



Code of Practice for Small Quarries

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Definitions

Angle of repose	The maximum angle above horizontal of a stable slope formed by a given material (depends on friction, cohesion and the shapes of the material particles).	Diversion drain	A ditch and/or earth bank constructed to direct clean water from uphill of a disturbed area around the disturbed area.
Batter	The face of the slope.	Disturbed land	Any area of land where the natural surface has been removed, excavated, shaped or otherwise altered from its natural condition.
Bench	That part of a quarry where material is loaded and hauled away.	Drip line:	The outer most leaves on a tree defines its drip line; the ground within the drip line is known as the drip zone.
Bond	An amount of money, usually in the form of a bank guarantee, which is forfeited if the rehabilitation of a site is not successfully completed in the allocated time or to an acceptable standard.	Environmental incident	An occurrence that will, or is likely to cause, material harm to the environment.
Bund	An earthen mound wall which may be used for noise attenuation or visual screens. Bunds may also be used to contain spillage of liquid materials.	Flocculation treatment	The addition of an approved agent to water with high suspended sediment levels that cause the suspended material to clump together and fall out of solution as sediment.
Community	A broad term used to define groups of people, whether they are stakeholders, interest groups or citizen groups.	Geotextiles	Permeable fabrics used to stabilise slopes and prevent erosion.
Contour bank	An earth mound or similar, constructed approximately along the contour and which is designed to slow down and control water run-off.	Heritage sites	Sites of cultural significance identified under the <i>Heritage Act 1995</i> or the <i>Aboriginal Heritage Act 2006</i> .
Contour drain	Drainage channel constructed approximately along the contour, and which is designed to slow down and direct the flow of water across a disturbed area to a sediment trap for sediment removal.	Level sill outlet	A pond or drain outlet point which causes water to spread evenly across a level surface to dissipate energy before being released to the environment.
Crown land	Land that is, or that is by any Act deemed to be, unalienated land of the Crown, and includes: <ul style="list-style-type: none"> a) Land of the Crown that is reserved permanently or temporarily by or under any Act; and b) Land of the Crown occupied by a person under a lease, licence or other right under the MRSD Act or any other Act; but does not include land which is the subject of a licence granted under Part 3A of the <i>Victorian Plantation Corporation Act 1993</i> . (Source: <i>MRSD Act</i>).	Noxious weed	means a — <ul style="list-style-type: none"> (a) State prohibited weed; or (b) regionally prohibited weed; or (c) regionally controlled weed; or (d) restricted weed; under the <i>Catchment and Land Protection Act 1994</i> .
		Overburden	Material which overlays the resource being quarried, excludes soil and topsoil.
		Pest animal	means — <ul style="list-style-type: none"> (a) a restricted pest animal; or (b) an established pest animal; under the <i>Catchment and Land Protection Act 1994</i> .
		Proponent	The person or entity proposing to develop a quarry.

Relevant agencies	The relevant Catchment Management Authority, Local Government Authority, Department of Sustainability and Environment, Rural Water Authority and/or Urban Water Authority, Environment Protection Authority and Aboriginal Affairs Victoria with statutory obligations that may relate directly or indirectly to the small quarry operations.
Sediment trap	Collects waterborne sediment running off areas of disturbed land using a device, such as a structure, pond barrier, silt fences, hay bales or grassed strips.
Sediment pond	Collects highly turbid water and stores it while suspended sediments fall out of solution and discharge it to a vegetated area.
Sensitive land-use	Residential areas and zones (whether occupied or not), hospitals, schools, caravan parks, and other similar uses involving the presence of individual people for extended periods, except in the course of their employment or for recreation.
Significant slope failure event	A slope failure event that causes (or has the potential to cause) a public risk, an impact outside the Work Authority boundary or the need to review the design of the quarry.
Topsoil	This is usually the surface material to a minimum of 150 mm in depth.
Turbid water	Muddy or opaque water, which carries suspended sediment or foreign particles.
Waterway	A river, creek, stream, lake, lagoon, swamp, marsh or watercourse, or a channel in which water may flow.
Work Authority	means a Work Authority granted under section 77I of the <i>Mineral Resources (Sustainable Development) Act 1990</i> .
Work Authority boundary	The perimeter of the Work Authority.
Work Plan	means a Work Plan lodged under section 77G of the <i>Mineral Resources (Sustainable Development) Act 1990</i> .
Work site	The area within the Work Authority where operations are being undertaken.
Works Approval	means a Works Approval granted under the <i>Environment Protection Act 1970</i> .

Abbreviations

AAV	Aboriginal Affairs Victoria
AS	Australian Standard
CHMP	Cultural Heritage Management Plan
CaLP Act	<i>Catchment and Land Protection Act 1994</i>
CMA	Catchment Management Authority
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment
EP Act	<i>Environment Protection Act 1970</i>
EPA	Environment Protection Authority
ERR	Earth Resources Regulation Branch of the Department of Primary Industries
Heritage Act	<i>Heritage Act 1995</i>
HV	Heritage Victoria
MRSD Act	<i>Mineral Resources (Sustainable Development) Act 1990</i>
RWA	Rural Water Authority
SEPP	State Environment Protection Policies
UWA	Urban Water Authority
VPP	Victorian Planning Provisions
Water Act	<i>Water Act 1989</i>

1. Introduction

1.1 Background

From 1 January 2010, Victoria's extractive industries must operate according to new provisions included in the *Mineral Resources (Sustainable Development) Act 1990* (MRSD Act). The MRSD Act replaces the *Extractive Industries Development Act 1995* as the Act which governs extractive industries. The regulation of the mining and extractive industry sectors through one piece of legislation allows greater streamlining and consistency of regulation for these sectors.

The MRSD Act is administered by the Department of Primary Industries (DPI). One of the objectives of the MRSD Act is to ensure that operations are carried out within safe operating standards and in a manner that ensures rehabilitation of land to a safe and stable landform. A Code of Practice for Small Quarries (the Code) has been developed to support this objective in relation to certain small-scale quarries which are exempt from the Work Plan requirements of the MRSD Act.

Extractive industries are defined in the MRSD Act as the extraction or removal of stone from land if the primary purpose of the extraction or removal is the sale or commercial use of the stone, or the use of the stone in construction, building, road or manufacturing works. The MRSD Act defines stone as:

- sandstone, freestone or other building stone, or
- basalt, granite, limestone or rock of any kind ordinarily used for building, manufacturing, or construction purposes, or
- quartz (other than quartz crystals), or
- slate or gravel, or
- clay (other than fine clay, bentonite or kaolin), or
- peat, or
- sand, earth or soil, or
- other similar materials.

Extractive industries provide vital resources to the community for building, construction and infrastructure. However, extractive industry activities have the potential to have negative impacts on people and the environment. The Code creates obligations which Work Authority holders must meet in relation to the management and control of these impacts when operating small quarries.

1.2 Application of the Code

From 1 January 2010, quarries that are less than five hectares in area and less than five metres in depth, provided that no blasting or native vegetation clearance occurs, will be exempt from the requirement to work to an approved Work Plan (section 77G of MRSD Act). Such small quarries are instead required to comply with the Code, which is made under sections 89A – 89H of the MRSD Act.

The Code does not apply to quarries that are less than one hectare in area and less than two metres in depth. These quarries are exempt from regulation under the MRSD Act.

1.3 Development of the Code

The Code has been developed by the Earth Resources Regulation Branch (ERR) of the DPI through consultation with stakeholders. A working draft Code of Practice applied to eligible extractive industries from 1 July 2009. The Code has now been made under section 89E of the MRSD Act.

The Code will be regularly reviewed to incorporate changes in technology, new environmental information, public submissions, administration experience, as well as changes in legislation and policy.

1.4 Transitional arrangements for the Code

Under the MRSD Act, all new extractive industries that are less than five hectares in area and less than five metres in depth, where blasting and native vegetation clearance are not required, will be exempt from the Work Plan requirements. These extractive industries must instead comply with the Code. These extractive industries will still require an approved Work Authority.

Different arrangements apply to quarries that are less than five hectares in area and less than five metres in depth, with no blasting and no native vegetation clearance, and which have a Work Plan approved before 31 December 2009 (existing small extractive industries).

Existing small extractive industries can continue to operate according to the approved Work Plan. Alternatively, existing small extractive industries can seek approval to move to the Code. Existing operators with an approved Work Plan and Work Authority must apply to the DPI in writing and obtain approval if they wish to operate according to the Code rather than a previously approved Work Plan. Existing operators of small extractive industries cannot vary a Work Plan at any time after 31 December 2009.

After 1 January 2015, all existing operators of small extractive industries will be required to operate according to the Code.

If a Work Plan for a proposed extractive industry that is less than five hectares in area and less than five metres in depth, where no blasting and native vegetation clearance occurs, has been submitted before 31 December 2009 but has not been approved, the Work Plan cannot be approved. The applicant will instead be required to work according to the Code and the approved Work Authority.

2. Purpose of the Code

The Code sets out the minimum mandatory requirements that Work Authority holders must meet (see Requirements in sections 3, 5, 6, 7 and 8). Appendix 1 contains a full list of requirements. The Work Authority issued to proponents under the Code will specify that Work Authority holders are bound by the requirements of the Code.

The Code also provides practical guidance on how to achieve a well-designed and operated quarry (see Recommended Practice in sections 4, 5, 6, 7 and 8), which will help Work Authority holders to meet the minimum mandatory requirements of the Code. Appendix 2 contains a checklist to enable quarry operators to determine if they are meeting the objectives of the Code.

The Code is primarily for use by Work Authority holders operating small quarries. However, the Code will also provide useful information about quarries to a range of other stakeholders including community members, landowners/occupiers and environmental groups.

Extractive industry operators will use the Code to:

- understand and comply with minimum mandatory requirements of the Code; and
- implement best-practice operations.

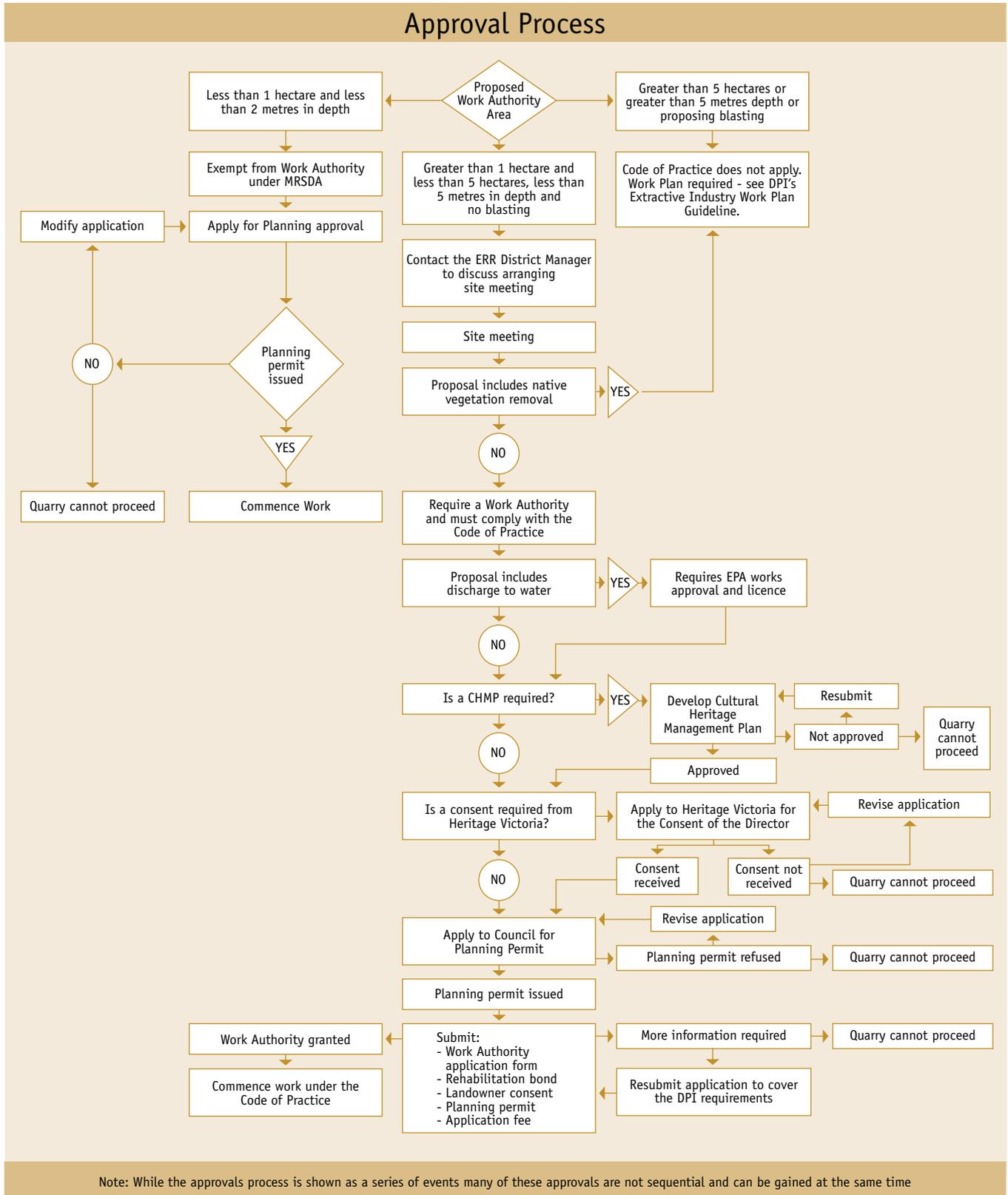
Community members and environment groups will use the Code to:

- understand the legislative framework that governs community and environmental issues for smaller quarries;
- identify the compliance requirements for Work Authority holders;
- enhance their capacity to engage with quarries; and
- improve their understanding of the regulation of quarries.

3. Approval Requirements

Key approval requirements for small quarries are summarised in Figure 1.

Figure 1 – Approvals process flow diagram



Note: While the approvals process is shown as a series of events many of these approvals are not sequential and can be gained at the same time

3.1 DPI approval for quarries under the Code

Earth Resources Regulation Branch

The ERR of the DPI is responsible for regulating the minerals, petroleum, geothermal and quarry resources in Victoria and its offshore waters.

The DPI regulates quarries through administration of the MRSD Act. The DPI's regulatory role is principally the assessment of applications, issuing of licences, monitoring and auditing of operations, collection and administration of rehabilitation bonds and enforcement activities. The DPI also provides advice and guidance to proponents on how to meet their obligations under the MRSD Act.

Approval to commence works

Operators must hold a Work Authority under the MRSD Act prior to commencing work on a small quarry. Work Authority holders must also comply with the MRSD Act, which specifies obligations in relation to information requirements, royalties, fees and infringement offences.

A proponent intent on applying for a Work Authority should contact the relevant ERR District Manager to organise an initial onsite meeting. The proponent must attend a site meeting with the DPI and other relevant agencies to discuss the proposal and identify all the approval requirements.

The proponent submits a Work Authority Application Form, along with the application fee and a plan defining the Work Authority area to the DPI for assessment. The proponent should also submit to the DPI:

- Planning consent;
- Rehabilitation bond;
- Other applicable consents; and
- In the case of Crown land, the Crown land Minister's consent.

Rehabilitation bonds for sites under the Code will be determined on a per hectare basis. The per hectare rates are specified in the DPI's publication: *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries 2010*.

Once the Work Authority has been granted, works may commence subject to the requirements of the Work Authority conditions and the requirements set out in the Code.

Please visit: www.dpi.vic.gov.au for more information.

Requirements

- R1. The Work Authority holder must carry out work in accordance with the Code of Practice for Small Quarries.
- R2. The Work Authority holder must ensure that final land-use of the site is agreed with the landholder prior to the commencement of work on the site.
- R3. Prior to commencing any work, the Work Authority holder must have public liability insurance that covers all work authorised under the Work Authority and must ensure that the insurance is maintained at all times while work occurs under the Work Authority.
- R4. The Work Authority holder must erect and maintain posts along the boundary of the Work Authority so that the boundary of the Work Authority is clearly identifiable.
- R5. The Work Authority holder must ensure that the posts required in R4 meet the following specifications:
 - a) the post is not less than one metre high above the ground;
 - b) the post is painted white;
 - c) the Work Authority number is painted within the top 20 centimetres of the post, is legible and in a contrasting colour to the white post; and
 - d) the post must be situated so that each post is clearly visible from each post on either side of that post.
- R6. The Work Authority holder must ensure that there is no extraction within 10 metres of the Work Authority boundary. A wider site specific buffer may apply to protect infrastructure or to minimise visual impact.
- R7. The Work Authority holder must erect and maintain a legible sign at the main entrance to the Work Authority that contains the following information:
 - a) the name of the Work Authority holder and the Work Authority number;
 - b) the name and contact details of the Manager of the Work Authority; and
 - c) emergency contact details for the Work Authority holder and the DPI.
- R8. The Work Authority holder must ensure that public safety is maintained within the Work Authority area at all times, including through the use of fencing, gates and signage as required around the work site.
- R9. The Work Authority holder must ensure that all fences are maintained to prevent access to the work site and that all gates are locked when the work site is unattended.

- R10. The Work Authority holder must as soon as is practicable after becoming aware of any non-compliance with the conditions of the Work Authority, and/or requirements of the Code of Practice for Small Quarries and/or an environmental incident that will, or is likely to cause, material harm to the environment, notify the relevant ERR District Manager of the non-compliance and/or environmental incident.
- R11. The Work Authority holder must notify any other relevant government department or agency of the non-compliance and/or incident.

3.2 Non-DPI approval for quarries under the Code

Work Authority holders complying with the Code may also need to obtain approvals under other regulatory frameworks prior to undertaking any quarrying activity. Such frameworks may include the *Planning and Environment Act 1987*, *Environment Protection Act 1970*, *Occupational Health and Safety Act 2004*, *Aboriginal Heritage Act 2006*, *Heritage Act 1995*, *Water Act 1989* and the *Dangerous Goods Act 1985*.

Where applicable, the Code provides information about the requirements of related laws and policies. However, it is the Work Authority holder's responsibility to ensure compliance with all Victorian and Commonwealth legislation.

The Code does not replace other related laws and regulations and, to the extent there is a conflict between the Code and other related laws and policies, the laws and policies will prevail.

Laws and policies that may be applicable are provided below and in the Reference Material section at the back of this code.

Native vegetation

If site planning or a site meeting with relevant government agencies reveals that the operation of a quarry requires the removal of native vegetation, then the operator is required to have an approved Work Plan and the Code will not apply. Affected quarries are subject to the requirements of *Victoria's Native Vegetation Management: A Framework for Action*. The Work Authority holder would need to prepare an offset management plan to the satisfaction of the Department of Sustainability and Environment (DSE).

For help in identifying native vegetation on a site, please contact the DSE. For information about native vegetation management requirements, please refer to the DPI and DSE publication: *Native Vegetation Management Guide for the Earth Resources Industries*; available at: www.dpi.vic.gov.au

Water use, dams, crossings and outlet

All works associated with or near watercourses may require approvals from one of the following statutory referral authorities:

Catchment Management Authority (CMA)

The local CMA may have an interest and approval requirement for small quarries if the proposed site relies on riverine extractions or is situated:

- on a floodplain - the CMA is the statutory referral authority where a Flood or Land Subject to Inundation overlay is present in the local government planning scheme;
- on, or adjacent to a wetland or waterway - most of the CMAs have a Waterways Protection By-law.

Rural Water Authority (RWA)

The Rural Water Authority will need to be contacted if a small quarry requires:

- permits to take and use surface or ground water;
- bore construction;
- irrigation dams;
- dams on waterways; and
- where a site is a Special Water Supply Catchment of the RWA. To view areas affected by these requirements, visit: http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/dwsc_areas

Urban Water Authorities (UWA)

If a quarry site is connected to town water, the UWA delivers the water through reticulated town water supplies. The proponent must discuss any proposal with the relevant UWA. To view areas affected by these requirements, visit: http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/dwsc_areas

Off site discharge

Extractive industry premises that are licensed in accordance with the *Mineral Resources (Sustainable Development) Act 1990*, and that discharge solely to land are exempt from requiring a Works Approval or from holding a licence under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007*.

Quarries that plan to discharge to water or air should contact the Environment Protection Authority for advice on applying for a Works Approval and licence under the *Environment Protection Act 1970* (EP Act). All operations are subject to controls on discharge, including noise, through the State Environment Protection Policies under the EP Act.

Site safety

All quarry sites are considered workplaces and are subject to the *Occupational Health and Safety Act 2004*. Please contact WorkSafe Victoria for advice on how to comply with this legislation.

Heritage sites

Sites with potential cultural heritage significance should be identified during the site selection phase. Identifying cultural heritage sites early at the proposal stage will avoid delays during construction and operation.

Aboriginal Cultural Heritage sites

The *Aboriginal Heritage Act 2006* protects places and objects of aboriginal cultural heritage significance in Victoria. Please contact Aboriginal Affairs Victoria (AAV) for advice on how to comply with this legislation.

If the proposed small quarry is located in an area of cultural heritage sensitivity the proponent may be required to prepare a Cultural Heritage Management Plan (CHMP). AAV or the Registered Aboriginal Party will approve the CHMP and it must be submitted to the DPI prior to a Work Authority being granted. To view areas affected by these requirements, visit: www.dpcd.vic.gov.au/aav

If a CHMP is required a quarry must then be planned and operated in accordance with the approved CHMP.

If items of Aboriginal cultural heritage or value are found during extraction activities and no CHMP was required, it should be reported to AAV. The Work Authority holder will then need to obtain a permit to continue to work a quarry or disturb the Aboriginal cultural heritage sites or items of value.

Other Cultural Heritage sites

Places and objects considered to be of non-indigenous cultural heritage significance to the State of Victoria may be protected under the *Heritage Act 1995* (Heritage Act). Places that have been assessed as having significance to the State of Victoria are included on the Victorian Heritage Register. It is necessary to obtain approval from Heritage Victoria (HV) to authorise any works that may affect the cultural heritage significance of a registered area.

There is blanket protection for all historical archaeological sites in Victoria under section 127 of the Heritage Act. All known historical archaeological sites are included in the Victorian Heritage Inventory.

The discovery of a cultural heritage site or object during the course of work must be reported as soon as possible to HV.

In some cases, places of significant heritage to a local community may be included in a Heritage Overlay of the Municipal Planning Scheme. Where the continuation of work could compromise the integrity of a site or object, the work must cease until advice has been obtained from HV.

Please contact HV for advice on how to comply with legislation, or for information about the Victorian Heritage Register and Heritage Inventory.

Planning approval

The proponent should discuss a proposal with the responsible planning authority (normally the local municipal council) very early in the process to determine if a planning permit is required; and to ensure that all the requirements of the planning scheme are met in an application.

The planning authority may refer an application to other authorities such as the Department of Sustainability and Environment, the relevant Catchment Management Authority, VicRoads, Heritage Victoria, the Environment Protection Authority and relevant water authorities.

Notice of the planning permit application must generally be provided to the owners and occupiers of adjoining land(s), and to any other people nominated by Council. However, this does not apply if the Council is satisfied that the proposed quarry operations will not cause material detriment to any person.

4. Quarry Design

Giving consideration to the layout of a quarry operation prior to starting work, or when opening up new areas will greatly reduce the effort required to meet environmental and safety requirements in future. Some proponents may benefit from engaging a consultant to assist in the design of a quarry.

The selection of a site, construction of access tracks, location of plant and equipment, site security and final land-use should all be carefully planned prior to commencement of work at a quarry. Proper planning will assist in efficient extraction and progressive rehabilitation and help to reduce costs and minimise the potential for issues or negative environmental impacts to arise.

4.1 Checklist for site design and planning

Site selection

- Ensure that there is sufficient resource in the proposed quarry to make a site financially viable; including rehabilitation expenses.
- Locate a site at a sufficient distance from watercourses to ensure that turbid waters do not enter a watercourse.
- Identify land-use conditions, local planning provisions and legislative responsibilities of the proponent and or land manager; like the responsibilities for pests, plant and animal management, cultural, heritage and catchment issues and environmental protection.
- If the quarry is located on a floodplain or waterway discuss the design with the CMA.
- Analyse the potential visual impact of a quarry from surrounding and frequently used roads or vantage points. Some methods used to minimise impacts include: orientation of quarry faces, tree screening and progressive rehabilitation.

- Locate a quarry to minimise all environmental impacts, including visual, dust and noise impacts on adjacent land-users.
- Aboriginal and European heritage sites must be identified and protected.
- Ensure native vegetation is protected and that extraction does not occur any closer than to the drip line of remnant vegetation.
- Ensure all easements are identified and where applicable, protected.

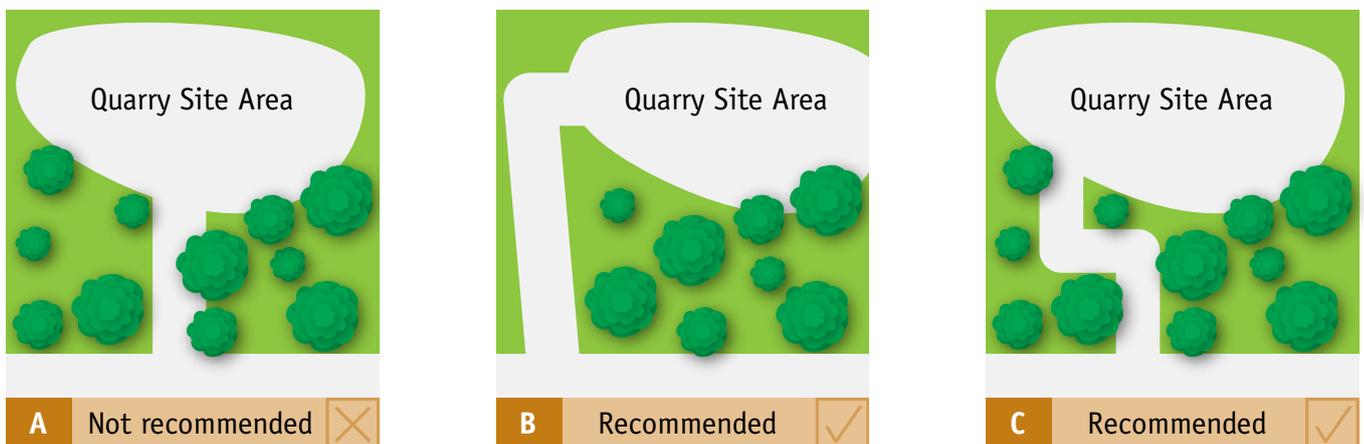
Minimising disturbance/staging of operations

- Control erosion caused by storm water run-off, raised dust and weed invasion, minimise the area of disturbed ground at any one time in the operation of a quarry.

Access tracks and road traffic

- Locate the entrance gate and any weighbridge operation away from sensitive land-uses.
- Locate the entrance to a quarry so that its workings are not visible from public roads (see Figure 2).
- Restrict the hours of truck access to minimise disturbance to nearby residents.
- When determining the point of access to a site and internal haulage roads, plan for empty trucks being louder than when loaded and that vehicle speed may significantly affect the noise of a vehicle.
- Minimise gradients of tracks to reduce noise from the use of brakes and/or increased engine power to climb slopes, especially when fully loaded. A maximum gradient of 1:10 (vertical:horizontal) is generally recommended for haul roads.

Figure 2 – Preferred location of access roads to reduce visual impact



Drainage

- Construct roads with sufficient diversion drains and culverts to ensure that clean stormwater is diverted away from roads.
- Ensure that the gradient and orientation of tracks do not cause runoff to be fast flowing.
- Drainage of roads should be to a vegetated area.

Weeds

- Identify noxious weeds (see the declared weed species under the *Catchment and Land Protection Act 1994*) and develop a control plan.
- Establish vehicle and equipment hygiene practices to prevent the spread of weeds and pathogens. This may include wash down facilities/areas.

Safety

- Access tracks must be of adequate width. As a guide, in the case of one-way traffic, the track should be twice the width of the widest vehicle that will use the track. In the case of two-way traffic, the track should be three times the width of the widest vehicle to use the track.
- Please contact WorkSafe Victoria for more information on adequate track construction.

Plant location

- Ensure that the proposed site of the plant complies with industry standards, municipal planning schemes and legislative requirements.
- Locate fixed plant with consideration for surrounding sensitive land-uses and land-use conditions.
- Site a plant with consideration of the direction of prevailing winds. For example, avoid siting machinery likely to cause a dust nuisance upwind of a sensitive land-use.
- Consider the likely visual, dust or noise impact of each piece of plant.
- Use topographical features that may form a barrier between the plant and the surrounding sensitive land-uses.
- Consider constructing bunds to provide barriers to shield from noise, visual impacts and dust.
- Consider the use of vegetation as a visual screen.

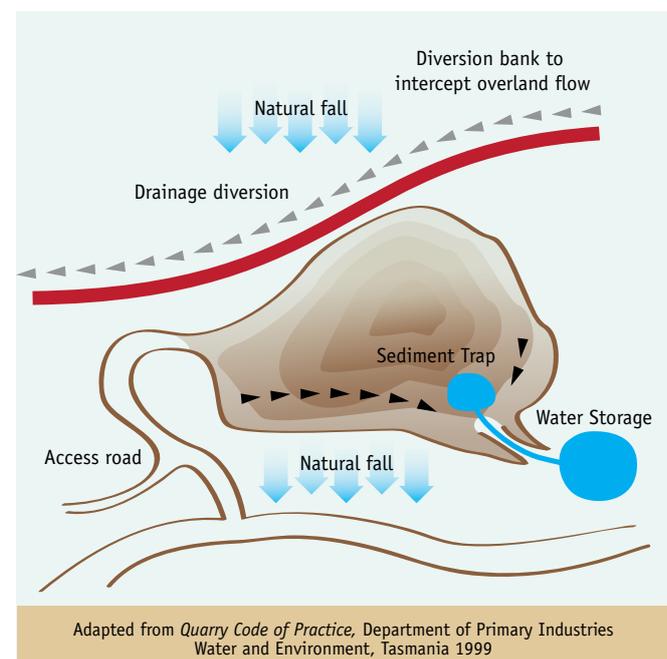
Site security

- Gates and fences should be designed to prevent unauthorised entry and be regularly inspected and repaired.
- Install signs at any hazardous locations on a site indicating the hazard.

Planning for final land-use

- Determine the intended future-use and final landform of a site at an early stage. This should be in consultation with the landowner or Crown land Manager, the local council and the CMA. Typical final land-uses include: grazing land, dams, wetlands, native vegetation and plantation forest.
- Ensure that topsoil is stockpiled and appropriately managed so it is suitable for rehabilitation works. Topsoil should not be buried, driven on, excessively handled, contaminated or stockpiled so as to hinder final land-use.
- Plan the location of roads, working areas and facilities to minimise the total area required to be disturbed.
- A plan of drainage works and the final drainage pattern should generally be determined prior to beginning work (see Figure 3). If located on a floodplain or waterway the layout will need to consider the form and function of the waterway and floodplain, e.g. no loss of flow conveyance or flood storage. Significantly changing the drainage pattern of a site may require water authority approval.

Figure 3 – Typical Drainage Plan to Manage Water across the Work Site



5. Operational Management

5.1 Topsoil management

Topsoil is a valuable resource for low-cost revegetation of disturbed sites, particularly where it contains viable seeds, nutrients and microbes. However, the way topsoil is collected and stored can affect soil characteristics and reduce its revegetation value.

Soil seeds, nutrients and microbes rely on oxygen to survive. Where topsoil has to be stockpiled these qualities will gradually deteriorate over time. Growing vegetation on the stockpile helps reduce topsoil losses through erosion and assists in maintaining biological activity in the soil.

Soil structure can deteriorate if topsoil is collected when saturated or if the soil is compacted during handling.

Subsoils and overburden may also need to be kept on site for future use in building final landforms or providing additional rooting medium over hard rock areas. However, subsoils and overburden materials are of lower value for revegetation than topsoil, and contamination of topsoil with these materials can reduce its value.

The costs of respreading stockpiled materials can be reduced through the careful location of stockpiles.

Objective

To protect the regenerative capacity of the natural topsoil.

Requirements

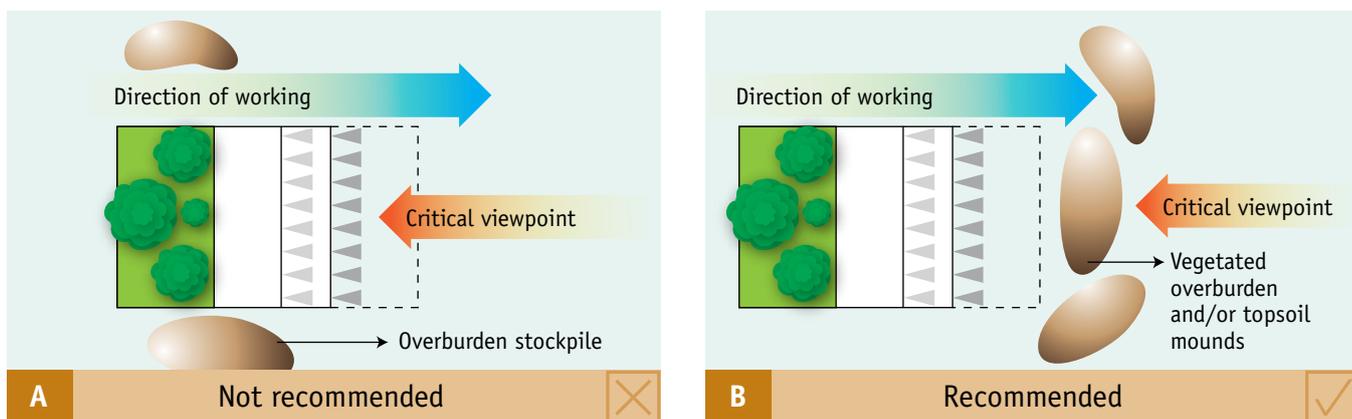
R12. At the commencement of quarrying excavation, the Work Authority holder must ensure that topsoil to a depth of 150 millimetres below the natural surface is removed and placed in stockpiles not exceeding two metres in height.

R13. The Work Authority holder must ensure that topsoil stockpiles are protected from erosion and compaction.

Recommended Practice

- Avoid stripping topsoil when it is saturated or when very dry.
- Minimise handling of topsoil.
- Keep topsoils separate from overburden, gravel and other materials.
- Protect topsoil stockpiles from erosion.
- Avoid burying topsoil.
- Store topsoil above or beside the excavation, depending on which direction the deposit is being worked, to allow for easier respreading.
- Avoid long term stockpiling of topsoil by using it to rehabilitate worked out areas immediately.
- Locate topsoil stockpiles away from traffic, waterways and sources of pollution.
- Install drainage measures to allow drainage through or around large soil stockpiles.
- Grow vegetation on stockpiles (shrubs and grasses).
- Control and/or prevent the spread or establishment of noxious weeds.
- Avoid driving on stockpiles.
- Align stockpiles parallel to the slope contour in stable heaps.
- For longer term stockpiles, use stockpiles strategically as noise or visual barriers (see Figure 4).

Figure 4 – Placement of Overburden for Visual, Noise and Dust Screening



Adapted from Mine Rehabilitation Handbook, Australian Mining Industry Council 1989

5.2 Landform design

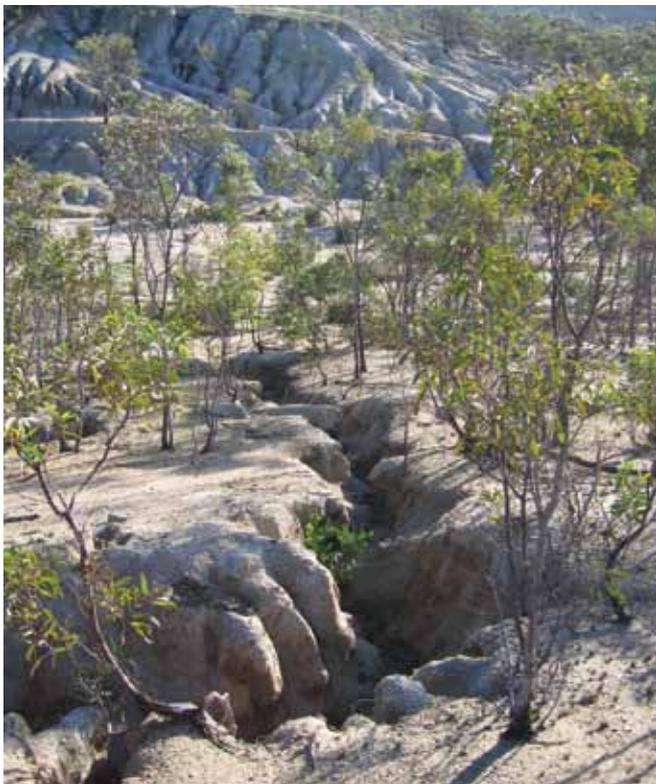
A quarry should be carefully constructed so that the landform poses no slope failure, slumping or collapse risk to employees, the public, or the viability of the operation.

Objective

All landforms on a site should be safe and stable.

Requirements

- R14. The Work Authority holder must ensure that all slopes/batters including excavations, roadways, stockpiles and dumps are designed, constructed and maintained to ensure stability.
- R15. If there is a significant slope failure event, the Work Authority holder must cease all operations, notify the relevant ERR District Manager and not recommence operations until authorised to do so by the relevant District Manager.



Gully erosion occurring in a previously rehabilitated sand quarry.

Recommended practice

- Construct benches to be self-draining.
- Ensure that stockpiles are constructed with no greater than the angle of repose for the material.
- The angle of working faces should be determined by the nature of material, in general:
 - Clay should have an overall slope of no greater than 1:1 (vertical:horizontal).
 - Sand should have an overall slope of no greater than 1:1.5 (vertical:horizontal), and
 - Vertical faces should be less than two metres.
- Locate stockpiles away from drainage lines and natural waterways.
- Seek advice on flooding from the CMA.
- Establish drainage and sediment controls around unstabilised stockpiles and batters.

5.3 Control of noxious weeds, pest animals and plant disease (Invasive species)

The establishment of a quarry site may provide the opportunity for invasion or spread of noxious weeds. A site should be managed so that:

- it does not become a source of noxious weeds, plant diseases and pest animals; and
- to prevent their introduction throughout establishment, operation and rehabilitation phases of a quarry.

Quarry operators need to abide by the *Catchment and Land Protection Act 1994* (CaLP Act). Depending upon the catchment region, operators may be responsible for control or eradication of noxious weeds. The CaLP Act also requires that reasonable steps are taken to manage noxious weed movement away from a site on vehicles, plant or in extracted materials.

Please contact the DPI for advice on the control of invasive plants and animals.

Weeds or diseases may be introduced by planting vegetative screens or rehabilitation, or through the importation of mulches, soil or machinery.



Uncontrolled artichoke thistle outbreak.

Imported mulches or topsoil can be a source of weed species. It is an offence under the CaLP Act to sell material that contains noxious weeds or seeds of noxious weeds.

Plant diseases can also enter a site by the movement of mud or organic matter on vehicles, plant, equipment and/or people's clothing or footwear.

Movement of contaminated quarried material can also spread the root rot pathogen *Phytophthora cinnamomi*, which causes dieback. This risk should be addressed according to the sensitivity of the area to be quarried and the sensitivity of the area receiving the quarried material. Crushed rock can be considered free of contamination by *Phytophthora cinnamomi*, provided it is not contaminated with topsoil.

The working of quarries can create habitat for pest animals such as rabbits and foxes. Poor housekeeping and having unsecured waste bins can also attract pest animals to the area.

Objective

To ensure that operations of a quarry do not lead to the spread or proliferation of noxious weeds, plant disease and pest animals.

Requirements

- R16. The Work Authority holder must establish and implement a program to control and/or eradicate noxious weeds and pest animals within the Work Authority area.
- R17. The Work Authority holder must take measures to prevent the spread of declared noxious weeds, pest animals and plant diseases within the Work Authority area.
- R18. The Work Authority holder must ensure that all mobile machinery is thoroughly cleaned prior to coming onto, or leaving a work area affected by noxious weeds and/or plant diseases.
- R19. The Work Authority holder must ensure that all soil that is imported into and exported out of the Work Authority area is free of disease and noxious weeds.

Recommended Practice

- Operators should be familiar with noxious weeds in the area and regularly inspect a site for the presence of noxious weeds. For more information, visit: www.dpi.vic.gov.au
- Develop and implement a plan to manage noxious weeds and pest animals.
- Employ appropriate control or eradication measures. If a problem is not responding to current management techniques it is recommended that advice be sought from the local council, the DSE or relevant DPI officers.
- Contact the DPI to determine if the *Plant Health and Plant Products Act 1995* impacts on activities.
- When using chemicals in the control or eradication of weeds, contact the Chemical Standards Branch of the DPI for appropriate Codes of Practice to ensure: operator safety, environmental protection and protection of other land-users.
- Use organic mulches that are free of seeds of noxious weeds.
- Clean all heavy equipment entering or leaving a site of all soil and organic matter in a designated onsite wash-down area.
- To avoid product contamination, stockpile and quarantine soil and subsoil likely to contain weed seeds or pathogens.
- Provide animal-proof bins for contractors and employees at locations where they consume food and ensure bins are regularly emptied to an appropriate offsite facility.

Phytophthora cinnamomi

- Where possible, locate new quarries in areas free of *Phytophthora cinnamomi*.
- Source soil that is imported into the Work Authority area from areas that are free of *Phytophthora cinnamomi*.
- Maintain good drainage to prevent mud building up in working areas.
- Provide diversion drains to prevent spores of *Phytophthora cinnamomi* washing into the pit from surrounding areas.
- Wash machinery that is brought onto the site.
- Stockpile topsoil so that water from the stockpile drains away from working areas.

5.4 Drainage and erosion control

The greater the area disturbed, the greater the risk of environmental impact such as erosion caused by stormwater run-off, dust and weed invasion. This can lead to increased problems on site and management requirements in the future.

Good drainage and sediment capture systems prevent erosion and ensure run-off does not contaminate offsite areas or waterways. Erosion leads to instability of faces and slopes and also allows the movement of soil offsite which can negatively impact waterways. Stormwater should be diverted away from disturbed areas to avoid it being contaminated with sediment.

To avoid and control erosion, vegetation clearance should be kept to a minimum as it mitigates high volume of run-off occurring at high speed which increases the rate of erosion.

Drainage control measures should be used to control the flow of stormwater as much as possible. Measures should maximise infiltration and minimise the speed that water flows over a site.

Construct access tracks so they do not increase the movement of water or increase erosion, as both have potential to impact on water quality.

Drainage around areas where hazardous materials are handled or stored should be captured and treated, to ensure that there is no movement of these substances into the environment.

Objective

To minimise offsite erosion and turbid water impacts from small quarry operations.



Rock lined discharge point to prevent erosion.

Requirements

- R20. The Work Authority holder must minimise the area of ground disturbance throughout the life of the quarry operation.
- R21. The Work Authority holder must design, install and maintain erosion and sediment controls to prevent erosion of areas of disturbed land and sedimentation of waterways.
- R22. The Work Authority holder must ensure that any drainage from an area where fuels, lubricants and/or hazardous materials are stored, and/or used is directed to a sump or interceptor trap.

Recommended Practice

Minimise disturbed area

- Work a site in discrete stages so that the minimum area is exposed at any one time, subject to seasonal constraints.
- Mark out areas to be disturbed for machinery operators using boundary markers, like stakes or flagging tape.
- Supervise machinery operators to ensure they are taking action to limit disturbance to required areas only.
- Stabilise disturbed land as soon as possible to minimise erosion.

Drainage

- Use drains or bund walls to direct clean stormwater away from disturbed areas, working areas and stockpiles.
- Construct drainage works to mimic natural drainage patterns and use natural drainage lines with retained vegetation.
- Use diversion drains and contour drains to capture and slow down water that would otherwise gather momentum as it travels down a slope.
- Surface drains should have slopes that prevent the erosion or scouring of drains. A maximum slope of 1:100 (vertical:horizontal) is considered appropriate for earthen drains.
- Stabilise drains and channels in high velocity areas using stone, concrete or vegetation.
- Drains should discharge clean stormwater into vegetated natural drainage lines, or via a level sill that distributes run-off across a stable area or to water storage dams.

Access Tracks

- Minimise gradients of access tracks.
- Maintain table drains and install regular cross drains or culverts.

5.5 Water storage and discharge control

All water which passes through a site should be managed to either avoid areas where it would become silt laden or be sufficiently treated to ensure that there is no contamination remaining when it is released from a site.

Sediment ponds must be of sufficient size to retain water until all sediment has fallen out of suspension.

Approval may be required for the construction of any sediment pond or other form of dam, under the *Water Act 1989*. Please contact the relevant Rural Water Authority (RWA) for more information regarding the construction of dams. Contact the Catchment Management Authority for more information regarding the construction of outlet works to a waterway, or any access that crosses over waterways.

Objective

To ensure that all discharges from a site are free of sediment and other pollutants.

Requirement

R23. The Work Authority holder must prevent contaminated runoff from entering receiving waterways.

Recommended Practice

Capture of contaminated water/stormwater

- Install diversion drains uphill of a site, to minimise the amount of water flowing through a site.
- Collect all run-off from working areas (including washing, screening and dust reduction facilities) in sediment ponds before discharging it from the premises.
- Capture sediment in erosion prone areas by placing hay bales, silt fences or other control devices in drainage lines.
- Design the drainage system to address seasonal factors, high rainfall events, the area exposed and nature of the soils.
- Remove sediment from sediment traps and ponds on a regular basis to ensure there is sufficient capacity to capture all contaminated run-off in the event of a storm.
- Dispose of sediment removed from traps and ponds so as to avoid polluting downstream waterways.
- Continuously assess the effectiveness of sediment control measures and make necessary improvements.

Construction of sediment ponds

- Calculate drainage capacity and water balance in the design stage.
- Design storage ponds and other drainage measures to contain and control rainfall for a one in ten year storm event. In sensitive areas a higher storm event such as a one in 100 year may be required.
- Where complete containment is a design goal, facilities should be designed to contain all water in a one in ten wet year.
- Where finer particles such as clay are present, flocculation treatment or a 24 hours or longer retention period in sediment ponds may be required.
- Sediment pond outlets and drain outlet points will usually require erosion protection mechanisms, like: spillways to undisturbed natural drainage lines; level sill outlets; pond decant pipes; riprap outlets; straw bale barriers or other methods of energy dissipation.

Discharge

- Direct discharge of all treated stormwater should be to vegetated areas.
- A 40 metre filter strip of undisturbed native vegetation adjacent to all waterways is one of the best available means of protecting water quality.

Reuse

- Design an adequate stormwater system to ensure that stormwater from roofed areas is directed to dedicated stormwater drains.
- Use water from sediment ponds onsite for dust control purposes or for watering vegetation.

5.6 Groundwater

Groundwater is becoming an increasingly common source of water for both industry and domestic purposes. Therefore, the quality and quantity of groundwater resources must be maintained.

Groundwater contamination can occur through a range of activities, from fuel and chemical storage areas to the operation of waste dumps and settlement areas for quarry tailings.

State Environment Protection Policies (Groundwaters of Victoria) require all practicable measures be taken to prevent pollution of groundwater or those that create changes to the beneficial uses that groundwater is suited.

Extractive sites may alter the water table by either extraction from or discharge to groundwater. Where a quarry intersects groundwater, the appropriate Rural Water Authority will need to give approval for the collection and pumping of groundwater as part of a quarrying process.

Permission must also be obtained from the appropriate RWA should an operator choose to install a groundwater bore for groundwater investigation or extraction purposes.

Objective

To meet groundwater quality objectives and to minimise any environmental impact on the quality of groundwater.

Requirement

- R24. Prior to the intersection and removal of any groundwater from a Work Authority, appropriate approvals need to be obtained from a groundwater licensing authority.

Recommended Practice

- Comply with all requirements of the Water Act, the Water Authority Approvals and/or SEPP (Groundwaters of Victoria).
- Install above-ground, banded facilities in preference to underground fuel tanks.
- Manage water in and surrounding a site to reduce the potential for impacts on groundwater.

5.7 Slimes management

The majority of sand quarries wash sand to produce a marketable product. The waste from this operation is a fine, clay slurry, generally referred to as slimes. Slimes may also be generated from cleaning out sediment ponds or erosion protection mechanisms.

Slimes are normally discharged to a slimes dam for solar drying and consolidation. However, slimes can remain high in water content for a long time and may present safety hazards. Slimes dams can continue to be unstable even after the surface has dried and a crusted layer has formed.

Dried out slimes may also become a source of raised dust.

Objective

To manage the disposal and rehabilitation of slimes to minimise the risk to public safety and the environment.

Requirements

- R25. The Work Authority holder must take all reasonable measures to minimise the generation of slimes material.
- R26. The Work Authority holder must ensure that the location, design, construction, operation and safe management of slimes dams within the Work Authority area are undertaken in a way that prevents the release of slimes to the environment.
- R27. The Work Authority holder must ensure that slimes dams on site are not accessible to the public.

Recommended Practice

- Plan for and ensure a site has adequate storage capacity for all slimes produced.
- Design slimes disposal areas to promote, where possible, rapid drying and consolidation.
- Minimise storage of slimes in dams wherever possible.
- Monitor the stability of slimes dams.
- Control dust from dried slimes.
- Ensure that slimes are securely fenced and appropriate signs are in place to warn of potential hazards.
- Properly cover and rehabilitate slimes dams as quickly as practicable after filling.
- Dried slimes may be useful in rehabilitation works.

5.8 Fire management

Many human activities like quarrying can increase the risk of fire in an area and pose a hazard to the surrounding population and environment.

Objective

To ensure that a quarrying activity does not contribute to, or exacerbate fire hazards.

Requirements

- R28. The Work Authority holder must take all reasonable measures to prevent the ignition and spread of fire.
- R29. The Work Authority holder must ensure that all buildings, fixed plant and mobile equipment are fitted with fire-fighting equipment, such as fire extinguishers, fire blankets, knapsack spray pumps and rake-hoes.

Recommended Practice

- Develop a fire management plan.
- Maintain appropriate fire fighting equipment at a work site.
- Check the undersides of vehicles periodically to ensure they are kept free of vegetation debris that could dry out and ignite.
- Store flammable materials such as waste hydrocarbons away from ignition sources.

5.9 Hazardous materials management

Hazardous materials are known to pose serious risks if released to the environment. The management of hazardous materials must therefore include the appropriate storage of these materials, and preparation for leaks and spills to ensure that the risk of hazardous materials being released into the environment is minimised.

Objective

To manage the storage, use and handling of hazardous materials in a way that minimises the risk of environmental harm.

Requirements

- R30. The Work Authority holder must prevent contamination of the environment by the release of fuels, lubricants and/or hazardous materials.
- R31. The Work Authority holder must ensure that all fuels, lubricants and/or hazardous materials are stored in accordance with the relevant requirements of AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids.
- R32. The Work Authority holder must ensure that spill prevention and clean-up equipment is readily available and accessible in the vicinity of all plant and machinery, including mobile and fixed fuel storages.
- R33. The Work Authority holder must ensure that spills of fuels, lubricants and/or hazardous materials are cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, sweeping or otherwise releasing such contaminant into waterways. Equipment and soil contaminated by fuels, lubricants, hazardous materials and clean up substances which cannot be salvaged must be disposed of in an approved waste facility.

Recommended Practice

Hazardous materials storage areas

- Design and install bunding and surface sealing of fuel storage areas.
- Provide high-performance grease traps and oil traps near workshops and places where vehicles and machinery are parked.
- Locate storage areas away from waterways or areas prone to flooding.
- Install bund walls or diversion drains to divert surface water away from areas dedicated for the storage of hazardous materials.
- Line bunded storage areas with impervious material.
- The volume of bunded areas should be at least 125 per cent of the maximum volume of the fuel and lubricant capable of being stored.
- Bund heights should be at least 150 millimetres.
- Bunded areas should be drained to a sump if the volume of the hydrocarbons exceeds 1200 litres.
- Minimise the amount of hazardous substances kept onsite.



Fuel spill beneath a mobile fuel storage tank.

Spill and leak response

- Develop contingency plans to address spills and leaks.
- Install trays, thick plastic mats or similar beneath stationary machinery to protect the soil from oil or fuel spills and leaks.
- Install spill trays immediately if there is any potential for, or evidence of, leakage.
- Ensure that appropriate clean-up equipment is readily accessible.
- Maintain a supply of oil-absorbent material.
- Contain and treat spills and leaks.
- Notify relevant authorities of significant spills or leaks.
- Ensure that drainage from areas where spills may occur like a refuelling area is diverted through a sump or interceptor trap to remove hydrocarbon contamination.

5.10 Noise

Quarry activities have the potential to produce significant noise. Where residences or other sensitive land-users are located adjacent to quarries; precautions should be taken to reduce the impact of noise.

Solid barriers, such as bund walls and topographical features, provide the most effective reduction of sound levels when directly along the line of sight from the source of noise to the neighbour. Vegetation will only marginally reduce noise levels.

Objective

To avoid a quarry being a source of nuisance noise to surrounding land-users.

Requirement

R34. The Work Authority holder must avoid causing unacceptable noise.

Recommended Practice

Site Layout

- Provide an adequate buffer distance between a quarry and sensitive land-users.
- Locate crushing and screening equipment in appropriate locations to reduce existing and potential noise impacts. Where possible, take advantage of natural topographical features when planning a site.

- Provide noise barriers such as earthen bunds to shield residential or other sensitive land-users.

Operation planning

- Limit operating hours where necessary to comply with SEPP (Control of Noise from Commerce, Industry and Trade) N-1. This is usually achieved by restricting operations, including: the loading of trucks in the vicinity of residential premises between 0700 and 1800 hours on Mondays to Fridays and from 0700 to 1300 hours on Saturdays, with no work on Sundays or public holidays.
- Maintain access and haul roads in good condition to prevent corrugations which can contribute to truck road noise.
- Identify road routes to and from a quarry that minimise nuisance noise and direct trucks to use these routes.
- Give preference to haul routes with low grades.
- Maintain and lubricate plant and equipment to manufacturer's specifications.
- Locate materials-processing in the least noise-sensitive area, or enclose these operations if necessary.
- Fit equipment with mufflers, housing or silencers where necessary.
- Fit multi-frequency broadband reversing beepers to mobile equipment.

5.11 Dust control

Dust can impact on nearby residences and sensitive land-users. As a general rule, dust should be confined to the Work Authority area. However, certain weather conditions make dust control difficult.

Dust can have health impacts and quarry operators should use best-practice site management techniques for dust control. Dust control and monitoring for quarries is specified in the EPA's Protocol for Environmental Management - Mining and Extractive Industries, which is required by the SEPP (Air Quality Management).

Quarrying, crushing and screening are also a significant source of dust from some quarry facilities.

Some dust mitigation measures include:

- Minimising the area of disturbance and progressively revegetating to prevent the generation of dust.
- Minimising truck and vehicle movements onsite and on public roads that are often a source of dust.



Dust emanating from a quarry site.

Objectives

To avoid dust impacting on surrounding land-users and people.

Requirement

R35. The Work Authority holder must prevent dust release that causes adverse impacts to the surrounding area and people.

Recommended Practice

Site

- Consider the direction of prevailing winds when designing the Work Area, plant, work faces and stockpile layouts to minimise dust nuisance.
- Plant trees as windbreaks or use topography and embankments to shield stockpiles and working areas from prevailing winds.

Overburden or topsoil stockpiles

- Revegetate stockpiles that will not be used for some time.

Vehicle movements

- Minimise vehicle movements.
- Reduce onsite vehicle speeds, especially during dry or windy conditions.
- Apply water to access tracks to prevent raised dust occurring.
- Use dust suppressants where watering is not possible or appropriate; oil must not be used as a dust suppressant.
- Cover or dampen loads leaving a site.

Plant

- Service and maintain plant and equipment so that it is in proper operating condition.
- Fit plant and equipment with appropriate dust suppression devices, such as water sprays.
- If required, locate crushers and conveyors within a purpose-built housing.

Dry, windy conditions contributing to nuisance dust

- Stop the crushing plant.
- Increase use of watering systems.
- Stop work in some areas of the site.

5.12 Visual management

The visible impact of quarries on the landscape may be significant despite their size. High visual impact could be due to: the location or design of a site, its inconsistencies with surrounding areas; or its proximity to sensitive land-uses.

Objective

To ensure that a quarry is not visually intrusive to neighbours or other sensitive land-users.

Requirements

- R36. The Work Authority holder must ensure that the colour of fixed plant and buildings do not cause an unwarranted negative impact on surrounding visual amenity.
- R37. The Work Authority holder must take all reasonable measures to reduce visual impact on the surrounding area.

Recommended Practice

Site layout

- Carefully choose the direction of the working so that the working face is shielded from the most critical views (see Figure 5).
- Use topographic features to assist in reducing visual impact when designing a quarry.
- Use natural screening when locating entry to a quarry to reduce the view into the site.
- Provide visual screening or use natural features to screen plant and stockpile areas.

Operations

- Minimise the exposure of bare surfaces.
- Ensure vegetation used for rehabilitation or vegetative screens is compatible with surrounding vegetation or is sourced from local native plant stocks.
- Develop the size and shape of any bunds to blend in with existing landforms.
- Paint all exterior surfaces of buildings and fixed plant with matt non-reflective colours to blend with the environment.
- Rehabilitate the uppermost bench as soon as possible.
- Use progressive rehabilitation to minimise exposed surfaces.

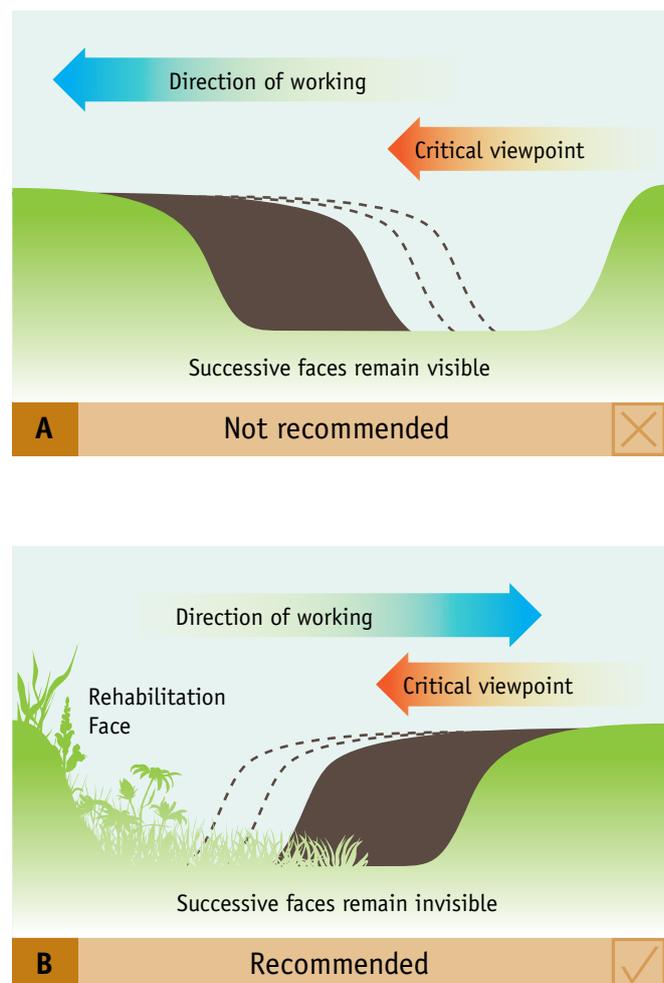


Figure 5 – Designing Pit Development to Minimise Visual Impact

5.13 Community

Relevant communities should be engaged at an early stage and throughout the life of a quarry to assist in creating open communication and a good working relationship. Under the MRSD Act, the holder of an extractive industry Work Authority has a duty to consult with the community throughout the period of the Work Authority.

The community may include residents or groups surrounding the Work Authority area. This could include a Landcare group or a group who have a special or legal interest in the land.

Good communication is essential to good working relationships with the community and will help to ensure the effective management of any impacts of a quarry.

Developing a process for formal and informal community engagement is advisable. This can include one-on-one meetings, site visits and an effective complaints handling process.

Objective

To inform and engage the community regarding the operation of a quarry.

Requirements

- R38. The Work Authority holder must maintain a complaints register.
- R39. In response to a complaint, the Work Authority holder must record the following information in the complaints register:
- a) the date and time of the complaint;
 - b) who the complaint was from;
 - c) the specific issue/s raised in the complaint; and
 - d) the actions taken to address the specific issue/s raised in the complaint.

Recommended Practice

- Identify how the operations on a site may impact on the local environment, people and their surroundings and take measures to reduce the risks.
- Establish good working relationships early in the project's development to better understand community expectations and possible issues.
- Be contactable and flexible in dealing with community concerns and issues.
- Listen to all community concerns and facilitate a reasoned response to all issues raised.
- Identify and acknowledge special interest groups.
- Commit to ongoing engagement as projects develop.

6. Rehabilitation

The term rehabilitation encompasses any measures taken to repair disturbed or degraded land and return it to a stable and non-polluting state; suited to the proposed future use of the land (see section 7.1).

6.1 Progressive rehabilitation

Progressive rehabilitation refers to the rehabilitation of worked out, or surplus areas while extractive operations continue.

As new quarry sections are opened, worked out areas should be progressively rehabilitated to avoid increasing the total disturbed area of a quarry. Overburden and topsoil can be stripped from areas being opened up and placed directly onto worked out areas which are being rehabilitated. This will avoid double handling of materials and prevent degradation of the topsoil (see Figure 6).

Rehabilitation works may be considerably more efficient if carried out while the necessary machinery is onsite and operating, rather than having machinery transported back to a site.

Progressive rehabilitation can reduce the total liability of rehabilitation and should be conducted while there is a steady cash flow from a quarry.

Progressive rehabilitation helps to minimise the visual impact of a quarry and control dust, erosion, and the invasion of weeds. It also assists in fostering good community relations.

Objective

To efficiently and effectively rehabilitate a quarry.

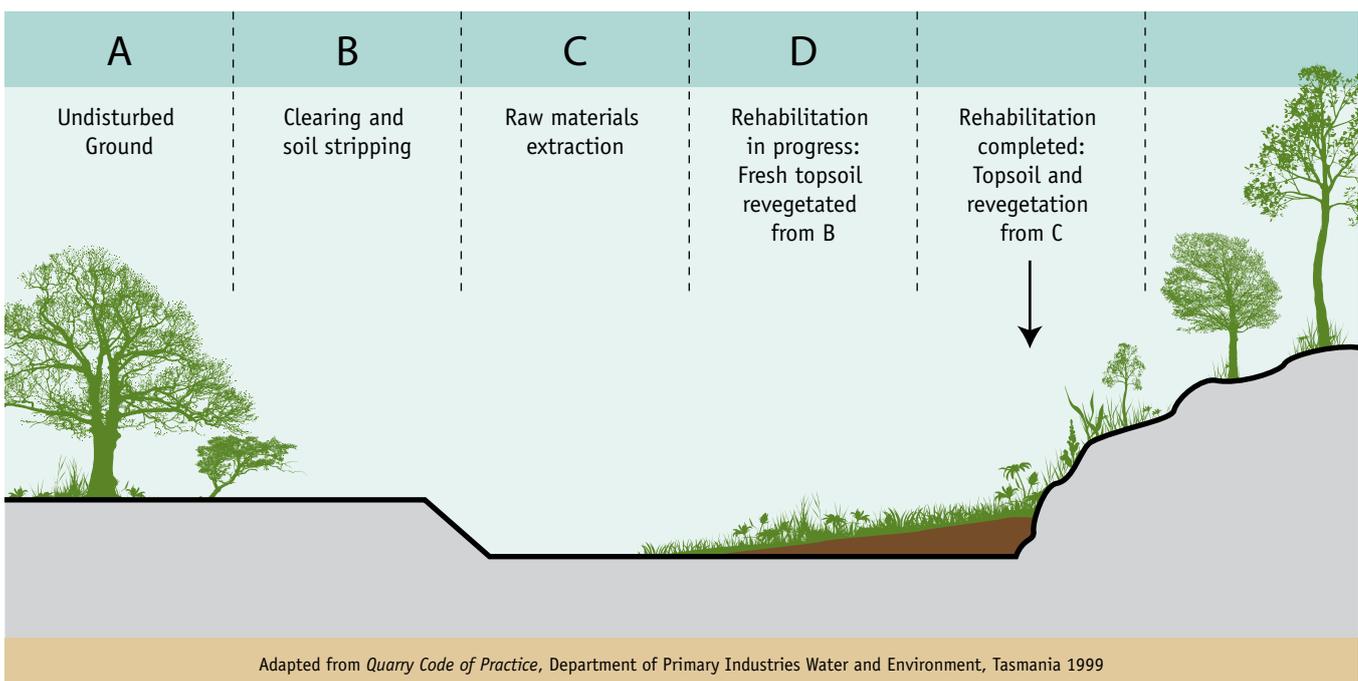
Requirement

R40. The Work Authority holder must ensure that progressive rehabilitation of disturbed land is carried out as soon as possible.

Recommended Practice

- Agree on the final land form and use of a site with the relevant landowner/manager in consultation with the DPI and the local council.
- Rehabilitate in accordance with the intended final use of the land.
- Develop work areas systematically, as a series of benches or bays.
- Fully work out each section of a quarry and commence progressive rehabilitation works as soon as possible.
- Once the final landform is established, revegetate areas to stabilise the landform and to give the vegetation maximum time to establish while the quarry is still in operation.

Figure 6 – Progressive Rehabilitation to Maximise Visual Amenity



Adapted from *Quarry Code of Practice*, Department of Primary Industries Water and Environment, Tasmania 1999



Reclaimed quarry face, cross ripped and hydroseeded.

6.2 Earthworks

The area should be reshaped to blend in with the surrounding landscape as much as possible. A site should be left in a stable, free draining state.

Well designed and maintained drainage works will help to avoid flooding and erosion.

On erodible sites it is most important that slopes be reduced when constructing final landforms.

Ripping of compacted areas will improve the 'roughness' of the seedbed and provide suitable sites for lodgement and germination of seeds as well as promoting water infiltration and root penetration.

Objective

To reconstruct the landform to be compatible with the surrounding landscape and to prepare the ground for revegetation.

Requirement

R41. The Work Authority holder must ensure that the site is left in a safe and stable condition.

Recommended Practice

- Reduce all slopes to a gradient of 1:3 (vertical:horizontal) or less, or apply an artificial means of stabilising the slope such as with the use of geotextiles, mulch mats or benching to break up the slope.
- Where long slopes cannot be avoided and have the potential to erode, it may be necessary to use contour banks or reverse incline benches.

- Once a stable landform has been created, respread topsoil uniformly over the area at a suitable depth to support revegetation.
- Leave topsoil with a rough surface.
- Do not spread soil when saturated or sticky, as compaction and other damage to the soil structure will occur.
- Where topsoil is not available, extreme care should be taken when importing topsoils that may contain weed seeds and soil pathogens like *Phytophthora cinnamomi*.
- Deep rip compacted areas along the contour; either before or after spreading topsoil.
- Ripping after soil spreading will help to 'key' in the soil to the underlying material.
- To increase soil break-up carry out ripping when the soil is relatively dry.

6.3 Erosion prevention

Unless preventative measures are implemented, erosion will continue long after extractive activities have ceased. Poor drainage can damage rehabilitation work.

The best erosion prevention at a site is the establishment of vegetation on a stable landform. However, while vegetation is becoming established, it may be necessary to employ other erosion prevention techniques.

Objective

To minimise erosion of final landforms and transportation of sediment offsite.

Recommended Practice

- To slow down surface runoff retain drainage controls, like diversion drains, contour banks and rock filters upslope of the area being rehabilitated.
- Leave surfaces in a rough or uneven state. Rough surfaces will capture more water and allow rainfall to infiltrate rather than flow away. It may be beneficial to retain any sediment ponds onsite with the owners consent. However, ponds will need to be periodically cleaned out for the first year or so.
- Apply surface mulches around growing seedlings on steep batters to reduce erosion, weed establishment and to conserve soil moisture and add nutrients to the soil.

6.4 Revegetation

Establishing a self-sustaining cover of vegetation is the best way to stabilise disturbed sites in the long term. Revegetation also minimises the visual impact of quarries. Generally, the vegetation type which existed before the disturbance, or a similar vegetation type will regenerate most successfully.

Prior to the commencement of a quarrying activity the type of revegetation should be agreed with the landowner/manager, and should be consistent with the proposed final land-use.

Timing of revegetation is critical to its success (see Timing of Revegetation section below).

Objective

To provide a stable self-sustaining cover that protects the rehabilitation asset and is consistent with the final land-use.

Recommended Practice

Steps of successful revegetation

- Prepare the revegetation area.
- Where native vegetation is to be used, select appropriate species with the advice of the DSE, CMA and the council so that the species used is: sourced from the local area; of local provenance; and appropriate to a site's Ecological Vegetation Class (EVC).
- Sow seed or plant tubestock.
- Use high quality seeds free from noxious weeds.
- Apply mulch or fertiliser.
- Protect the new plants from pest animal browsing or disturbance.
- Control weeds in accordance with the CaLP Act; some ongoing weed control is often necessary on rehabilitated sites.



Revegetated quarry face.

Timing of Revegetation

- Carry out site preparation earthworks in the drier months.
- Plant seed and/or tubestock at a time when it is most likely to be successful at that location (usually autumn or spring). However, where frost sensitive species are involved, seeds should be sown after the last frosts.
- Apply seeds to recently disturbed ground.
- Plant seedlings in early spring.

6.5 Monitoring and maintenance

Revegetation may take several years to produce a stable, safe and self-sustaining ecosystem.

After the substantial work of the rehabilitation has been completed the monitoring and maintenance phase begins to ensure the successful rehabilitation work long after the operator has left a site. Any damage to rehabilitation should be quickly rectified.

Objective

To monitor and maintain a site until the rehabilitation is stable, safe and self-sustaining.

Recommended Practice

- Inspect rehabilitated areas regularly to assess the health of the vegetation and to check for erosion, pest animal browsing damage and weed infestation.
- In areas where germination has failed, carry out enrichment planting of seedlings into unstocked areas or spot sowing by hand sowing of seed into small cultivated patches.
- Apply fertiliser if poor growth and yellow leaves indicate nutrient deficiencies.
- When revegetating using native vegetation, plant a diverse range of species to increase the likelihood of success. Natural disturbances such as fire, flood and the incursion of noxious weeds, pest animals and plant diseases have the potential to compromise the success of a rehabilitation project.
- Where significant erosion has occurred, bring machines back onto a site to repair the landform and install more effective drainage as quickly as possible.

7. Decommissioning and Closure

Quarrying activities create changes to topography with ongoing potential to impact the environment long after a quarrying activity has ceased. The DPI holds rehabilitation bonds over quarries with a Work Authority and it only releases these once the rehabilitation is successfully completed.

7.1 Final land-use of a site and criteria for determining completion of rehabilitation

Consult the landowner and the DPI about potential final land-uses for a site. Municipal Council agreement may also be required if the proposed final land-use will change the land-use zone currently applied to the area, or the area is subject to planning overlays.

When the final land-use has been agreed, the completion criteria can be determined. The completion of rehabilitation must be assessed by a DPI Inspector of Mines, in order for the rehabilitation bond to be returned to the operator. It is advisable to consult the DPI prior to commencing rehabilitation works.

Requirement

R42. The Work Authority holder must ensure that:

- a) the rehabilitated area is left in a stable, safe, non-polluting state;
- b) the area is suitable for the planned final use or rehabilitation objective;
- c) rehabilitated areas are not excessively affected by erosion;
- d) the revegetated area is free from noxious weeds; and
- e) vegetation is consistent with the final land-use.

Recommended Practice

- Consult the DPI regarding any proposed final land-use and rehabilitation of a site that was agreed to by the landowner/manager prior to commencing works.
- Carry out progressive rehabilitation in order to maximise the efficiency of the rehabilitation and to ensure that the majority of the rehabilitation liability is addressed prior to the closure of a site.
- Upon site closure, discuss final works and monitoring and maintenance with a DPI Inspector of Mines.

7.2 Site clean up

After the productive life of a quarry has finished, it is the responsibility of the Work Authority holder to ensure that the site is cleared of all of the remnants of a quarry operation.

Objective

To have a clean site ready for the final land-use.

Requirements

R43. The Work Authority holder must ensure that all derelict and redundant plant, vehicles, machinery and equipment is removed from the Work Authority area and deposited at an appropriate waste disposal site.

Recommended Practice

- Remove all fixed and mobile plant.
- Remove all temporary and permanent structures unless required for an agreed future use.
- Level off any noise-control bunds and overburden stockpiles, or shape to an appropriate form for the site's final land-use requirements.
- Identify and dispose of all waste materials including hazardous and contaminated materials to appropriately licensed landfills.
- Break up and remove concrete slabs, unless required for future use.
- Remove surplus roads, office sites and hard standing areas where necessary.
- Dispose of all materials to appropriately licensed landfills.

7.3 Final rehabilitation

While most of the rehabilitation should take place during the working phase of a quarry, some areas will need to be rehabilitated after work has finished. All rehabilitation work should be in accordance with the principles detailed in section 6.

Monitoring of rehabilitation may be required for some time before it is established that the works are safe, stable and non-polluting. The level of monitoring required may vary according to site characteristics and the proposed final land-use.

Once the DPI Inspector of Mines has agreed that the rehabilitation is satisfactorily completed, the proponent may apply to have the rehabilitation bond released and the site can be returned to the land owner/manager.

8. Exceptional Circumstances - Riverine Extractions

In some areas, land management practices have resulted in erosion and transportation of large quantities of sediment, particularly sand, into rivers and streams. These sediments can be a significant threat to the health of river systems through:

- destruction of in-stream habitat;
- damage to riparian vegetation;
- reduction in bed and bank stability; and
- increased risk of damage to infrastructure by flooding.

Catchment Management Authorities (CMA) allow strategic extraction of materials from rivers to manage these threats to river health. Where a riverine extraction proposal is exempt from the requirement to prepare a work plan, the Code applies. However, it is understood that some of the requirements of the Code are inconsistent with operations in a riverine context and it is considered an exceptional circumstance.

Sediment extraction is conducted in locations and in a manner that minimises impacts to a river environment. Many stakeholders have an interest or statutory requirements with regard to riverine extractions as shown in the table below.

Stakeholder	Interest/statutory requirement
Private landowner	Access to and operation at a site
Catchment Management Authority	Permits under the <i>Water Act 1989</i>
Local Government	Planning Permit
DSE	Crown land permits to occupy
Aboriginal Affairs Victoria	Aboriginal cultural heritage
DPI	Work Authority

 Specific to riverine extractions

Proponents should understand key stakeholder requirements when considering riverine extraction. The DPI will work closely with other stakeholders to ensure that requirements are met.

Potential environmental impacts of sediment extraction from riverbeds and banks requiring management include: bank erosion, damage to riparian flora and fauna and channel bed erosion that can work its way up or downstream in the main channel and upstream in lateral waterways.

Requirements

- R44. The Work Authority holder must have authorisation under the *Water Act 1989*, prior to commencing any extraction activities in or on a waterway.
- R45. Riverine extractions are exempt from compliance with requirements R12 and R23.
- R46. Only deposited material is to be extracted from the waterway, and no extraction is to be undertaken below the natural bed of the waterway.

Recommended Practice

Site selection

- Riverine extractions are only permitted at locations and at rates agreed to by the CMA based on its confidence that extraction will cause minimal environmental risk and be of benefit to river health.

Site preparation

- Use existing access tracks where available.
- Where new tracks or turning areas are planned, choose the location with the minimum impact and do not excavate below existing surface levels or remove vegetation.
- Locate stockpile and screening areas where they will: have minimum impact on the riparian zone; have low likelihood of being impacted by floodwater; and not require removal of native vegetation. Stockpiles should not extend or intrude into the drip-line zone around large established trees.
- Establish stockpiles on the existing ground surface with no excavation below ground surface.

Extraction

- Confine extraction to the material deposited in the river bed with care not to disturb the riverbank and river bed.
- Do not scrape or remove the surface of the river banks or the bed when accessing the river bed or constructing ramps to access the river bed.
- Relocate exposed in-stream logs and large woody debris downstream of the extraction area in accordance with requirements of the CMA.

Screening

- Stockpile any river debris removed by screening and spread it back into the extraction area.
- Remove any rubbish separated by screening from a site and dispose of appropriately.

Site rehabilitation

- Smooth displaced materials, tracks and ramps in the waterway to simulate natural conditions.
- Collect and remove all rubbish from a site and dispose of appropriately.
- Remove all stockpiles and hardstand areas.
- Rehabilitate disturbed areas adjacent to the waterway (including roads, turning areas and hardstands) by grading, adding topsoil and revegetating.

Reference Material

References

A number of publications have been used in the preparation of this Code. Use of these publications is gratefully acknowledged:

Aboriginal Heritage Act 2006 – Exploration Licence Holders
– Advisory Note 2008.

Best Practice Environmental Guidelines for Extractive Industries (Draft),
Department of Natural Resources and Environment 2001.

Code of Practice for Mineral Exploration, Department of Primary
Industries 2008.

Environmental Guidelines for Major Construction Sites,
EPA Victoria, 1995.

Extractive Industry Proposals – VPP Practice Note 2006.

Mine Rehabilitation Handbook, Australian Mining Industry Council
1989.

Quarry Code of Practice, Department of Primary Industries, Water
and Environment Tasmania, 1999.

Water Act 1989 - Guidelines for Quarries and Mines, Department of
Sustainability and Environment, 2004.

*Work Plan Guidelines for Areas of 5 Hectares or More or Greater than
2 Metres in Depth – G3*, Department of Primary Industries Victoria.

Relevant legislation, policy and guidance documents

Acts

Aboriginal Heritage Act 2006.

Catchment and Land Protection Act 1994.

Conservation, Forests and Lands Act 1987.

Crown Land (Reserves) Act 1978.

Dangerous Goods Act 1985.

Environment Effects Act 1978.

Environment Protection Act 1970.

Flora and Fauna Guarantee Act 1988.

Forests Act 1958.

Heritage Act 1995.

Land Act 1958.

Mineral Resources (Sustainable Development) Act 1990.

National Parks Act 1975.

Occupational Health and Safety Act 2004.

Planning and Environment Act 1987.

Plant Health and Plant Products Act 1995.

*Environment Protection (Scheduled Premises and Exemptions)
Regulations 2007*.

Policies

State Environment Protection Policy (Ambient Air Quality) 1999.

State Environment Protection Policy (Air Quality Management) 2001.

State Environment Protection Policy (Waters of Victoria) 2003.

State Environment Protection Policy (Groundwaters of Victoria) 1997.

State Environment Protection Policy (Control of Noise from
Commerce, Industry and Trade) No. N-1 1989.

State Environment Protection Policy (Prevention and Management
of Contamination of Land) Publication 859, 2002.

Protocol for Environmental Management (Mining and Extractive Industries) EPA Publication 1191, December 2007.

Industrial Management Policy (Waste Acid Sulfate Soils) 1999.

Waste Management Policy (Siting, Design and Management of Landfills) 2004.

Standards

Australian Standard AS 1940:2004, *The Storage and Handling of Flammable and Combustible Liquids*, 2004.

Australian/New Zealand Standard, AS/NZS ISO 3100:2009
Risk management - Principles and guidelines.

Guidelines

A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes EPA Publication No. 441, March 2000.

A Guide to the Sampling and Analysis of Air Emissions and Air Quality, EPA Publication No. 440.1, December 2002.

Bunding Guidelines, EPA Technical Guideline, Publication No. 347, December 1992.

Classification of Wastes, EPA Information Bulletin, Publication No. 448, May 2007.

Construction Techniques for Sediment Pollution Control, EPA Publication No. 275, May 1991.

Designation of types of zones and reservations in the metropolitan region planning schemes for the purposes of State Environment Protection Policy (Control of Noise for Commerce, Industry and Trade) No. N-1.

EPA Information Bulletin *Guidelines for Preparation of Waste Management Plans*, Publication No. 383, 1993.

Environmental Guidelines for Major Construction Sites, EPA Publication No. 480, 1995.

Explanatory notes: State Environment Protection Policy (Control of noise from commerce, industry and trade) No. N-1. EPA publication N4/91.

Extractive Industry Work Plan Guideline, Department of Primary Industries, June 2010 (replaces WorkPlan Guidelines for Areas of 5 Hectares or More or Greater than 2 Metres in Depth - G3, Department of Primary Industries).

Interim Guidelines for the Control of Noise from Industry in Country Victoria, EPA Information Bulletin N3/89, April 1989.

Guidelines for Environmental Management – Use of Reclaimed Water - EPA Publication 464.1.

Guidelines for Preparation of Waste Management Plans, EPA Information Bulletin, Publication No. 383, 1993.

Guidelines on the Design, Installation and Management requirements for Underground Petroleum Storage Systems (UPSS), EPA Publication No. 881.1, January 2009.

Industrial Waste Resources Guidelines, EPA publication IWRG600, June 2009.

Interim Guidelines for the Control of Noise from Industry in Country Victoria, EPA Information Bulletin N3/89, April 1989.

Native Vegetation Management Guide – For the Earth Resources Industry, Department of Sustainability and Environment and Department of Primary Industries, 2009.

Recommended Buffer Distances for Industrial Residual Air Emissions, EPA Publication AQ 2-86, July 1990.

Ten Steps to Successful Community/Industry Consultation, EPA Information Bulletin 520, November 1996.

The New SEPP (Air Quality Management) – Information for All EPA Licence Holders - Publication 843, May 2002.

Appendix 1 - Requirements

- R1. The Work Authority holder must carry out work in accordance with the Code of Practice for Small Quarries.
- R2. The Work Authority holder must ensure that final land-use of the site is agreed with the landholder prior to the commencement of work on the site.
- R3. Prior to commencing any work, the Work Authority holder must have public liability insurance that covers all work authorised under the Work Authority and must ensure that the insurance is maintained at all times while work occurs under the Work Authority.
- R4. The Work Authority holder must erect and maintain posts along the boundary of the Work Authority so that the boundary of the Work Authority is clearly identifiable.
- R5. The Work Authority holder must ensure that the posts required in R4 meet the following specifications:
 - a) the post is not less than one metre high above the ground;
 - b) the post is painted white;
 - c) the Work Authority number is painted within the top 20 centimetres of the post, is legible and in a contrasting colour to the white post; and
 - d) the post must be situated so that each post is clearly visible from each post on either side of that post.
- R6. The Work Authority holder must ensure that there is no extraction within 10 metres of the Work Authority boundary. A wider site specific buffer may apply to protect infrastructure or to minimise visual impact.
- R7. The Work Authority holder must erect and maintain a legible sign at the main entrance to the Work Authority that contains the following information:
 - a) the name of the Work Authority holder and the Work Authority number;
 - b) the name and contact details of the Manager of the Work Authority; and
 - c) emergency contact details for the Work Authority holder and the DPI.
- R8. The Work Authority holder must ensure that public safety is maintained within the Work Authority area at all times, including through the use of fencing, gates and signage as required around the work site.
- R9. The Work Authority holder must ensure that all fences are maintained to prevent access to the work site and that all gates are locked when the work site is unattended.
- R10. The Work Authority holder must as soon as is practicable after becoming aware of any non-compliance with the conditions of the Work Authority, and/or requirements of the Code of Practice for Small Quarries and/or an environmental incident that will, or is likely to cause, material harm to the environment, notify the relevant ERR District Manager of the non-compliance and/or environmental incident.
- R11. The Work Authority holder must notify any other relevant government department or agency of the non-compliance and/or incident.
- R12. At the commencement of quarrying excavation, the Work Authority holder must ensure that topsoil to a depth of 150 millimetres below the natural surface is removed and placed in stockpiles not exceeding two metres in height.
- R13. The Work Authority holder must ensure that topsoil stockpiles are protected from erosion and compaction.
- R14. The Work Authority holder must ensure that all slopes/batters including excavations, roadways, stockpiles and dumps are designed, constructed and maintained to ensure stability.
- R15. If there is a significant slope failure event, the Work Authority holder must cease all operations, notify the relevant ERR District Manager and not recommence operations until authorised to do so by the relevant District Manager.
- R16. The Work Authority holder must establish and implement a program to control and/or eradicate noxious weeds and pest animals within the Work Authority area.
- R17. The Work Authority holder must take measures to prevent the spread of declared noxious weeds, pest animals and plant diseases within the Work Authority area.
- R18. The Work Authority holder must ensure that all mobile machinery is thoroughly cleaned prior to coming onto, or leaving a work area affected by noxious weeds and/or plant diseases.
- R19. The Work Authority holder must ensure that all soil that is imported into and exported out of the Work Authority area is free of disease and noxious weeds.
- R20. The Work Authority holder must minimise the area of ground disturbance throughout the life of the quarry operation.
- R21. The Work Authority holder must design, install and maintain erosion and sediment controls to prevent erosion of areas of disturbed land and sedimentation of waterways.
- R22. The Work Authority holder must ensure that any drainage from an area where fuels, lubricants and/or hazardous materials are stored, and/or used is directed to a sump or interceptor trap.

- R23. The Work Authority holder must prevent contaminated runoff from entering receiving waterways.
- R24. Prior to the intersection and removal of any groundwater from a Work Authority, appropriate approvals need to be obtained from a groundwater licensing authority.
- R25. The Work Authority holder must take all reasonable measures to minimise the generation of slimes material.
- R26. The Work Authority holder must ensure that the location, design, construction, operation and safe management of slimes dams within the Work Authority area are undertaken in a way that prevents the release of slimes to the environment.
- R27. The Work Authority holder must ensure that slimes dams on site are not accessible to the public.
- R28. The Work Authority holder must take all reasonable measures to prevent the ignition and spread of fire.
- R29. The Work Authority holder must ensure that all buildings, fixed plant and mobile equipment are fitted with fire-fighting equipment, such as fire extinguishers, fire blankets, knapsack spray pumps and rake-hoes.
- R30. The Work Authority holder must prevent contamination of the environment by the release of fuels, lubricants and/or hazardous materials.
- R31. The Work Authority holder must ensure that all fuels, lubricants and/or hazardous materials are stored in accordance with the relevant requirements of AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids.
- R32. The Work Authority holder must ensure that spill prevention and clean-up equipment is readily available and accessible in the vicinity of all plant and machinery, including mobile and fixed fuel storages.
- R33. The Work Authority holder must ensure that spills of fuels, lubricants and/or hazardous materials are cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, sweeping or otherwise releasing such contaminant into waterways. Equipment and soil contaminated by fuels, lubricants, hazardous materials and clean up substances which cannot be salvaged must be disposed of in an approved waste facility.
- R34. The Work Authority holder must avoid causing unacceptable noise.
- R35. The Work Authority holder must prevent dust release that causes adverse impacts to the surrounding area and people.
- R36. The Work Authority holder must ensure that the colour of fixed plant and buildings do not cause an unwarranted negative impact on surrounding visual amenity.
- R37. The Work Authority holder must take all reasonable measures to reduce visual impact on the surrounding area.
- R38. The Work Authority holder must maintain a complaints register.
- R39. In response to a complaint, the Work Authority holder must record the following information in the complaints register:
- a) the date and time of the complaint;
 - b) who the complaint was from;
 - c) the specific issue/s raised in the complaint; and
 - d) the actions taken to address the specific issue/s raised in the complaint.
- R40. The Work Authority holder must ensure that progressive rehabilitation of disturbed land is carried out as soon as possible.
- R41. The Work Authority holder must ensure that the site is left in a safe and stable condition.
- R42. The Work Authority holder must ensure that:
- a) the rehabilitated area is left in a stable, safe, non-polluting state;
 - b) the area is suitable for the planned final use or rehabilitation objective;
 - c) rehabilitated areas are not excessively affected by erosion;
 - d) the revegetated area is free from noxious weeds; and
 - e) vegetation is consistent with the final land-use.
- R43. The Work Authority holder must ensure that all derelict and redundant plant, vehicles, machinery and equipment is removed from the Work Authority area and deposited at an appropriate waste disposal site.
- R44. The Work Authority holder must have authorisation under the *Water Act 1989*, prior to commencing any extraction activities in or on a waterway.
- R45. Riverine extractions are exempt from compliance with requirements R12 and R23.
- R46. Only deposited material is to be extracted from the waterway, no extraction is to be undertaken below the natural bed of the waterway.

Appendix 2 - Checklist and reference for operators of small quarries

Issue	Objectives	Objective achieved by	Guideline reference	✓
Quarry Design	See Checklist for site design and planning.		4.1	
Operational Management				
Topsoil management	To protect the regenerative capacity of the natural topsoil.		5.1	
Landform design	All landforms on the site should be safe and stable.		5.2	
Control of noxious weeds, pest animals and plant disease (Invasive species)	To ensure that the working of the quarry does not lead to the spread or proliferation of noxious weeds, plant disease and pest animals.		5.3	
Drainage and erosion control	To minimise erosion and turbid water impacts offsite.		5.4	
Water storage and discharge control	To ensure that all discharges from the site are free of sediment and other pollutants.		5.5	
Groundwater	To meet groundwater quality objectives and to minimise any environmental impact on the quality of groundwater.		5.6	
Slimes management	To manage the disposal and rehabilitation of slimes in order to minimise the risk to public safety and the environment.		5.7	
Fire management	To ensure that the quarrying activities do not contribute to, or exacerbate, fire hazards.		5.8	
Hazardous materials management	To manage the storage, use and handling of hazardous materials to minimise the risk of environmental harm.		5.9	
Noise	To avoid the quarry being a source of nuisance noise to surrounding land-users.		5.10	
Dust control	To avoid dust impacting on surrounding land-users and people.		5.11	
Visual management	To ensure that the quarry is not visually intrusive.		5.12	
Community	To inform and engage the community regarding the operation of the quarry.		5.13	
Rehabilitation				
Progressive rehabilitation	To efficiently and effectively rehabilitate the quarry.		6.1	
Earthworks	To reconstruct the landform to be compatible with the surrounding landscape and to prepare the ground for revegetation.		6.2	
Erosion prevention	To minimise erosion of final landforms.		6.3	
Revegetation	To provide a stable self-sustaining cover through revegetation that protects the rehabilitation asset and is consistent with the final land-use.		6.4	
Monitoring and maintenance	To monitor and maintain the site until the rehabilitation is stable, safe and self-sustaining.		6.5	
Decommissioning and Closure				
Site clean up	To have a clean site ready for the final land-use.		7.2	

Earth Resource Regulation Branch Contacts

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