



**MINING INDUSTRY
OCCUPATIONAL
SAFETY & HEALTH**



**MINERALS COUNCIL
SOUTH AFRICA**

MOSH TRAFFIC MANAGEMENT LEADING PRACTICE

FOR OPEN PIT/CAST MINES:

SUCCESS STORY GLENCORE RHOVAN

BACKGROUND

Glencore Rhovan is a Ferroalloys-managed vanadium mining and processing operation situated near Brits in the North-West province of South Africa. It plays a strategic role in supplying high quality vanadium products used in applications that support a low carbon and energy efficient global economy. As part of its continuous improvement and health and safety leadership journey, Glencore Rhovan embarked on enhancing its traffic management systems to align with the Mining Occupational Safety and Health (MOSH) Traffic Management Leading Practice for Surface Operations (TMLP). Given the complex interactions between heavy mining equipment, plant vehicles, business partner vehicles, pedestrians, and processing activities, strengthening traffic management became a critical pillar in Glencore Rhovan's commitment to collision prevention and the protection of life. This work forms part of the operation's broader focus on health and safe production, sustainable operations, and operational excellence.

This case study highlights how Glencore Rhovan successfully advanced the adoption of the Traffic Management Leading Practice through a model grounded in shared ownership, transparency, and strong multi-stakeholder collaboration. Its purpose is to showcase the MOSH Traffic Management Leading Practice adoption journey and process, while demonstrating the tangible benefits and value achieved through its implementation.

As a mature and complex operation comprising mining, plant, kiln, and logistics activities, Glencore Rhovan committed to the MOSH Traffic Management Leading Practice and progressed through Steps 1 to 7, establishing the structured foundation required for effective change. The Mine Adoption Team embedded regulatory expectations into the design of the adoption process. From that point forward, Glencore Rhovan maintained a continuous change management process including engagement with the Department of Minerals and Petroleum Resources (DMPR) through routine reviews of risk assessments, Codes of Practice, procedures, and monitoring programmes, ensuring alignment and demonstrating effective control adoption in practice.



OVERVIEW

- **Mining Company** – Glencore
- **Commodity** – Vanadium
- **Operation/Mine** – Rhovan
- **Health and Safety Success Story** – Adoption of the MOSH Traffic Management Leading Practice for Surface Mines
- **Number of Employees affected by H&S Success Story** – Entire Mine
- **Stakeholders Consulted** – Mine Management, Health and Safety Representatives, Department of Minerals and Petroleum Resources (DMPR), Organised Labour and TMM Operators
- **Occupations Affected/Benefited** – All mine personnel



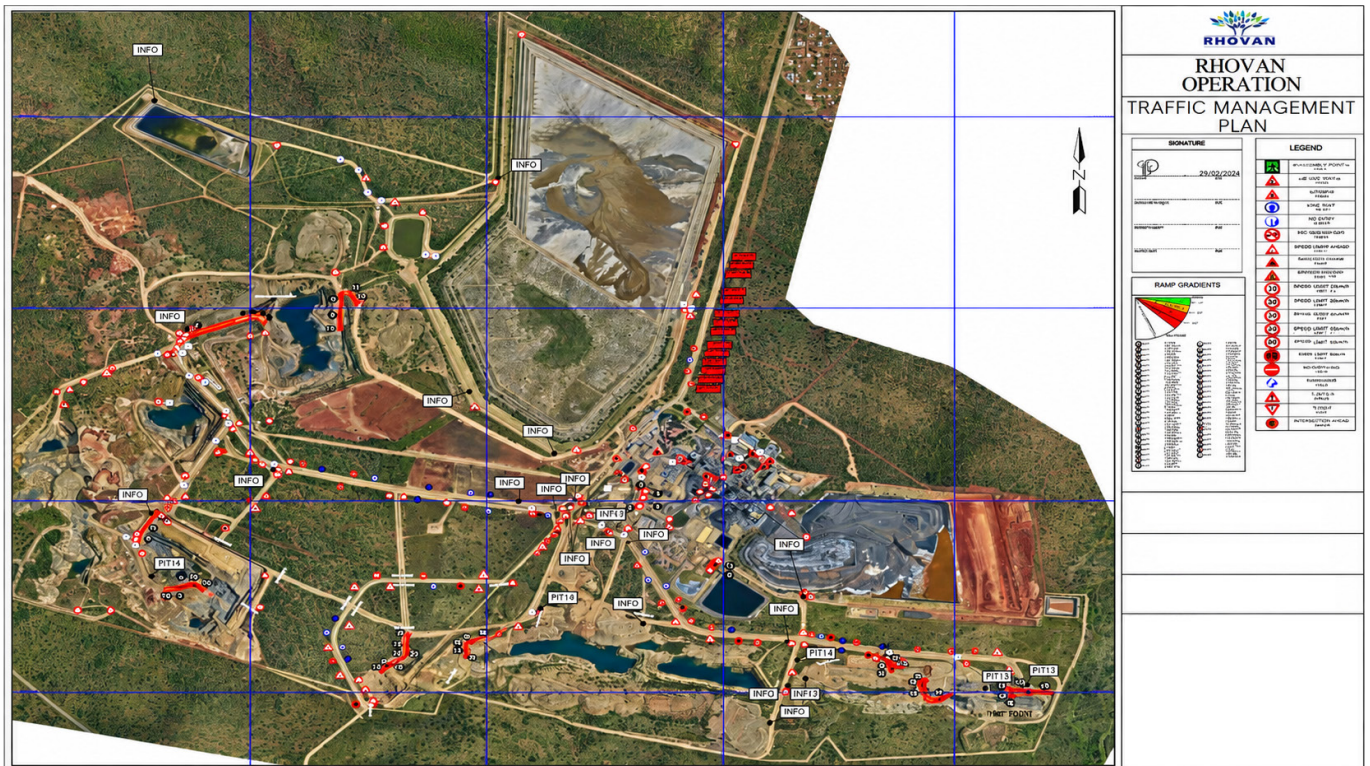


Figure 1: Mine Layout and Road Systems (Routes)

Full Description of The Risk Addressed

The primary risk profile involved Vehicle-to-Vehicle (V-V) and Vehicle-to-Pedestrian (V-P) interactions across mixed fleets and constrained operational layouts. To mitigate these risks, the mine implemented physical segregation through dedicated walkways, barriers, and controlled access points, alongside a collision prevention strategy utilising Level 8 Proximity Detection Systems (PDS) for internal fleets, Level 7 for contractors, and full CPS slow down and stop technology for articulated dump trucks. Traffic efficiency was further optimised through the introduction of one-way systems, traffic management zoning and redesigned parking zones.



Figure 2: Pedestrian Crossings and Walkways

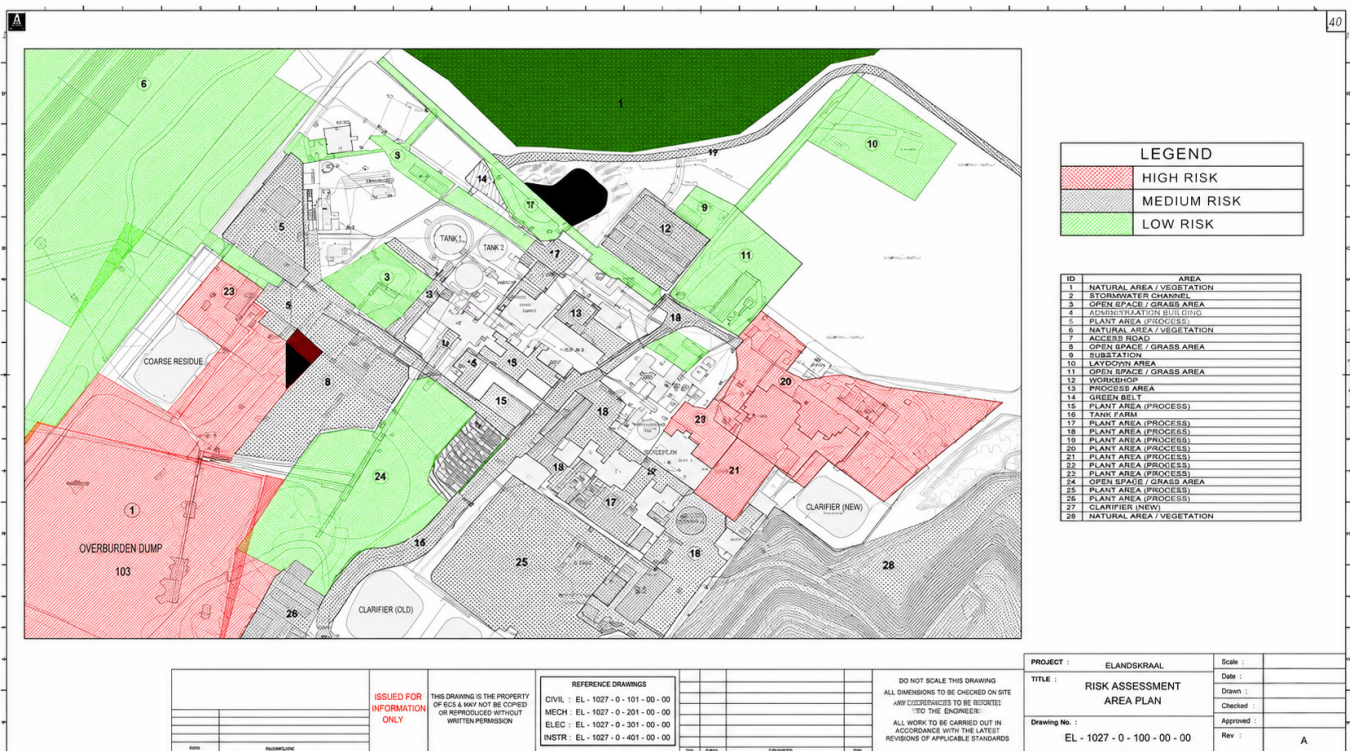


Figure 3: Traffic management zoning

Findings and Improvements Made

Engineering improvements included upgraded road design, visibility aids such as reflective tape and buggy whips, and the deployment of Collision Prevention System (CPS) geo-zoning in high-risk areas.

Glencore Rhovan strengthened behavioural standards through refined right-of-way rules, recovery protocols for Trackless Mobile Machinery (TMM) governed by a revised Safe Work Procedure (SWP), and structured pre-start disciplines. Operationally, the site implemented annual reviews of the TMM Code of Practice and Traffic Management Plan, developed standardised SWPs, and applied targeted training matrices for both operators and workshop artisans to ensure workforce competency.

Collectively, these engineering, behavioural, and operational changes contributed to measurable benefits and ongoing improvements across the operation.

Internally, Glencore Rhovan implemented a multi stakeholder engagement model that actively involved management, the Health and Safety Committee, supervisors, operators, artisans, plant personnel, contractors, organised labour, and employees through open discussions, monthly leadership campaigns, structured training, induction videos, and task-based risk assessments for TMM.

Vusness partners were integrated through mandatory Level 7 PDS fitment on entry, compliance with site rules and signage, and alignment with OEMs and technology partners for CPS deployment. This collaborative approach was strengthened by continuous and transparent engagement with the DMPR, with regular communication on plans, risk assessments, and progress, building trust, regulatory alignment, credibility, and enabling the effective and sustainable adoption of the MOSH Traffic Management Leading Practice at Glencore Rhovan.



Road Design

Road design at Glencore Rhovan plays a critical role in ensuring safe and efficient movement of heavy and light vehicles across the mining operation. The mine applies engineering-based design principles that include cross slope, crown, or camber road shapes to ensure optimal water drainage and to maintain road stability under heavy traffic loads, as discussed in the MOSH Traffic Management Leading Practice Adoption Guide. Primary haul roads are constructed with a nominal width of twelve metres and a grade of 1:10, supporting TMM movement while maintaining traction and visibility. Secondary and temporary ramps are established as operational needs evolve, with steeper grades permitted depending on mining progression. These design elements ensure that vehicle interactions occur on stable, predictable road surfaces aligned with the MOSH Traffic Management Leading Practice elements.

Shape of the roadway should be cross-slope, crown, or camber. This is critical for the design and successful operation of mine roads.

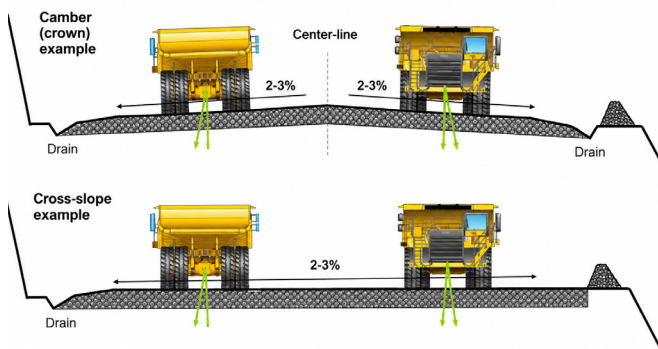


Figure 4: Road Design

Primary ramps of a nominal 12m width and grade of 1:10 shall be incorporated into the final open pit design. Secondary and temporary ramps shall be established from time to time as necessary. Secondary and temporary ramps may have steeper grades to suit the mining operation.



General guidance in regard to roads and travel speed limits

ROAD	WIDTH	SPEED LIMIT
PRIMARY HAUL ROADS	± 12 m split way	50 km/h
SECONDARY ROADS	± 12 m not split	40 km/h
TRENCHES AND PIT ROADS	Less than 12 m not split	30 km/h

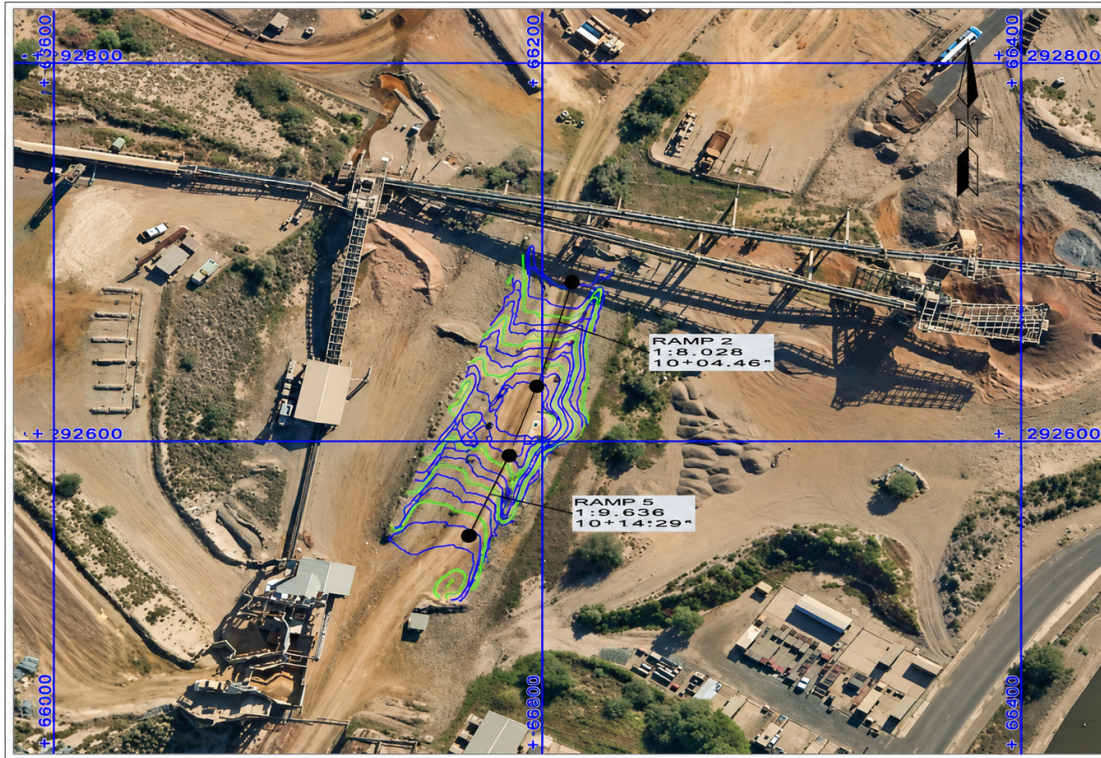
Road Maintenance and Repair

Maintaining road quality is essential for reducing incident risk, controlling dust, and supporting the effectiveness of CPS and braking systems. Glencore Rhovan employs a structured road maintenance programme that utilises equipment such as water carts for dust suppression, and dozers for shaping and compacting the road surface. These interventions allow the operation to maintain road integrity, repair deterioration, and ensure that traffic routes consistently meet safety and design specifications. Effective maintenance supports braking performance, visibility, and the stability of TMM, thereby contributing to reduced incident rates and smoother traffic flows.

Maintenance categories and activities for mine haul roads

MODE	ACTIVITY	EFFECT
ROUTINE MAINTENANCE	Spot re-gravelling	Fill potholes and small depressions, reduce roughness, exclude water
	Drainage and shoulder maintenance	Reduce erosion and material loss, Improve roadside drainage.
	Dragging	Redistribute surface gravel
	Shallow blading	Redistribute surface gravel, fill minor depressions and ruts
	Dust control/watering	Reduces loss of binder and generation of dust
RESURFACING	Full re-gravelling	Restore thickness of wearing course
	Deep blading	Reprofile road and reduce roughness. Remix wearing course material.
REHABILITATION	Rip, re-gravel, re-compact	Improve, strengthen or salvage deficient pavement
BETTERMENT	Rehabilitation and geometric improvement	Improve geometric alignment and structural strength

 **Figure 5:** Road Maintenance and Repair




RHOVAN WORKINGS
BRAKE TEST PLAN
NOTES

Brake Test Ramps and Braking Performance

Glencore Rhovan implemented compliant TMM dedicated brake test ramps and formalised the brake testing procedures. Separate brake test ramps are provided for the mining fleet and kiln fleet, ensuring that distinct operational requirements are addressed. These ramps allow for controlled and repeatable assessment of braking systems before equipment enters high risk operational zones. This structured approach reduces the likelihood of brake related failures and enhances overall TMM fleet reliability.

Test ramp requirements.

The test ramp should be approximately 4 degrees more than the steepest gradient at the mine.

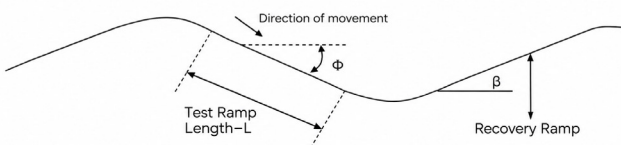


Figure 6: Brake Test Ramps and Braking Performance

Parking Areas

Parking management is a key component of Glencore Rhovan's traffic management strategy. The site provides designated parking areas for employees, visitors, and the mining fleet, including dedicated mining hard park zones designed to safely accommodate heavy vehicles when not in operation. These areas reduce the risk of uncontrolled vehicle movement, segregate light and heavy vehicle parking, and ensure clear visibility and access for operators. Structured parking arrangements help prevent congestion, enable orderly vehicle staging, and support controlled start up procedures. The layout also aligns with pedestrian walkways and access routes to separate foot traffic from vehicle activity, further reducing interaction risk.



EMPLOYEE PARKING



MINING HARD PARK



MINING HARD PARK

Figure 7: Brake Test Ramps and Braking Performance

Refuelling Area

The refuelling area at Glencore Rhovan is designed to control vehicle movement, reduce congestion, and ensure that fuel handling takes place in a safe and structured environment. The layout of the refuelling stations, including the dedicated refuelling bays near the stores area, allows for orderly queueing and prevents unnecessary interaction between heavy and light vehicles. Clear signage, demarcation, and controlled access points guide operators through the refuelling process while maintaining separation between pedestrians and moving equipment. The design also ensures adequate visibility, spill containment, and space for vehicles to enter and exit without creating traffic conflicts.



Figure 8: Refuelling Area

Glencore Rhovan maintained open communication with the DMPR throughout the process of leading practice adoption, sharing plans, risk assessments, progress updates, and operational changes. This transparent engagement ensured alignment, strengthened regulatory confidence, and contributed to smoother adoption of new practices.

Training emerged as a foundational enabler of sustainable change. Continuous improvement of training materials, including TMM and CPS content, enhanced operator competence and awareness. Induction videos formed part of the formal training programme, ensuring that all entrants to the site understood the associated risks and behavioural expectations before commencing work. A SWP training matrix for TMM operators and workshop artisans ensured that individuals received the appropriate training for their roles. This focus on targeted, ongoing training reinforced one of Glencore Rhovan's most important learnings: meaningful and sustainable change is achieved when people are equipped with the right knowledge, supported by strong leadership communication, transparent regulatory engagement, and disciplined governance processes.

Figure 9: SWP Training Matrix for TMM Operators and Vehicle Workshop Artisans

Conclusion

The adoption of the MOSH Traffic Management Leading Practice at Glencore Rhovan demonstrates that sustainable safety improvements in complex mining environments require a multi-disciplinary approach.

By integrating regulatory expectations early, maintaining continuous engagement with the regulator, and fostering strong relationships with labour, contractors, suppliers, and internal teams, Glencore Rhovan built a unified adoption culture rooted in ownership and accountability. The deliberate progression through the MOSH steps, supported by rigorous risk assessments, traffic flow risk analysis, technology deployment, and clearly defined behavioural expectations, ensured that the practice was implemented with discipline, consistency, and shared commitment. This structured approach has not only enhanced collision prevention capabilities but also improved overall operational efficiency across the site.





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