CMPA

Traffic Management Guideline

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Disclaimer

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Contents

Introduction to this Guideline

1 - Overview

This Guideline together with the CMPA's Work Safely Reference Manual aims to support members in meeting the requirements of the Victorian Occupational Health and Safety (OHS) Act 2004 and the Victorian OHS Regulations 2017.

In doing so this document demonstrates a process that can be used to establish and successfully implement a Traffic Management Plan specific to your site requirements.

2 - Scope of this Guideline

The Traffic Management Guideline focuses on the management of traffic inclusive of light and heavy vehicles, mobile equipment and pedestrians within CMPA member's operational sites. This guideline does not consider traffic management on public roads or customer sites.

3 - References and guidance materials;

- National Heavy Vehicle Regulator Website - https://www.nhvr.gov.au/;
- WorkSafe Victoria - Code of Practice for Fatigue Management;
- Department of Natural Resources Queensland, Mines and Energy Guidance Note QGN 27 Collision prevention December 2017;
- Safe Work Australia (SWA) Code of Practice - Traffic Management in Workplaces December 2013;
- Safe Work Australia (SWA) Draft Code of Practice - Road and other Vehicle operating areas 2013;
- Australian Standard AS 1743 - 2001 Road signs – Specifications.
- How WorkSafe applies the law in relation to Reasonably Practicable, Edition 1, November 2007

4 - Attachments to this Document

- (A) Traffic Management Plan Template;
- (B) Contents of a Traffic Management Map;
- (C) Traffic and Pedestrian Movements;
- (D) Traffic Hazard Identification Checklist;
- (E) Mobile Equipment Safety Devices Checklist;
- (F) Site Specific Traffic Rules Template;
- (G) Traffic Management Plan Review Checklist;
- (H) Example of a Traffic Management Plan using Aerial Photograph;
- (I) Safe Work Australia Road Design Principles.

Note - All attachments are available in electronic format from the CMPA

General Traffic Management Requirements to assist with Compliance

The following table is an overview of the general traffic management requirements that must be taken into account to assist in achieving compliance with regulatory requirements whilst providing a safe workplace.

This guideline provides details on how to apply these requirements.

A Traffic Management Plan must be established and implemented to ensure segregation of mobile equipment, road trucks, light vehicles and pedestrians so far as is reasonably practicable.	√
The Traffic Management Plan must be established in consultation with relevant workers; those who operate mobile equipment, road trucks and light vehicles across the site.	√
A Site Traffic Management Map and Traffic Rules must be established, displayed and used to induct workers, contractors, suppliers and visitors.	√
SWPs and or SWMSs should be established for mobile equipment and road truck operations.	√
All hazards associated with traffic must be controlled in alignment with the Hierarchy of Controls and as far as is reasonably practicable.	√
The widths of a road should be based on the size of the largest vehicle using that road whilst taking into account other traffic movements.	√
Edge protection Berms should be at least 1.5 times the front axle height of the largest item of mobile equipment on site.	√
The gradient of haul roads should generally be no more than 1/10 but must be within the operating parameters of the vehicle.	√
Right of way must be established and signposted throughout the site.	√
SWPs for approaching mobile equipment and road trucks must be established and implemented so as to ensure the blind spot zones are not entered by unauthorised workers, operators or drivers.	√
Exclusion zones must be established around operating light mobile equipment, such as skid steers, forklifts and telehandlers.	√
Hold Points and Call Up Points must be established at the entrance to specific areas.	√
Traffic signs must be clearly visible, reflective, easy to understand, preferably pictorial, consistent and positioned so that operators and drivers have sufficient time to identify, read and react to the sign.	√
Traffic Management controls must be inspected on a routine and scheduled basis to ensure integrity of the controls and records of these inspections must be maintained.	√
The Traffic Management Plan must be reviewed and amended as required on a scheduled basis (typically 2 years) or in the event of an incident, a change in traffic movements or a change in mobile equipment/truck configuration as applicable.	√

OHS Legislation relevant to Traffic Management

The Traffic Management Plan and any associated procedures shall take into account the following legislation:

- Victorian Occupational Health and Safety Act 2004, Section 21: duties of employers to employees and Section 35: Duty of employers to consult with employee;
- Victorian Occupational Health and Safety Regulations 2017, Part 3.5. Regulation 109: Powered Mobile equipment;
- Heavy Vehicle National Law (HVNL) Chain of Responsibility (CoR) 2018.

1 - General Duties

The Occupational Health and Safety Act 2004 - Section 21 list the duties of employers have to employees as follows:

- Provide or maintain plant or systems of work that are, so far as is reasonably practicable, safe and without risks to health;
- Make arrangements for ensuring, so far as is reasonably practicable, safety and the absence of risks to health in connection with the use, handling, storage or transport of plant or substances;
- Maintain, so far as is reasonably practicable, each workplace under the employer's management and control in a condition that is safe and without risks to health;
- Provide such information, instruction, training or supervision to employees of the employer as is necessary to enable those persons to perform their work in a way that is safe and without risks to health.

The Occupational Health and Safety Act 2004 - Section 23 Duties of employers to other persons, states that an employer must ensure, so far as is reasonably practicable, that persons other than employees (visitors, contractors) of the employer are not exposed to risks to their health or safety arising from the conduct of the undertaking of the employer.

2 - Regulations specific to Powered Mobile equipment

The Occupational Health and Safety (OHS) Regulations 2017 Part 3.5 Section 109 Powered Mobile equipment states the following.

An employer or self-employed person must so far as is reasonably practicable, eliminate the following risks or, if it is not reasonably practicable to eliminate the risks, reduce them so far as is reasonably practicable:

- Powered mobile equipment overturning;
- Objects falling on the operator of the powered mobile equipment;
- The operator being ejected from the powered mobile equipment;
- Powered mobile equipment colliding with pedestrians or other powered mobile equipment.

The employer or self-employed person must ensure, so far as is reasonably practicable, that an appropriate combination of operator protective devices is provided, maintained and used to reduce so far as is reasonably practicable the risks to the operator as listed above.

An employer or self-employed person must ensure, so far as is reasonably practicable, that no person, other than the operator, rides on powered mobile equipment unless the person is afforded a level of protection from exposure to any risk that is equivalent to that provided to the operator.
An employer or self-employed person must ensure that powered mobile equipment that has a likelihood of colliding with pedestrians or other powered mobile equipment is fitted with a warning device that will warn persons who may be at risk from the movement of the plant.

Note - A reference to an employee includes a reference to an independent contractor engaged by an employer and any employees of the independent contractor in relation to matters over which the employer has control or would have control if not for any agreement purporting to limit or remove that control.

3 - What does Reasonably Practicable mean?

The test for what is reasonably practicable is an objective test; that is, a person is to be judged by the standard of behaviour expected of a reasonable person in the duty-holder's position who is required to comply with the same duty and is:

- Committed to providing the highest level of protection for people against risks to their health and safety;
- Proactive in taking measures to protect the health and safety of people.

To avoid doubt, a duty imposed on a person by the regulations to ensure health and safety so far as is reasonably practicable, requires the person:

a) To eliminate risks to health and safety so far as is reasonably practicable; and
b) If it is not reasonably practicable to eliminate risks to health and safety, to reduce those risks so far as is reasonably practicable.

To avoid doubt, regard must be had to the following matters in determining what is (or was at a particular time) reasonably practicable in relation to ensuring health and safety:

a) The likelihood of the hazard or risk concerned eventuating;
b) The degree of harm that would result if the hazard or risk eventuated;
c) What the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk;
d) The availability and suitability of ways to eliminate or reduce the hazard or risk;
e) The cost of eliminating or reducing the hazard or risk.

4 - Duty to Consult

The OHS Act 2004 requires employers or self-employed persons to consult with workers in regards to anything that has the potential to affect their health and safety so therefore the Traffic Management Plan must be established in consultation with those persons who shall work under the direction of the plan.

This includes but is not restricted to:

- Mobile equipment operators, in particular sales loader operators;
- Road truck drivers who deliver the materials;
- Light vehicle drivers who access the quarry.

Objective of the Traffic Management Plan

A site Traffic Management Plan is established so as to:

- Ensure the segregation of mobile equipment, road trucks, light vehicles and pedestrians so far as is reasonably practicable so that any interaction between these parties is controlled and does not result in an incident causing personal injury, property or environmental damage;
- Create a safe, effective and smooth traffic flow into and throughout the site in the most efficient and economical manner possible;
- Provide information to workers, contractors and visitors.

Establishing a Traffic Management Plan

1 - Site Specific Traffic Management Plan

A Traffic Management Plan Template is provided for your company to populate with information specific to the traffic arrangements and controls on your site/s. The template follows the same sequence as this guideline.

Your use of this template will ensure a consistent approach across the industry that can be improved upon through CMPA facilitated reviews. The use of the template will also provide the workplace regulator with a common expectation when visiting sites to audit processes and procedures. Feedback regarding the effectiveness of the template from both the regulator and members shall be channelled into ongoing CMPA reviews.

Refer Attachment (A) Traffic Management Plan Template.

2 - Documented Action Plan

To ensure all information relating to identified hazards, associated operational issues or restraints, suitable controls and so forth is captured during the establishment of the Traffic Management Plan it is vital to establish and maintain an Action Plan that records and details the required action, who is responsible for implementation and expected timelines for completion.

Action	*By Whom*	*By When*	*Complete*
Identify all routine Traffic and Pedestrian Movements using Attachment (C) Traffic and Pedestrian Movements and mark such aerial photograph	*Traffic Management Team*		
Identify all potentially non-routine Traffic and Pedestrian Movements and mark such aerial photograph	*Traffic Management Team*		
Meet with all mobile equipment operators and truck drivers and: • *Confirm movements.* • *Undertake hazard identification process attachment (D) Traffic Hazard Identification Checklist*	*Traffic Management Team &* *operators/drivers*		

Example of Action Plan

3- Site Traffic Management Map

The Traffic Management Map is a fundamental element of the Traffic Management Plan and shall take into account the findings identified through assessing your current traffic and pedestrian movements.

The map is used as part of the site induction process for workers, contractors, suppliers and visitors and should be displayed in a prominent and easily accessible location, typically the weighbridge, batch room, training room or front office where inductions are undertaken.

The map exhibits the site's pedestrian routes, radio communication channel, vehicle routes, signage, designated parking areas, restricted areas, overhead hazards, hold and call up points, stockpiles and other detail required to ensure a safe and efficient traffic flow.

The map can be presented in several forms. Larger sites such as quarries would generally use an aerial photograph or large to scale surveyed plan. Smaller sites such as concrete plants may elect to use a diagram using common computer software. The map displayed on the wall should preferably be A0 size (841 mm x 1189 mm) so as to clearly visualise the detail. A handout map for drivers may be of A4 size (210 mm x297 mm) so as to easily be held in the truck cabin for reference.

The map can be incorporated into an overall site map that details the site layout inclusive of buildings, dangerous goods storage locations, first aid stations, fire extinguisher locations and so forth. Larger quarries may elect to have separate maps for the stockpile and sales area as well as the quarry hole/pit.

The scope of your map should detail the content listed in the provided checklist as applicable.

Refer Attachment (B) Contents of a Traffic Management Map.

This checklist can be used to assess/review the scope of your existing map or direct you in the development of your proposed map.

Example of a Traffic Management Map

Identifying Traffic and Pedestrian Movements

Identifying all current and potential interactions between, mobile equipment, road trucks, light vehicles and pedestrians is the first step in establishing your Traffic Management Plan. In doing so all potential collision scenarios should be highlighted.

Consult with workers, contractors, pedestrians, incoming drivers, (heavy truck and light vehicle) about any traffic hazards they have encountered. Review incident and injury records, including Near Miss incidents.

It is recommended that you start with an aerial photo or large to scale plan of the site and identify the current traffic and pedestrian movements. These movements should be recorded on the aerial photo or large to scale plan of the site.

This will become the basis of the Traffic Management Map.

Traffic and pedestrian movements are inclusive of but not limited to:

- General traffic flows;
- Potential or established pedestrian and light vehicle interaction with heavy vehicle/mobile equipment;
- Areas where there are common reverse movements;
- Areas for light and heavy vehicle parking, fuelling, queueing, overweight tip off, truck hold points;
- Area of poor visibility including low lighting levels, excessive dust, wind or sun glare ;
- Areas where there are ad-hoc traffic movements, deliveries to workshop, office or laboratory, maintenance contractors requiring access to plant or other areas; water cart or road grader movements, explosive and other dangerous goods delivery routes.

A checklist is provided to assist you in identifying traffic and pedestrian movements.

Refer Attachment (C) Traffic and Pedestrian Movements

Identifying Traffic Related Hazards

A hazard is defined as anything that has the potential to harm.

Risk is defined as the likelihood and possible consequences of exposure to that hazard.

To create risk you must be exposed to or interact with the hazard. Therefore, when identifying hazards it is essential to consider what interaction or activities are associated with that hazard and for what period of time is that exposure.

Hazards must be identified in consultation with relevant workers such as:

- Mobile equipment operators, in particular Sales Loader operators;
- Road truck drivers who deliver the materials;
- Light vehicle drivers who access the quarry.

The following Traffic Hazard Identification Checklist will assist in guiding a comprehensive identification process.

Refer Attachment (D) Traffic Hazard Identification Checklist.

All hazards that may pose potential risk must be identified and recorded in detail on your Action Plan.

Where hazards are not understood, the level of risk is unknown, or a suitable control is not realised, the hazard and the associated activity should be subject to a risk assessment process.

The above photo presents the complexity of potential quarry traffic flows therefore the exposure to risk if not controlled through an effective Traffic Management Plan.

Hierarchy of Controls

It is a legislative requirement that the control of occupational hazards and associated risk is conducted following the Hierarchy of Controls as far as is reasonably practicable.

Hierarchy of Controls		
Elimination	Eliminate the interaction between light, heavy vehicles and pedestrians. Elimination is often cheaper and easier to achieve when designing the layout of the workplace.	**Safe Workplace**
Substitution	Substitute bin trucks with conveyors or radial stackers to reduce traffic movement in congested areas.	
Isolation	Physically separate vehicles and mobile equipment from people by distance, using sturdy barricades or by isolating a delivery area from other pedestrian or work activities.	
Engineering	Install speed limiters to mobile equipment, widen haulage routes. Create physical barriers/speed humps, redesign stockpile layout.	
Administration	Create 'no-go zones' and or 'exclusion zones that are clearly marked and documented. Signage, training, safe work procedures and Traffic Management Plans.	**Safe Workforce**
PPE	Provide high visibility or reflective clothing.	

The upper 4 levels of the Hierarchy of Controls attempt to ensure a **Safe Work Place**, whilst the lower 2 levels attempt to ensure a **Safe Workforce**. A combination of both Safe Work Place and Safe Workforce controls are generally required to ensure risk is reduced to an acceptable level, i.e. as far as is reasonably practicable.

Initially controls can be short or long term:

Short-term controls may be in a form of lower level **Safe Workforce Controls**. These controls may not be adequate or sustainable to lower the risk over a long-term duration. These short-term controls allow the safe continuation of work whilst long-term **Safe Workplace Controls** are being established. Where short-term controls cannot reduce the risk to an acceptable level, the exposure of people to the activity or environment must cease until long-term controls are implemented and the risk has been reduced to an acceptable level.

When establishing controls you must take into account what is reasonably practicable, as listed below.

- The likelihood of the hazard or risk concerned eventuating;
- The degree of harm that would result if the hazard or risk eventuated;
- What the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk;
- The availability and suitability of ways to eliminate or reduce the hazard or risk;
- The cost of eliminating or reducing the hazard or risk, and
- Controls should also take into account, relevant legal requirements, incident history and the suitability of the controls in respect to not creating other hazards and associated risk.

Traffic Management Controls

The following pages comprise of common controls utilised in the construction materials industry to reduce the risk associated with traffic to an acceptable level, i.e. as far as is reasonably practicable.

1 - General Controls

General controls include:

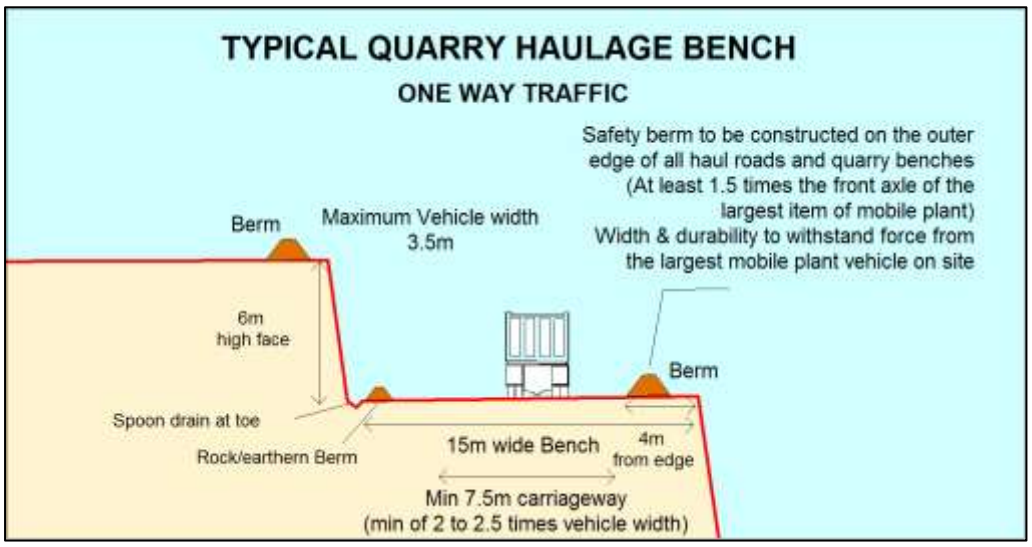
- Defined tarping, queueing, hold points and tip off area/s;
- Danger areas sign posted and excavation work in progress cordoned off;
- Boom gates controlling entrance and exit, if practical;
- Barricades restricting/stopping access to 'no entry' areas;
- Fuel storage away from traffic areas or protected by bollards/bunding;
- Regular maintenance of roadways including grading of unsealed roads;
- Roads with appropriate cross fall to allow sufficient drainage;
- Bollards/berms around drains, culverts and channels;
- Protruding edges of bins, stands and support structures painted yellow;
- Adequate lighting for night work (minimum 80 lux), especially near buildings, intersections and walkways including inspection/maintenance programs for the lights to ensure they work and are clean/effective;
- Blind spot mirrors;
- Control of roadway vegetation;
- Signposted adequate parking areas and/or sidings to allow drive to in/drive out parking where practical; and/or
- Mandated reversing parking to allow drivers full vision of the driving pathway when leaving a parking bay.

2 - Road Width

The widths of a road should be based on the size of the largest vehicle in use specific to using road, i.e. the larger the vehicle the more clearance is required.

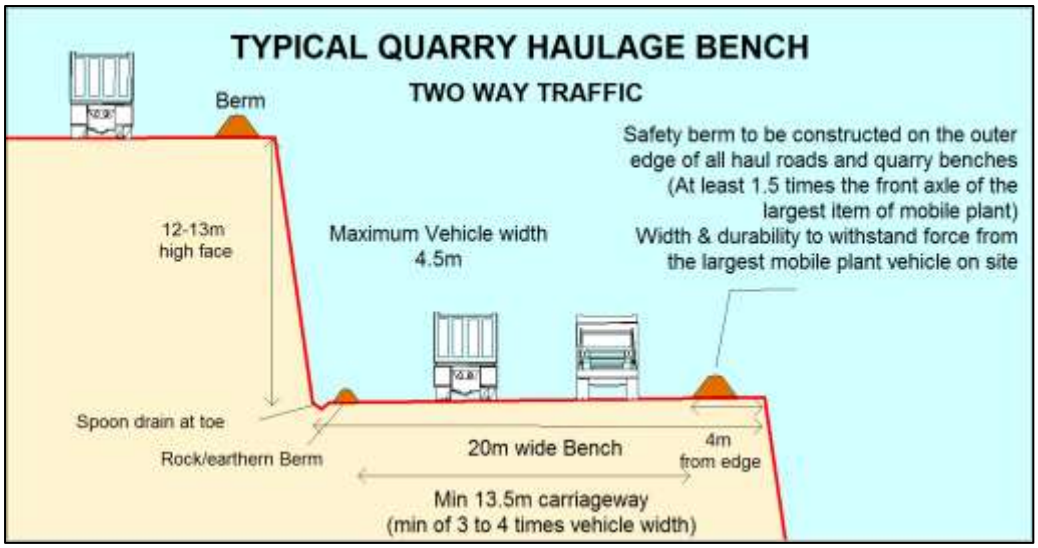
One way traffic, straights and corners:

- A minimum of 2 to 2.5 times vehicle width.



Two way traffic:

- In straights a minimum of 3 to 4 vehicle widths
- In corners a minimum of 3.5 to 4.5 vehicle widths



Assess the stability of bench and face below berm before constructing and placing berm.

4 metres to the inside is a guide only.

Other information to be taken into account is as follows:

- If the design is for a major feeder road, the road width will need to be increased accordingly;
- The gradient of the haul road is generally no more than 1/10 but must be within the operating parameters or specifications of the equipment operating on those roads;
- Right of way should be established and signposted;
- Overtaking bays should be established and signposted;
- Blindside turns should be eliminated or limited as achievable;
- Driver line of sight needs to be taken into account on bends, corners and rises/crests;
- T- Intersections should be at 90 degrees to the through road;
- Where applicable provide delineation of roads using guideposts with reflective tape/markers; and
- Utilise speed humps and or bends in roads to reduce speed in critical areas.

The condition of haul roads can be a contributory factor to other incidents aside from collisions when they are not constructed or maintained in the correct manner. Surface sheeting, road camber, gradients, curvature and drainage are all crucial elements of a well-designed, constructed and maintained haul road.

For further information in regards to road design refer to:

- *The CMPA's guideline Working Safely with Geotechnical Risk in Quarries Issue 1 February 2016*
- *Attachment (I) Safe Work Australia Road Design Principles*

Note - This attachment is an edited extract from Safe Work Australia's Draft Code of Practice titled Roads and Other Vehicle Operating Areas.

3 - Edge Protection Berms

Edge Protection Berms are designed to prevent mobile equipment, light vehicles and persons from driving, reversing or falling into dangerous areas, e.g. sediments ponds/dams or another level, or the bench below.

Edge Protection Berms should be at least 1.5 times the front axle height of the largest item of mobile equipment so as to be able to constrain that mobile equipment. Larger berms may be necessary in areas where vehicles have more speed, are travelling around curves or are negotiating steep gradients.

Berms should be constructed out of unweathered, freely draining, materials which can be easily maintained and act as a suitable barrier and constraint. Large rocks or concrete blocks used as berms could potentially be dislodged and fall to another level

Example of Edge Protection Berm

When constructing berms give consideration to the following:

- Berms should be firm enough that they are not easily penetrated by tyres;
- Berms constructed of broken rock will normally offer adequate restraint due to the interlocking and frictional resistance of the rock pieces;
- The inside slope of a berm should be steep enough to prevent the tires from easily climbing up and going over the berm;
- The angle of repose of material being used;
- The distance required from edge of face to toe of berm (falling rock protection);
- Whether a berm is also required at the toe of the face to catch roll out of rock from face from entering into the drainage system. (falling rock protection); and
- Angle of repose of faces, stability of ground (historical evidence of movement).

4 - Road Maintenance

Roads must be maintained so as to ensure the safe movement of vehicles at all times.

Road maintenance activities should be scheduled and include:

- Routine inspection and monitoring of road conditions, traffic and drainage controls;
- Inspection of roads and drainage systems after heavy rainfall events;
- Correct application of water and or other means of dust suppression;
- Ongoing grading to ensure road surfaced is not rutted nor pot holed; and
- Fit for purpose and readily accessible road maintenance equipment and construction material.

Traffic management controls should be established to protect workers undertaking road maintenance and other road users.

For further information regards to road maintenance refer to:

- *The CMPA's guideline Working Safely with Geotechnical Risk in Quarries Issue 1 February 2016*
- *Attachment (I) Safe Work Australia Road Design Principles*

5 - Separation and Stopping Distances

Ensuring effective separation and stopping distances that are aligned with the sites speed limits, road conditions, road grades and the vehicle configurations and operator ability is vital to ensure a safe traffic flow.

Site separation and stopping distances must be greater than the actual (measured) stopping distance of the vehicle with the longest (worst) braking distance, under the worst road (slippery / wet, downhill), vehicle (maximum speed, fully laden, bald tyres) and operator conditions (operator fatigue, distraction, unfamiliar with situation).*

Importantly, the nominated separation distance must also take into account the natural reaction time of the operator, and the mechanical delay time between brake actuation and actual slowing of the vehicle.*

Depending on the vehicle, payload, road conditions, efficiency of braking systems, operator capability etc., this may not be sufficient to prevent a collision. As a result, a greater separation distance must be considered.*

Vehicle separation Distances should be included in Site Specific Traffic Rules.

*** Reference – DNR QLD, Mines and Energy Guidance Note QGN 27 Collision prevention December 2017**

Refer Attachment (F) Site Specific Traffic Rules Templates

6 - Separation of heavy and light vehicles and pedestrians

To ensure the separation heavy and light vehicles and pedestrians:

- Install walkways away from roadways, if practical;
- Install physical barriers at exit of walkway / entrance of pedestrian crossing;
- Implement and define pedestrian walkways in forklift / mobile equipment operating areas;
- Establish 10/20/30 rule (see page 19) and Exclusion Zones;
- Create pedestrian crossings across roadways where frequently used;
- Define a secure staff parking area away from roadways and operating mobile equipment.

7 - Restricted Access Areas

Restricted Access refers to the restriction of either pedestrians, light vehicles, mobile equipment, road trucks, or a combination of such to a specific hazardous area.

For example the operating area of a front end loader feeding raw materials from the bins to the weigh hopper would be an area that is deemed restricted access to both pedestrians and light vehicles.

Restricted Access Areas should be signposted, clearly marked on the Traffic Management Map and a procedure established for when controlled access is required.

8 - Entry to Blind Spots (10/20/30 Rule)

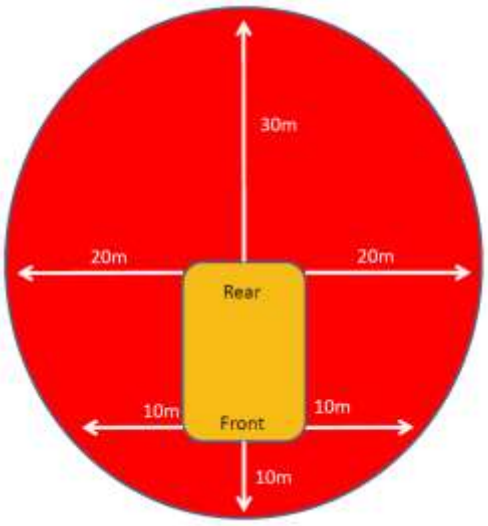
Unauthorised entry to mobile equipment blind spot zones is a major cause of incidents involving light vehicles, pedestrians, road trucks and other mobile equipment.

All sites should establish and implement a procedure using two way radios to ensure no other vehicle or pedestrian enters the 10-20-30 zone without approval from the mobile equipment operator in the 10-20-30 zone.

The 10-20-30 Zone as illustrated above is generic i.e. a rule of thumb.

It is essential potential blind spots are accurately identified on each piece of equipment and the 10-20-30 Zone is amended to suit the greatest distance in each of the 4 components of the zone, e.g. in front, front sides, rear sides and rear.

Note - Mobile Equipment suppliers should have details of the blind spot zones for each machine they manufacture and sell.



9 - Operational Exclusion Zones

Exclusion zones are generally established when workers have the potential to interact with light mobile equipment such as skid steer loaders cleaning around plant, telehandlers moving parts, elevated work platforms providing access or forklifts moving products/parts in a workshop/storage area.

All sites should establish and implement a procedure to ensure workers remain at least 2 or more metres from operating light mobile equipment (depending on its turning circle, operator vision and the activity being undertaken) and shall not enter the exclusion zone until authorised to do so by the operator.

Prior to entry to the exclusion zone the operator must lower tynes/bucket to the ground and shut down the light mobile equipment.

10 - Temporary Exclusion Zones

Temporary exclusion zones may be established as and when required for loading or unloading activities or where workers are working in area with potential for mobile equipment, heavy or light vehicle interaction.

Temporary exclusion zones can be established using traffic cones, warning tape barriers or yellow chain to define the area where the activity is being undertaken.

11 - Call Up and Hold Points

Call Up and Hold Points are used to control either traffic coming into the quarry or accessing area's within the quarry and should be highlighted on the Traffic Management Plan.

Call Up points are generally placed in positions prior to entering specific areas such as on approach to the weighbridge or entering the sales floor/stockpile area and do not require a positive confirmation to enter.

Hold Points are generally placed in positions prior to entering high risk areas such as the quarry extraction pit or certain haul roads and require the vehicle to stop in the designated park bay and await positive confirmation prior to entry.

12 - Communication Devices

Communication devices in the context of this guideline are inclusive of but not limited to mobile phones, UHF radios, trunk radios, and iPads.

Several fatalities have occurred in the industry due to persons using communication devices in areas where traffic and pedestrians have the potential to interact or when vehicles lose control through the driver being disturbed and not focussed on the task at hand.

Rules should be established for the use of communication devices in light vehicles, road trucks and other mobile equipment and should also reference where pedestrians can use/cannot use communication devices.

These Rules should be listed in the Site Traffic Rules.

Vic Roads states that using a mobile phone while driving is prohibited, except to make or receive a phone call or to use its audio/music functions provided the phone:

- Is secured in a commercially designed holder fixed to the vehicle, or
- Can be operated by the driver without touching any part of the phone and the phone is not resting on any part of the driver's body.

Victorian Road Safety Rules 2017, Regulation 244, allows the use of CB and two way radios to be operated at all times by drivers including picking up and pressing a microphone.

13 - Collision Avoidance Systems

Collision avoidance systems include cameras, radar, sonar, infrared, Global Positioning Systems (GPS) and Radio-Frequency Identification (RF-ID) technology.

They are utilised to give an operator notice of the presence of another vehicle, pedestrian or infrastructure that may not be in the operator's field of vision, i.e. in the operator's blind spot.

Collision avoidance systems cannot replace other controls such as existing restricted access area, exclusion zones, separation bunds, e.g. higher listed controls within the Hierarchy of Controls.

14 - Mobile Equipment Inspections and Maintenance

All mobile equipment and road trucks should be subject to a daily and or shift handover pre start inspection check.

The mobile equipment manufacturer should supply a pre start checklists, alternately the CMPA offer several pre start checklists to suit a broad range of mobile equipment.

Refer to the CMPA Website section titled Purchase Publications *(cmpavic.asn.au)*

All mobile equipment should be fitted with the appropriate safety devices. The devices should be checked on a routine basis using the safety devices for mobile equipment checklist. Amend the checklist to suit your site specific requirements.

Refer Attachment (E) Mobile Equipment Safety Devices Checklist

All operator's controls for mobile equipment should be clearly identifiable so as to indicate their nature and function and located so as to be readily operated by each person using the mobile equipment; and located or guarded to prevent unintentional activation; and able to be locked out: isolating all energy sources.

Emergency stop devices should be prominent, clearly and durably marked and immediately accessible to each operator of the mobile equipment. Any handle, bar or push button associated with the device is coloured red.

Emergency stop devices should be checked for working order when the mobile equipment is serviced.

Where it is foreseeable that mobile equipment could be at risk of rollover and/or exposed to falling objects, they must be fitted with Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) as per the Original Equipment Manufacturers (OEM) or Australian Standard specification.

All mobile equipment should be fitted with Australian Standard compliant seat belts that are worn by operators at all times.

All mobile equipment should be subject to a maintenance program that meets the OEM specification and records of the program should be maintained throughout the working life of the mobile equipment.

The above paragraph also applies to contractor's equipment being used on your site.

15 - Safe Work Practices

The OHS Act 2004 section 21: Duties of Employers to Employees, requires employers to provide such information, instruction, training or supervision to employees as is necessary to enable those persons to perform their work in a way that is safe and without risks to health.

In doing so employers should ensure that all employees (inclusive of independent contractors and their employees):

- Are inducted to the site inclusive of the Traffic Management Plan and Traffic Rules;
- Understand how to undertake and document a pre start inspection of the mobile equipment they operate;
- Understand when and how to tag faulty or unsafe mobile equipment "Out of Service";
- Are trained and competent in the application of Safe Work Procedures (SWPs) and or Safe Work Method Statements (SWMSs) relative to the operation of mobile equipment;
- Are regularly consulted with in regards to the safe operation of mobile equipment; and
- Are regularly communicated to in regards to industry safety alerts relevant to mobile equipment safety.

Employers should ensure that managers, supervisors and or OHS representatives routinely undertake and document work practice observations. The objective of the work practice observation is to ensure workers are working in compliance with the specific SWPs whilst also ensuring the suitability of the SWPs to direct safe work practices.

16 - Management of Fatigue

Fatigue can be a significant contributor to workplace health and safety incidents. In the construction materials industry, where there is continual use of mobile equipment and road trucks, the consequence of such incidents can be severe.

The common factors that contribute to fatigue are:

- The mental and physical demands of work;
- Work scheduling and planning;
- Working time;
- Environmental conditions;
- Individual factors such as:
    - Lack of sleep;
    - Diet and eating times/patterns;
    - Exercise and your general level of fitness;
    - Drug and alcohol consumption;
    - Illness or chronic injury and the medications used;
    - Personal and family issues.

The OHS Act 2004 section 21: Duties of Employers to Employees, requires employers to provide or maintain plant or systems of work that are, so far as is reasonably practicable, safe and without risks to health.

To assist in meeting this duty employers should refer to WorkSafe Victoria's Your Health and Safety Guide to Fatigue Prevention in the Workplace Edition 2, June 2017.

All workers should undertake fatigue management awareness training covering topics such as:

- The OHS responsibilities of everyone in the workplace;
- The body clock and how fatigue can affect it;
- Risk factors for fatigue;
- Symptoms of fatigue;
- Effective control measures for fatigue such as work scheduling;
- Procedures for preventing fatigue such as incident reporting;
- Effects of medication, drugs and alcohol;
- Nutrition, fitness and health issues relating to fatigue;
- Balancing work and life demands; and
- The effects that some illnesses can have on fatigue.

17 - Chain of Responsibility (CoR)

CoR is regulated through the National Heavy Vehicle Regulator (NHVR).

The aim of CoR for a heavy vehicle is to make sure everyone in the supply chain actively prevents breaches of the Heavy Vehicle National Law (HVNL).

Drivers and operators have traditionally been the focus of road laws. However, breaches are often caused or influenced by the actions of others. Under CoR complying with transport law is now a shared responsibility and all parties in the road transport supply chain are responsible for preventing breaches. This approach recognises the effects of the actions, inactions and demands of off-the-road parties in the transport chain.

Who has a responsibility?

Under CoR laws, if you undertake specified functions that exercise, or have the capability of exercising, control or influence over any transport task, you are part of the chain of responsibility and have an obligation to ensure compliance with the HVNL.

Within the construction materials industry order takers, batchers, weighbridge personnel, sales loader operators, truck drivers, supervisors, managers and directors have CoR responsibilities.

As an employer your key responsibilities may include ensuring that:

- **Your business practices do not require or encourage drivers to:**
  - Exceed the speed limits;
  - Exceed regulated driving hours;
  - Fail to meet the minimum rest requirements; and
  - Drive while impaired by fatigue;
- Heavy vehicles and their loads comply with relevant mass and dimension requirements;
- Competent employees are recruited who understand their HVNL responsibilities;
- Relevant HVNL training programs are implemented;
- Appropriate, serviceable and well maintained loading and restraining equipment is provided;
- Suitable and appropriate vehicles and/or combinations are provided;
- Systems to manage safety and all requirements are established; and
- Obligations of the HVNL are in place.

For more information on Heavy Vehicle National Law and CoR responsibilities refer to the NHVR website.

https://www.nhvr.gov.au/about-us

18 - Signage

Traffic signs are important to ensure that there is orderly and predictable movement of traffic.

To be effective signs should be clearly visible, reflective, easy to understand, preferably pictorial, consistent and positioned so that people have sufficient time to identify, read and react to the sign.

For ease of recognition and purpose traffic signs should be consistent with those signs used on public roads for example, stop, give way and speed limit signs.

Refer to Australian Standard AS 1743—2001 Road signs—Specifications plus VicRoads Supplement to AS 1743 - Edition 1 Revision 1 August 2017

Alternately refer to Vic Roads website https://www.vicroads.vic.gov.au/

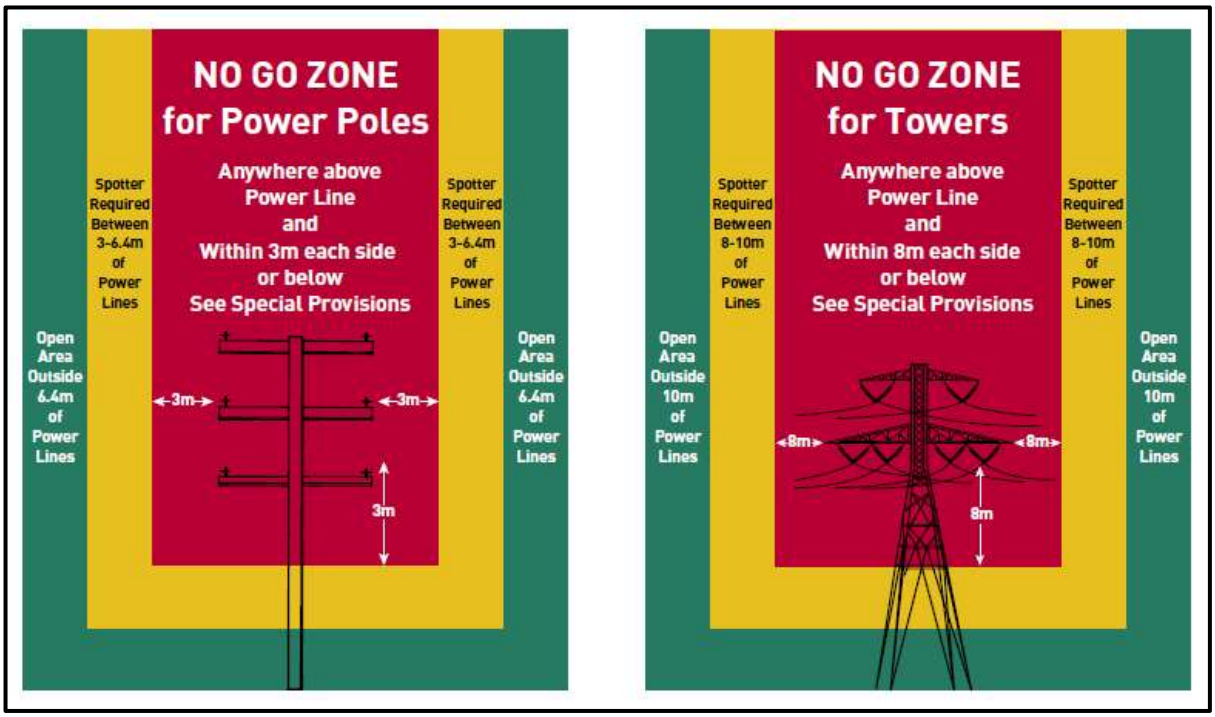
Note - Too many signs may potentially create confusion, therefore complacency in regards to observing them.

Once erected traffic signs need to be maintained to ensure that they remain visible and are still relevant and their inspection should be included on the workplace safety inspection checklist.

- Use safety signs for speed limits, sharp bends, junctions, pedestrian crossings, vehicle crossings, blind corners;
- Install reflective IN and OUT signs (Exit/Entry);
- Display reflective signs on Haul Roads to assist vision with early starts;
- Display visitor car parking signs/along with instructions to report to site office;
- Display courier directions sign;
- Signage and line marking should be used to direct traffic on sealed roadways. Signage should be used to direct traffic on unsealed roadways;
- Install road markings / signs to provide clear direction to drivers and pedestrians;
- Install overhead power line signs signalling the presence of overhead power lines and other overhead structures such as conveyors; and
- Use road closed or road work signage to clearly identify temporary work affecting traffic movements.

19 - Overhead Powerlines

When raising truck bodies ensure you maintain a safe clearance from Power Poles or Towers as illustrated below and be aware of Spotter requirements as listed below.



Where a spotter is to be used, they must be properly inducted into all site safety procedures including the relevant Safe Work Method Statement (SWMS).

The spotter must remain at the task for the entire time the equipment is required to operate in accordance with the SWMS. The spotter may only observe for one item of equipment at any time.

The spotter must also carefully position themselves so they can monitor the distance between the equipment and the lines, and must provide early and effective warning to the earthmoving equipment operator of any potential encroachment on the No Go Zone.

Spotters for overhead electrical lines shall have completed an endorsed spotter training course by a registered training provider and be competent in the following areas:

- The design envelopes for the equipment/plant being used;
- The operation and uses of the equipment/plant being used; and
- The hazards posed by overhead electrical assets.

For further information refer to Energy Safe Victoria's website

www.esv.vic.gov.au

20 - Site Specific Traffic Management Rules

The Traffic Management Map should be accompanied by a set of Site Specific Traffic Management Rules.

The Site Specific Traffic Management Rules should be:

- Brief, clear and unambiguous and must never be based on assumptions;
- Able to be understood by workers;
- Consistently applied and complied with by all workers including managers, contractors and public;
- Able to be monitored and enforced;
- Not create another hazard or require/influence a worker to carry out potentially dangerous actions;
- Displayed alongside the Traffic Management Map;
- Communicated during the site induction process for workers, contractors, suppliers and visitors;
- Communicated to all persons who travel in/out or within the site; and
- Reviewed at specific intervals, e.g. when circumstances/layout changes or an incident occurs and removed/amended where a specific rule is no longer relevant or requires improvement.

An option is to print the Site Specific Traffic Management Rules on the back of the Traffic Management Map and used as a handout to persons entering the quarry.

A template listing common Site Specific Traffic Management Rules is provided as an attachment to this Guideline. The template should be reviewed in consultation with relevant workers and amended to meet the site specific requirements and align with the sites TMP.

Refer Attachment (F) Site Specific Traffic Rules Template

Reviewing and Monitoring Controls

An essential but often overlooked element of the risk management process is to review and monitor controls. The objective of reviewing and monitoring of controls is to ensure the controls:

- Adequately control the risk;
- Do not create another hazard or operational restriction/issue;
- Allow a person to conduct their work safely in a safe environment;
- Allow you to maintain the activity/operations effectively and efficiently; and
- Are sustainable and are maintaining that risk at the targeted level.

Activities deemed high risk prior to being controlled may require on going reviews to ensure the integrity of the controls.

Review and monitoring involves checking the integrity of the physical controls, and asking questions of those who operate; maintain; test and clean the plant or equipment; or are associated with this activity.

- Controls must be reviewed immediately after implementation; and
- Controls must be monitored on a scheduled basis after the immediate review.

The monitoring dates should be scheduled within site documentation such as safety plans, safety meeting minutes or workplace safety inspection schedules.

Reviewing Traffic Management Plan

The Traffic Management Plan should be reviewed in its overall context with users of the plan on an annual basis.

The following checklist will support this review.

Refer Attachment (G) Traffic Management Plan Checklist

Attachments

Attachment (A) Traffic Management Plan Template

(Refer to separate word file)

Attachment (B) Contents of a Traffic Management Map

Attachment (B) Contents of a Traffic Management Map	Yes	No	N/A
Access to amenities, weighbridge, office, laboratory and workshop			
All traffic controls			
Call Up and Hold Points			
Delivery drop off locations and consumable acceptance/storage areas.			
Designated parking areas			
Emergency assembly areas			
Emergency services access			
Employee lunch room			
Fuel stations for accepting and distributing fuels			
Inward rock tip off locations			
Material inspection locations			
Material wet down locations			
Off road maintenance locations			
On road truck drivers room			
Overhead power lines			
Pedestrian routes			
Pit entry holding locations. Delineated restricted areas for on road vehicles			
Plant layout where loading occurs from under conveyors			
Radio communication channel			
Restricted or no go areas			
Sediment pits, dams and septic pits			
Signage inclusive of speed limit sign			
Site layout inclusive of perimeter boundaries			
Stockpile layout			
Tarping locations			
Vehicle routes – on road and off road			
Waiting or queuing for loading locations			
Water delivery and water cart fill location			

Attachment (C) Traffic and Pedestrian Movements

Attachment (C) Traffic and Pedestrian Movements	Issue identified	
	Yes	No
Ad-hoc traffic movements, deliveries to workshop, office or laboratory, maintenance contractors requiring access to plant or other areas; water cart or road grader movements; explosive and other dangerous goods delivery routes		
Areas for light and heavy vehicle parking, fuelling, queueing, overweight tip off, truck hold points, call up points, material wet down, material inspection, tarping inspection etc.		
Areas of high noise, or multiple sources of noise that distract pedestrians or traffic		
Areas of poor visibility including low lighting levels, excessive dust, wind or sun glare at different times of the day		
Areas where there is the potential for collision, road surfaces and descents, corners, blind spots, berms, exits, driveways, overhead structures, blind spots caused by stationary equipment and vehicles		
Area where unloading of vehicles/mobile equipment may occur, i.e.		
Areas where vehicles could be engulfed or drive over bench or into a sump or dam		
Equipment/vehicles involved in these movements		
Expected or common reverse movements		
High employee concentration, offices, amenities, workshops, weighbridges, laboratories		
Mobile plant characteristics, including stopping distances, manoeuvrability, operating speeds, driver position and line of sight		
Number of and peak times of these movements		
On road and off road vehicles separation, no go or restricted areas		
Potential for interaction, traffic and pedestrian, light and heavy vehicle/mobile equipment		
Road design and characteristics including grade, camber, surface, berm conditions, steep drops, radius of curves and intersections		
Other		
Other		

Attachment (D) Traffic Hazard Identification Checklist

Attachment (D) Traffic Hazard Identification Checklist	YES	NO
Pedestrians		
Are all walkways delineated away from roadways?		
Do all walkways exiting a building have a physical structure to prevent pedestrians walking straight on to pedestrian crossing / roadways?		
Are there defined pedestrian walkways within forklift / mobile equipment operating areas – in and out of buildings?		
Is high visibility clothing worn by all personnel (workers, contractors, visitors) in operational areas?		
Site entry and exits		
Are IN and OUT gates clearly defined?		
Are the opening hours displayed?		
Is the Traffic Management Plan accessible at the entrance for Emergency Services?		
Are vehicle movement limitations displayed?		
Is staff parking secure and away from roadways and operating mobile equipment?		
Is visitor car parking provided and instructions to report to site office displayed?		
Are courier drop-off and pick-up points defined?		
Unauthorised access		
Are boom gates controlling the entrance and exit, if practical? If not practical, is a site communication procedure in place to capture visitors 'straying' on to the site, e.g. CCTV linkage to weighbridge?		
Are barricades restricting / stopping access to No Unauthorised Entry areas?		
Stockpiles, benches, berms roads		
Do road markings/signs provide clear direction to drivers and pedestrians?		
Are all marking/signs and other physical controls included on safety inspection checklists?		
Do all 'on-top' dumping stockpiles have safety berms and or is a spotter/observer utilised?		
Are Berms/Windrows/Bund heights at least 1.5 times the front axle height of the largest item of mobile equipment and constructed out of unweathered, freely draining, materials which can be easily maintained and act as a suitable barrier.		
Are all roadways gradient no greater than 10%?		
Do minimum widths of haul roads meet the following requirements? One way traffic, straights and corners • A minimum of 2 to 2.5 times vehicle width. Two way traffic • In straights a minimum of 3 to 4 vehicle widths; • In corners a minimum of 3.5 to 4.5 vehicle widths.		
Is traffic direction restricted to one-way, if practical? If not practical, are roadways wide enough for the widest site vehicles to pass without changing lanes?		

Attachment (D) Traffic Hazard Identification Checklist	YES	NO
Are sealed roads clearly line marked and/or clear signage utilised to indicate traffic flow?		
Are roadways kept clean and clear of obstructions and regularly graded with storm water control?		
Are all roads designed to be free draining to minimise the pooling of water creating potholes?		
Are all drains, culverts and channels protected from traffic and in working order?		
Is fuel storage away from traffic areas or protected by bollards or bunding?		
Are all overhead power lines and conveyors clearly signposted?		
Driver/Operator Vision		
Are intersections designed to allow maximum vision for drivers to reduce the risk of a collision?		
Do operators have effective line of sight on bends, corners and crests?		
Does vegetation or other obstacles, such as structures, reduce effective line of sight?		
Is there adequate lighting for night (dim light) work – internal & external?		
Have all blind spots arising from sun glare, shadows, fog, vegetation and dust been identified?		
Are protruding edges of bins, stands and other structures painted yellow for improved visibility?		
Are all blind spots assisted with the use of safety mirrors?		
Vehicle safety devices and their maintenance		
Are all trucks, loaders and other mobile equipment fitted with working reversing alarms?		
Are all trucks and mobile equipment fitted with mirrors inclusive of blind spot convex mirrors?		
Are pre-start safety checks conducted on all trucks and mobile equipment?		
Is there a need for cameras or radar reverse sensors on trucks to aid safe reversing?		
Is there a need for flood-type reversing lights on trucks?		
Do all light vehicles on site (past weighbridge) have flashing yellow safety lights and or raised red flags?		
Parking and sidings		
Is drive in/ drive out (in the same direction) parking and sidings adopted where practical? If not practical is reverse parking adopted to allow full view of the driving path before driving from a parking bay?		
Are parking bays clearly marked and are they safely accessible?		
Have parking bays and associated parking plans been developed for trucks or mobile equipment so as to control avoid parking blind spots?		
Is there a designated tarping area for drivers away from traffic and product loading areas?		
Temporary (or permanent) work affecting traffic flow		
Is signage for road works and temporary road closure/s available and in place?		
Have traffic controls been established and are they ready to implement on days where a blast is being undertaken?		
Other		

Attachment (E) Mobile Equipment Safety Devices Checklist

Attachment (E) Mobile Equipment Safety Devices Checklist			
Mobile Equipment	**ID Number**	**Site Location**	**Date**
Current Hours	**Current Kilometres**	**Date of last Service**	**Date of next Service**

Inspected by Name	Inspected by Signature

Safety Device	Mandatory	As Required	Fitted	
			Yes	No
Access ladder, foot holds and handrails				
Air conditioning				
Auto grease with ground fill point				
Brake light (Red)				
Bucket payload capacity				
Communication radio				
Emergency Stops				
Falling Object Protective Structure (FOPS)				
Fire extinguisher				
Fire suppression system				
First Aid Kit				
Flashing amber light –				
Horn or whistle				
Jump start plug				
Life hammer				
Lift point for freely suspended loads				
Load charts and capacity				
Lockout switch				
Loose wheel nut indicators				
OEM compliance plate				
Pressure release radiator cap				
Rear lights				
Rear vision camera				
Rear vision mirror				
Reversing alarms				
Roll Over Protective Structure (ROPS)				

Safety Device	Mandatory	As Required	Fitted	
			Yes	No
Seat adjustment device				
Seat belt				
Sun visor				
Task lights				
Windscreen guard				
Window tinting				
Other				

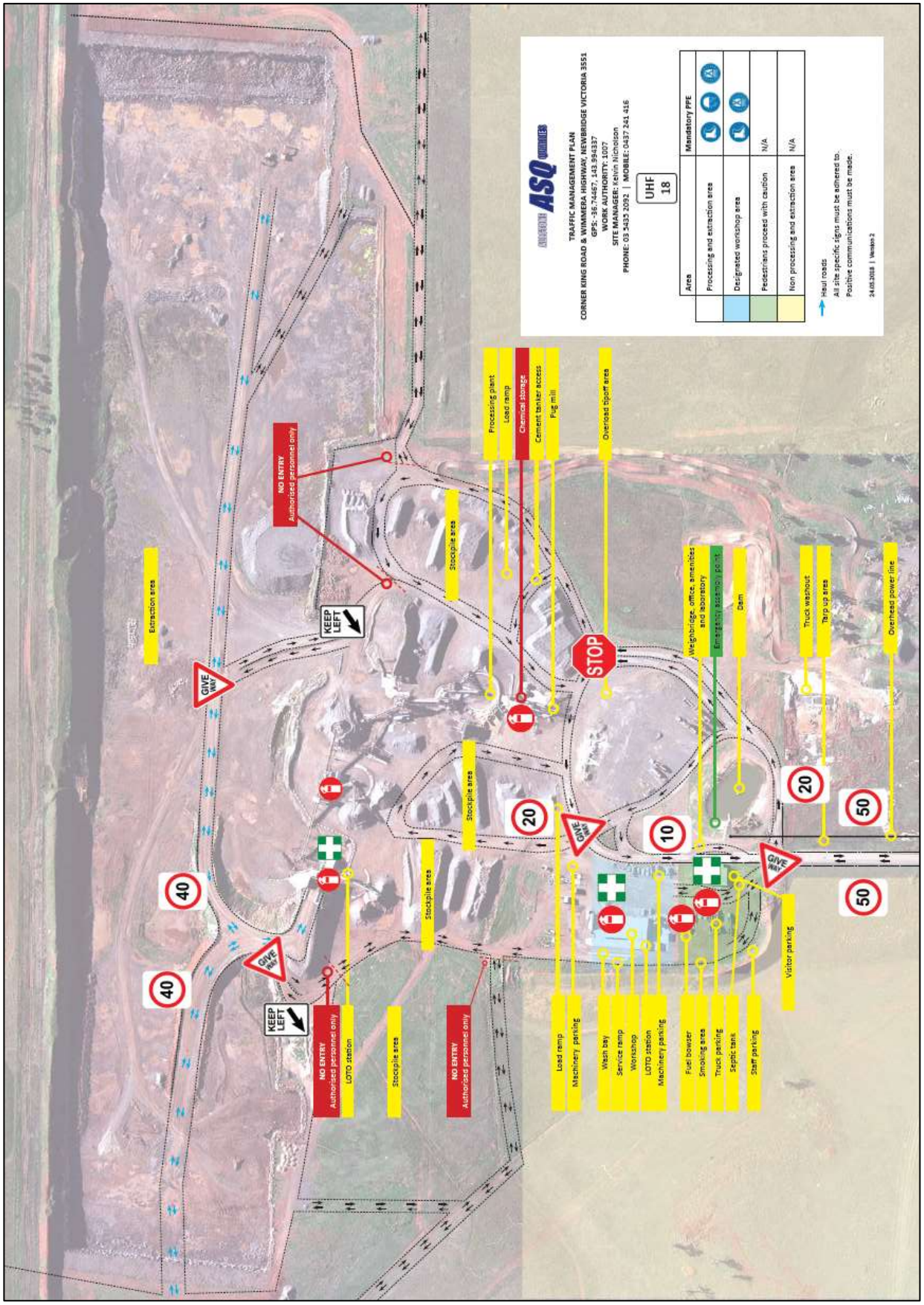
Attachment (F) Site Specific Traffic Rules Template

Attachment (F) Site Specific Traffic Rules Template
Example only; needs to be amended to suit your site specific requirements • **All drivers must hold a current drivers licence** • **All drivers and passengers shall wear seatbelts at all times** • **Never enter the designated blind spot zone of operating mobile plant without the authority of the operator** • **Never move into signed areas advising of no entry (e.g. blast zone)** • **Never travel beyond the office without the approval of the manager** • **Never travel on the outside of any moving vehicle or in a bucket** • **Never work or pass under a suspended object (crane, bucket, etc.)** • **Obey all site signage and machine decals** • **Operating speeds** • **Overtaking, parking and breakdown procedures** • **Radio communications, when, where and what channel** • **Restricted area requirements, for example, dumps, stockpiles, park bays, overhead power lines and obstructions** • **Reverse parking in designated areas is mandatory** • **Road vehicles taken beyond the site office shall be fitted with an appropriate flashing light and high-visibility flag** • **Tipper drivers must stay in cabin when being loaded unless instructed otherwise due to rock size** • **Use of communication devices** • **Vehicle/equipment separation distances** • **Where a flashing light is not fitted or available, hazard lights must be utilised and a company escort provided**

Attachment (G) Traffic Management Plan Review Checklist

Attachment (G) Traffic Management Plan Review Checklist	Yes	No
Pedestrian routes – Are safe pedestrian movements provided for?		
Traffic demand – Has capacity required to accommodate the traffic demand been met?		
Vehicle routes – Has safe and efficient means of routing traffic, inclusive of ad-hoc and lesser used routes such as explosive and other dangerous goods delivery routes been established?;		
Separation – Have heavy and light vehicles and pedestrians been separated?		
10-20-30 Rule – Has the 10-20-30 Rule been established and communicated?		
Exclusion Zones – Are Exclusion Zones being utilised		
Weighbridge demand – Have areas for all trucks to queue, wet down, tarp, tip off overload, turn around been established?		
Stockpile layout – Are there any blind spots, congested loading or queueing areas, safe access for testing of materials?		
Stock levels – Are required stock levels provided for without creating unacceptable risk and congestion?		
Materials testing – Is there safe entry/exit from stockpiles for materials testing?		
Emergency services access – Is access appropriate and easily identifiable and accessible?		
Fuel stations – Are mobile or fixed fuel stations located so as to avoid queueing and interaction?		
Parking requirements – Are heavy and light vehicles accommodated for and have parking rules been established and communicated?		
Visitor access – Is there safe access to amenities and parking for visitors or customers?		
Road blind spots– Have all blind spots been identified and are controls such as dust suppression and convex mirrors adequate?		
Roads, drains and berms. – Are roads, drains and berms being regularly inspected and maintained to ensure their integrity?		
Restrictions – Are road closures established during blasting or when work is being conducted on benches above or below the road/route?		
Signage and other traffic controls – Are signage, other traffic controls and vehicle safety devices being regularly inspected and maintained to ensure their integrity?		
Weed control – Are weeds controlled so as not to restrict driver/operator vision		

Attachment (H) Example of a Traffic Management Plan using Aerial Photograph



Attachment (I) Safe Work Australia Road Design Principles

(This document is an edited extract from Safe Work Australia's Draft Code of Practice titled Roads and other vehicle operating areas).

Design

Terrain and geotechnical considerations

When designing and establishing quarry roads, the terrain and geotechnical issues must be taken into account as they will impact on the type of operation that will be carried out, the mobile equipment to be used and where infrastructure can be located.

Existing operations will have to determine how best to manage the design and the establishment of the quarry roads to accommodate prevailing terrain and geotechnical conditions.

Prevailing weather and environmental conditions

Prior to constructing and establishing roads, it is necessary to consider the weather and environmental conditions and how they will impact on materials used to construct the road and maintenance requirements. Consideration should be given to:

- The nature and type and load of vehicles to use the road;
- The expected volume of traffic;
- Weather conditions, for example, dry versus wet conditions;
- Vehicle operating speeds;
- Gradients; and
- The materials available for road construction and maintenance.

Primary roads design, construction and maintenance

Primary roads should be designed and constructed to carry the designed wheel loadings without undue deformations and subsidence.

Sub-base and Pavement

The following should be considered in the design of the road sub-base and pavement:

- Available materials;
- Shear forces of wheel loads;
- Braking and acceleration forces;
- Effects of water ingress and drainage requirements;
- Selected design speed;
- Ride characteristics of haul vehicles; and
- Potential for road material to be projected by vehicular traffic.

The outputs of the sub-base and pavement design should be:

- Construction and compaction specifications for the sub base and pavement;
- Drainage plans, drains and road crown and road cross fall specifications; and
- Maintenance specifications for remediation and restoration of the road shape, surface condition and drainage.

Secondary roads design, construction and maintenance

- Secondary roads will generally be constructed with in-situ material, or with waste overburden. The use of these materials may lead to an increased risk of road surface degradation, unacceptable surface roughness and reduced steerage and traction. Spillage may also lead to surface degradation and a loss of traction.
- Condition monitoring processes should be applied, with vehicle speeds, road maintenance and watering plans adjusted accordingly.

Road widths

The widths of a road should be based on the size of the largest vehicle in use, for example, the larger the vehicle the more clearance is required. Minimum widths for haul roads should be as follows:

One way traffic, straights and corners

- A minimum of 2 to 2.5 times vehicle width.

Two way traffic

- In straights a minimum of 3 to 4 vehicle widths;
- In corners a minimum of 3.5 to 4.5 vehicle widths.

Road gradients

A safe road gradient is typically 1:10 but must take into account the operating parameters or specifications of the equipment operating on those roads. Materials used to construct the road on steep gradients must provide adequate friction to be able to maintain control of the vehicle. Speeds and loads of equipment operating on steep gradients must be managed to ensure control of equipment is maintained. Road gradients should also take into account and support effective drainage.

Road curvature – vertical and horizontal

Vertical and horizontal alignment (curvature) should take into account the following characteristics of the equipment using the road:

- Design speed;
- Stopping and braking capabilities (stopping distance);
- Vision from the equipment (sight distance); and
- Interference lighting from adjacent facilities.

Sight distance

Sight distance is the distance a driver can see ahead of their vehicle. Roads should be designed so a driver has sufficient sight distance to see a hazard, react to it and bring their vehicle to stop.

Different sized vehicles have differing sight distances, for instance, a driver can see further down a road from the cabin of a truck than from a ute.

Sight distance can be reduced by environment factors including dust, rain, shade and night time operations. The sight distance at night is what the operator can see in the beam of their headlights.

To manage sight distance, the mine operator must consider:

- Removing obstacles that are limiting sight, for example, vegetation or piles of materials;
- Making curves more gradual;
- Cutting down crests;
- Ensuring vehicles are well lit and have suitable headlights;
- The speed of vehicles (where sight distance is an issue reduce the speed of the vehicle to ensure the stopping distance of the vehicles is within the available sight distance); and
- The use of convex mirrors on intersections where appropriate.

Stopping distance

Stopping distance is the distance it takes to bring a vehicle to a stop. It is made up of three components:

- The distance the vehicle travels between the operator recognising a need to stop and the operator applying the brakes (operator response);
- The distance the vehicle travels during the time it takes for the brakes to apply after the operator has pressed the brake pedal (vehicles brake system response); and
- The distance the vehicle travels while coming to a stop under braking effort.

There are a number of factors which impact on the stopping distance including:

- The speed of the vehicle (the higher the speed the greater the distance travelled over time);
- The response time of the operator (factors such as sight distance and fatigue can increase the response time of the operator);
- The condition of the vehicles braking components and tyres (worn or poorly maintained components take longer to apply and develop less friction);
- The condition and nature of the road (poorly maintained and wet roads reduce the friction that can be achieved between the tyre and the road); and
- Rolling resistance (the physical resistance to free rolling of the vehicle including deformation of the road surface, flexing of the tyres and irregularities in the road surface).

Drainage

Poorly maintained or inadequate drainage results in mud, ponding and potholes. Water running across haul roads can cause erosion and not only presents a hazard to mobile equipment but can cause structural damage to the road if the water penetrates into the various layers of the road. Bunding or windrows on the side of the road needs to have sufficient gaps to enable water to run off the road. Roads should also be constructed so direct water can run off the road as quickly as possible and limit or prevent ponding or erosion.

Road surface

The road surface should be subject to a schedule maintenance program inclusive of ongoing grading. The road running surface should be sheeted with competent material to provide adequate traction when wet, to maintain a suitable coefficient of friction. This should enable the surface condition to be restored through normal road maintenance.

When suitable sheeting material is not available, the maintenance plan and watering plan should be adjusted to provide the required ride and traction characteristics. The effect of watering the roads to suppress dust should be monitored to ensure the road surface is not damaged and drainage is effective.

Depending on the nature of the material used to construct the road it may also be necessary to change speed and load limits depending on the weather or road conditions.

Edge protection

Safety Berms/Windrows/Bunds must be placed on haul roads where there is the potential for a piece of mobile equipment to drive off an edge. Berms/Windrows/Bund heights should be at least 1.5 times the front axle height of the largest item of mobile equipment and constructed out of unweathered, freely draining, materials which can be easily maintained and act as a suitable barrier. When considering the distance from the edge to place the berm the stability of the bench the berm sits on and the face below must be taken into account. For example, where back break from a previous blast is identified, the berm should not be placed upon that back break but a safe distance inside. It is vital to inspect benches and faces before placing berms for edge protection.

Intersections

Intersections should be located and constructed so operators have sufficient sight and stopping distances. This can be achieved by:

- Keeping the intersection away from areas of vertical or horizontal alignment changes;
- Avoiding 4 way intersections that encourage traffic to drive straight through. Use 3 way “t” intersections where possible;
- Keeping the intersection as close to 90 degrees as possible;
- Using traffic islands to split and clearly delineate traffic;
- Keeping the area around the intersection clear of vegetation that may restrict vision;
- Construct windrows or berms at the intersection lower than normal to increase sight distance;
- Ensuring that intersections are constructed to accommodate the largest vehicle using the intersection;
- Ensuring that signage is clearly visible to all equipment using the intersection; and
- Establishing clear right of way rules that apply consistently to all traffic.

Parking areas

When establishing parking areas for mobile equipment consideration should be given to:

- Locating on as flat level ground as possible;
- Being consistent in design and layout;
- Where possible, have one way movement (limit need for reversing);
- Have drains or humps to prevent unintended movement of vehicles;
- Separate light and heavy vehicles;
- Manage/limit pedestrian vehicle interaction with mobile equipment; and
- Have clear signage.

Overhead power lines and structures

Overhead power lines and other structures including pipe bridges and conveyors can present a hazard to operating equipment. Consideration should be given when locating these structures or constructing roads to ensure the risk of mobile equipment contacting overhead power lines and structures is controlled.

Considerations for managing this hazard include:

- Positioning roads, stockpiles and dumps clear of overhead structures;
- Where possible, routing power lines under roads rather than over;
- Maintaining vertical and horizontal clearance distances between mobile equipment and overhead power lines;
- Ensure that there is sufficient barricading or bunding to prevent vehicular access to restricted areas; and
- Using height restriction barriers.

Dumps and pads

When establishing dumps and pads thought should be given to the vehicle activities that will occur in these areas and controls established to manage the risk. When establishing controls to manage this risk consider:

- Ensuring there is sufficient room for vehicles to operate;
- Where possible, have traffic flow in one direction;
- Managing stockpiles so that they do not encroach on vehicle operating areas;
- Managing stockpile size so that it does not restrict vision of operators;
- Restricting vehicular and pedestrian access;
- Providing additional lighting if operating at night; and
- Ensuring regular inspections to check controls.

Workshops and fixed plant areas

The risk of a vehicle collision with a pedestrian or plant is greatly increased in workshop and plant areas. To reduce the risk of this occurring consideration should be given to:

- Providing specific parking areas;
- Restricting vehicular access;
- Establishing clearly identified pedestrian crossings and walkways;
- Providing bollards or barricading to protect equipment close to roads;
- Establishing appropriate speed limits; and
- Ensuring housekeeping standards are maintained.

Traffic Management Photo Gallery

Traffic Management Signage

• ***Clear and concise signage in view of drivers.***

Traffic Management Signage

• ***Call up point prior to passing weighbridge.***

Traffic Management Signage

• ***Directions to stockpiles and cement tanker deliveries.***

Traffic Management Signage

• ***General instructions prior to entering sales area.***

Traffic Management Signage

• ***Advice to drivers preventing accidental damage to vehicles and boom gate.***

Traffic Management Signage

• ***Clear directions for visitors parking.***

Traffic Management Signage

• ***Signage directing all visitors to office.***

Traffic Management Signage

• ***Clear instruction to drivers on entry to weighbridge.***

Traffic Management Signage

• ***Clear and concise directions for truck drivers.*** • ***Proactively controlling spillage on public roads.***

Traffic Management Signage

• ***Stop and No Entry signage important for one way roads to reduce the potential for head on incidents.***

Traffic Management Signage

• ***Wrong way go back signage wherever necessary.***

Traffic Management Signage

• ***Advice that dump trucks also operate in this area.***

Traffic Management Signage

• ***Warnings for hazardous and restricted areas of the site.***

Traffic Management Signage

• ***Clearly identified stockpiles improve traffic management efficiency.***

Traffic Management Signage

• ***Designated speed limits and give way requirements clearly signposted.***

Traffic Management Signage

• ***Hold Points for dump trucks waiting to tip, kept clear of other traffic and previous dump truck.***

Traffic Management Signage

- ***Speed limited to walking distance around pedestrians traffic.***

Traffic Management Signage

- ***On concrete and asphalted surfaces painted areas are an alternative to signs.***

Traffic Management Signage

• ***Clear line marking designating traffic direction.***

Traffic Management Signage

• ***Directions for separate truck entrance.***

Traffic Management Signage

• ***Signposting of overhead wires if they cannot be relocated below ground or road cannot be re-routed.***

Traffic Management Signage

• ***Discuss with local councils the adequacy of roadside signage to improve safety for those entering and exiting site or on road vehicles passing site.***

Traffic Management Signage

• ***Crossing sign to advise vehicle operators that pedestrians may be crossing.***

Site Map

• ***Good example of a site map on entrance to site, aids in directing ex-bin drivers to loading areas.***

Site Map

• ***Aerial photographs with clear legend.***

Road Design

• ***Allow sufficient space for vehicle movement wherever possible.***

Road Design

- ***Adequate width in roadways to ensure clearance between vehicles.***

Road Design

- ***Internal roadways designed with bends to keep speed to a safe level whilst reducing dust emissions.***

Road Design

- ***Bollards signalling intersections and protecting drainage.***

Road Design

- ***Using quality materials and regular grading are key to safe road maintenance.***

Road Design

• ***Well signposted and physical separation.***

Road Design

• ***Physical separation of traffic travelling in opposite directions.***

Road Design

• ***Physical separation of two way traffic and directions to visitor car park.***

Road Design

• ***Simple and effective use of concrete bollards and chain to ensure segregation.***

Access Control

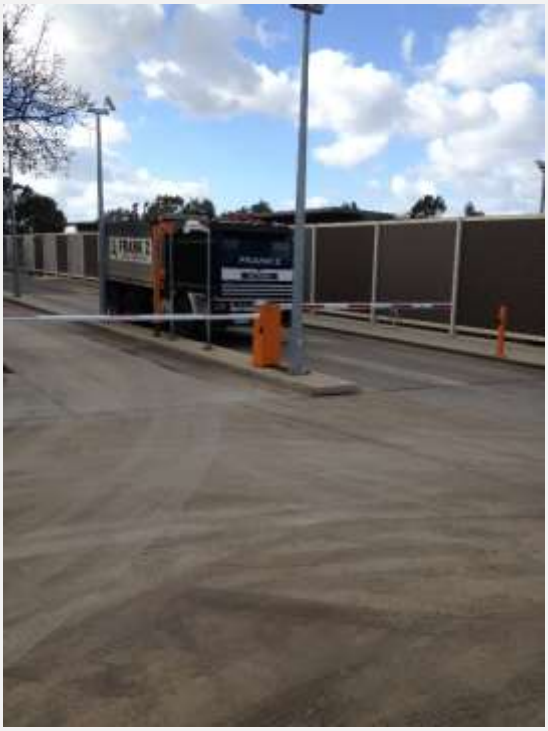
- ***Preventing unauthorised site access through the use of boom gates and fencing.***

Access Control

- ***Intercom to gain access, site map on hand for easier communication of directions.***

Access Control

• ***Intercom & pin pad access for employees.***

Access Control

• ***Boom gates to control all movements in and out of site.***

Load Inspection

• ***Raised catwalk and CCTV for inspection of loads.***

Tip-Off Area

• ***Designated tip off area with physical barriers.***

Light Vehicles

• ***Flashing amber light and fluoro flag at a height visible to mobile equipment when driving around bunding or stockpiles.*** • ***Designated light vehicle parking around the plant with physical barriers***.

Light Vehicles

• ***Reflective tape on tray to increase visibility.***

Traffic Management General

• ***Traffic light to control flow onto weighbridge.***

Traffic Management General

• ***Open area around offices reduces the risk of people 'popping out' from behind blind corners etc.***

Traffic Management General

- ***Designated pedestrian walkways.***

Traffic Management General

- ***Designated pedestrian walkway and speed hump highlighted.***

Traffic Management General

• ***Speed hump highlighted with solid paint and sign.***

Traffic Management General

• ***Pedestrian walkways in employee car park that directs reverse parking of vehicles.***

Traffic Management General

• ***Wheel wash minimises waste brought onto public roadways.***

Traffic Management General

• ***Reverse parking for mobile equipment prevents other vehicles being parked behind and provides clear vision on departure.***

Traffic Management General

• ***Reverse parking for light vehicles to ensure clear vison on departure.***