



Government of **Western Australia**
Department of **Mines and Petroleum**
Resources Safety

**Mobile equipment on mines
high impact function (HIF) audit
Part 1 – Traffic management 2011**

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Contents

Introduction 2

1 Traffic management plan 3

2 Mine access roads 7

3 Road standards 9

4 Intersections 14

5 Parking areas 16

6 Traffic control signage 19

7 Pedestrians 21

8 Traffic movement around buildings, structures and service corridors 24

9 Road construction and maintenance 26

Introduction

The scope of this audit document is designed to cover the safety standards associated with the management of road standards and the movement of mobile equipment and pedestrians at a surface mine.

The audit is split up into sections covering the development of a traffic management plan, mine site access, road standards, intersections, parking, traffic control signage, pedestrians, buildings and structures, power line and railway corridors, road construction and maintenance, and emergencies.

This audit does not cover mobile equipment operations and maintenance requirements as these standards are to be included in separate audit documents (parts 2 and 3).

Autonomous equipment operations are not covered in this audit.

Where the term “verify” is used in the guideline intent then that implies there is a regulatory requirement for compliance with the standard, and where the term “ensure” is similarly used then there is no mandatory requirement for compliance, but the standard sets out a recommended practice, which if followed, should minimise the potential for a traffic incident.

Useful references include:

- Selected Safety Bulletins, Significant Incident Reports, and Safety Alerts from
 - www.dmp.wa.gov.au
 - www.dme.qld.gov.au
 - www.dpi.nsw.gov.au
- Australian Standards
- WA Main Roads “Road and Traffic Engineering Standards”
- Austroads guides (**www.austroads.com.au**)
 - Guide to Road Design
 - Guide to Road safety
- Unsealed Roads Manual: ARRB 2009
- Design of Surface Mine Haul Roads (US Department of Interior, Bureau of Mines) information circular 8758, 1977:1-50
- Haul Road Inspection handbook (US MSHA) <http://www.cdc.gov/niosh/srchpage.html>

1 Traffic management plan

Point	Standard	Guideline
1.1	The operation has prepared and approved a traffic management plan.	<p>Intent: To verify that rules have been developed for the safety of all vehicles and pedestrians at the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIA s. 9, MSIR r. 6.17.</p>
1.2	The traffic management plan sets out requirements for permitting a vehicle driver to operate equipment on the mine.	<p>Intent: To verify that vehicle operators are competent to operate mobile equipment safely.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for details of procedures, training and assessment of competency.</p> <p>Refer to MSIR r. 4.13.</p>
1.3	The traffic management plan sets out the design requirements for access roads leading to the mine.	<p>Intent: To verify that road design requirements are developed for the safe operation of vehicles on access roads leading to the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIA s. 13.</p>
1.4	The traffic management plan sets out the design requirements for mine internal roads, open pit roads and other vehicle operating areas within the mine.	<p>Intent: To verify that road design requirements are developed for the safe operation of vehicles within the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIR r. 13.7.</p>
1.5	The traffic management plan sets out the design requirements for the standard and formation of intersections at the mine.	<p>Intent: To verify that road design requirements are developed for the safe operation of vehicles at intersections within the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIR r. 13.7.</p>

Point	Standard	Guideline
1.6	The traffic management plan sets out the design requirements for the standard and formation of parking areas at the mine.	<p>Intent: To ensure that road design requirements are developed for the safe parking of vehicles within and outside the mining areas at the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation.</p> <p>Refer to AS/NZS 2890:2004 <i>Parking facilities – Off-street car parking</i> (Note: referenced for non-mining area parking).</p>
1.7	The traffic management plan sets out the design requirements for warning signage, traffic signage, and devices to control the speed and movement of traffic within all areas of the mine.	<p>Intent: To verify that requirements are developed for the signage and devices to be used for the control and safe operation of all vehicles at the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIR rr. 4.10 and 13.7, AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i> and AS/NZS 1906.1:2007 <i>Retroreflective materials and devices for road traffic control purposes – Retroreflective sheeting</i>.</p>
1.8	The traffic management plan sets out design requirements that, so far as is practicable, segregates the transport routes used by heavy vehicles, road trains, and buses/light vehicles.	<p>Intent: To ensure that, where practicable, segregated transport routes are provided for heavy vehicles, road trains, and buses or light vehicles.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation.</p>
1.9	The traffic management plan sets out the design requirements for the control and segregation of the traffic/pedestrian interface within all areas.	<p>Intent: To ensure that road design requirements are developed for the segregation and protection of pedestrians at the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation.</p>
1.10	The traffic management plan sets out the design requirements for the standard and formation of roads in the vicinity of infrastructure such as fixed plant, services, buildings and structures.	<p>Intent: To verify that road design requirements are developed for the safe operation of vehicles in the vicinity of infrastructure such as fixed plant, services, buildings and structures.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation (e.g. bollards and similar protection treatments). Refer to MSIR r. 13.7.</p>

Point	Standard	Guideline
1.11	The traffic management plan sets out the design requirements for the standard of lighting.	<p>Intent: To verify that adequate lighting is provided within the mine. Particular consideration needs to be given to pedestrian and parking facilities.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIR r. 13.6(1).</p>
1.12	The traffic management plan sets out the design requirements for the standard and formation of roads which intersect power line corridors.	<p>Intent: To verify that road design requirements are developed for the safe operation of vehicles within power line corridors.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIR r. 5.28.</p>
1.13	The traffic management plan sets out the requirement for the standard of communication and equipment to be utilised in mobile equipment and in pedestrian interface areas.	<p>Intent: To verify that the traffic management plan outlines the requirements for the provision and usage of communication devices within mobile equipment operational areas.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIA s. 9.</p>
1.14	The traffic management plan sets out the management duty and responsibility requirements for ensuring compliance with the plan.	<p>Intent: To verify that the traffic management plan outlines who is responsible for ensuring compliance with the traffic management plan.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Refer to MSIA s. 44.</p>
1.15	The traffic management plan sets out the requirements for managing human factors and fitness for work requirements.	<p>Intent: To verify that the traffic management plan addresses the employee suitability and fitness for work issues for operating mobile plant.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Confirm that pre employment standards are established covering past experience, medical fitness and licence requirements. Identify whether the plan defines standards for fatigue, drugs and alcohol and other employee safety factors.</p> <p>Refer to MSIA ss. 9 and 10.</p>

Point	Standard	Guideline
1.16	The traffic management plan sets out the road rules for all vehicle operators.	<p>Intent: To ensure that the traffic management plan outlines the road rules for the safe operation of mobile equipment.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation.</p>
1.17	The traffic management plan sets out a schedule of inspections and checks for maintaining compliance with the traffic standards.	<p>Intent: To verify that traffic standards are consistently being achieved and maintained.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation.</p> <p>Refer to MSIA s. 43 and MSIR r. 3.18.</p>
1.18	The traffic management plan is updated by the principal employer in accordance with a change management policy.	<p>Intent: To ensure that the traffic management plan is under continuous review and is kept up to date.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for change management policy. Check that it is reviewed and updated at regular intervals in accordance with company policy after any procedural changes or after changes made arising out of any incident. The management of change policy should include the method of communication to all affected personnel.</p>
1.19	A traffic management audit is carried out on a regular basis.	<p>Intent: To ensure that traffic management at the mine is subject to a regular internal audit.</p> <p>Personnel: Registered manager.</p> <p>Method: View copy of company audit of traffic management.</p>

2 Mine access roads

Point	Standard	Guideline
2.1	Speed and traffic control signs are displayed along the access road.	<p>Intent: To ensure that all traffic entering the mine is provided with clear operating instructions.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine access road signage.</p>
2.2	Direction signs are provided along the mine access road and at the mine entry point.	<p>Intent: To ensure that the location of the mine and reception area is clear and easily identifiable to all visiting traffic.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine access road signage. Ensure visitors are provided with adequate directions to the mine reception and visitor parking area.</p>
2.3	Measures are implemented at all mine access points to prevent inadvertent access.	<p>Intent: To verify the existence of a means to prevent inadvertent access of unauthorised persons into the mine.</p> <p>Personnel: Registered manager.</p> <p>Method: Inspect the mine access road signage and control measures utilised to restrict access. Mines in close proximity to local communities or where there is a likelihood of the public inadvertently accessing the mine operations should provide security fences, gates and/or earth bunding to restrict access.</p> <p>Refer to MSIR rr. 4.10 and 13.11.</p>
2.4	Marker guides and reflectors are provided along the mine access road.	<p>Intent: To verify that all traffic using the mine access road is provided with sufficient road indicators to traverse the road safely both by day and night.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine access road marker guide posts. Confirm that the delineators on the posts are red on the left and white on the right. The posts should be about 1.5 m from the traffic, about 1 m in height and spaced at 150 m intervals on straights and closer spacing on curves.</p> <p>Refer to MSIA s.13 and AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i>.</p>

Point	Standard	Guideline
2.5	Roadside hazards are protected by a suitable barrier.	<p>Intent: To ensure that adequate barriers are installed to prevent vehicles leaving the road and contacting hazards such as a steep bank, drainage structure, utility pole.</p> <p>Personnel: Registered manager.</p> <p>Method: Inspect the traffic management plan and the mine access road. Any barrier size installed should be determined by risk analysis.</p>
2.6	Safety signage to warn of a hazard and prevent incidents is displayed along the mine access road.	<p>Intent: To verify that safety warning signage is used at relevant locations to inform drivers of the dangers arising at points along the road.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Inspect the mine warning signage in use (e.g. trucks entering, sharp bend, steep incline or decline, one way, call up point, road repairs).</p> <p>Refer to MSIR r. 4.10, and AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i>.</p>
2.7	Road line markings are provided and maintained on the sealed access road.	<p>Intent: To ensure that all traffic using a sealed access road is provided with road markings to traverse through each area safely.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine sealed road for white line markings. Segregation lines need to be provided between traffic flow directions.</p> <p>Refer to AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i>.</p>
2.8	A clear zone free from hazards is maintained on each side of the road.	<p>Intent: To ensure that the access road has a zone on each side of the road clear of non-frangible hazards.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the road edge for evidence of a road clearance zone. Typically, this is 1 m for low speed (<30 kph) traffic, otherwise 3 m or more.</p>

3 Road standards

Point	Standard	Guideline
3.1	The mine roads and other vehicle operating areas are built utilising the correct sequence of materials and material competency	<p>Intent: To verify that the mine roads are built with sufficient stability suitable for the size and operational limitations of the mobile equipment.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Review the traffic management plan. Confirm that the road has been designed, built and layered with competent material using an in-situ layer, a ripped and compacted in-situ layer, a base layer and a wearing course with suitable rolling resistance.</p> <p>Refer to MSIR r. 13.7(2).</p>
3.2	The primary mine roads and other vehicle operating areas are built in accordance with the width requirements of the largest vehicle currently operating on the primary roads.	<p>Intent: To verify that the primary mine roads are of sufficient width to minimise the risk of traffic collisions.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect traffic management documentation and the primary mine roads. Check that each road is of suitable width for single or two way traffic (e.g. 2X for single lane one-way traffic and 3.5X for two-way traffic where X is the width of the largest vehicle).</p> <p>Refer to MSIR r. 13.7(2).</p>
3.3	Secondary mine roads that are not built in accordance with the width requirements of the largest vehicle currently operating on that road have controls which ensure the safe passage of vehicles.	<p>Intent: To ensure that there are measures in place to ensure the safe passage of vehicles using secondary mine roads. Such measures may include use of warning signs, call-up signs and radio communication, passing bays.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect traffic management documentation and the secondary mine roads. Check the means provided (e.g. signage, communication requirements, provision of parking bays).</p>
3.4	Clear zones are maintained on both sides of the road.	<p>Intent: To ensure that the area on the side of the road is free of non-frangible hazards and should be available for the safe use of errant vehicles.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the road edge for clearance zone. Typically, the zone should be 1 m for vehicles travelling at <30 kph , otherwise 3 m or more.</p>

Point	Standard	Guideline
3.5	The mine roads and other vehicle operating areas are built in accordance with safe operating gradients.	<p>Intent: To verify that the road gradients at the mine are suitable for the operational limitations of the mobile equipment.</p> <p>Personnel Registered manager, quarry manager, planning engineer.</p> <p>Method: Review the traffic management plan and inspect the mine roads. Confirm that road gradients do not, so far as is practicable, exceed 10%.</p> <p>Refer to MSIR r. 13.7(2), DMP Mines Safety Bulletin 72 and NSW Safety Alert SA06-14.</p>
3.6	Any loss of control of mobile equipment on pit ramps is effectively managed through the use of engineering controls.	<p>Intent: To ensure that mobile equipment can be brought to a safe halt when out of control on a pit ramp.</p> <p>Personnel Registered manager, quarry manager, planning engineer.</p> <p>Method: Review the traffic management plan. Determine whether controls have been developed to manage the hazard. Identify whether wall side windrows, edge windrows, central dividers, deceleration pits or run off areas have been installed. Refer to DMP Significant Incident Report 84 and QLD Safety Alert 194.</p>
3.7	The mine roads and other vehicle operating areas are built with a suitable camber.	<p>Intent: To verify that the road cambers are appropriately graded to ensure stable traffic conditions.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Review road design documentation. Check if the mine road cambers are neutral or positive. Adverse cambers on straight sections or bends fail this standard. Refer to MSIR r. 13.7(2).</p>
3.8	The mine roads and other vehicle operating areas are built with a suitable super elevation and run in/run out on bends and curved sections of the road.	<p>Intent: To ensure that the super elevation and run in run out utilised on bends and curved sections of the road are appropriately graded to ensure stable traffic conditions.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Review road design documentation. Check if the road super elevation and run in/run out grades are suitable (e.g. in the order of 2-3%).</p>

Point	Standard	Guideline
3.9	The mine roads and other vehicle operating areas are built in accordance with the required radius of curvature for bends as specified by vehicle equipment manufacturer.	<p>Intent: To verify that the radius of curvature on bends is consistent and appropriate for the size of equipment operating at the mine.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect the documentation and the mine roads. Curves are designed based on speed, with the maximum radius possible and changes in curve radius are avoided. Refer to MSIR r. 13.7(2).</p>
3.10	The mine roads are designed and built using cut and fill techniques.	<p>Intent: To ensure that the mine roads are built and maintained to a safe road standard eliminating blind spots.</p> <p>Personnel: Registered manager.</p> <p>Method: Inspect the mine roads. Check that the road construction utilises cut and fill techniques. Roads which follow the regional topography do not meet this standard.</p>
3.11	The mine roads and other vehicle operating areas which follow the topography are built in accordance with the acceptable sighting distance for bends and crests based on the speed.	<p>Intent: To ensure that sufficient sighting distances are provided on roads for mobile equipment to be able to stop safely at the mine.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect the documentation for the mine roads sighting calculations.</p>
3.12	The mine road surfaces are provided with adequate drainage.	<p>Intent: To ensure that traffic is not exposed to the risk of poor drainage or road erosion resulting from adverse weather conditions at the mine.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect the traffic management plan and the mine roads. The roads should be designed and built with adequate culverts, drainage channels, correct camber and cross-fall (used with caution) to control drainage. Confirm table drains, silt traps and/or rock armouring is utilised to control the flow of rain water and minimise erosion. Roads which have water standing on the road or significant surface erosion do not meet this standard.</p>

Point	Standard	Guideline
3.13	Flood crossings are constructed and depth warning indicators are installed where complete under road drainage is not provided.	<p>Intent: To ensure that stable delineated floodways are installed to allow safe crossing and inform the driver of the water depth at creek crossings and floodways.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect the traffic management plan and the mine roads at creek crossings and floodways. Confirm that a permanent flood crossing surface has been installed and flood warning and depth indicator signs have been erected.</p>
3.14	An adequate windrow or bund of material is provided on the outer edge of each road in the open pit and on the outer edge of any extension of those pit roads on the surface adjacent to a bank or steep slope.	<p>Intent: To verify that adequate structures are installed to prevent vehicles leaving the road.</p> <p>Personnel: Registered manager, quarry manager, planning engineer.</p> <p>Method: Inspect the traffic management plan and roads. Any windrow should be determined by risk analysis, but should be at least half (50-66%) the wheel height of the largest vehicle operating on that road. Refer to MSIR r. 13.7(5) and NSW Safety Alert SA06-10.</p>
3.15	Barriers are provided on the edge of each road (other than mine access road and open pit roads) adjacent to elevated road sections and or naturally occurring or manmade hazards.	<p>Intent: To ensure that adequate structures are installed to prevent vehicles leaving the roadway.</p> <p>Personnel: Registered manager and road design engineer.</p> <p>Method: Inspect the traffic management plan and the mine roads. Any highway barrier size installed should be determined by risk analysis.</p> <p>Refer to NSW Safety Alert SA06-10.</p>
3.16	Speed and traffic control signs are displayed along each road and in other vehicle operating areas.	<p>Intent: To verify that all traffic in the mine is provided with clear driving information.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine road signage.</p> <p>Refer to MSIR r. 13.7(4).</p>
3.17	Traffic controls are implemented where mine haul roads cross a public roadway.	<p>Intent: To verify that mine haul road vehicles are provided with clear control when approaching a public roadway.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine traffic controls used at public transport routes.</p> <p>Refer to MSIR r. 13.7(4).</p>

Point	Standard	Guideline
3.18	Direction signs are provided within the mine.	<p>Intent: To ensure that the each workplace location is clear and easily identifiable to traffic.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine road direction and location signage. Ensure traffic users are provided with adequate directions to each workplace.</p>
3.19	Traffic control devices are erected along each road and in other vehicle operating areas.	<p>Intent: To verify that traffic controls are installed to control the movement of vehicles at the mine.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine traffic control devices. Determine if windrows, islands, traffic calming bunds or other traffic control measures are utilised to prevent equipment cutting corners or ending up on the wrong side of the road at an intersection or at a crest.</p> <p>Refer to MSIR r. 13.7(4), and QLD Safety Alert 194.</p>
3.20	Safety warning signs are displayed along mine roads and in other vehicle operating areas.	<p>Intent: To verify that safety warning signage is used at relevant locations to inform drivers of the dangers arising at the site.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation. Inspect the traffic warning signage in use (e.g. trucks entering, sharp bend, steep incline or decline, floodway, one way, call up point, road repairs).</p> <p>Refer to MSIR r. 4.10, and AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i>.</p>
3.21	Roadside marker guides and reflectors which are clearly visible at night are provided.	<p>Intent: To verify that all traffic using mine roads are provided with sufficient road indicator guides to traverse the road safely.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the road marker guides. Ensure that marker guides utilise the red on the left and white on the right convention. Establish that the traffic management plan stipulates where the delineators are erected i.e. a set distance from the road, on both sides of the road and the repeater distance. Confirm that plastic and wooden devices are used instead of tubular metal posts and metal star pickets.</p> <p>Refer to MSIR r. 13.6(3).</p>

4 Intersections

Point	Standard	Guideline
4.1	The mine roads are designed and laid out to avoid four way or greater intersections.	<p>Intent: To ensure that the road design is developed for the safe movement of vehicles.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for the intersection layout parameters. Determine if any four way intersections are present at the mine.</p>
4.2	Intersections are designed and laid out to minimise blind spot hazards.	<p>Intent: To ensure that the intersection design is developed for the safe operation of vehicles.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for the intersection layout parameters. Inspect a sample of intersections to determine whether intersections are laid out approximately at right angles. Confirm that the connecting road is designed so far as is practicable at right angles to the through road to minimise the blind spot issues and allow for maximum sighting distance. "Y" intersections do not meet this standard.</p>
4.3	Intersections are located and spaced a safe distance from other intersections, bends and obstructions, which limit visibility, taking into account vehicle speed, safe stopping distance and an appropriate factor of safety.	<p>Intent: To ensure that the intersection design is developed for the safe operation of vehicles.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for the intersection layout parameters. Identify whether a safe sighting and stopping distance has been determined and incorporated into the traffic management design. Confirm intersections are positioned in safe locations away from horizontal and vertical alignment changes.</p>
4.4	Intersection gradients are defined and implemented.	<p>Intent: To ensure that the intersection gradient design is safe for the operation of vehicles.</p> <p>Personnel: Registered manager.</p> <p>Method: Review the traffic management plan documentation for the intersection layout parameters. Identify whether a minimum safe gradient has been determined for the mine intersections. Gradients greater than 2-3% are to be avoided.</p>

Point	Standard	Guideline
4.5	Traffic control signage is displayed at each intersection.	<p>Intent: To ensure that all traffic at the mine is provided with clear traffic control instructions.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine road intersection signage.</p> <p>Refer to AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use.</i></p>
4.6	Traffic control devices are utilised to control traffic movement at each intersection.	<p>Intent: To verify that traffic controls are installed to control the movement of vehicles at the mine.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine intersection traffic control devices. Determine if windrows, islands, traffic calming bunds or other traffic control measures are utilised to prevent equipment cutting corners or ending up on the wrong side of the road. The traffic splitter islands should be set back 1 m from the through road and extend over a distance of 15 m.</p> <p>Refer to MSIR r. 13.7.</p>
4.7	A hazard marker sign (Chevron sign) is displayed at each terminating road.	<p>Intent: To verify that warning signage is used to signify the termination of a road.</p> <p>Personnel: Registered manager.</p> <p>Method: Inspect the mine road intersection signage.</p> <p>Refer to MSIR r. 13.7 and AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use.</i></p>
4.8	The minor approach roads have a flat area constructed to the minimum length of the longest vehicle using the intersection.	<p>Intent: To ensure a safe intersection entry point is provided.</p> <p>Personnel: Registered manager.</p> <p>Method: Inspect the mine road intersection entry length and compare it with the length of the longest vehicle operating on the road in that area.</p>

5 Parking areas

Point	Standard	Guideline
5.1	Adequate size designated parking areas are provided for all private vehicles and visitor's vehicles entering the mine.	<p>Intent: To ensure that sufficient parking spaces are provided for all non-mining vehicles visiting the mine.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the employee and visitor vehicle parking areas. Determine if an overflow parking facility is provided if there is insufficient room for parking.</p>
5.2	Adequate size designated parking areas are provided for all mine vehicles at the mine.	<p>Intent: To ensure that sufficient designated parking spaces are provided for all mining vehicles at the mine.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine vehicle parking areas. Determine if an overflow parking facility is provided if there is insufficient room for parking.</p>
5.3	In parking areas with sealed road surfaces line markings are provided to define traffic flows and vehicle parking bays of suitable width.	<p>Intent: To ensure that road widths and parking bay areas of adequate width are clearly marked to provide a safe parking environment.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle parking areas. Determine if the parking area has been marked out to provide safe traffic flows and adequate parking spaces.</p>
5.4	Where practicable, parking areas are levelled using cut and fill techniques.	<p>Intent: To ensure that the potential for traffic rolling away is minimised at each designated parking area.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle parking areas. Determine if the parking area has been levelled or if there is a significant slope evident.</p> <p>Refer to DMP Significant Incident Report 81.</p>
5.5	In those parking areas which are sloped, parked vehicles are orientated at right angles to the gradient.	<p>Intent: To ensure that the potential for traffic rolling away is minimised at designated parking areas that are sloped.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle parking areas.</p>
5.6	Parking areas have devices installed to prevent any uncontrolled vehicle movement.	<p>Intent: To ensure there are engineering controls in place to prevent unattended vehicle movement.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine vehicle parking areas. Determine if vehicle wheel stops, spoon drains or tyre humps are provided where there is potential for uncontrolled vehicle movement.</p>

Point	Standard	Guideline
5.7	Pedestrian walkways are provided at all vehicle parking areas.	<p>Intent: To ensure that personnel are provided with safe access to their vehicles.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle parking areas. Pathways should be provided off the road for accessing vehicles in order to meet this standard.</p>
5.8	Parking in the mining areas is such that interaction between heavy vehicles and light vehicles/pedestrians is avoided.	<p>Intent: To ensure that parking areas are constructed such as to avoid interaction between heavy vehicles and light vehicles or pedestrians.</p> <p>Personnel: N/A</p> <p>Method: Inspect the mining equipment parking areas and ascertain if the layout is such that interaction between heavy vehicles and pedestrians or light vehicles is avoided.</p>
5.9	Large mobile equipment vehicle parking areas are designed, so far as is practicable, to eliminate the need for reverse parking.	<p>Intent: To ensure that vehicles can be parked and driven away in a forward direction to reduce the risk of reversing into equipment or people.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the large mobile equipment parking areas for parking and drive through design.</p> <p>Note: In parking areas where there is complete separation of heavy vehicles from light vehicles or pedestrians, reverse parking into individual parking bays would be acceptable.</p>
5.10	Vehicle parking areas have a defined traffic flow and are provided with separate signposted entry and exit points.	<p>Intent: To ensure that the risks of vehicle collisions are reduced.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle parking areas. Determine if devices or bunds are installed to control and define vehicle movement at each parking area.</p>
5.11	A Lightning Management Plan has been developed and implemented for all large earthmoving machinery parking areas.	<p>Intent: To ensure that the risks associated with lightning during electrical storms have been assessed in respect of earthmoving equipment parking areas.</p> <p>Personnel: N/A.</p> <p>Method: Check for Lightning Management Plan and earthmoving equipment parking areas.</p> <p>Refer to NSW Safety Alert SA08-03.</p>

Point	Standard	Guideline
5.12	Disabled parking areas and facilities are provided at the mine.	<p>Intent: To ensure that disabled visitors and employees are provided with a safe access to the site.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the light vehicle parking areas for disabled parking facilities. Confirm that there is sufficient parking space to exit the vehicle safely and sloped ramps are provided at stair and change of gradient areas.</p>
5.13	Bus pick up and drop off parking areas and facilities are provided at the site	<p>Intent: To ensure that facilities for the safe transportation of groups of visitors and employees are provided at the site.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the bus pick up and drop off parking areas and facilities. Confirm that there is sufficient off road parking space for the buses and weather protection is provided for individuals waiting for transportation.</p>

6 Traffic control signage

Point	Standard	Guideline
6.1	The traffic signage utilised conforms to an appropriate road safety sign standard.	<p>Intent: To ensure that the traffic signage utilised meets a consistent standard.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the traffic signage standards. Confirm if the signage is of the appropriate size (B size for light vehicle routes and C size for heavy haulage routes), is fit for purpose and is easy to read and understand. Refer to AS 1742.2:2009 <i>Manual of uniform traffic control devices – Traffic control devices for general use</i>.</p>
6.2	The traffic signage is installed at the required height so as to be immediately observed.	<p>Intent: To ensure that traffic signage is installed at least at the minimum height which makes it immediately observed by vehicle operators.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the height of signage. A minimum height of 1.5 m for light vehicles where no pedestrians or parked vehicles are present, 2 m where pedestrians or parked vehicles are present and 1.8 m for heavy haulage routes is considered to be an appropriate compliance with this standard.</p>
6.3	The traffic signage is installed and firmly secured.	<p>Intent: To ensure that traffic signage can be readily seen.</p> <p>Personnel: N/A.</p> <p>Method: Determine if the road signage utilised is adequately secured and facing the traffic.</p>
6.4	The traffic signage installed is suitable for night operations and low light situations.	<p>Intent: To ensure that traffic signage can be readily seen in adverse lighting conditions.</p> <p>Personnel: N/A.</p> <p>Method: Determine if the signage utilised is retro-reflective and readily visible at night.</p> <p>Refer to AS/NZS 1906.1:2007 <i>Retroreflective materials and devices for road traffic control purposes – Retroreflective sheeting</i>.</p>
6.5	Customised non standard traffic signage standards are determined and followed.	<p>Intent: To ensure that non-standard signage does not distract or pose a hazard to vehicle operators.</p> <p>Personnel: N/A.</p> <p>Method: Inspect sample of customised signage. The signage developed should, where possible, be graphical in representation, the message should be restricted to five words per line with a maximum of five lines, and the text size should be large enough to read when travelling at the required speed limit without having to slow down.</p>

Point	Standard	Guideline
6.6	Speed limit variances are limited, controlled and appropriate for the prevailing road conditions and pedestrian hazards.	<p>Intent: To ensure that speed limits are consistent, practical and relevant.</p> <p>Personnel: N/A.</p> <p>Method: A speed limit zone map is prepared identifying the speed variances. The number of speed limits is limited to a maximum of three or four, the speed limits utilised are in multiples of 10 km/h, signage is installed on the left hand side as a minimum, or preferentially on both sides of the road, and repeater signs are installed at a spacing of 500 m on long stretches of road.</p>
6.7	Traffic signage clutter is minimised.	<p>Intent: To ensure that the number of traffic signs is appropriate but kept to a minimum to avoid driver confusion and/or error.</p> <p>Personnel: N/A.</p> <p>Method: Determine if the traffic signage is being maintained to a minimum.</p>

7 Pedestrians

Point	Standard	Guideline
7.1	High visibility clothing is provided to employees who work in operational mobile equipment areas.	<p>Intent: To ensure that vehicle operators can identify the presence of pedestrians in their operational areas.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the vehicle operating areas. Confirm whether pedestrians are wearing high visibility clothing.</p>
7.2	Pedestrian walkways are provided in all operational mobile equipment areas.	<p>Intent: To ensure that walkways are provided for pedestrians to avoid being hit by mobile equipment.</p> <p>Personnel: N/A.</p> <p>Method: Inspect roads and other operational mobile equipment areas. Confirm whether a pedestrian network of walkways is provided. Identify that pedestrian “desire” routes do not deviate from the path provided.</p>
7.3	The walkways are located a safe distance from the road as far as is practicable.	<p>Intent: To ensure that walkways are located a safe distance from roads to keep pedestrians and vehicles segregated.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the pedestrian walkways. Confirm whether the pedestrian walkways are located a safe distance away from roads.</p>
7.4	The walkways are provided with a suitable width, well drained, anti-slip, man- made surface.	<p>Intent: To ensure that the walkways provided have a suitable man made surface to minimise slip, trip and fall hazards.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the pedestrian walkways. Confirm whether the pedestrian walkways are provided with a suitable man-made surface a minimum of 1 to 1.2m in width. Grass paths or unmaintained earthen tracks do not meet this standard.</p>
7.5	Walkways located beside roads with high pedestrian and/or traffic flows have segregation barriers.	<p>Intent: To ensure that highly trafficked pedestrian walkways are provided with additional barriers to keep pedestrians and vehicles segregated.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the high traffic volume pedestrian walkways. Confirm whether the pedestrian walkways have handrails or other barriers installed.</p>

Point	Standard	Guideline
7.6	Changes in elevation, including steps and stairs, on pedestrian walkways are clearly identified by marking.	<p>Intent: To ensure the hazards of potential trip and fall locations are clearly identified.</p> <p>Personnel: N/A.</p> <p>Method: Inspect any stairs and steps on walkways. Refer to AS1657:1992 <i>Fixed platforms, walkways, stairways and ladders – Design, construction and installation</i>.</p>
7.7	Steps and stairs on pedestrian walkways are equipped with a handrail or handrails, as appropriate.	<p>Intent: To verify that pedestrian walkways and stairways are provided with adequate handrails where there is a risk of injury to employees from falling.</p> <p>Personnel: N/A</p> <p>Method: Inspect a selection of pedestrian walkway steps and stairways for handrail installation.</p> <p>Refer to MSIR r. 4.4 and AS1657:1992 <i>Fixed platforms, walkways, stairways and ladders – Design, construction and installation</i>.</p>
7.8	Designated pedestrian crossing zones are provided at strategic locations.	<p>Intent: To ensure that clearly defined pedestrian road crossings are provided to control their movement.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine roads and other vehicle operating areas. Confirm whether pedestrian road crossings are provided and high volume crossings are marked. Pedestrians have right of way at marked crossings and traffic has right of way at unmarked crossings</p>
7.9	Crossing warning signage is displayed at each pedestrian crossing.	<p>Intent: To verify that all drivers are appropriately warned when approaching a pedestrian crossing.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the pedestrian crossing for vehicle and/or pedestrian signage. Refer to MSIR r. 4.10.</p>
7.10	Deflection handrail barriers are provided at each high usage pedestrian crossing and road/walkway connection area.	<p>Intent: To ensure that deflection handrail barriers are installed at high usage pedestrian crossings and at road/walkway connections to prevent pedestrians from stepping directly out on to a road.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the pedestrian crossings and road/walkway connections for the installation of deflection handrails. Confirm that the deflection handrail at the pedestrian crossing turns the pedestrian, where possible, to face the flow of traffic prior to stepping onto the road.</p>

Point	Standard	Guideline
7.11	Vegetation growth which reduces visibility is trimmed or removed from each pedestrian crossing access point.	<p>Intent: To ensure that vegetation growth at pedestrian crossings which could restrict the view of pedestrians and drivers is trimmed or removed.</p> <p>Personnel: N/A.</p> <p>Method: Inspect any pedestrian crossings and confirm whether trees or vegetation growth are being trimmed or removed on a regular basis.</p>
7.12	Safety PPE and traffic controls are utilised where cyclists are present on a mine.	<p>Intent: To ensure that cyclists and pedestrians are adequately protected from injury and collisions.</p> <p>Personnel: N/A.</p> <p>Method: Inspect any cycle/pedestrian routes for clear route segregation lines and warning signage. Confirm that cyclists wear the appropriate PPE and helmet protection and have a warning signal fitted to their bikes.</p>

8 Traffic movement around buildings, structures and service corridors

Point	Standard	Guideline
8.1	Protection bollards or segregation barriers are installed at every vehicle interface with infrastructure and ground level hazards such as covered sumps, soak wells, and drains not designed to support any vehicle.	<p>Intent: To ensure that adequate protection is provided to prevent damage to the installed infrastructure in vehicle access areas and to prevent vehicle access to hazardous installations such as covered soak wells, sumps, and drains where the cover is not designed to support any vehicle.</p> <p>Personnel: N/A.</p> <p>Method: Inspect buildings, tanks, hydrants, lighting towers, covered drains, soak wells and sumps etc. Confirm bollard devices or segregation barriers are installed.</p>
8.2	Fixed infrastructure protection devices are visible both in low light and night time conditions.	<p>Intent: To ensure that vehicle operators can see the protection devices and avoid a collision incident.</p> <p>Personnel: N/A.</p> <p>Method: Inspect a sample of fixed infrastructure protection devices. Confirm that the devices are coated with high visibility reflective paint or have reflective strips attached.</p>
8.3	Height limit signage and warning devices are installed where vehicles pass under any mine infrastructure.	<p>Intent: To ensure that adequate warning is provided to avoid damage to the installed infrastructure in vehicle access areas.</p> <p>Personnel: N/A.</p> <p>Method: Inspect elevated structures, conveyors etc. Confirm height clearance signage and segregation barriers or warning devices are installed to avoid damage to infrastructure.</p>
8.4	Falling object protection devices, barriers and signage are installed where vehicles or pedestrians are required to pass under the mine infrastructure from which an object could fall.	<p>Intent: To ensure that falling object protection is provided in areas where employees and/or vehicles pass underneath mine infrastructure (e.g. process plant).</p> <p>Personnel: N/A.</p> <p>Method: Inspect elevated structures such as conveyors. Confirm area access restrictions and signage is in place to minimise exposure to falling object dangers. Where access is permitted, roof canopies and/or catch netting are installed to protect the areas from the falling object danger.</p>

Point	Standard	Guideline
8.5	Where there is a vehicle and pedestrian collision potential at building entry/exit points, separate doorways, warning signs, guardrails, mirrors, etc. are provided.	<p>Intent: To ensure that adequate protection and controls are provided to prevent employees being struck by a vehicle when exiting any building.</p> <p>Personnel: N/A.</p> <p>Method: Inspect building entry/exit points. Confirm that diversion barriers are installed at pedestrian exit points leading directly on to roads. Where separate pedestrian doorways are not provided and personnel and vehicle entry is combined, handrail gates, diversion barricades, signage, mirrors and vehicle horn signals should be used to manage the hazard.</p>
8.6	High voltage installations and overhead powerline corridors are located, installed and identified to prevent inadvertent contact by mobile plant.	<p>Intent: To verify that adequate controls are provided to prevent vehicles contacting high voltage equipment and overhead powerlines.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the high voltage areas and powerline corridors. Confirm that high voltage installations are located away from roadways and other vehicle operating areas. Verify the installation of marker bollards, height clearance signage or warning signage at each vehicle and powerline crossing and/or high voltage installation access point.</p> <p>Refer to MSIR r. 5.28 and DMP Mines Safety Bulletin 51.</p>
8.7	Minimum powerline corridor clearances have been established at the mine.	<p>Intent: To verify that an adequate clearance is provided to prevent vehicles penetrating the electrical danger zone.</p> <p>Personnel: N/A.</p> <p>Method: Inspect powerline corridors. Confirm the height clearance provided is in accordance with AS 3007.5:2004 <i>Electrical installations – Surface mines and associated processing plant – Operating requirements</i>.</p> <p>Refer to MSIR r. 5.28(1)(c).</p>
8.8	Railway corridors are designed and constructed to minimise a collision between rail equipment and road and pedestrian traffic.	<p>Intent: To ensure that adequate separation and controls are provided to prevent a collision between road and railway vehicle.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine rail line and rail crossing areas. Confirm they are segregated with barriers and are located a sufficient distance away from road reserves and other vehicle operating areas for vehicle length not to pose a hazard (e.g. a multiple set roadtrain straddling rail crossing while waiting at an intersection). Check for the installation of rail crossing signage and/or warning light boom gates at each rail installation access point.</p> <p>Refer to AS 1742.7:2007 <i>Manual of uniform traffic control devices – Railway crossings</i>.</p>

9 Road construction and maintenance

Point	Standard	Guideline
9.1	Temporary bypass roads and traffic control measures are provided where there is any obstruction on the road or road construction work is being undertaken.	<p>Intent: To ensure that separate safe access routes are established and maintained prior to, and during any, road construction work or where there is any obstruction on the road.</p> <p>Personnel: N/A.</p> <p>Method: Review the procedure for road construction. Confirm that temporary transport routes will be provided and maintained throughout any road construction work or around any obstruction on the road.</p>
9.2	Standards are developed for access restriction into areas which do not meet the traffic management standard or are currently not in operational use.	<p>Intent: To ensure that vehicle access is controlled into restricted areas and non-operational areas.</p> <p>Personnel: N/A.</p> <p>Method: Review the procedure for traffic control into restricted and non-operational areas. Confirm that the procedure outlines the safety requirements for restriction of access, area closure and re-opening due to weather or other causes. Inspect the area workplace restrictions and barriers installed for compliance with the procedure.</p>
9.3	A maintenance programme has been established for the inspection, repair and resurfacing of all sealed roads and their markings.	<p>Intent: To verify that sealed roads are maintained in a safe condition.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the sealed roads and other sealed vehicle operating areas. Confirm whether the roads are being checked for wear, instability and potential collapse and are being maintained in a safe condition. Refer to MSIR rr. 3.18 and 13.7(3).</p>
9.4	A maintenance programme has been established for the inspection, repair and resurfacing of all unsealed roads.	<p>Intent: To verify that unsealed roads are maintained in a safe condition.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine haul roads and other vehicle operating areas. Confirm whether the roads are being checked for instability, potential collapse, etc. Confirm whether there is grading equipment available and the roads are being maintained in a safe condition.</p> <p>Refer to MSIR rr. 3.18 and 13.7(3), and DMP Significant Incident Report 121.</p>

Point	Standard	Guideline
9.5	Resources are available and used for the suppression of dust on unsealed roads.	<p>Intent: To verify that driver visibility is maintained by managing and suppressing dust on operational roads.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine haul roads. Confirm whether there is adequate means and equipment available for dust suppression, and it is being utilised to minimise dust creation</p> <p>Refer to MSIR rr. 3.18 and 13.7(3).</p>
9.6	A maintenance programme has been established for material spillage clean up on roads.	<p>Intent: To verify that spillage does not pose a danger to mobile equipment.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the method of identification, temporary control, and rectification of spillage hazards on roads.</p> <p>Refer to MSIR rr. 3.18 and 13.7(3).</p>
9.7	A maintenance programme has been established for the removal of roadside vegetation.	<p>Intent: To verify that trees or vegetation growth beside roads, intersections and other vehicle operating areas, which could pose a visibility hazard to mobile equipment, are suitably trimmed or removed.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine haul roads, intersections, other vehicle operating areas and rail crossings areas etc. Confirm whether tree or vegetation growth is being trimmed or removed on a regular basis.</p> <p>Refer to MSIR rr. 3.18 and 13.7(3).</p>
9.8	A maintenance programme has been established for the inspection, cleaning and repair of roadside signage and delineators.	<p>Intent: To verify that road signage and delineators are maintained in a satisfactory condition.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the mine haul roads and other vehicle operating areas. Confirm whether the road signage and delineation are being maintained in good condition.</p> <p>Refer to MSIR rr. 3.18 and 13.7(3).</p>
9.9	A maintenance programme has been established for the inspection and repair of road side windrows, bunds and/or barriers.	<p>Intent: To verify that road side barriers are maintained in a satisfactory condition.</p> <p>Personnel: N/A.</p> <p>Method: Inspect the road side barriers installed to protect traffic and pedestrians from significant damage or injury. Confirm whether the road windrows and barriers are being maintained in a good condition.</p> <p>Refer to MSIR rr. 3.18 and 13.7(3).</p>

Point	Standard	Guideline
9.10	A maintenance programme has been established for the cleaning of material build up on process plant structures and in spillage catch nets which are installed over road and pedestrian traffic routes.	<p>Intent: To ensure that the build up of material on process plant structures is monitored and managed to maintain the structural integrity and prevent any falling object danger to vehicles or personnel.</p> <p>Personnel: N/A.</p> <p>Method: Inspect vehicle and pedestrian access points to process areas and confirm there are no significant amounts of material hung up on any structure or held in catch nets.</p>
9.11	Road work safety barrier equipment and/or signage is utilised during road maintenance work.	<p>Intent: To verify that maintenance equipment and employees are protected from operational vehicles working in the vicinity.</p> <p>Personnel: N/A.</p> <p>Method: Inspect road maintenance procedures and maintenance work for compliance with this standard. Refer to MSIR r. 4.10.</p>
9.12	Road standards are inspected on a shift and daily basis as applicable.	<p>Intent: To verify that road standards are checked and maintained in a safe condition on a regular basis.</p> <p>Personnel: N/A.</p> <p>Method: Inspect road standards and compare with the shift and daily inspection reports. Refer to MSIR r. 3.18.</p>