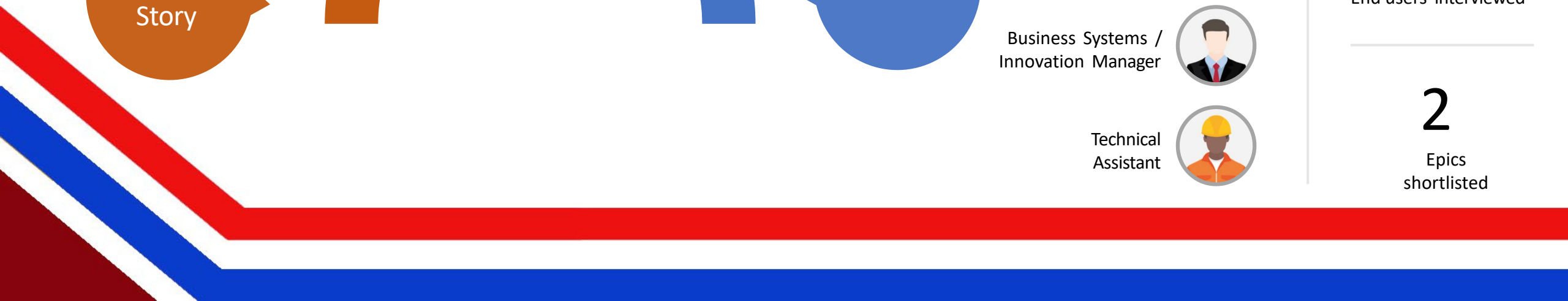
- Engineering Manager
- General Manager
- Sr. Maintenance Manager
- Finance Director
- Commercial Director
- Business Systems / Innovation Manager
- Technical Assistant

6
Workshops

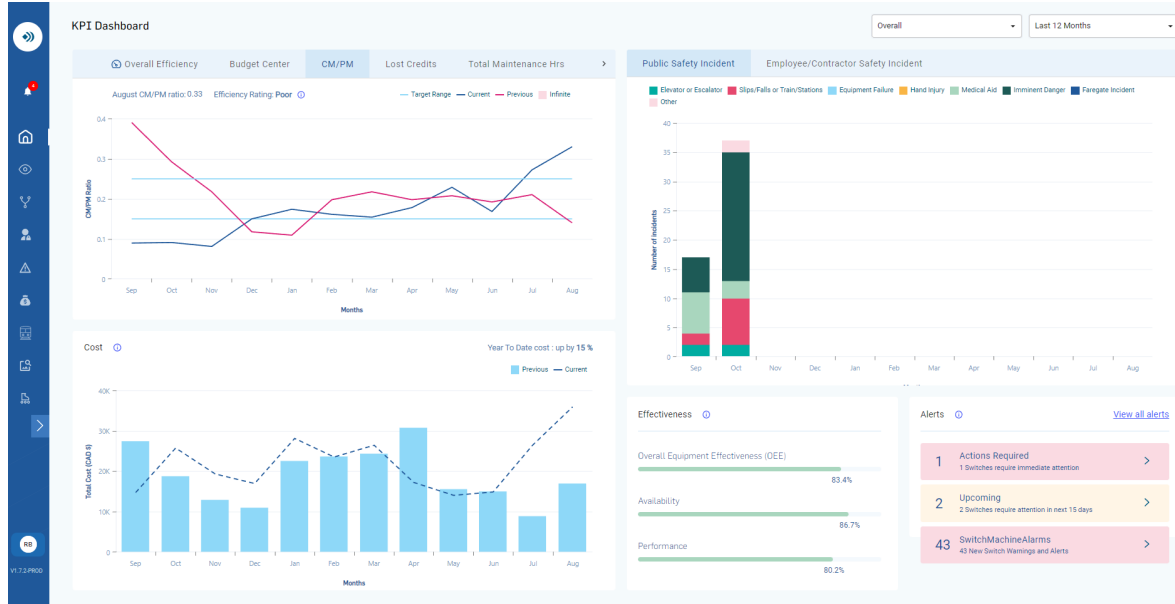
17
User stories identified

10+
End users interviewed

2
Epics shortlisted



Use Cases



Maintenance Insights Dashboard

Virtual Guideway

Assets

Select an asset to view more details and properties.

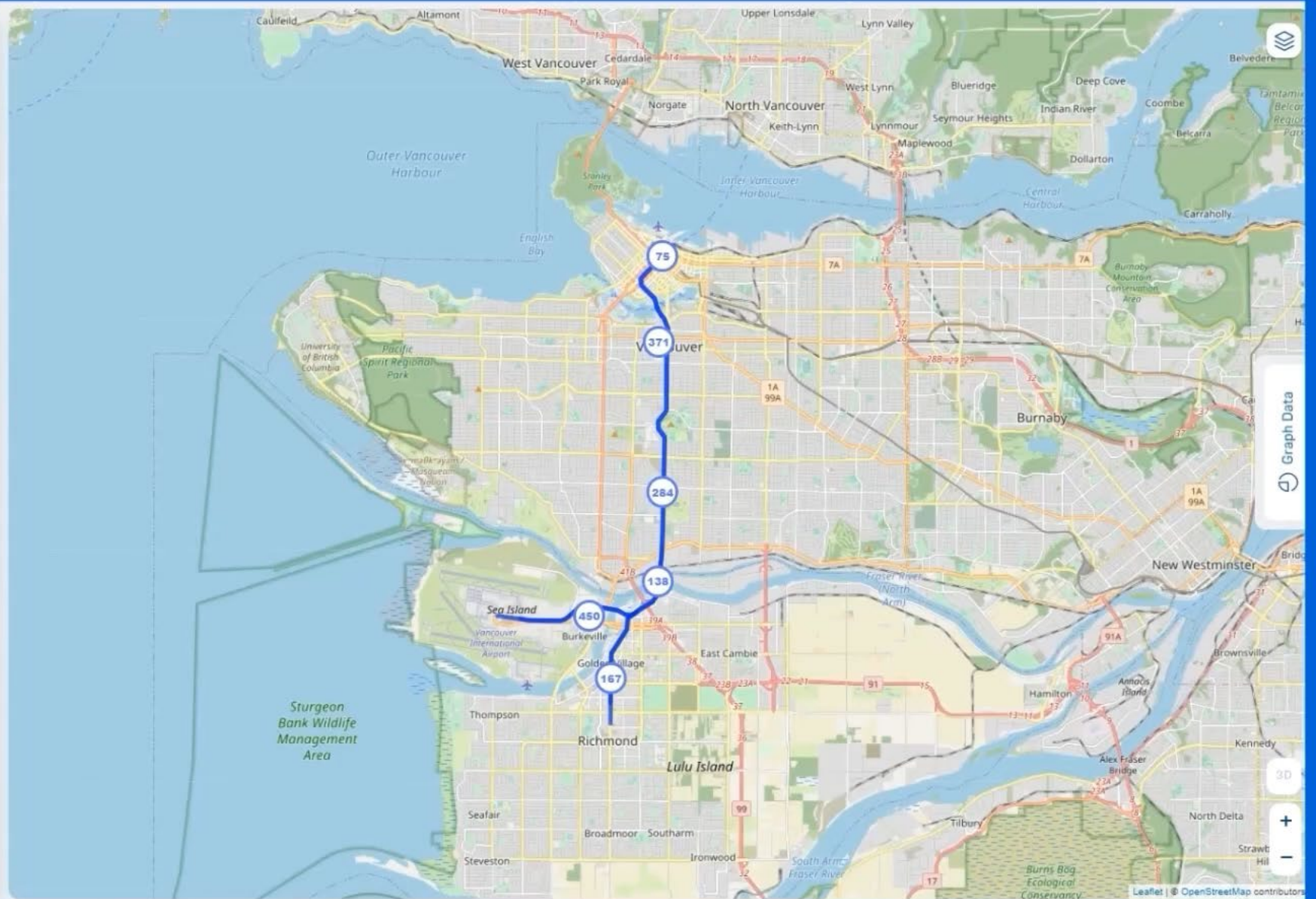
Search Assets:

[Export Data](#)

Asset List

Information

- Track (2)
- GuidewaySegments (5)
 - GS1 (4)**
 - GS2 (3)
 - GS3 (3)
 - GS4 (2)
 - GS5 (1)
- Stations (5)



Graph Data

3D

+

-

Graphical Data Overlay



- Rail Wear
- Geometry
- Noise
- Other track attributes

The screenshot displays a web-based asset management interface. On the left is a navigation sidebar with icons for home, search, and other functions. The main content area is divided into two panels. The left panel, titled 'Assets', contains a search bar, a view toggle for 'Asset List' and 'Information', and a 'View by: Track Map Hierarchy' dropdown. Below this is a tree view of assets, including 'MainLine (4)', 'GSI (4)', and several 'WSEC' (Walking Section) items. The right panel shows an aerial map with a blue and yellow track overlay. A tooltip is visible over a track segment, displaying attributes: TrackSection 2576, DbAvg 66.3, Powering 0, Velocity 38, and Flag 2. On the far right, an 'Attribute Information' panel is open, showing a detailed list of attributes for the selected track section.

Attribute Information	
Track Section	2576
Object	Tangent
Description	Tangent Track
Track	IB
Index	1
Walking Section	WSEC9
Guideway Section	GS3
Tag	WSEC9-1-TAN
Shared Walkway	NO
Note	Null
Track Number	648
Check	1
Chainage	204518.738
Loop Number	13
Position	64
Nearest Reference	Null
Chainage1	0
Alternate Chainage	Null
Target Track Speed	40
Grade	-0.0181
Radius	0
Crosslevel	0
TSC	Tangent

Switch Predictive Performance Module



Assets: SW325 Health BO

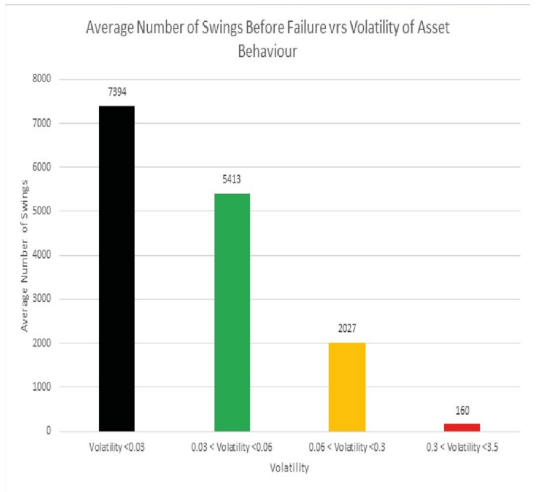
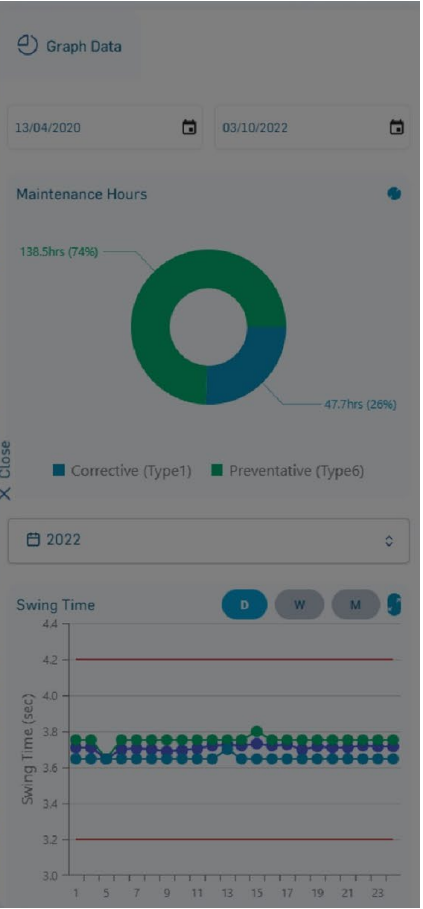
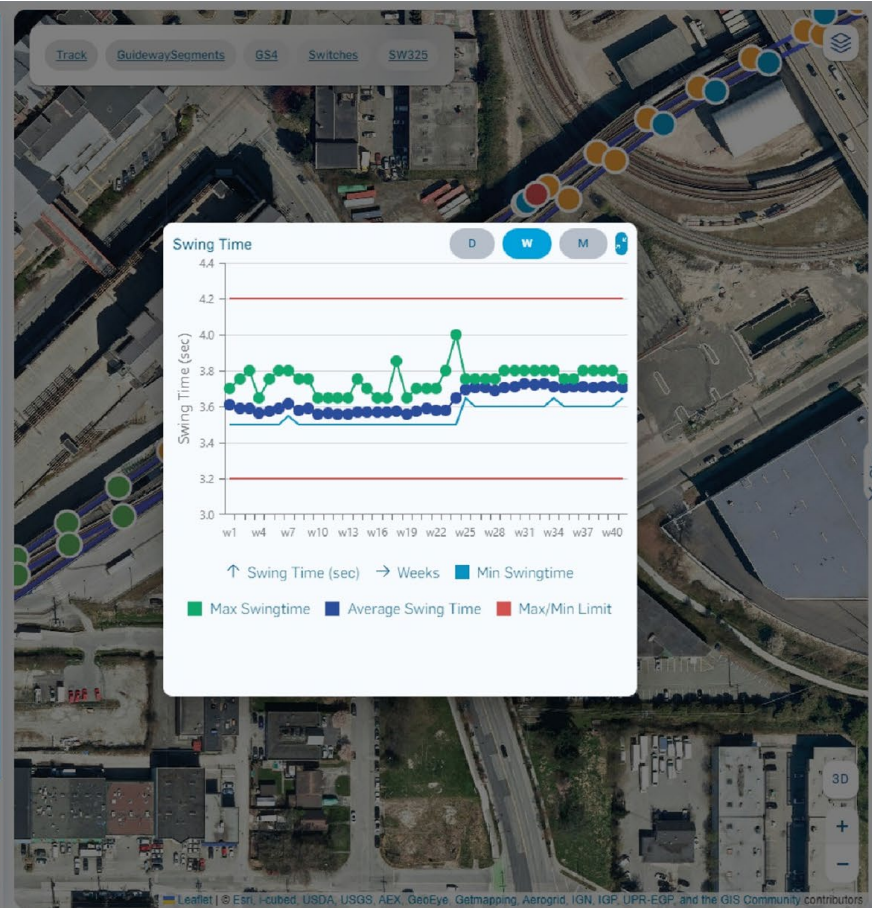
Description:
SWITCH #325 (2460)
 Part Number:
 Serial Number:

Asset List Information

Add / View Events

- Health 1
- Inventory
- Maintenance Info
- Switch Details
- Track Details
- Machine Details
- Switch Swing

Total Swing Count: **284552**
 Daily Swing Time Average: **3.71sec**
 Daily Swing Time Peak: **3.80sec**
 Daily Swing Count: **281**
 Daily Swing Current Average: **1.44A**
 Daily Swing Current Peak: **1.47A**



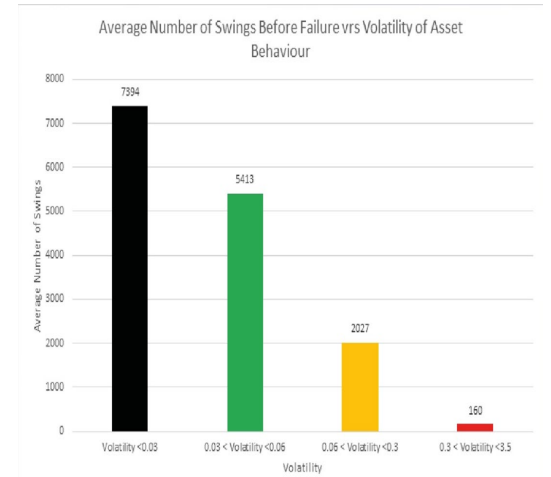
Switch Predictive Performance Module



Analytics center Search asset name...

Asset Name ↑	Reference Point ↑	Average No of ... ↑	50% probability... ↑	95% probability... ↑	Days left ↑	Risk ↑	View asset det... ↑
SW301	21/12/2020	43	26/11/2022	29/11/2024	55	Low	
SW302	10/05/2022	15	20/04/2023	11/06/2039	200	Low	
SW303	08/02/2022	8	09/08/2035	14/06/2106	4693	Low	
SW304	13/03/2018	10	19/09/2023	09/04/2047	352	Low	
SW305	30/12/2021	1	23/08/2039	15/09/2340	6168	Low	
SW306	26/04/2018	1	21/12/2140	17/04/2776	43179	Low	
SW307	19/06/2018	6	23/11/2036	04/09/2128	5165	Low	
SW308	16/01/2021	4	15/02/2048	20/09/2182	9266	Low	
SW309	30/05/2017	1	25/04/2029	05/06/2232	2396	Low	
SW310	30/12/2021	1	28/05/2162	02/04/2887	51007	Low	

< 1 2 3 4 5 6 >
High : Less then 14 days
Medium : Less then 28 days
Low : beyond 28 days





NAVIGATION

1 OVERVIEW

2 WATERFRONT STATION

3 KING EDWARD STATION

4 BRIDGEPORT STATION

5 RICHMOND-BRIGHOUSE STATION

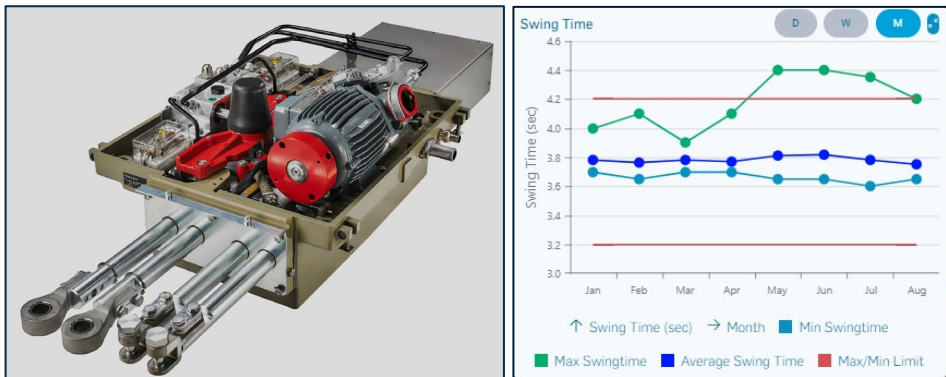
6 YVR AIRPORT STATION

7 MARINE DRIVE

Predicted Benefits Realization

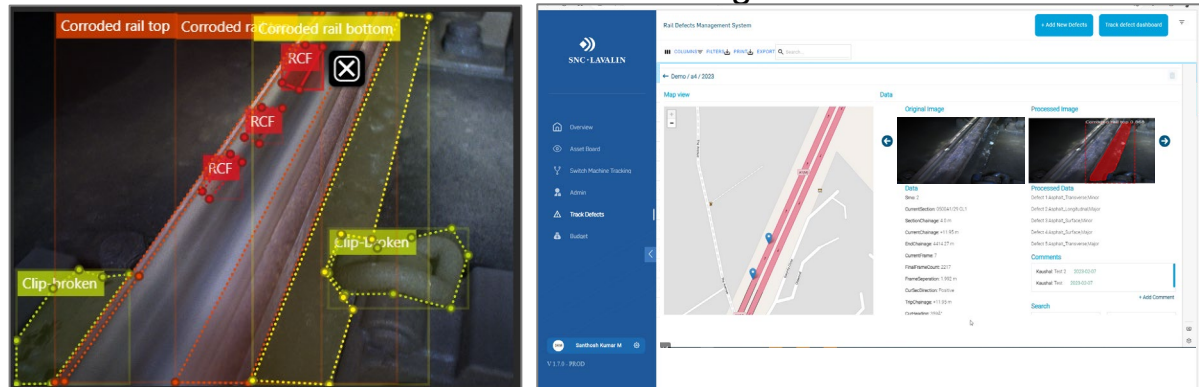


Switch Failure Prediction



Savings: CAD 50,000 per annum

Rail Defects Monitoring



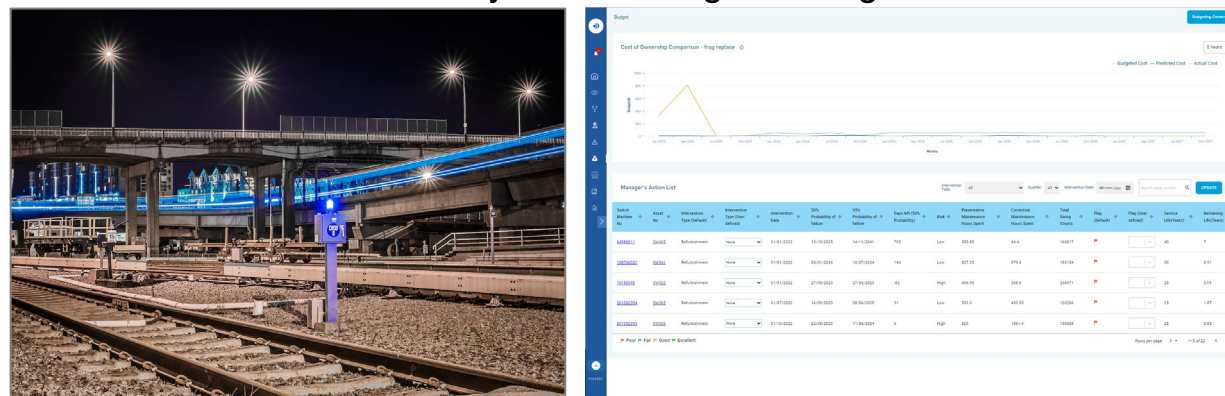
Savings: CAD 100,000 per annum

Integrated Data



Savings: CAD 25,000 per annum

Asset Lifecycle and Budget Management

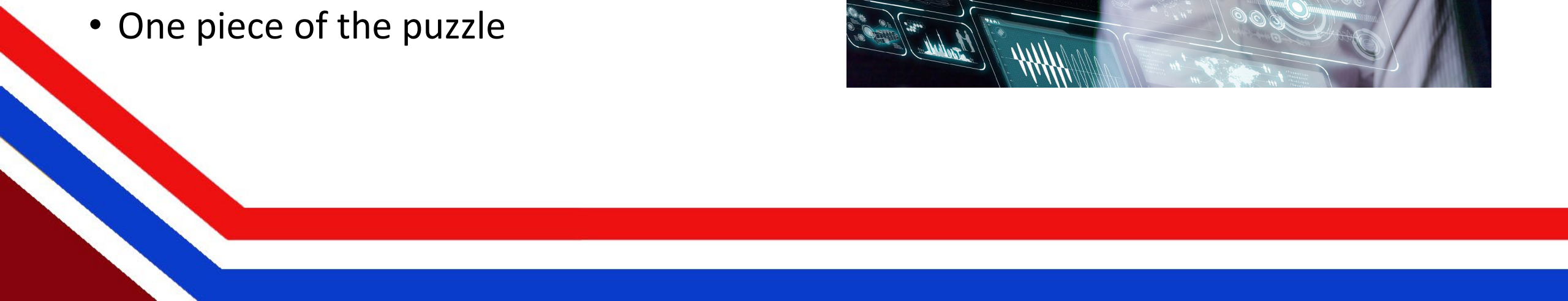


Saving: CAD 500,000 per annum

Continual Improvement



- Validate existing tools and analytics
- Expanded asset base
- More automated data collection systems
- Enhanced asset management module (Risk, improved degradation curves)
- Improved user experience
- One piece of the puzzle



Digital Success?



- A Culture of Innovation
- Start small, but plan big
- Incremental scalability
- Can it be controlled and measured?
- User-driven
- Mechanisms for course correction



Thank You

Ryan Versteeg-Biln
Director, Asset Management

