tharisa

enriching lives through innovating
the resources company of the future

Technology readiness

From Level 9 Collision avoidance
to Human Centric Solutions

DISCOVER
DEVELOP
DELIVER
DIVERSIFY

Tharisa Minerals Strategic Pillars

EXPANSION AND PROJECT ROLL-OUT	OPTIMISED EXISTING OPERATIONS	INNOVATIVE THINKING (TECHNOLOGY)	GLOBAL AND DIVERSIFIED	INVESTMENT OF CHOICE	RESPONSIBLY ENRICHING LIVES
EXPLORATION	MINING & PROCESSING	R&D	STRUCTURE & TEAM	CAPITAL MARKETS & FINANCE	SHE
PROJECT DEVELOPMENT	MARKETING & LOGISTICS	BENEFICIATION	NEW BUSINESS / M&A	STRATEGIC COMMUNICATION	ESG & CLIMATE CHANGE
TECHNICAL HUB	ADMIN & GROUP SERVICES	CLEAN ENERGY	TECHNOLOGY & INNOVATION		IMPACT INVESTMENT / COMMUNITY

Tharisa Minerals - Superheros Living our Values

- Safety
- Care
- Empowerment
- Innovation
- Integrity
- Communication

Clear Communication, Better Collaboration

Lingo

Communication Superhero

Lingo represents the power of clear communication, essential for effective collaboration and shared understanding. With the motto "Clear Communication, Better Collaboration," it fosters unity and encourages everyone to contribute to a culture where communication thrives.

Give More

Ingenious

Innovation Superhero

Ingenious champions innovation, urging everyone to think creatively and push the boundaries of what's possible. With the motto "Give More," it inspires a culture of continuous improvement, turning ideas into impactful solutions.

Concept of Business Partners

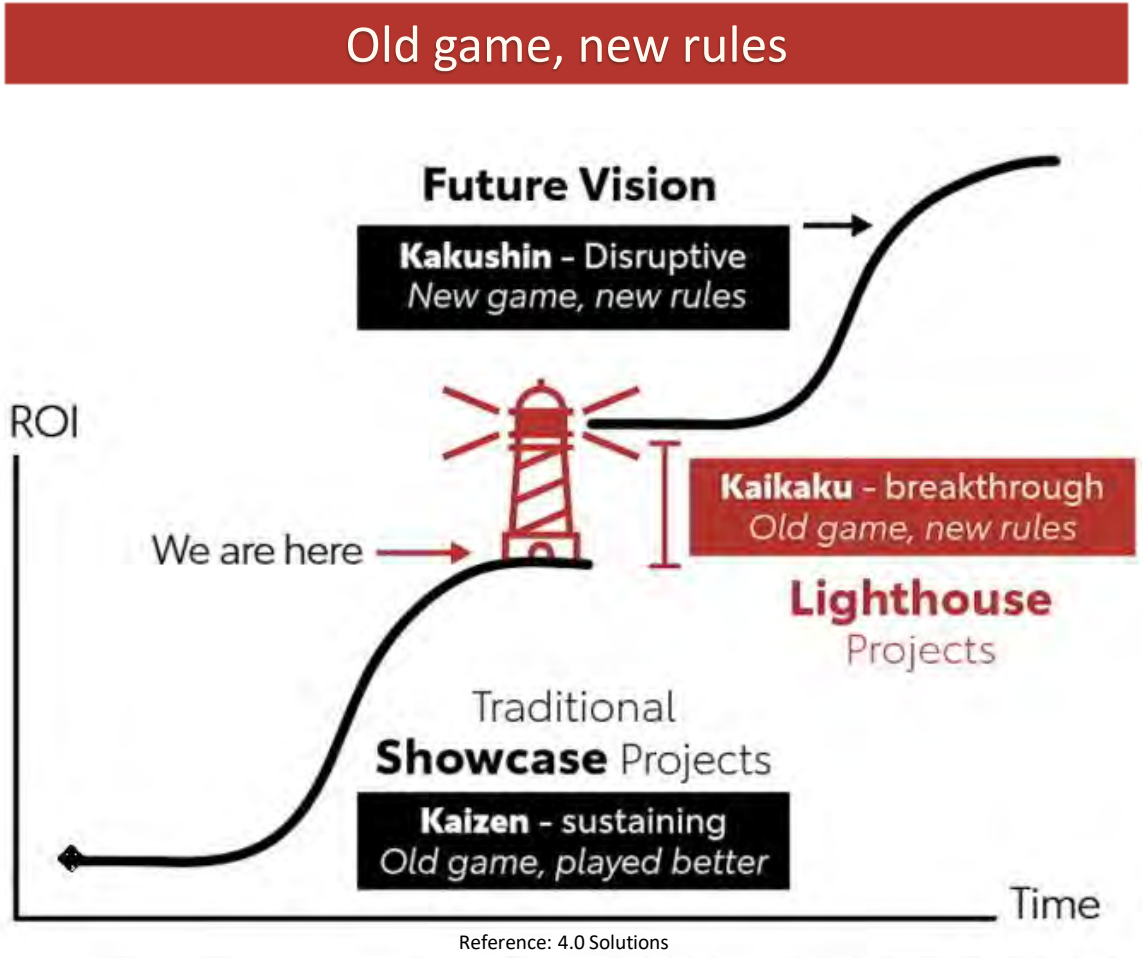
Lighthouse Partnerships

Business Partners - Lighthouse Partnerships

- Collaboration with external partners
- Leading edge technology
- Showcase future possibilities

Lighthouse represents:

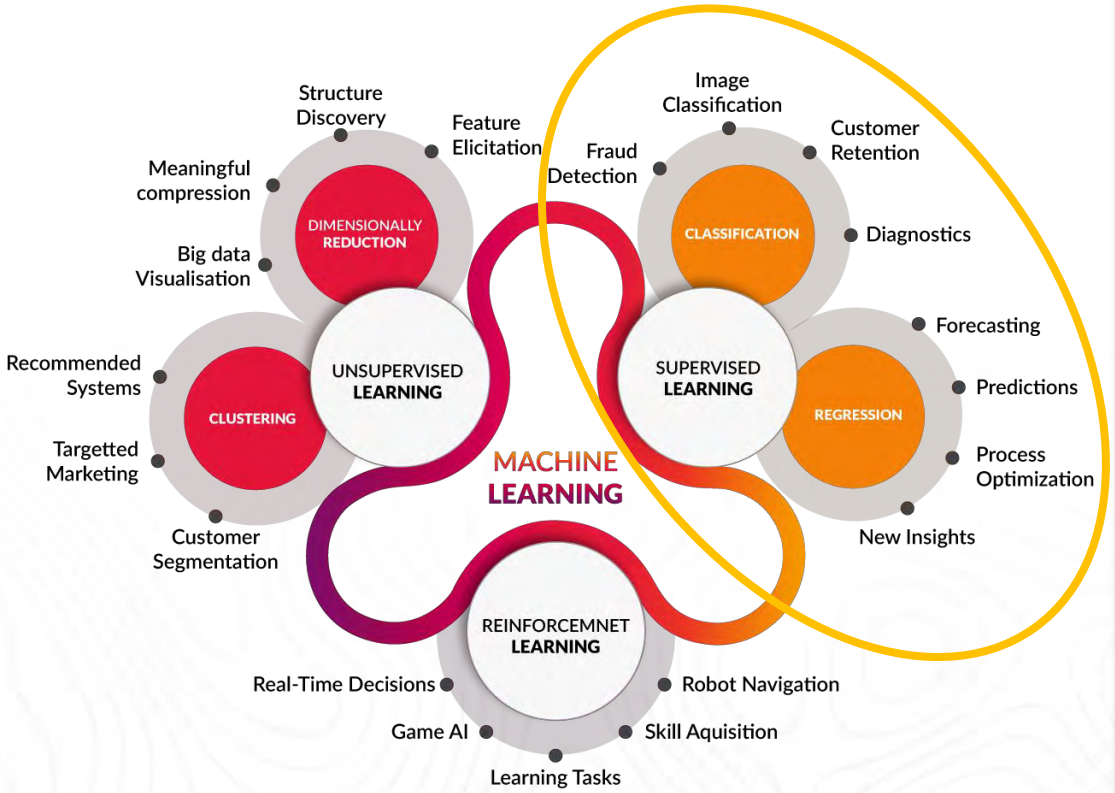
- Guidance
- Hope
- Warning
- Protection
- Resilience



Reference: 4.0 Solutions

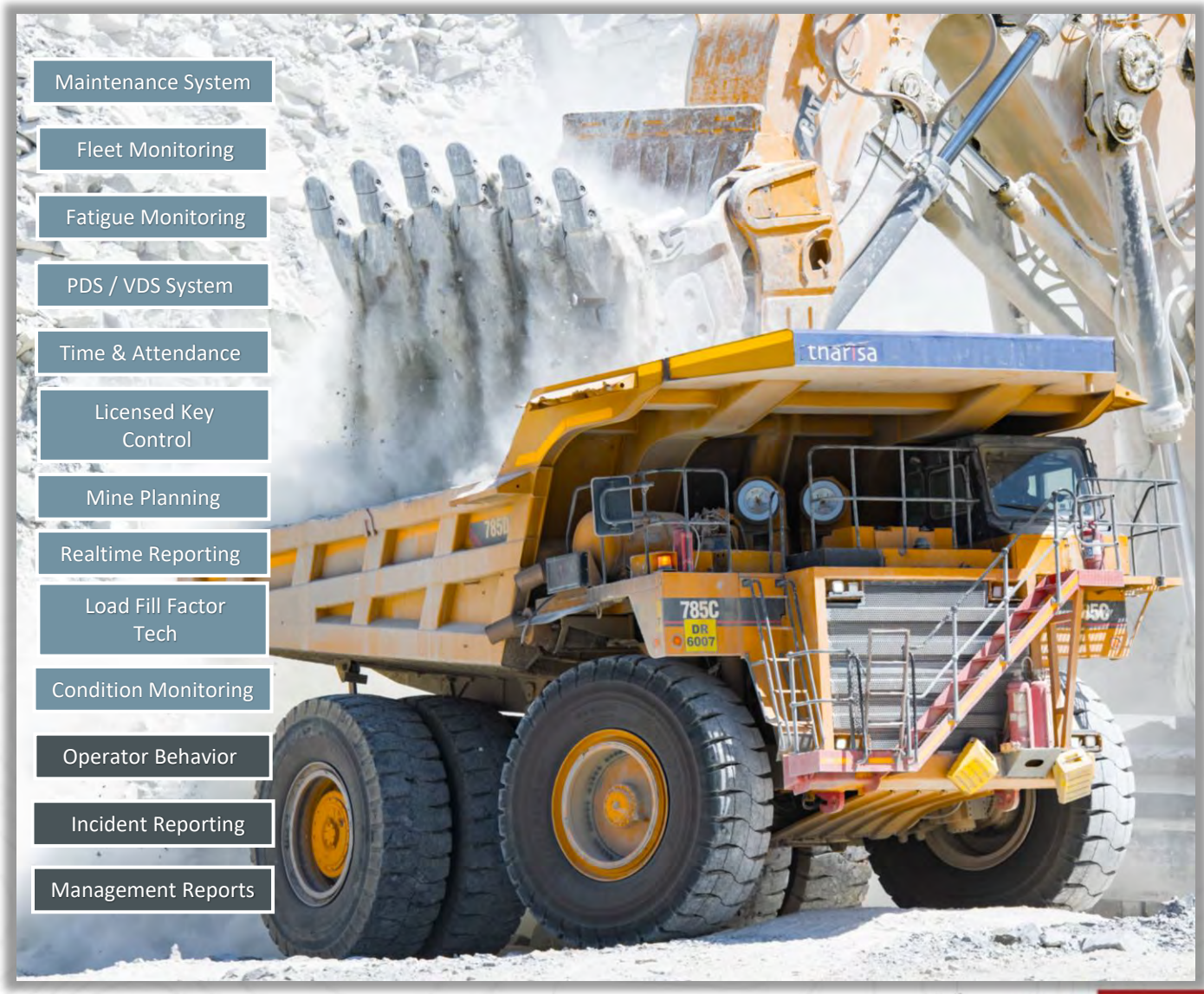
A Lighthouse Addresses Hardest Parts of Our Biggest Challenges

Business Partners - Enablers of Machine Learning Technology



Focused on Supervised Learning

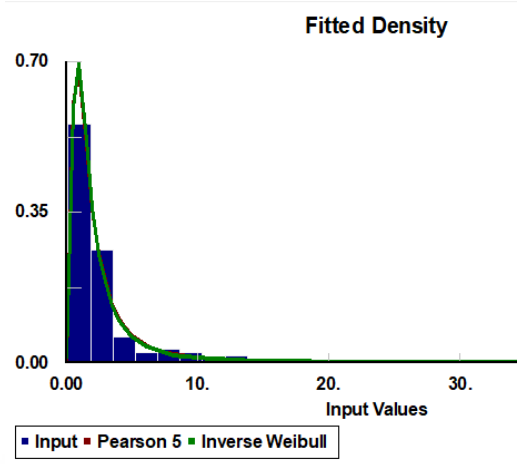
Coding Deep Learning For Beginners | by Kamil Krzyk | Towards Data Science

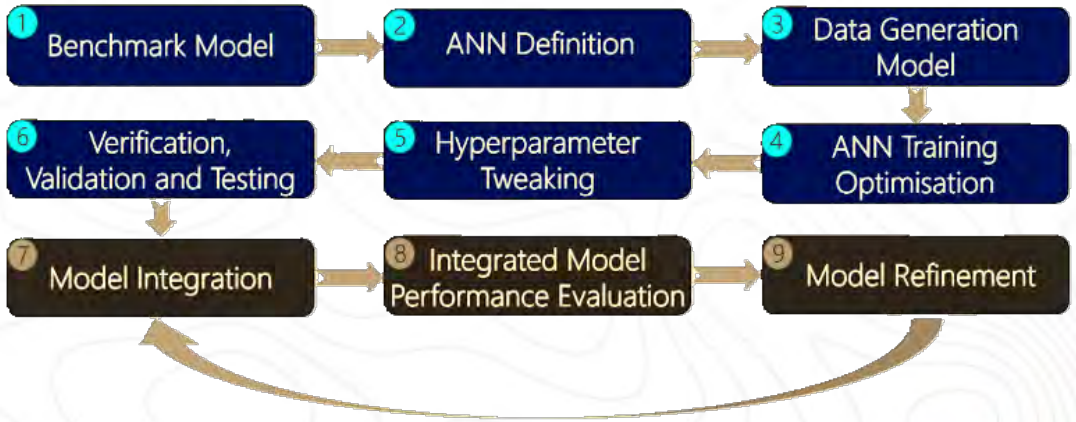


Business Partners - Simulation Modeling

- Discrete-Event Simulation
- Digital Twin
- “What If” Scenarios
- Optimisation Opportunities
- Model Development Strategy

Base model development





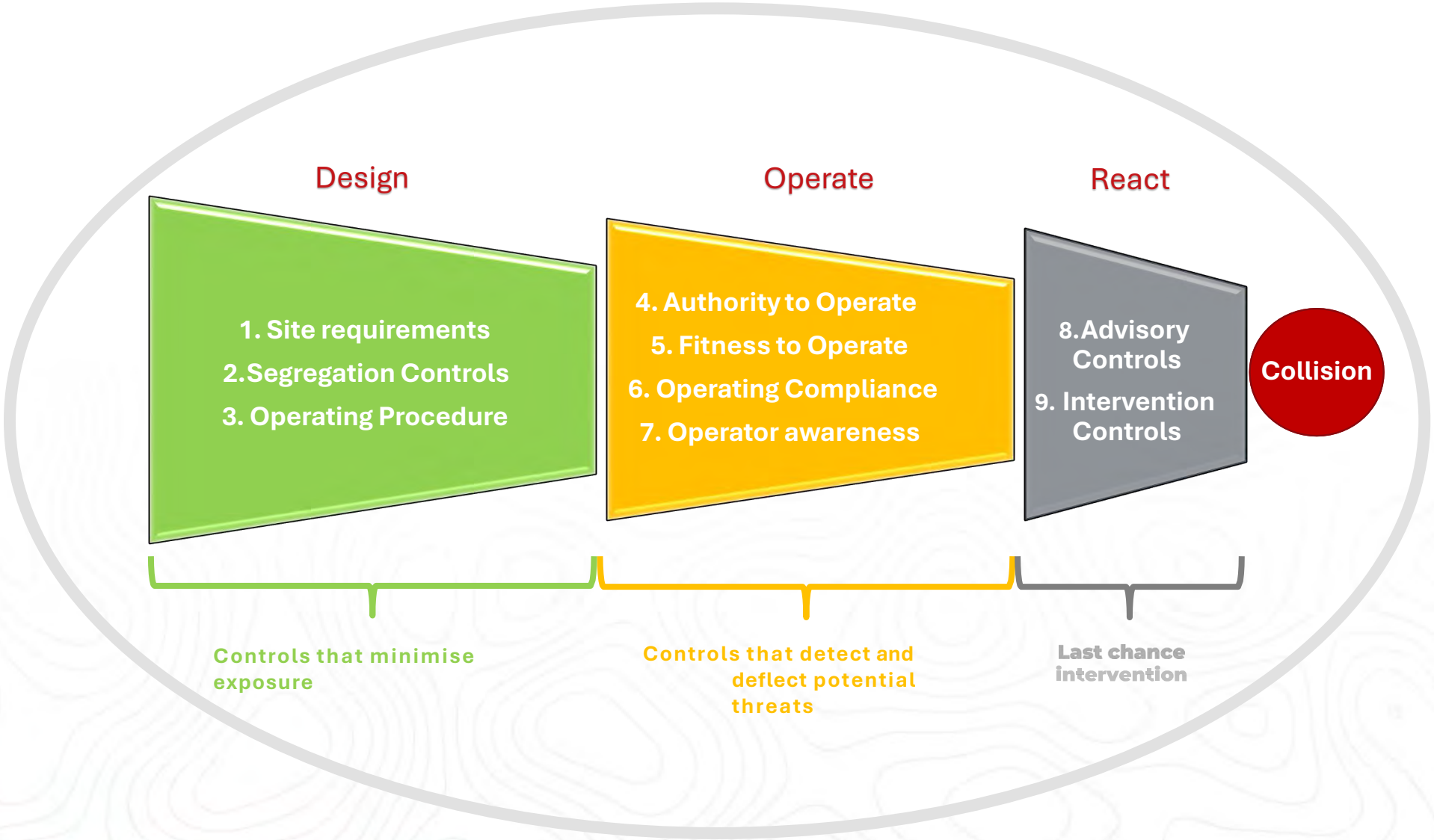
EMESRT
Earth Moving Equipment Safety Round Table

In the Beginning

EMESRT: Earth Moving Equipment Safety Round Table

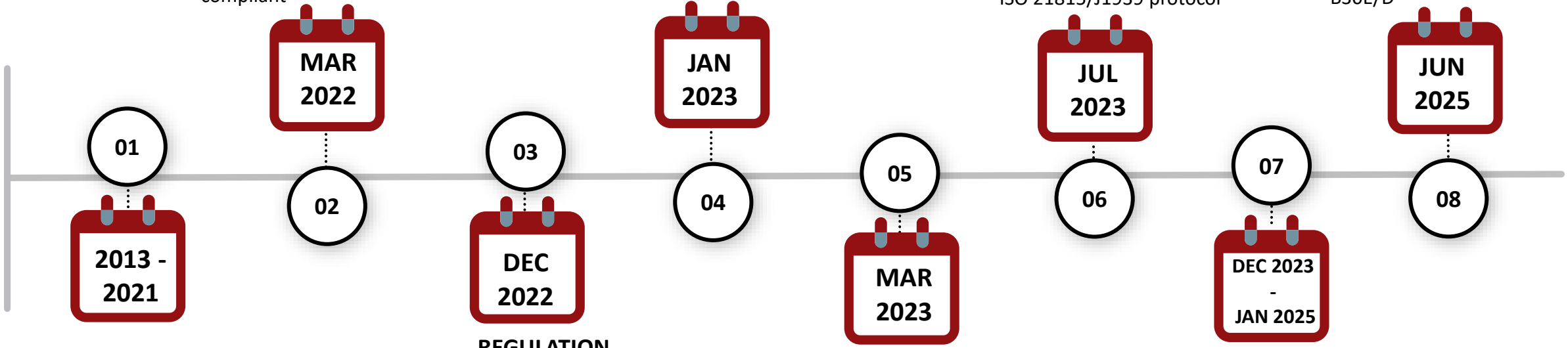
Formalised in 2006

EMESRT 9 Layer Model of Control Effectiveness



tharisa

Collision Warning and Avoidance - Level 9 Journey



PROTOCOLS

- ISO 21815 – J1939 protocol
- Test protocols for Collision prevention @ “UP / Gero-tech”
- SECDI –User, Functional & Test Requirements
- High Risk Areas Identification

LAB SCALE LEVEL 9

- L9 test in a controlled environment completed with CAT.
- L9 integration with Komatsu was completed.
- EMERST Controls level 1 to 8 fully compliant

REGULATION PROMULGATED

- 21 December 2022, Reg 8.10.1.2 (b) & 8.10.2.1 (b) was promulgated
- Risk Assessment ”TM –MOSH” reviewed by Industry subject matter experts
- Roll out action plan with all Stakeholders

SITE SPECIFIC TESTING

- Level 9 Interface integration units (CAT) installed for site specific level 9 testing.
- Fatigue monitoring system trail run

INTEGRATION TESTS & PRESENTATIONS

- L9 integration test plans completed in line with SECDI guidelines
- Simulator test work completed
- First Single Machine onsite test conducted.
- Presentation to DMRE on L9 progress

OEM TESTS CONTINUED

- OEM test work documented and recorded.
- OEM (CAT) failed test as per SECDI guideline and ISO 21815/J1939 protocol

IMPLEMENTATION & INSTALLATION

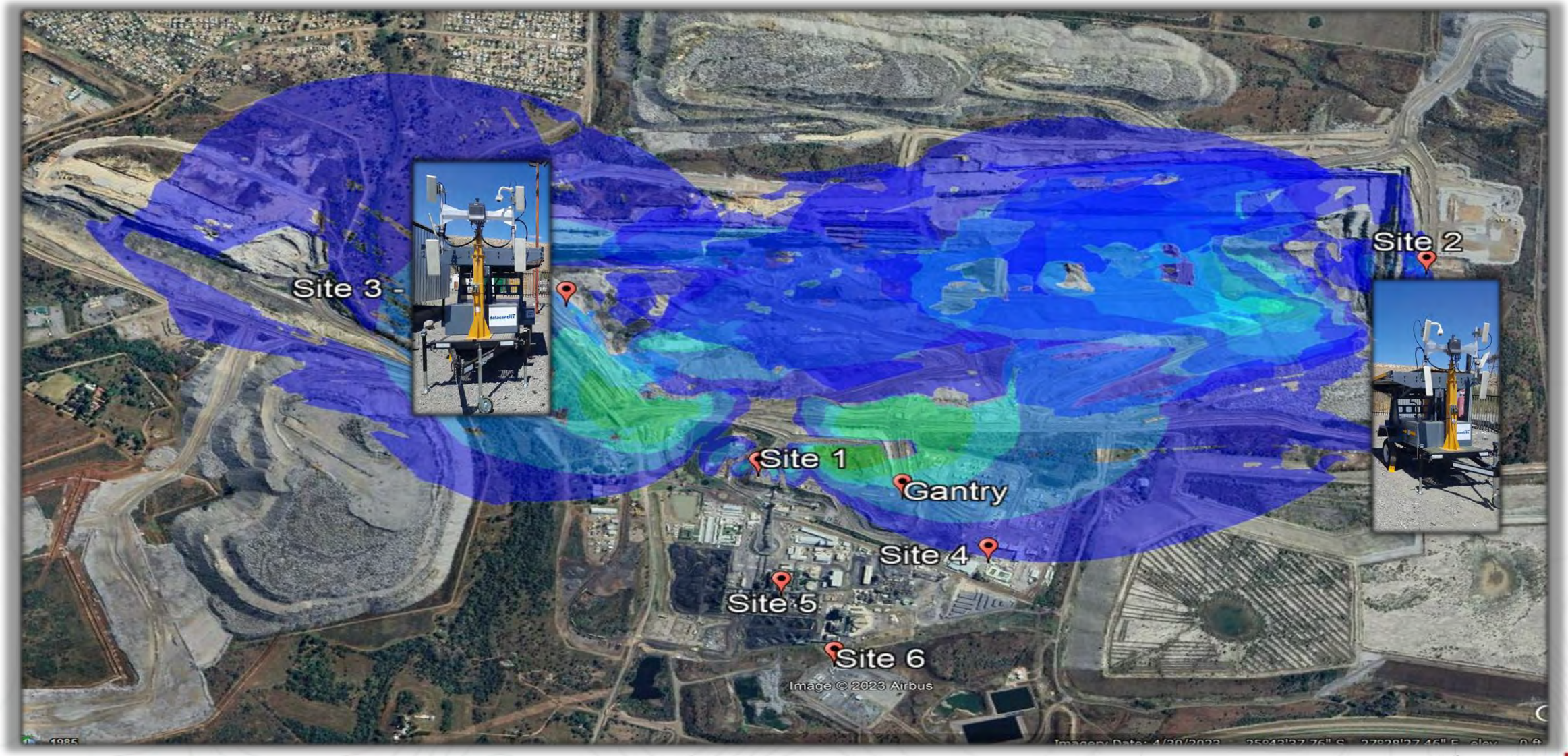
- Machine interface POC completed on 64 Tharisa Trucks and 45 Business Partner Trucks by Dec 2026
- Installation completed on 133 units by Jan 2025

EMESRT COMPLETE

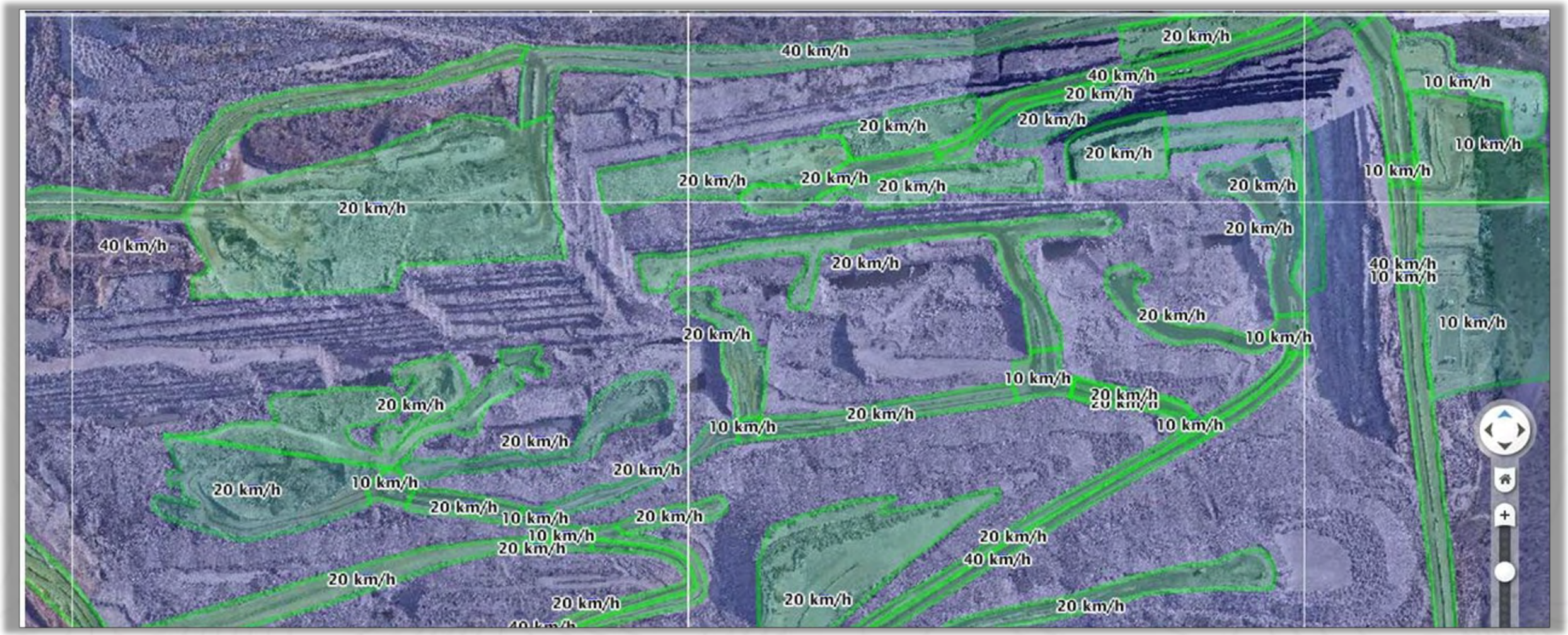
- Testing and commissioning complete on 149 Trucks including, CAT 745; 777;785; 789; HD465; A40F/G; Komatsu WA430/80 Bell B30E/D

Technology Stack

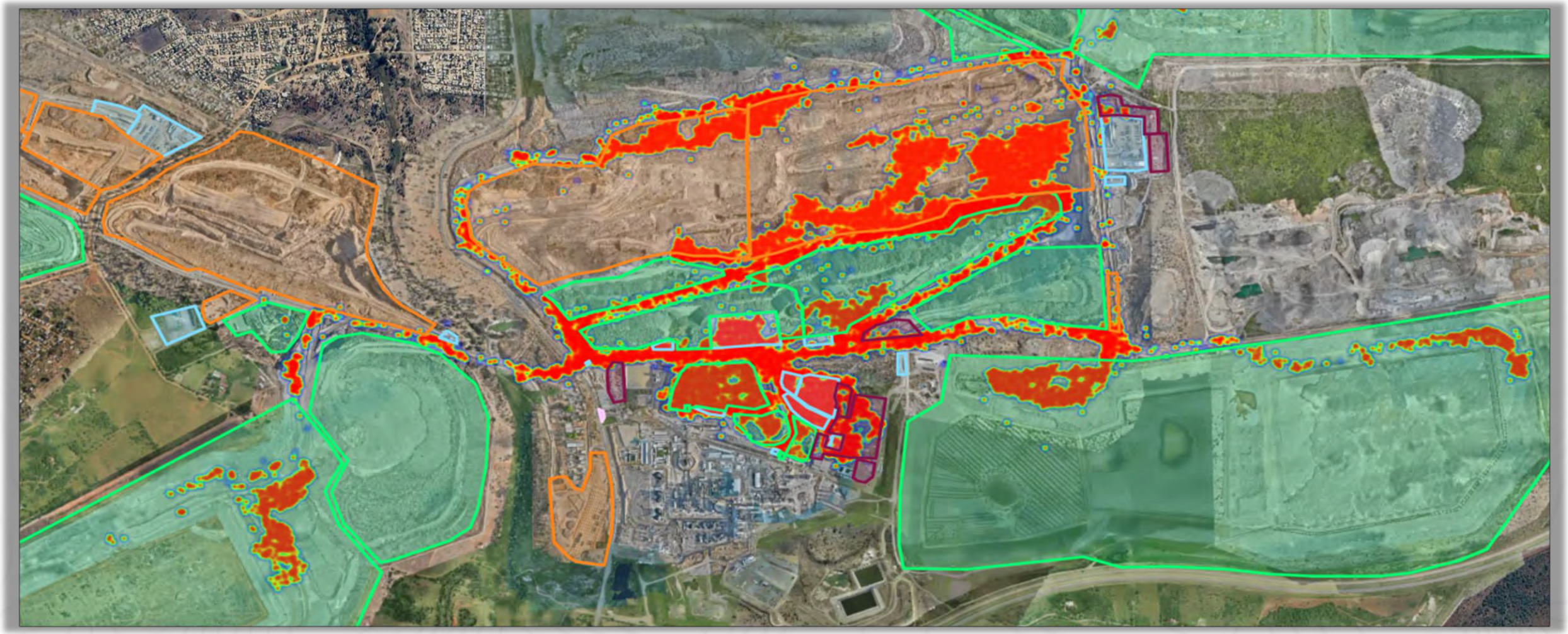
Communication Backbone – Fiber in Motion Network



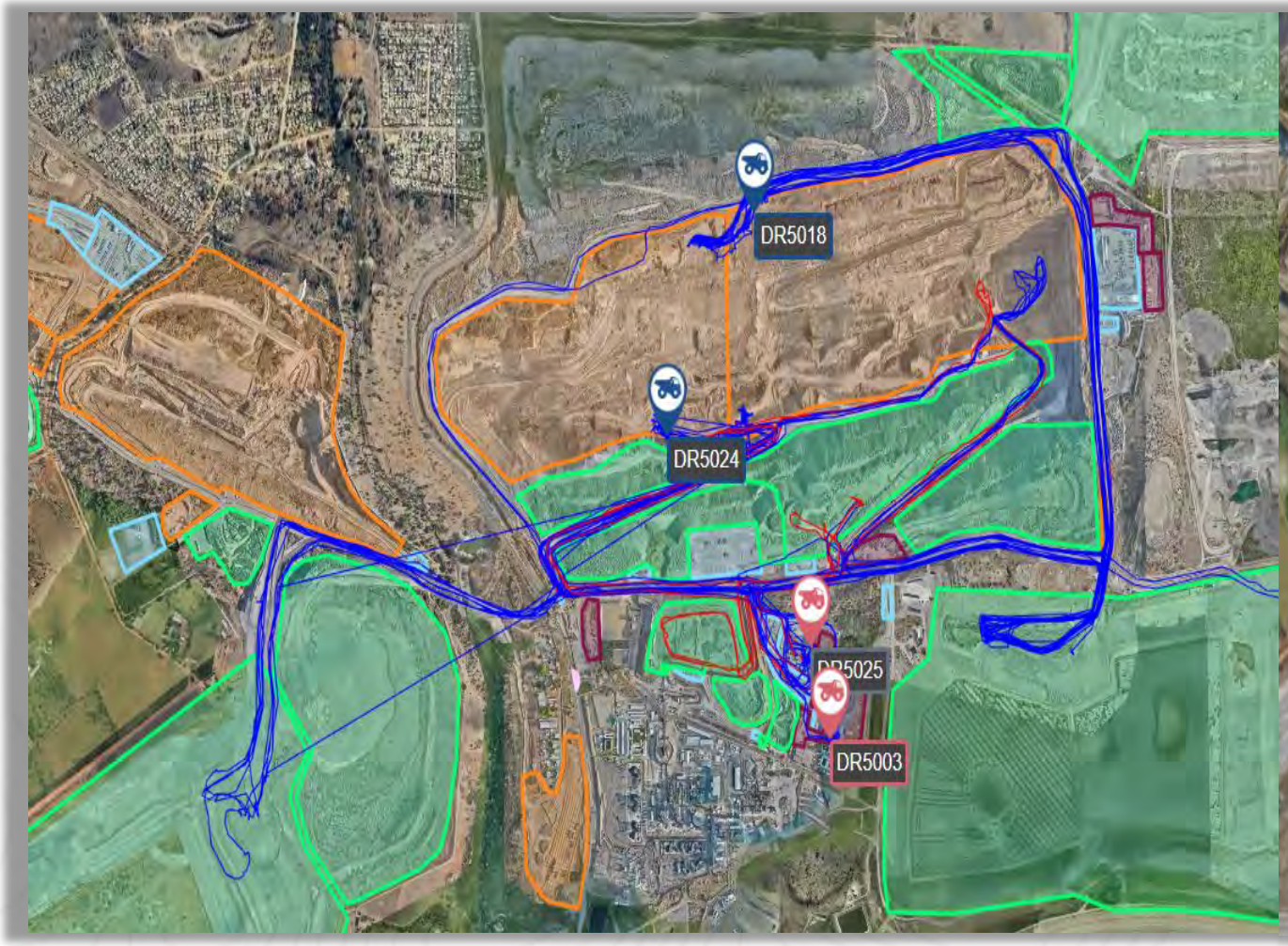
Level 9 Pit Geofences



Congestion Heatmap



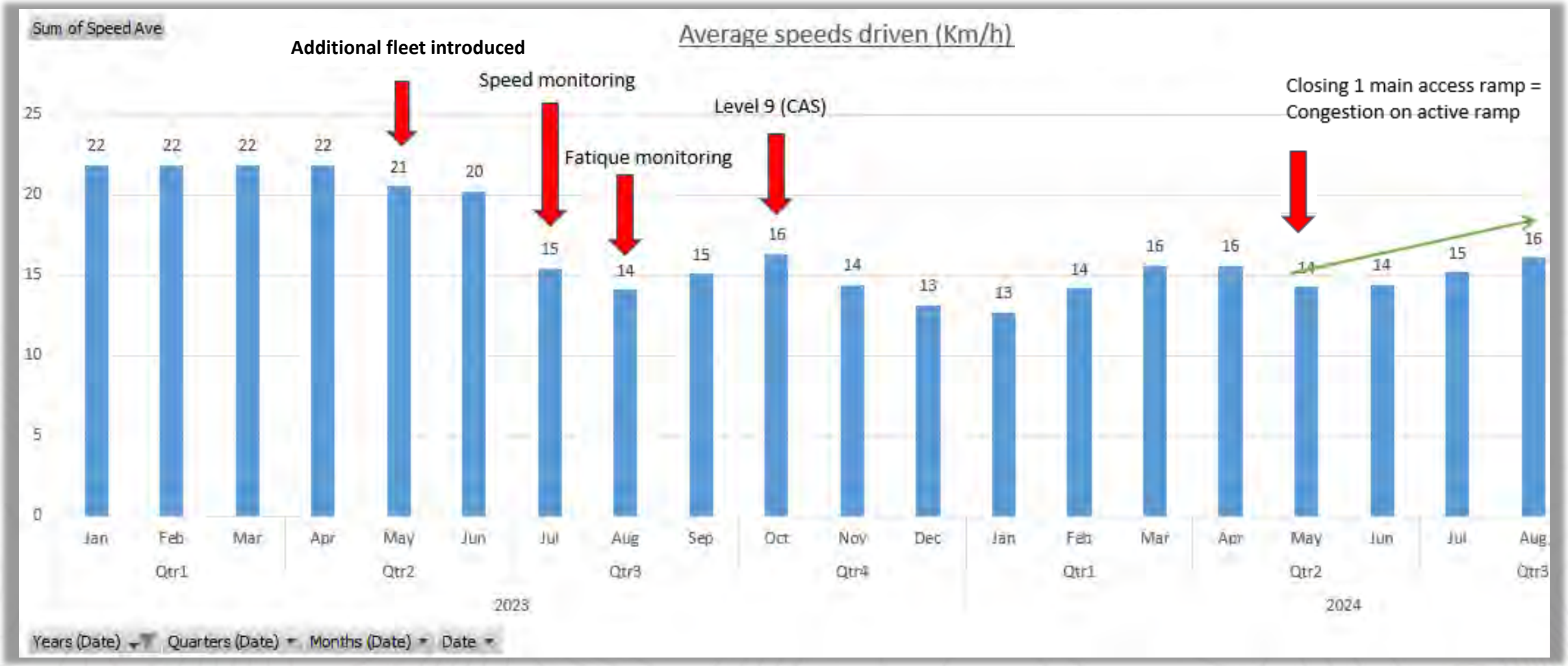
Cycle Tracing – Road Segment Speed Analysis



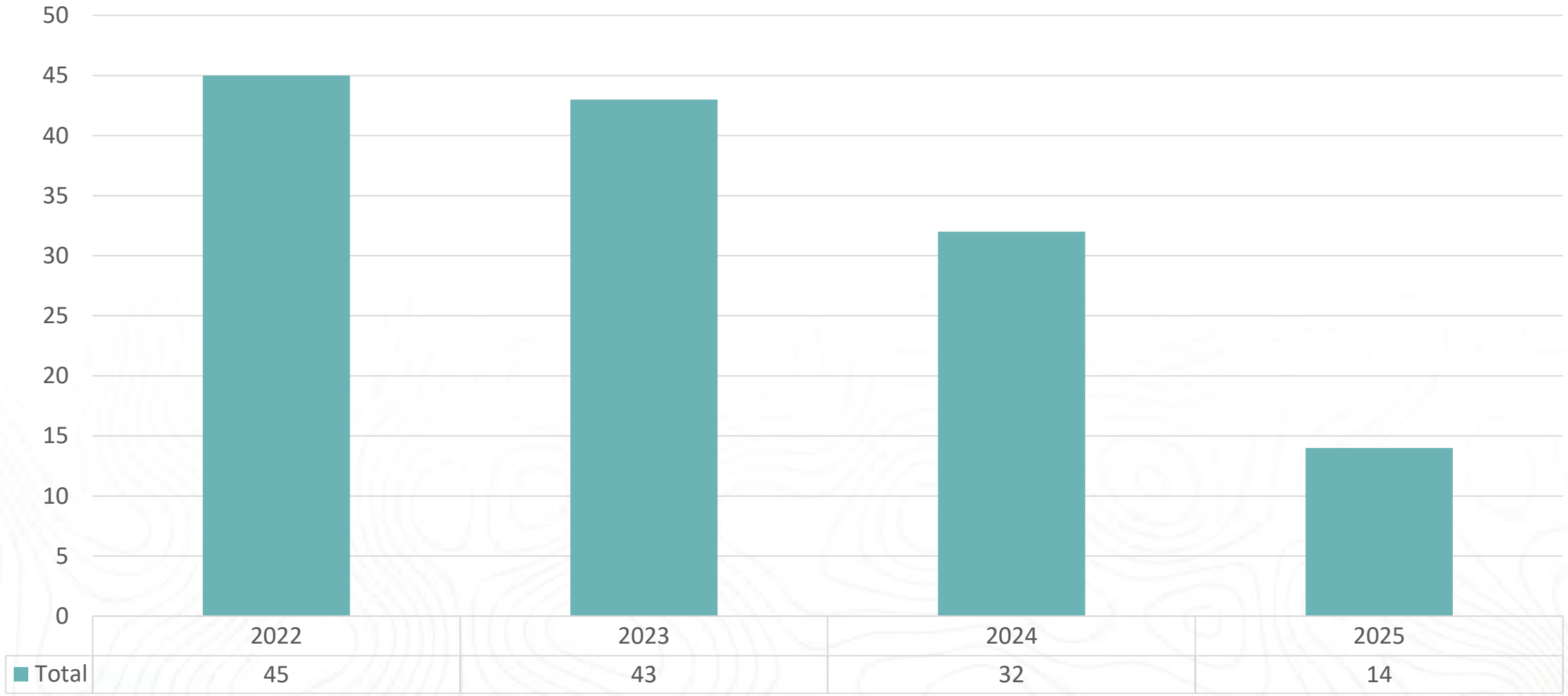
Live Violation Reporting

50% reduction in fatigue related events within the first 6 months of implementation

Various elements affecting average traveling speeds



Reduction in TMM Property damages

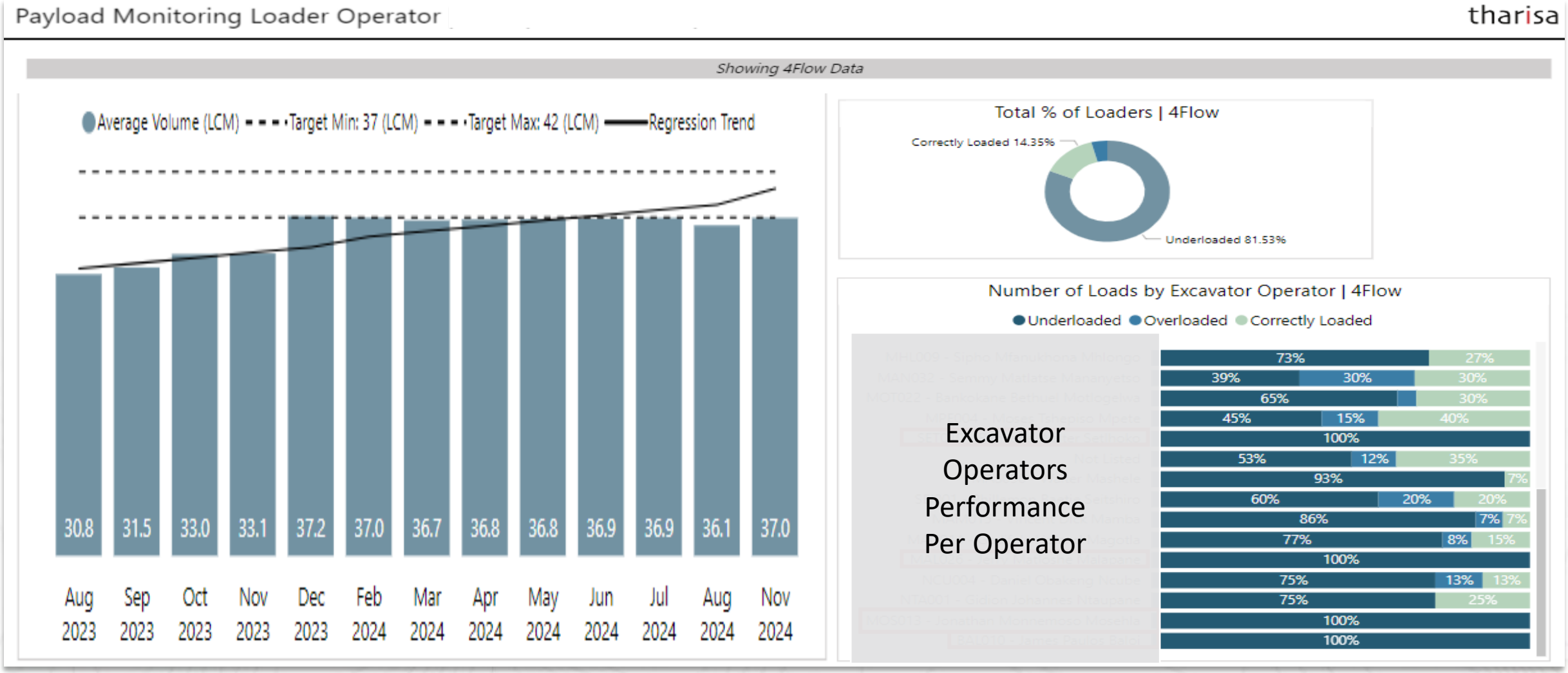


Volumetric Scanner

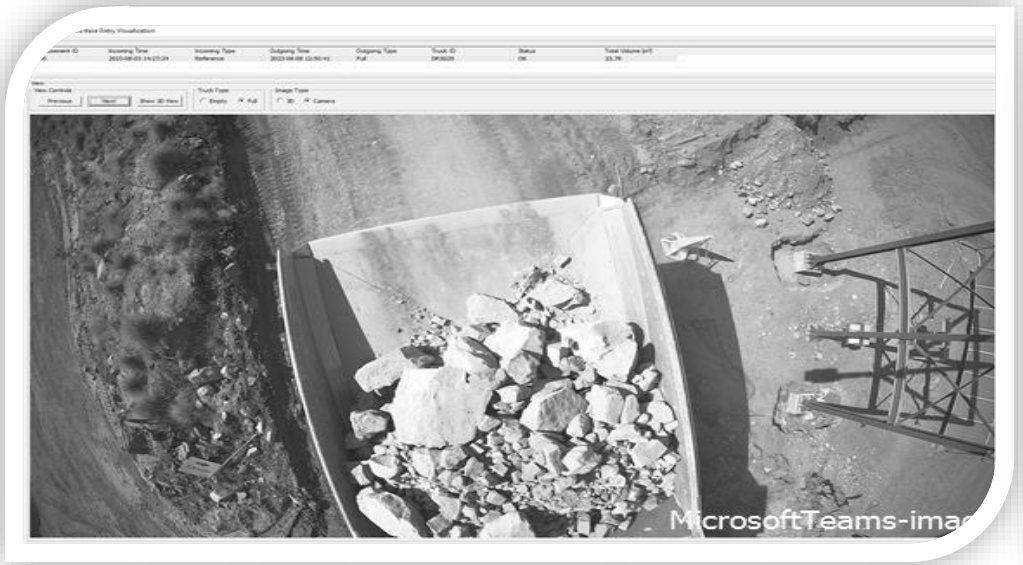
From mitigation to gaining value adds

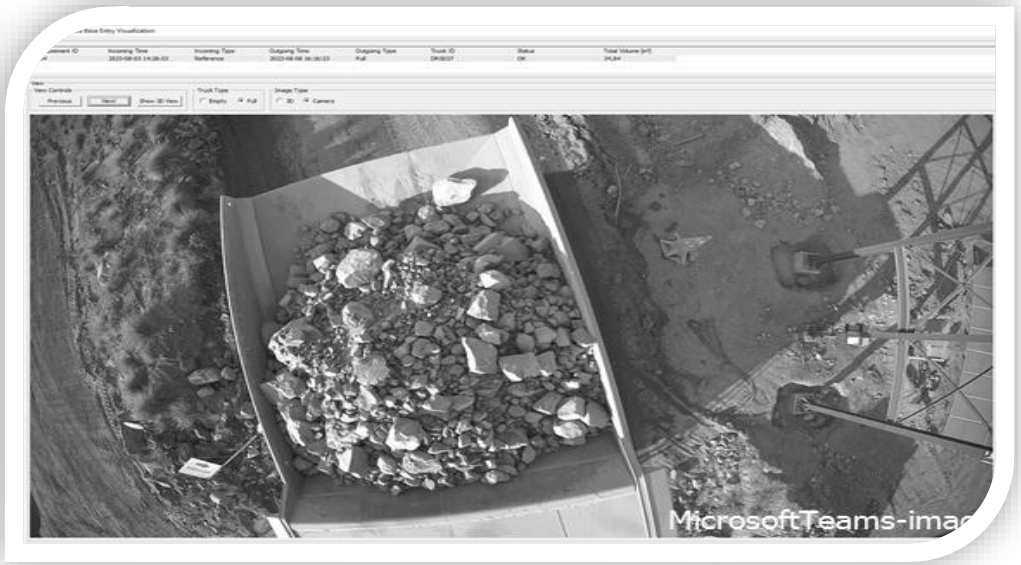
Volumetric Scanner

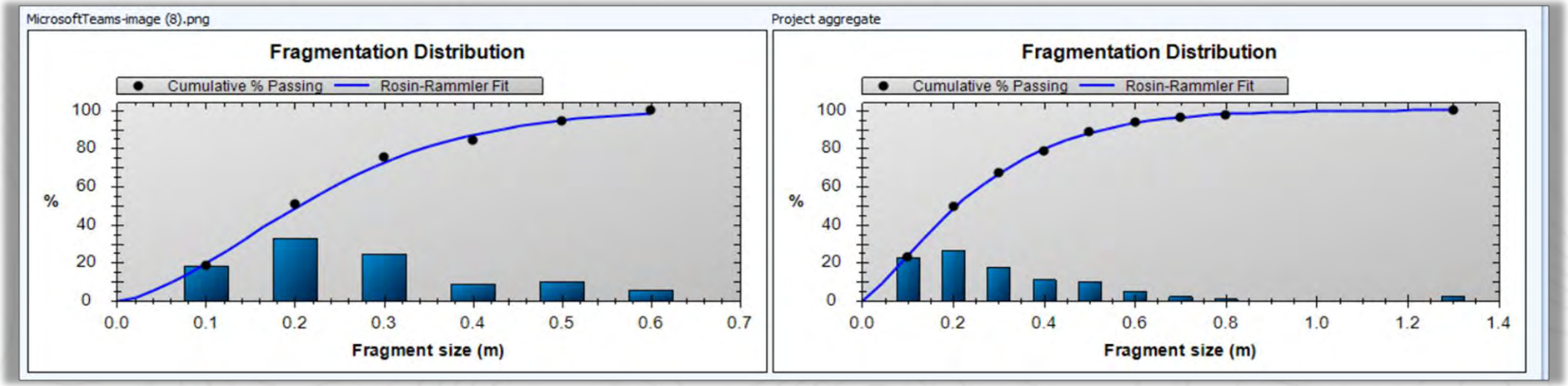
Operator – Payload Monitoring



Fragmentation Analysis



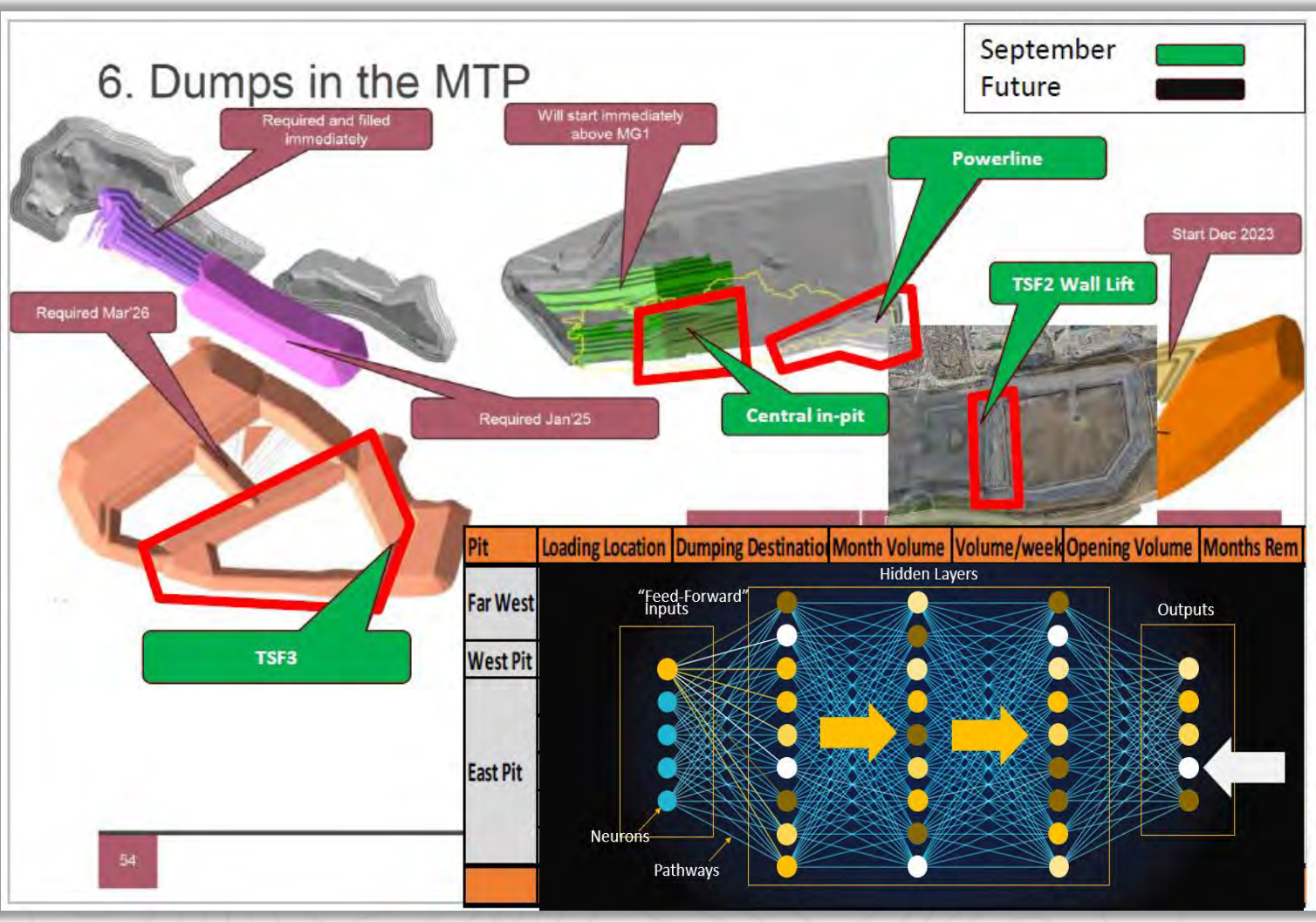


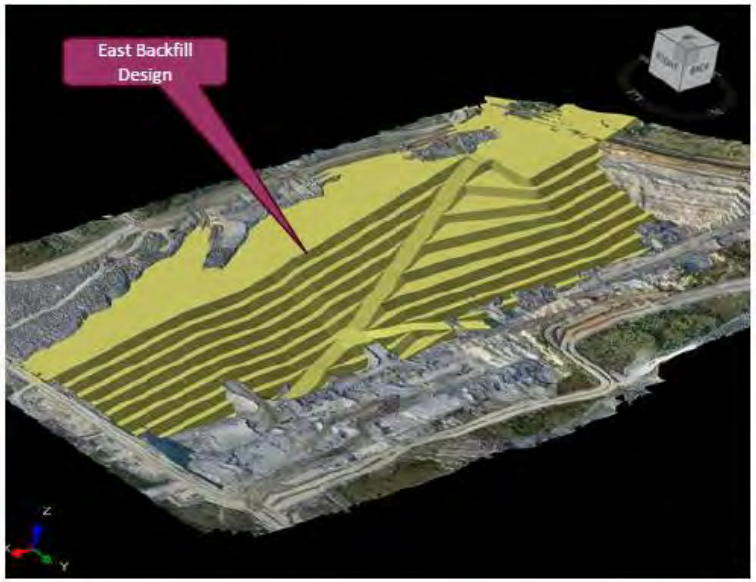


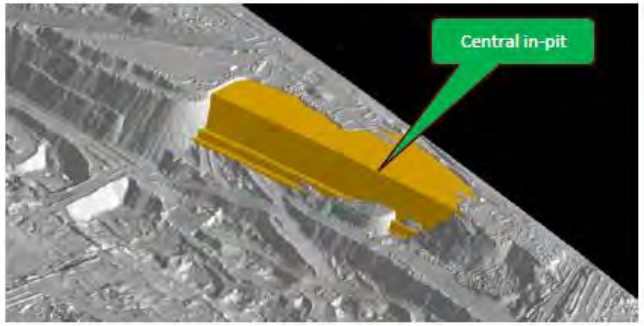
Simulation Modeling

Artificial Neural Network

Information from waste destination planning to advanced Neural Network Design



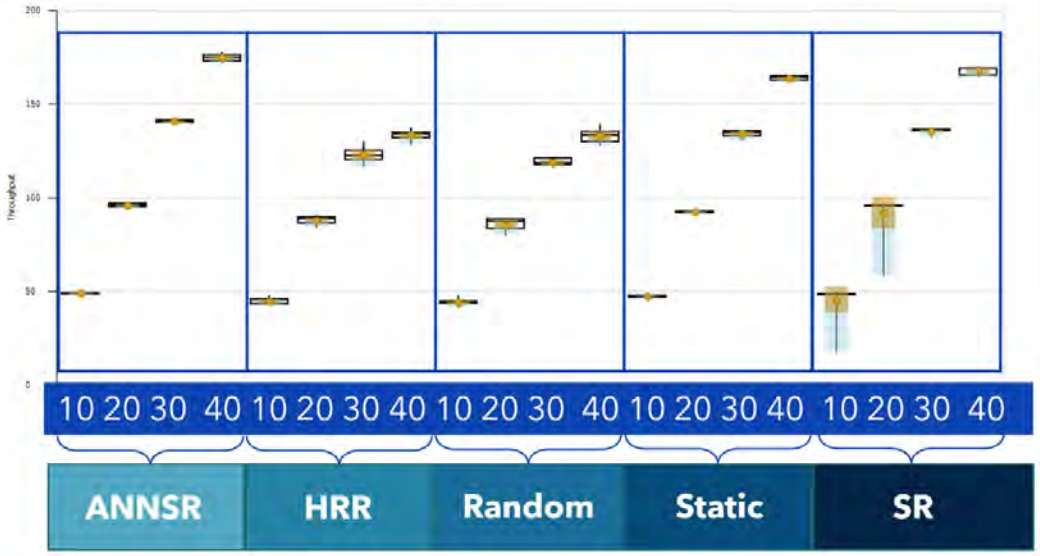


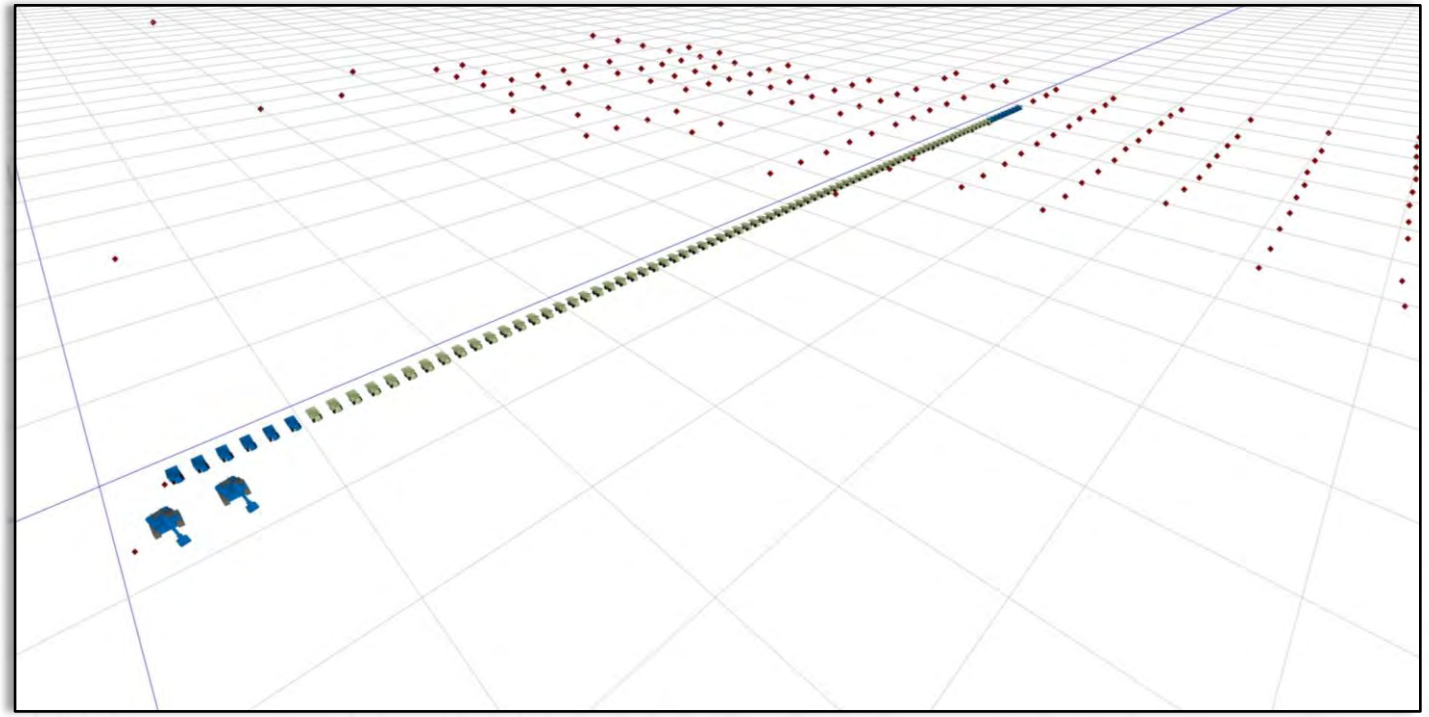


Results of AI in Simulation Test Case for Dispatch Agents

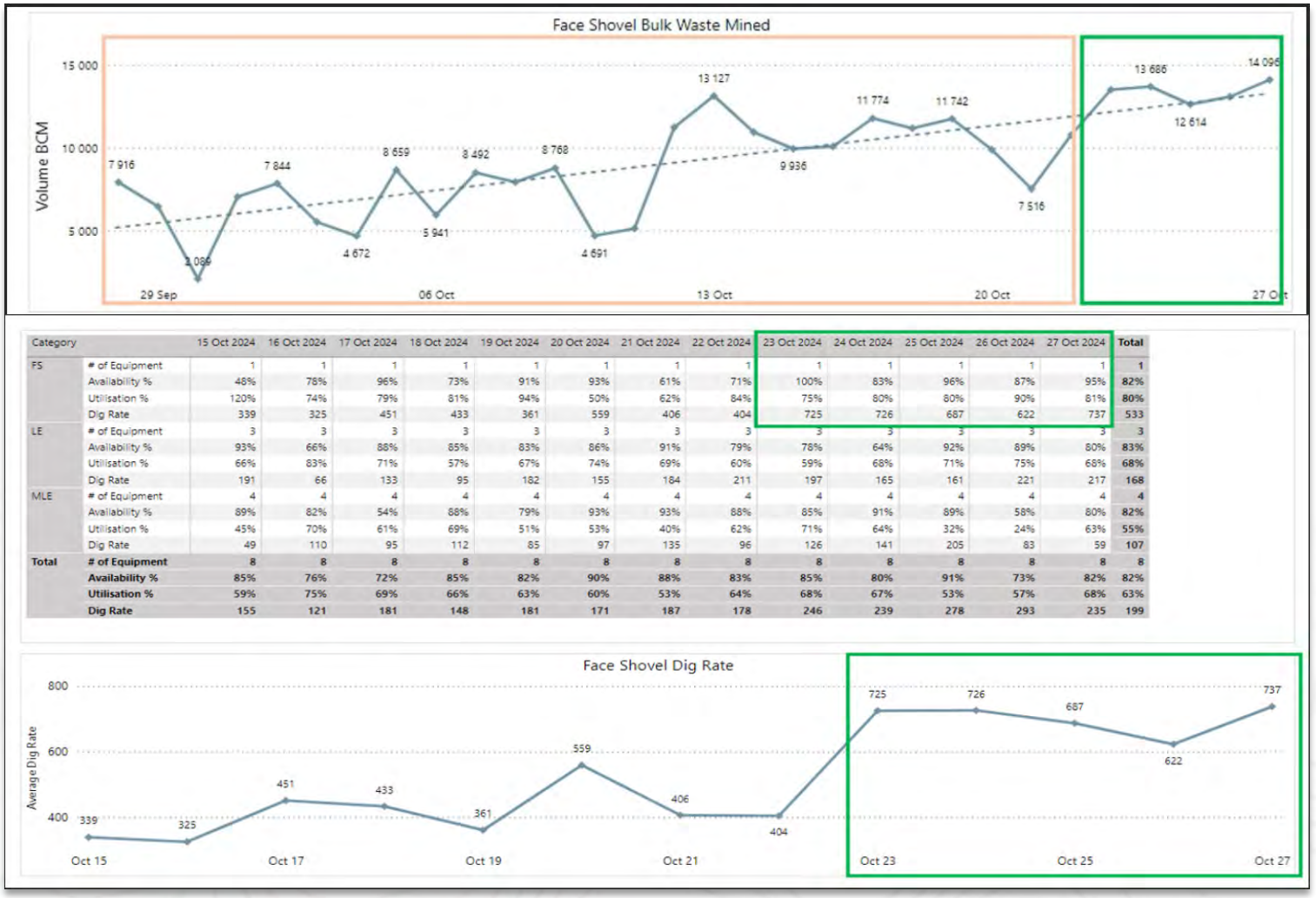
Advance Neural Network Specific Results

- Throughput Improvements between 5-15%
- Queueing Reductions of 10-20%
- Cycle Time Decreases of 3-10%



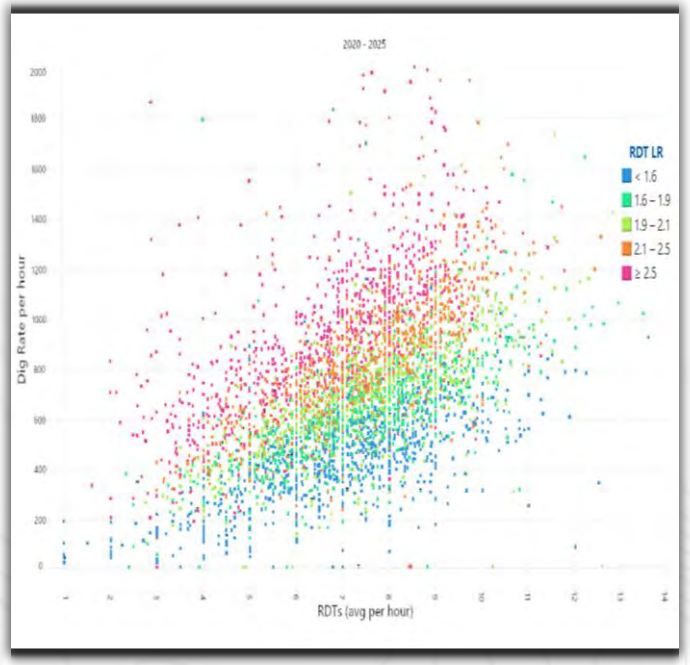


Results for Face Shovel Optimisation in Dig Rate Improvements



Category		15 Oct 2024	16 Oct 2024	17 Oct 2024	18 Oct 2024	19 Oct 2024	20 Oct 2024	21 Oct 2024	22 Oct 2024	23 Oct 2024	24 Oct 2024	25 Oct 2024	26 Oct 2024	27 Oct 2024	Total
FS	# of Equipment	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Availability %	48%	78%	96%	73%	91%	93%	61%	71%	100%	83%	96%	87%	95%	82%
	Utilisation %	120%	74%	79%	81%	94%	50%	62%	84%	75%	80%	80%	90%	81%	80%
	Dig Rate	339	325	451	433	361	559	406	404	725	726	687	622	737	533
LE	# of Equipment	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Availability %	93%	66%	88%	85%	83%	86%	91%	79%	78%	64%	92%	89%	80%	83%
	Utilisation %	66%	83%	71%	57%	67%	74%	69%	60%	59%	68%	71%	75%	68%	68%
	Dig Rate	191	66	133	95	182	155	184	211	197	165	161	221	217	168
MLE	# of Equipment	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Availability %	89%	82%	54%	88%	79%	93%	93%	88%	85%	91%	89%	58%	80%	82%
	Utilisation %	45%	70%	61%	69%	51%	53%	40%	62%	71%	64%	32%	24%	63%	55%
	Dig Rate	49	110	95	112	85	97	135	96	126	141	205	83	59	107
Total	**# of Equipment**	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Availability %	85%	76%	72%	85%	82%	90%	88%	83%	85%	80%	91%	73%	82%	82%
	Utilisation %	59%	75%	69%	66%	63%	60%	53%	64%	68%	67%	53%	57%	68%	63%
	Dig Rate	155	121	181	148	181	171	187	178	246	239	278	293	235	199

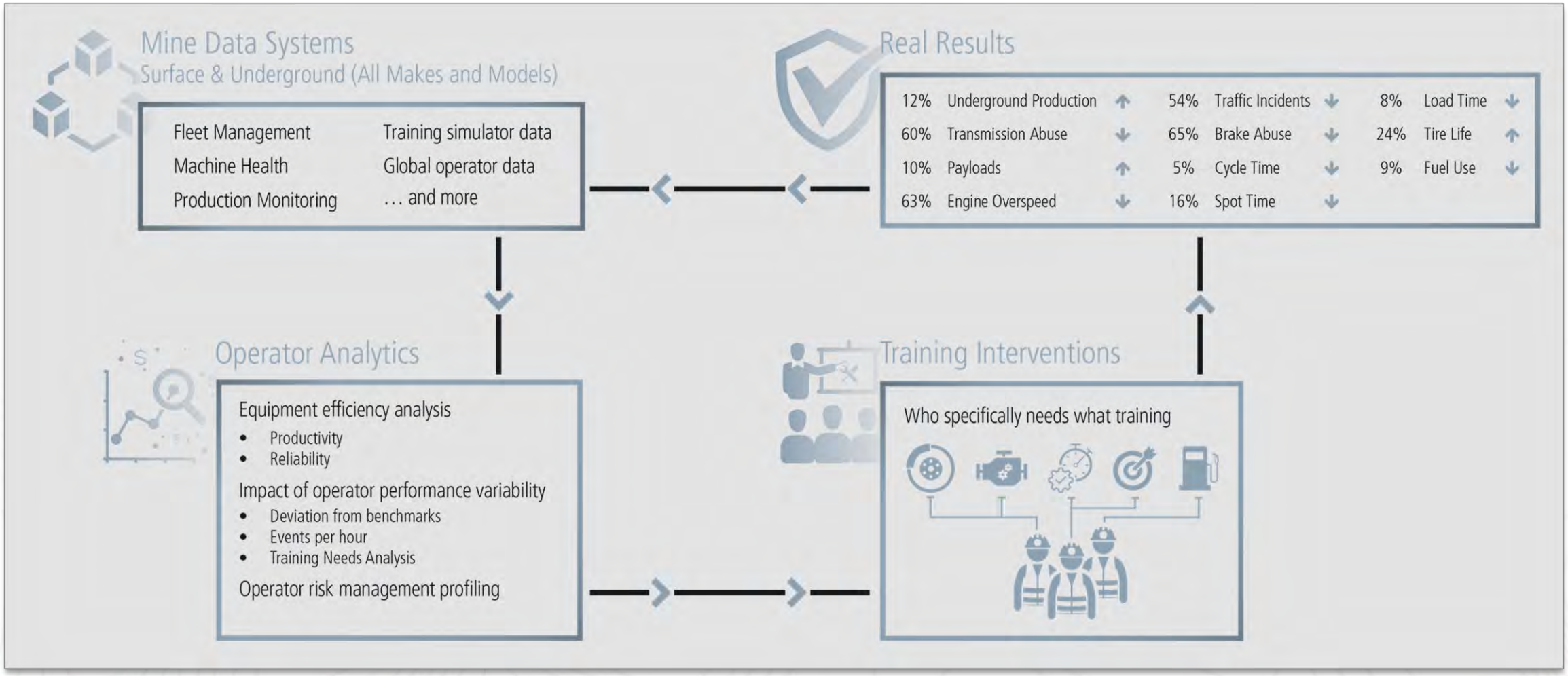
Face Shovel Investigation



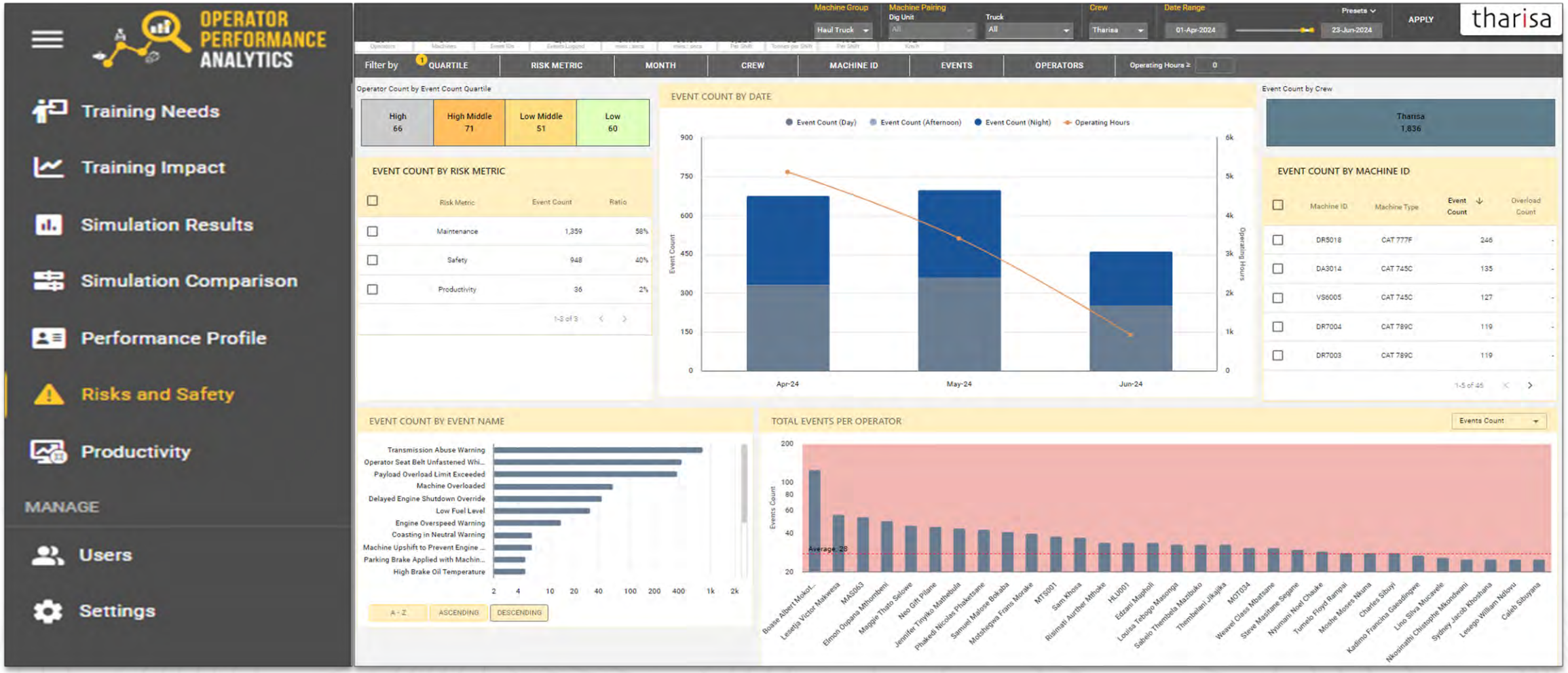
Operator Performance

Reporting and Analytics

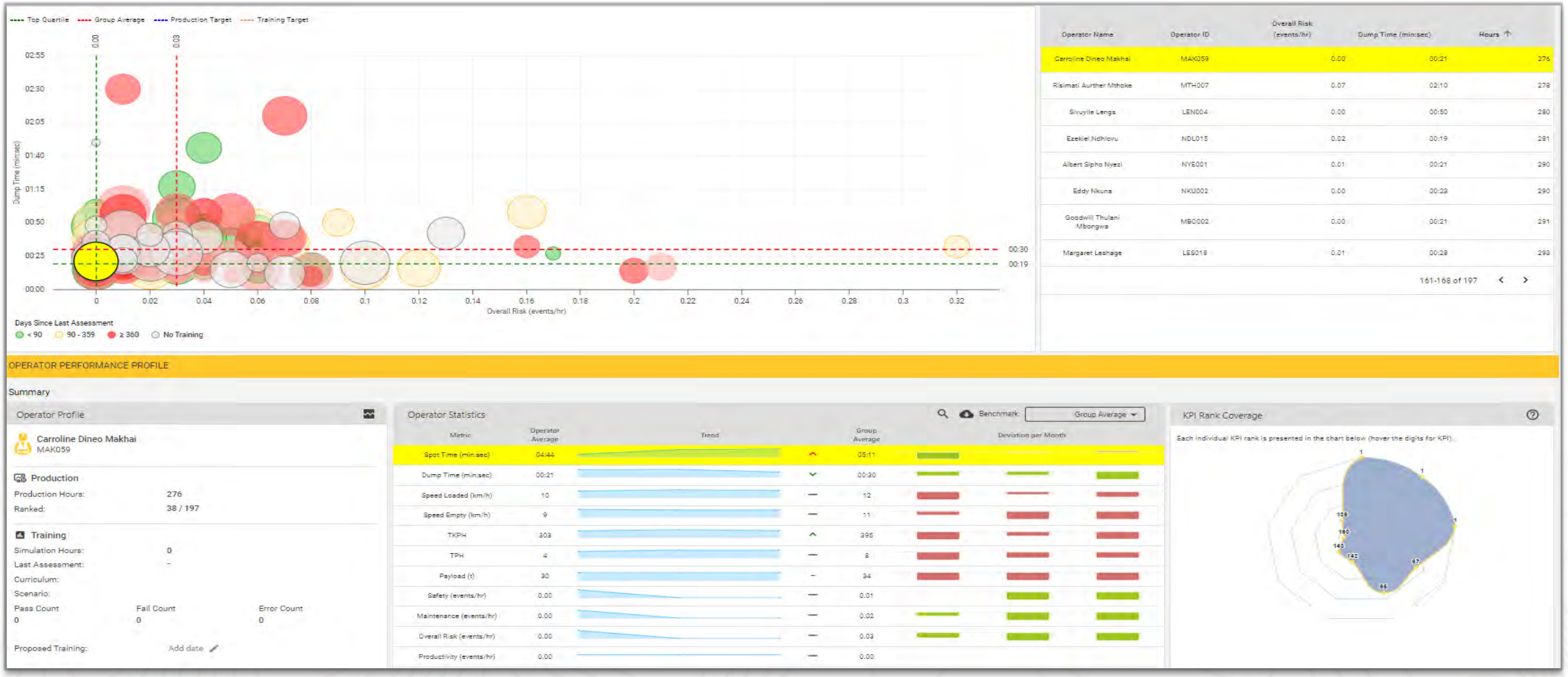
Operator Performance Improvement Cycle



Operator Performance Analytics



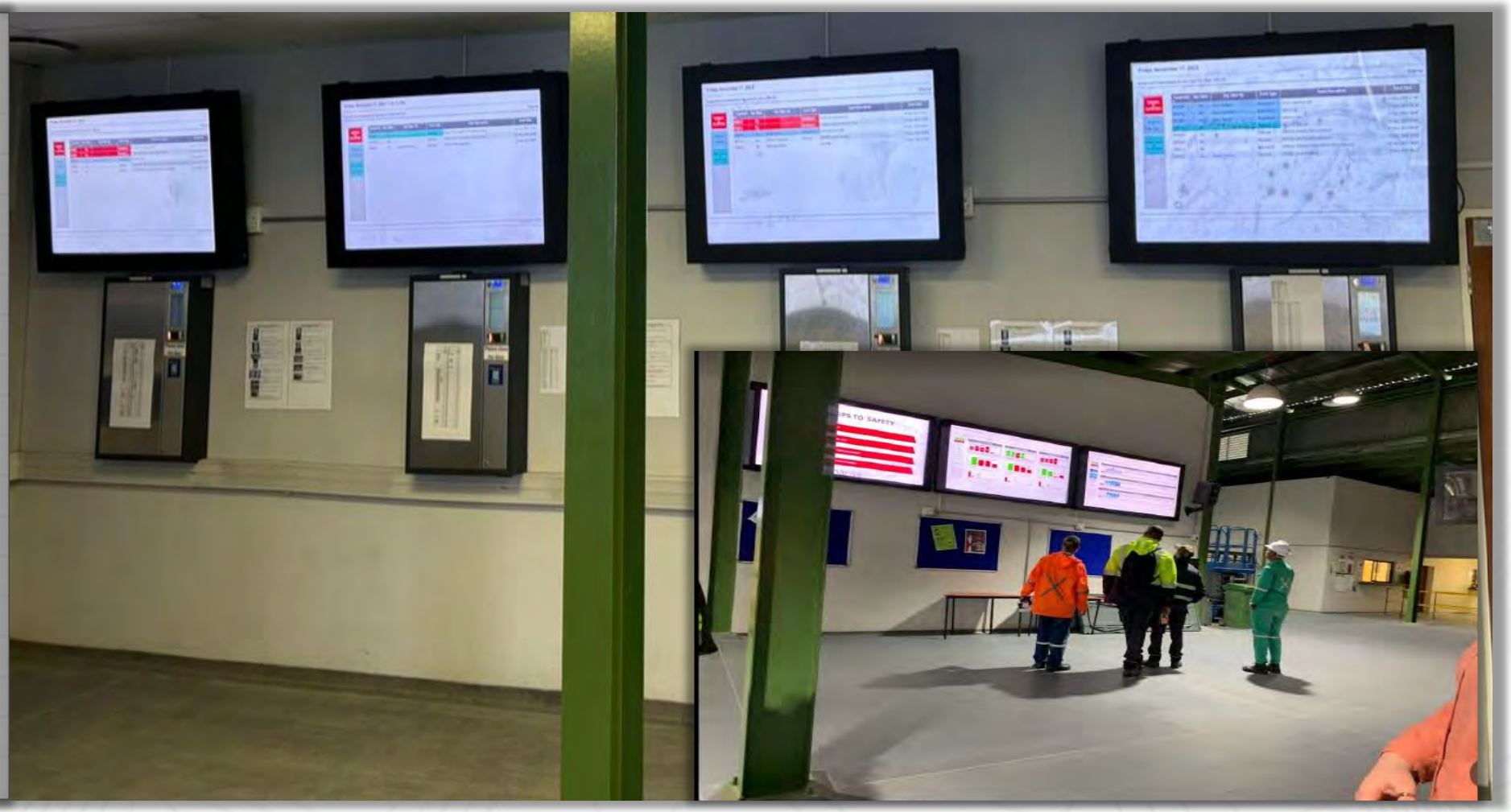
Operator Analytics – KPI Rank Coverage



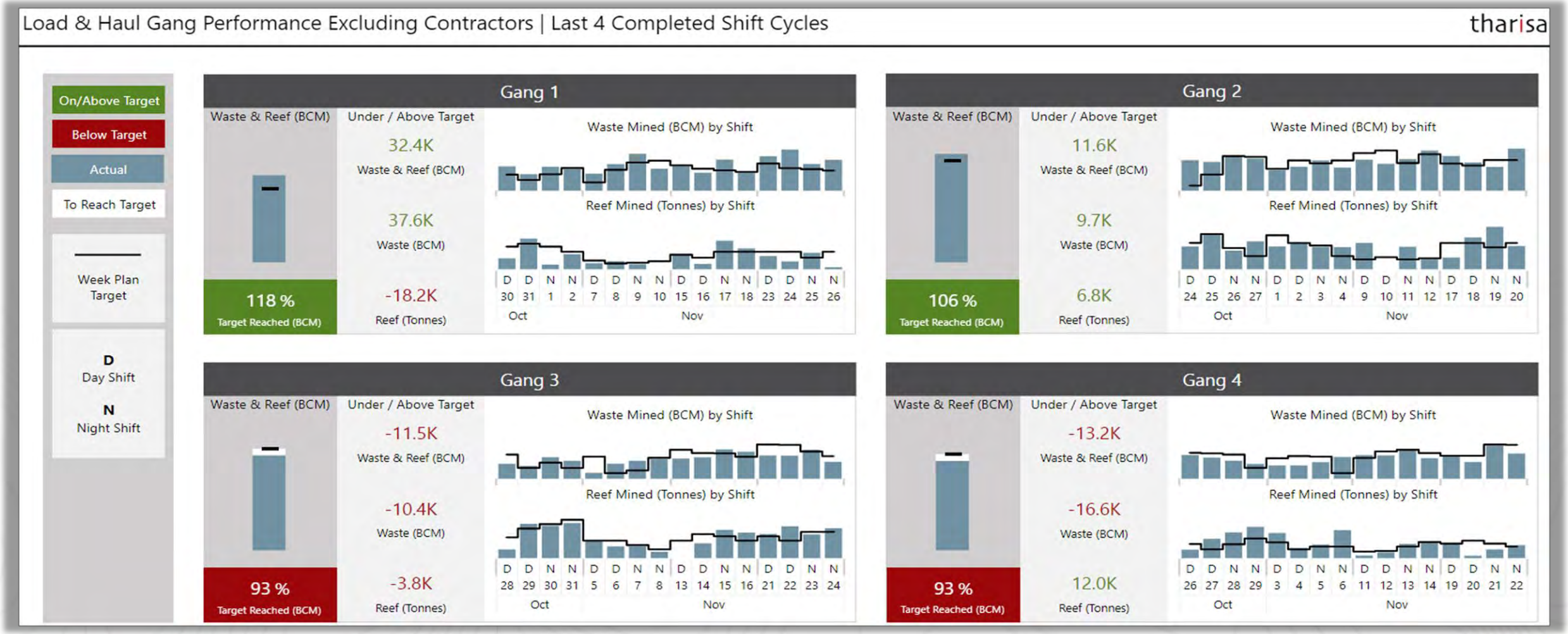
Operational Screen Reports

ining > Screens

Name
Drilling and Bench Prep and Dewatering Attendance and Events
Drilling and Load and Haul Performance
Drilling Gang Performance
Drilling Shift Targets
Engineering Attendance and Events
Equipment Unavailable CH_DRI_120_01
Equipment Unavailable CH_DRI_120_02
Equipment Unavailable CH_MEN_120_07
Equipment Unavailable CH_MLH_080_01
Equipment Unavailable CH_MLH_080_02
Equipment Unavailable CH_MLH_080_03
Equipment Unavailable CH_MLH_080_04
Load and Haul Attendance and Events
Load and Haul Gang Performance
Load and Haul Shift Targets
Mining Medium Term Plan Performance
Tyre Section Workshop Maintenance

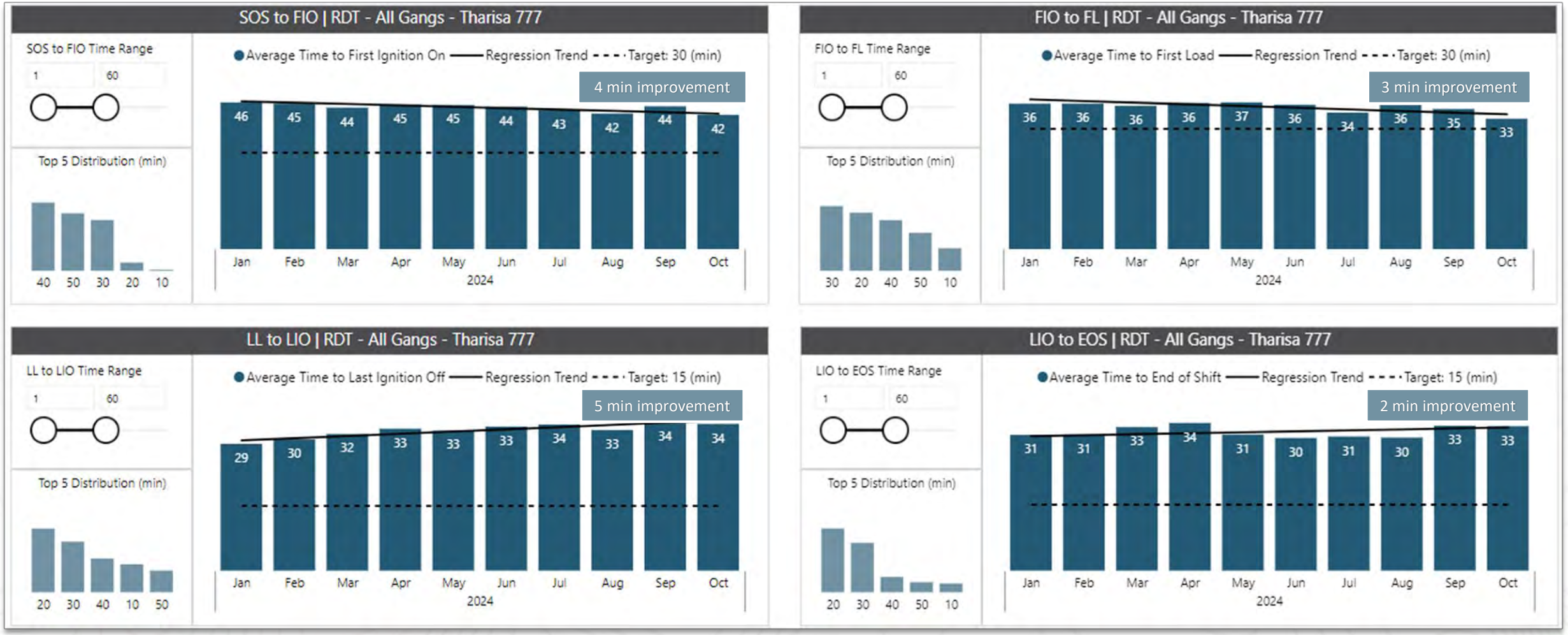


Operational Screen Reports



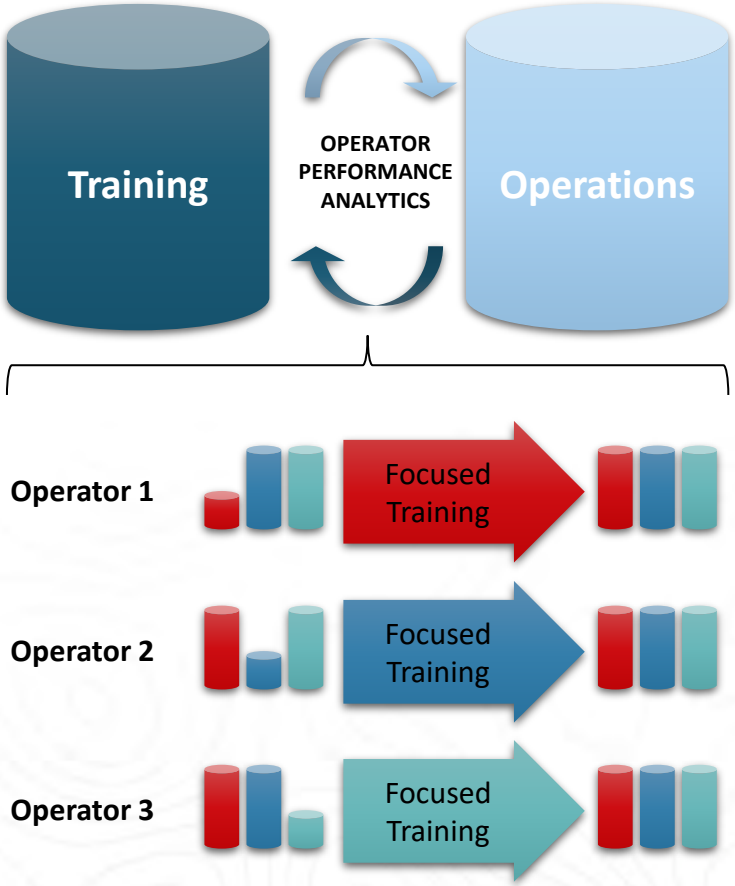
Fleet Monitoring Shift Analysis

SOS: Start of Shift | FIO: First Ignition On | LL: Last Load | LIO: Last Ignition Off | FL: First Load | EOS: End Of Shift



Operator Performance Focused Training

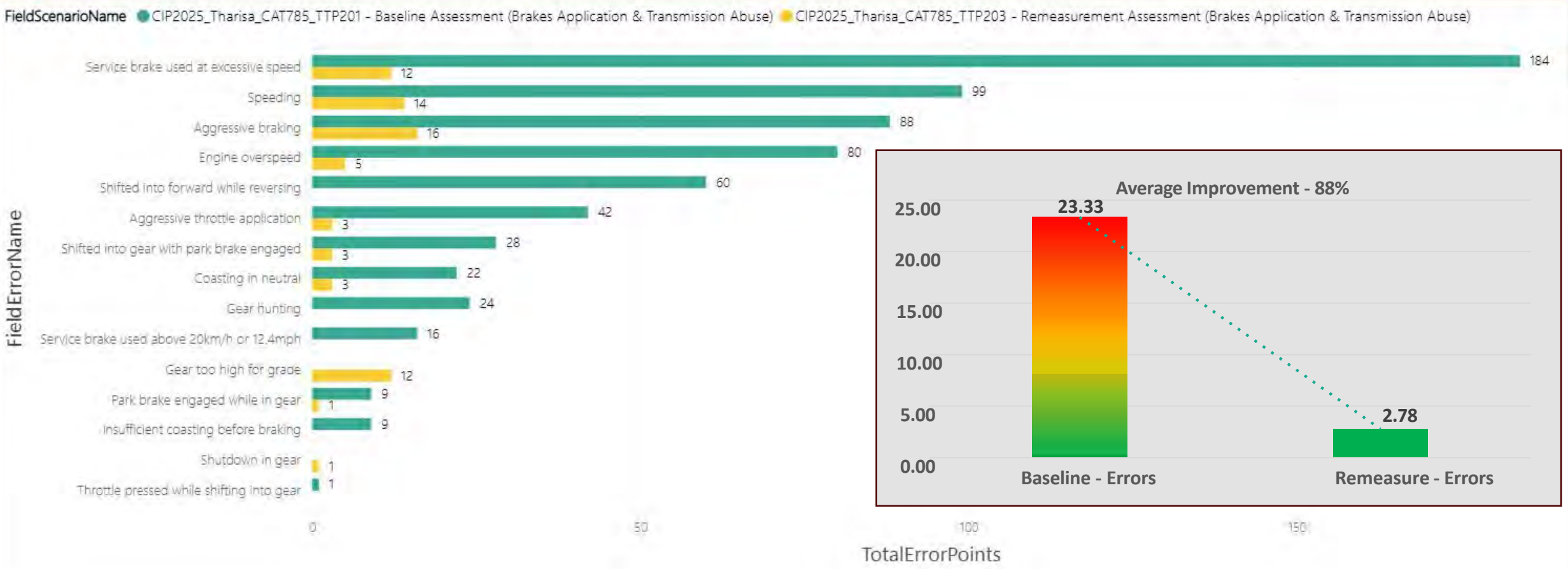
- Continuously analyzes FMS, EHM and Simulation data - **identifying operator risk, optimization and career development opportunities from leading indicators**.
- **Automatically identifies a prioritized list of operators for training** and recommends individual targeted projects.
- **Automatically identifies top performers** for career progression opportunities or better rewards.
- **Automatically assesses training effectiveness** following training.
- Permits detailed operator variability **analysis against KPIs**.
- **Prevents unnecessary training**, lost production, and equipment downtime.
- Reduces the effort for **onsite analysis skills, and capacity.**
- **Maximizes agility** of existing training resources.



Targeted Training – Transmission abuse and Brakes Application

Baseline Assessment | Remeasurement Assessment

Top Errors



BEACON OF MINING

LIGHTHOUSE PARTNERSHIP RESULTS

Level 9 to Action

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