



Department of Primary Industries

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Work Plan Endorsement

The attached Work Plan dated September 2011 for the Alcoa Anglesea Mine is hereby endorsed with the attached Schedule of conditions by the Department of Primary Industries under clause 21A of an Agreement being a Schedule to the Mines (Aluminium Agreement) Act 1961.

Signed for and on behalf of the Department of Primary Industries.

Date:

22 September 2011



**Alcoa Anglesea Coal Mine
Endorsed Work Plan Dated September 2011**

Schedule of Conditions

PART A GENERAL CONDITIONS

1. WORKING IN ACCORDANCE WITH THE ENDORSED WORK PLAN

- 1.1. The Company must carry out work in accordance with the endorsed Work Plan and any subsequent endorsed Work Plan Variations.
- 1.2. Where any inconsistency occurs between the endorsed Work Plan and/or an endorsed Work Plan Variation or the associated endorsed Work Plan conditions, and other lease conditions and/or regulations, the lease conditions and/or regulations have precedence.
- 1.3. Where requested by the Department head, the Company must submit a Work Plan Variation.

2. DOCUMENTATION AND RECORDS

- 2.1. The Company must record activities undertaken and the subsequent results obtained, regarding the implementation of any auditing environmental and rehabilitation monitoring programs, and complaints received.
- 2.2. The Company must ensure that documentation generated for any auditing, environmental and rehabilitation monitoring program, and any complaints received is appropriately stored and accessible to relevant personnel and is available upon request by an Inspector.

3. ADMINISTRATIVE ARRANGEMENTS

- 3.1. The Company must ensure that the relevant District Manager is at all times aware of the appropriate contact person for activities conducted within the endorsed workplan area, including exploration.
- 3.2. Where exploration is endorsed by an area work plan, the Company must submit a written work schedule for any program of work. The work schedule must be submitted to the relevant District Manager and the Crown land manager (for work on Crown land) at least twenty-one (21) days prior to the commencement of work. The Company must comply with any request by the relevant District Manager to defer, cease or modify the proposed works.

4. PUBLIC LIABILITY INSURANCE

- 4.1. Prior to commencing any work, the Company must have public liability insurance that covers all work authorised under the endorsed workplan and ensure the insurance is valid at all times while work occurs under that endorsed workplan.

5. PUBLIC SAFETY

- 5.1. The Company must ensure that public safety is maintained within the endorsed workplan area at all times, including through the use of fencing, gates and signage as required around the area.
- 5.2. The Company 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.

6. FIRE RISK MANAGEMENT

- 6.1. The Company must take all reasonable measures to prevent the ignition and spread of fire.
- 6.2. The Company 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.
- 6.3. The Company must develop and implement an appropriate fire response and readiness plan.

7. DESIGNATED PARKING AREAS

- 7.1. The Company must provide designated parking areas for employees and visitors at the work site.
- 7.2. The Company must ensure that the designated parking area is of sufficient size to accommodate the expected number of vehicles that employees and visitors may bring to the work site on a daily basis.
- 7.3. The Company must ensure that designated parking areas are designed and constructed to provide safe access for vehicles and people.

8. COMPLAINTS MANAGEMENT

- 8.1. The Company must establish and maintain a complaints register.
- 8.2. In response to a complaint, The Company 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.

9. NON-COMPLIANCE AND ENVIRONMENT INCIDENT NOTIFICATION

- 9.1. The Company must as soon as is practicable after becoming aware of any non-compliance with the conditions of the Endorsed Work Plan, and/or an environmental incident that will, or is likely to cause, material harm to the environment, notify the relevant District Manager of the non-compliance and/or environmental incident.
- 9.2. The Company must also notify any other relevant government department or agency of the non-compliance and/or incident.
- 9.3. Where requested to provide a written report on the non-compliance or environmental incident, the Company must provide a written report within 5 business days of the request that includes the following information:
 - (a) the date and time of the non-compliance and/or environmental incident;
 - (b) the cause, or likely cause of the non-compliance and/or environmental incident;
 - (c) the impacts, or likely impacts of the non-compliance and/or environmental incident;
 - (d) the actions that have been taken to prevent, minimise or otherwise manage the impacts, or likely impacts of the non-compliance and/or environmental incident; and
 - (e) the actions that will be taken to prevent such a non-compliance and/or environmental incident from happening again in the future.

10. REPORTING, MONITORING AND AUDITING

- 10.1. The Company must implement a program for monitoring environmental impacts and rehabilitation.
- 10.2. The Company must submit an Annual Report to the District Manager that includes:
 - (a) an outline of exploration and mining activities undertaken over that year;
 - (b) details of current progressive rehabilitation activities and targets;
 - (c) details of completed rehabilitation activities over that year.

PART B ACTIVITY BASED CONDITIONS**11. Ground Disturbance**

- 11.1. The Company must minimise the area of ground disturbance throughout the life of the mining operation.
- 11.2. The Company must not open up any area for mining and ancillary operations except where endorsed in the Endorsed Work Plan.

12. SOIL MANAGEMENT

- 12.1. The Company must take all reasonable measures to minimise adverse impacts on the physical and biological health of soil within the licence.
- 12.2. Where excavation occurs, The Company must ensure that topsoil to a minimum depth of 150mm below the natural surface is removed and placed in stockpiles not exceeding 2m in height.
- 12.3. The Company must ensure that topsoil stockpiles are protected from erosion and compaction.

13. EROSION, DRAINAGE AND WATER QUALITY CONTROLS

- 13.1. The Company must design, install and maintain erosion and sediment controls to prevent erosion of areas of disturbed land and sedimentation of waterways.
- 13.2. Where activities are being conducted in waters or on the banks of waterways with water in them, the Company must take all reasonable measures to minimise sedimentation of the water in the waterway.
- 13.3. The Company must take all reasonable measures to prevent contaminated runoff from entering receiving waterways.

14. VEGETATION MANAGEMENT AND BUFFER ZONES

- 14.1. The Company must take all reasonable measures to avoid, and/or minimise the removal and disturbance of native vegetation and faunal habitats.
- 14.2. The Company must not undertake any excavation work, or remove any vegetation other than noxious weeds, whether in part or in whole, within any buffer zone shown on the Endorsed Work Plan.
- 14.3. The Company must maintain the buffer zone to ensure that the required visual screen is provided between the relevant mining works and surrounding land and/or buildings.
- 14.4. Unless otherwise agreed, the Company must use species that are indigenous to the area and are appropriate to the lease area's Ecological Vegetation Class (EVC) when establishing plants within the buffer zone.

15. NOXIOUS WEEDS AND PESTS

- 15.1. The Company must establish and implement a program to control and/or eradicate noxious weeds and pest animals within the licence area.
- 15.2. The Company must take all reasonable measures to prevent the spread of declared noxious weeds, pest animals and plant diseases within the licence area.
- 15.3. The Company must ensure that all mobile machinery is thoroughly cleaned prior to coming onto, or leaving a work area.
- 15.4. The Company must ensure that all soil and aggregate that is imported into and exported out of the endorsed Work Plan area is free of declared noxious weeds, pest animals and plant diseases.

16. AIR EMISSIONS, DUST AND LIGHTING

- 16.1. The Company must take all reasonable measures to prevent adverse impacts as a result of the release of dust, odour and/or emission of light including that generated by exploration activities not requiring an endorsed work plan.

17. NOISE EMISSIONS

- 17.1. The Company must take all reasonable measures to ensure that noise emissions are minimised as far as is practicable and comply with any limits set in the endorsed work plan.
- 17.2. The Company must take all reasonable measures to avoid causing nuisance noise including that generated by exploration activities not requiring an endorsed work plan.

18. VISUAL AMENITY

- 18.1. The Company must take all reasonable measures to ensure that the colour of fixed plant and buildings do not cause an adverse impact on surrounding visual amenity.
- 18.2. The Company must consult with the relevant Inspector and the Crown land manager or the responsible authority on private land prior to painting any fixed plant and/or buildings.

19. HERITAGE SITES

- 19.1. The Company must ensure that no work is carried out, without appropriate consent, within 100 metres laterally of a registered Aboriginal place recorded in the Victorian Aboriginal Heritage Register, or within 100 metres below that place.
- 19.2. The Company must ensure that no work is carried out, without appropriate consent, within 100 metres laterally of an archaeological site on the Heritage Inventory or a place or object included in the Heritage Register or within 100 metres below that site, place or object.

20. HAZARDOUS MATERIALS MANAGEMENT

- 20.1. The Company must take all reasonable measures to prevent contamination of the environment by the release of fuels, lubricants and/or hazardous materials including those used for exploration activities not requiring an endorsed work plan.
- 20.2. The Company must install trays or similar apparatus beneath machinery to protect the soil and vegetation from leaks or spills of fuels, lubricants and/or hazardous materials.
- 20.3. The Company must ensure that all fuels, lubricants and/or hazardous materials are stored in accordance with the relevant requirements of AS1940 The Storage and Handling of Flammable and Combustible Liquids.
- 20.4. The Company 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.
- 20.5. The Company must ensure that all mobile plant and machinery including mobile fuel storages have immediate access to, and wherever possible are fitted with, spill prevention and clean up equipment.
- 20.6. The Company 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 endorsed waste facility.

21. WATER DAMS

- 21.1. The Company must ensure that the location, design, construction, operation and safety management of water dams on the endorsed Work Plan area are undertaken in accordance with the endorsed Work Plan.

22. SLOPE STABILITY

- 22.1. The Company must ensure that all slopes/batters including excavations, roadways, stockpiles and dumps must be designed, constructed and maintained to ensure stability.
- 22.2. Should a significant slope failure event occur, the Company must cease all operations, notify the relevant District Manager and not recommence operations until authorised to do so by the relevant District Manager.

23. INTERNAL ROADS

- 23.1. The Company must consult with the relevant Inspector, the Crown land manager or private land owner/occupier prior to establishing any roads on the endorsed Work Plan area.
- 23.2. The Company must construct any roads on the endorsed Work Plan area in accordance with the direction provided by the DPI Inspector, the Crown land manager or private land owner/occupier.
- 23.3. The Company must ensure that an internal road is only used by:
 - (a) employees of, or persons authorised by, the relevant Crown land manager, or persons engaged in fire control where the licence covers Crown land; or
 - (b) the landowners or their agent/s where the licence covers private land.
- 23.4. The Company must ensure that all roads on the endorsed Work Plan area are properly formed, surface treated, drained and maintained to provide for the safe operation of the road.

24. DERELICT AND REDUNDANT PLANT

- 24.1. The Company must ensure that all derelict and redundant plant, vehicles, machinery and equipment are removed from the endorsed Work Plan area and deposited at an appropriate waste disposal site or otherwise stored or disposed of in accordance with the endorsed Work Plan.

25. REHABILITATION

- 25.1. The Company must ensure that progressive rehabilitation of disturbed land is carried out as soon as possible including those areas used for exploration activities not requiring an endorsed work plan.
- 25.2. The Company must ensure that final rehabilitation is in accordance with the endorsed Work Plan.

26. CAMPING

- 26.1. The Company may only establish campsites with the permission of the Crown land manager or private land owner/occupier.
- 26.2. The Company must select, establish and manage campsites to minimise risks to the environment and public safety.

27. WORKING HOURS

- 27.1. The Company must conduct all works in accordance with the working hours in the endorsed Work Plan (if stated)
- 27.2. The Company may apply to the relevant District Manager to vary, or work outside of, the working hours described in the endorsed Work Plan.

28. GEOPHYSICAL AND GEOCHEMICAL SURVEYS AND GRIDLINES

- 28.1. In designing and constructing geophysical and geochemical surveys, the Company must take all reasonable measures to prevent adverse impacts to the environment and public safety.
- 28.2. Prior to designing and constructing geophysical and geochemical surveys, the Company must consult with the Crown land manager and/or private land owner/occupier about the position of gridlines and geophysical lines.

29. LIVESTOCK, DOMESTIC ANIMALS AND CROPS

- 29.1. The Company must take all reasonable measures to prevent adverse impacts to livestock and crops as a result of mining and exploration activities.

30. DRILL SITES, COSTEANS, TRENCHES AND BULK SAMPLING EXCAVATIONS

- 30.1. The Company must take all reasonable measures to prevent adverse impacts of establishing costeans, drill holes, bulk sample excavations and trenches to the environment and public safety.

31. DRILLHOLE OPERATIONS, CONSTRUCTION AND DECOMMISSIONING

- 31.1. The Company must ensure that all reasonable measures are taken to minimise the impacts of drilling operations and that the operations are conducted in a manner that ensures protection of the environment, public safety and amenity.
- 31.2. The Company must prevent contamination of aquifers as a result of drilling operations.
- 31.3. The Company must ensure that where a drillhole is to be left open overnight or longer, a temporary cap is fitted.
- 31.4. The Company must ensure that accurate records of decommissioning procedures are kept to provide future reference, and to demonstrate to the department that the drillholes have been satisfactorily plugged and abandoned.

32. TAILINGS MATERIALS AND STORAGE FACILITIES

- 32.1. The Company must take all reasonable measures to minimise the generation of tailings material.
- 32.2. The Company must ensure that the location, design, construction, operation and safety management of tailings dams on the endorsed Work Plan area are undertaken in accordance with the Endorsed Work Plan.
- 32.3. The Company must, in accordance with current recommended practice or guidelines, construct and maintain monitoring bores for the purposes of assessing potential seepage from tailings dams.
- 32.4. On detection of seepage from monitoring bores, the Company must immediately inform the relevant District Manager.

33. EXPLOSIVES

- 33.1. When using explosives or high electrical currents, all reasonable measures must be taken to prevent adverse impact on or significant disturbance to the public and environment.

34. GROUND CONTROL MANAGEMENT

34.1. Within one year of the endorsement of this Work Plan (3/2011) the Company must develop and submit a written variation to the operation's ground control management plan to the Department for endorsement that addresses the geotechnical and hydrogeological issues present at and around the mine. The revised ground control management plan should include, but not be limited to:-

- ◇ The establishment and maintenance of a geological database for the local lithological layers, including all the drill hole collar locations, in DXF format, on the regional grid system, and lithological logs for all drill holes in the database.

- ◇ The establishment and maintenance of the geotechnical database, including the location of all geotechnical drill holes and details of any sample locations or drill holes and depths. This geotechnical database should include copies of all geotechnical reports obtained by the Company.

- ◇ A stability analysis of each wall for the current stage of mining operation and for each of the proposed mining stages, prior to the commencement of mining operations for any stage.

- ◇ A stability analysis for the Salt Creek diversion channel in its current location showing potential impacts on the current mining operation and for each of the proposed mining stages, prior to the commencement of mining operations for any stage.

35. LAND MANAGEMENT PLAN

35.1 Within one year of the endorsement of this Work Plan (3/2011), the Company must develop and submit a written variation to Land Management Plan to the Department for endorsement and include:

- ◇ All material land management issues relating to the future mining stages outlined in the workplan.

- ◇ A Biodiversity Action Plan including but not limited to undertaking pre- mining surveys, management plans and actions to deal with identified threatened flora and fauna that will be disturbed and rehabilitation plans.

- ◇ A process for the Company to consult with DPI and other relevant government agencies on land management and other issues that have an impact on the environment and public safety.

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australia's
aluminium
SINCE 1963

ALCOA ANGLESEA POWER STATION

MINE WORK PLAN

September 2011

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Introduction

This Work Plan has been developed to outline the strategy for the continuing operation of the Anglesea Coal Mine by Alcoa of Australia Limited (Alcoa) to 2061 and to meet the intent and legislative requirements outlined in the Mineral Resources (Sustainable Development) Act 1990 to the extent that they apply to the Anglesea Coal Mine operations under the Mines (Aluminium Agreement) Act 1961.

1.1 Site Description

The Anglesea site is situated predominantly on unreserved Crown Land, 41 kilometres southwest of Geelong, and north of the town of Anglesea.

The site consists of Alcoa freehold and a 7097-ha area of Crown Land leased under provisions of the *Mines (Aluminium Agreement) Act 1961*, which grants Alcoa exclusive right to explore and extract coal found within the area for 50 years, until 2011, with the right of 50 years renewal.

Alcoa extracts brown coal in an open cut mine to fuel the adjacent 150-MW Anglesea Power Station, owned and operated by Alcoa.

Since 1969 Alcoa has mined approximately 1.1 million tonnes of brown coal each year from the main upper seam within the open cut.

1.2 Legal and Other Requirements

Under the terms of the agreement contained in the *Mines (Aluminium Agreement) Act (1961)* Alcoa has sole right to explore for and mine brown coal until 2011 and has the right to extend the lease by a further 50 years until 2061.

Anglesea Heath Agreement (2000) was prepared under part 8, section 69 of the *Conservation, Forests and Lands Act (1987)*, and provides for the co-management of the Anglesea Heath by Alcoa and Parks Victoria, to protect the Anglesea Heath's natural and cultural values, whilst providing access for appropriate recreation and industry use. The Agreement led to the development of the Anglesea Heath Management Plan (2002) which is attached as Appendix H.

Exemption of certain freehold land - Historically and as a result of continuity of mining activities, Alcoa has mined through an area of freehold land outside and adjacent to the mining lease boundary which was the subject of a minerals exemption granted pursuant to section 293 of the Mines Act 1958 on or about 19 August 1985. Mining Coal Royalties were not required to be paid against the coal won from this area. The freehold land is described as:

- (a) certificate of title volume 8230 folio 618 known as Lot 1 on Title Plan 408603H (formerly known as part of crown allotment 10 Parish of Angahook); and
- (b) certificate of title volume 8489 folio 766 know as Lot 2 on Plan of Subdivision 061660 (formerly known as part of crown allotment 10 Parish of Angahook);

Although the coal has now been completely mined from the area and it is outside the mining lease boundary, the freehold area has been included within the Work Plan boundary and will be managed accordingly as per the Work Plan principles.

1.3 Mine Extension Process and Specified Area

Alcoa's rights to explore for and mine brown coal are set out in, and subject to, the terms of the agreement contained in the *Mines (Aluminium Agreement) Act (1961)* (the Agreement).

Clause 21D of the Agreement sets out the Mine Extension Process which applies if the Company proposes to extend its mining operations outside the stage 1 area, or outside the area in which operations are being conducted in accordance with a mine extension plan previously approved under clause 21D, but within the specified area. Any such mine extension requires the approval of a mine extension plan by the Secretary or his or her delegate in accordance with the approval process specified in clause 21D and this work plan.

The area within the Work Plan Boundary is also referred to as the 'specified area'.

2 ANGLESEA COAL MINE

2.1 Location Geology

Approximately 150 million years ago, stresses developed within the Australo-Antarctic continent led to the Australian land mass moving northwards. Along the southern coastline, a long rift valley stretching from Cape Jaffa (South Australia) to Point Hicks (Victoria) subsequently formed. This rift area gradually evolved into four basins – from the west, the Otways, Torquay, Bass and Gippsland.

The latter is well known for the enormous Latrobe Valley brown coal deposits. The Torquay Basin is of local importance as the rock section of Alcoa's Anglesea mine is formed within.

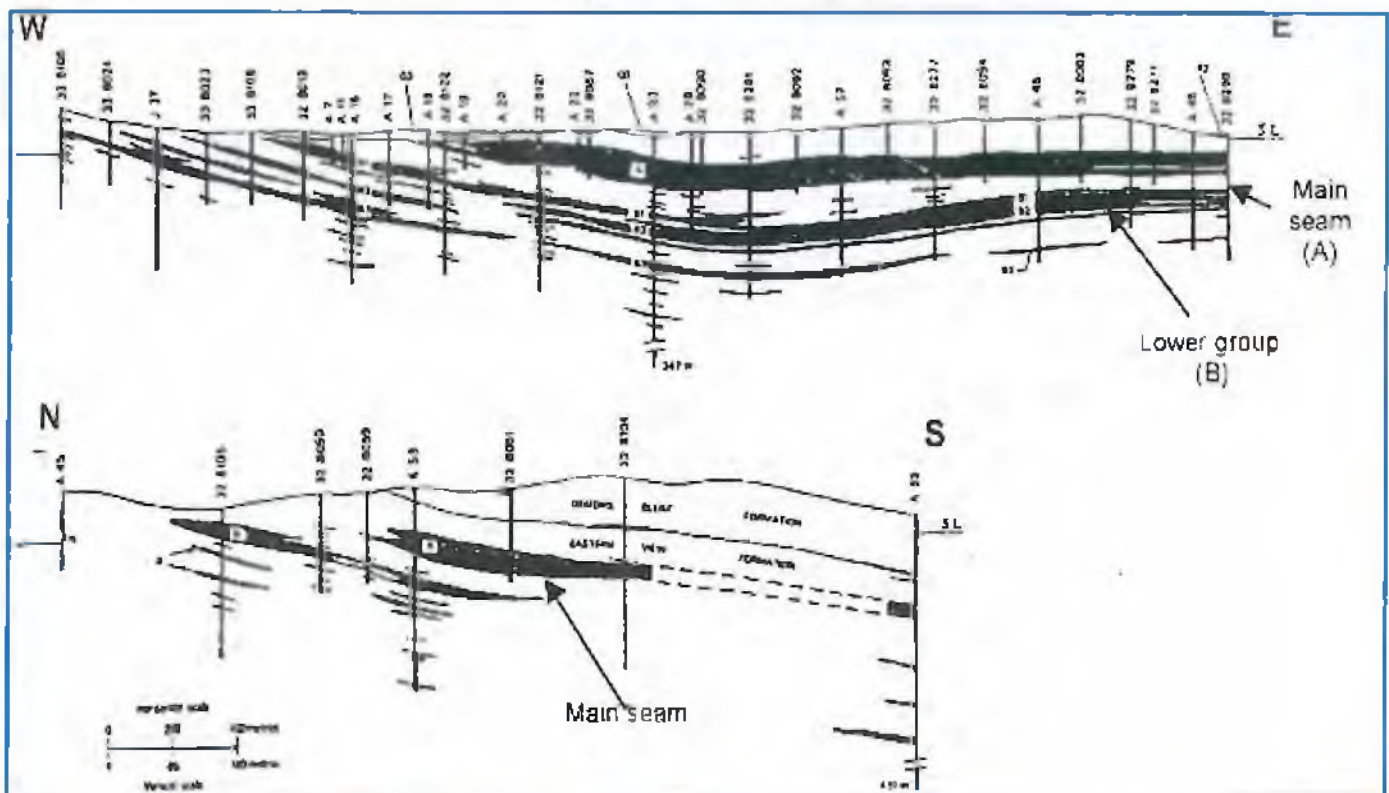
During the formation of these basins along the shorelines of the separating continent, gravels, sands, silts and clays were transported by streams to these areas and deposited within the spreading rift valley.

From approximately 80 million years ago, a series of water born deposits formed along the coastline from south of Aireys Inlet to Torquay. These included coaly materials such as trees and other plants and accumulated until approximately 40 million years ago. These deposits are known as the Eastern View group and as a result of further burial, the plant matter was compressed to form the current brown coal mined at Anglesea.

Two distinctly different major lithotypes are observable in the excavated sites

- the economic coal unit being recovered for the production of power, and
- the overburden coarse quartz sands and yellow clayey silts with prominent wavy structures.
- The coal seams can be divided into two main groups – the main seam (Group A) and the lower seam group (Group B) as shown below.

Figure 1: Anglesea Coal Field



2.2 Coal Characteristics

The Anglesea brown coal deposits were laid down some 40 million years ago.

Except for the coal at Benwerrin (Victoria) the Anglesea coal is of a higher grade than tertiary brown coal located elsewhere in Victoria. It is classified as a soft brown coal approaching the hard brown coal stage.

Samples of brown coal from more than 140 bores in the Anglesea field have been analysed in the 1950s and 1960s by what was then known as the Victorian Mines Department.

Alcoa also samples coal weekly and composites it into quarterly and monthly samples for analysis. This is represented in table below and is an average of data from 2000 to present.

Table 1: Anglesea Coal Analysis

		Mines Department Analysis	Alcoa Analysis
Moisture	% ar	46.2	44.7
Ash	% db	3.0	4.0
Volatiles	% db	49.8	48.3
Fixed carbon	% db	48.3	47.7
Carbon	% db	69.1	67.5
Hydrogen	% db	4.9	4.8
Sulphur	% db	3.9	3.3
Nitrogen	% db	0.7	0.6
Oxygen	% db	21.4	21.3
Calorific value (Gross dry)	MJ/kg	26.9	26.9
Calorific value (Gross Wet)	MJ/kg	14.4	14.9

2.3 Coal Reserves

Exploration for brown coal commenced in the later 1950's.

Roche Brothers commenced open-cut mining operations in 1959 with very little exploratory drilling and ended up mining in a seam of the lower group on the western limb of the known reserve. Results of exploratory drilling by the then Victorian Mines Department and Western Mining Corporation, together with additional Roche Brothers data, indicated a large economically viable field in the Salt Creek – Marshy Creek area immediately to the north of Anglesea. The drilling and subsequent interpretation realized a total proven reserve of 120 million tonnes of coal, divided into main and lower group seam formations. Western Mining Corporation then joined with Alcoa Inc. to form Alcoa of Australia Limited to establish an aluminium smelting industry in Australia. In 1961 Alcoa of Australia Limited was granted a long-term lease over the field, including a considerable tract of country to the north and west, referred to as the Mines (Aluminium Agreement) Act 1961 (MAAA).

Alcoa commenced open-cut mining operations in 1969 on a substantially larger basis than the Roche Brothers open cut, where output had dwindled from 169,000 tons in 1959 to 14,300 tons in 1968, largely as a result of falling customer demand.

Since 1969 Alcoa has mined approximately 1.1 million tonnes of brown coal each year from its established coal mine located in the south-east of the lease area. The current mine lies approximately in the center of a proven coal field that contains reserves to last over 100 years at the current rate of extraction from the start date of the mining operations.

Initially, Alcoa commenced open-cut mining in the central-eastern portion of the field and the open cut has progressively advanced west. Back filling and rehabilitation have taken place in areas that have been mined.

Other portions of the lease are known to contain some brown coal, but the extent of these reserves has not yet been fully defined but are thought to be largely uneconomic.

[Reference: Land Conservation Council – Melbourne Area, District 1 Review. Final Recommendations (June 1987)].

2.4 Mining Area

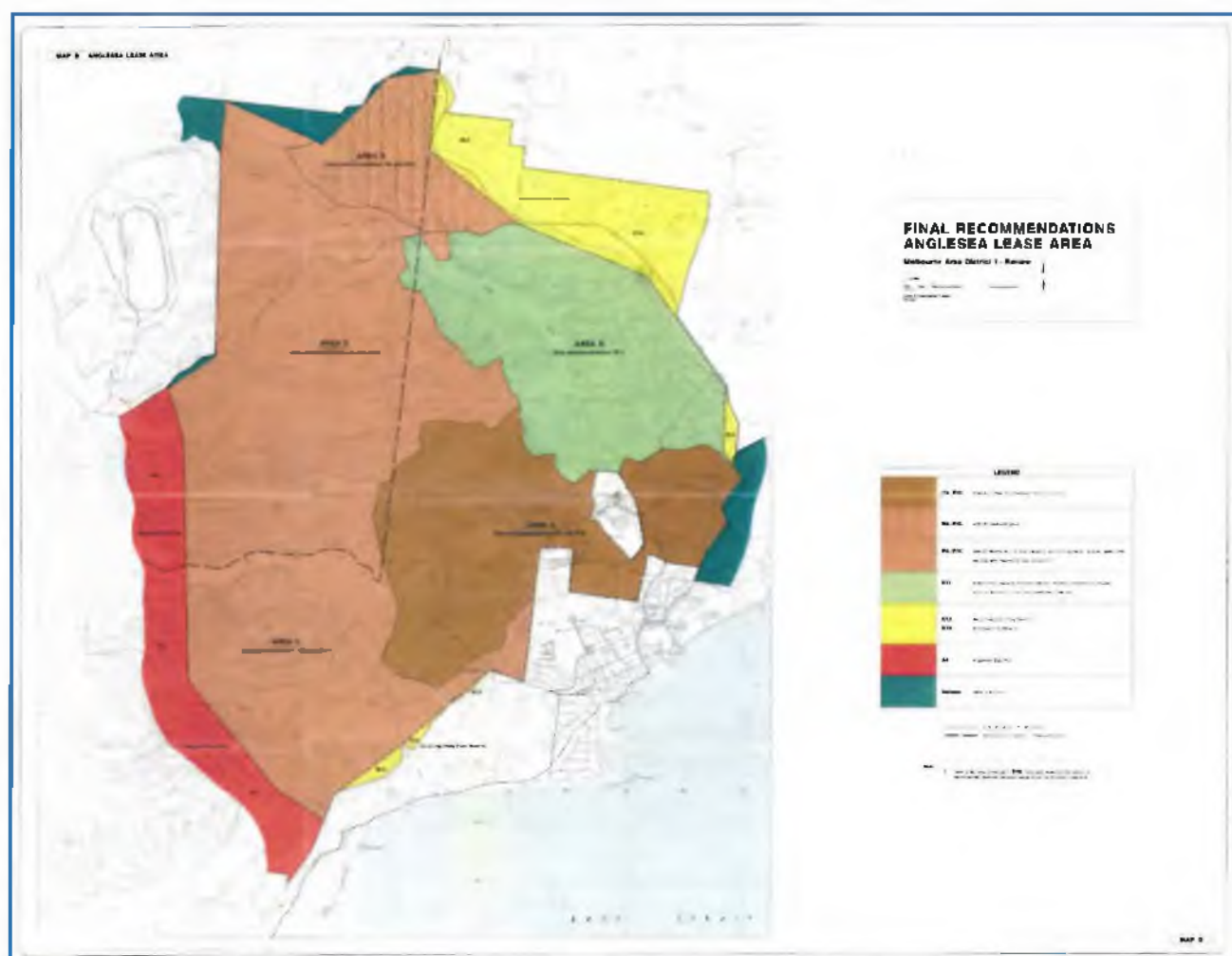
The Land Conservation Council has made numerous recommendations relating to the Anglesea Lease area with the resultant outcomes being documented in the Melbourne Area, District 1 Review (Final Recommendations) in 1987.

The areas referenced below are illustrated in Table 2 below.

Table 2: LCC Recommendations

R6	<p>That the area comprising areas A, B and C, continue to be available to Alcoa as specified in the Mines (Aluminium Agreement) Act 1961 for the mining of brown coal, exploration and associated works.</p> <p>Note: The area marked A includes the present work area and is known to contain coal reserves to last some 75 years at the current rate of extraction.</p>
R7	<p>That mining, where it is to proceed on part of the lease area outside the area marked A, should be subject of negotiated conditions between Alcoa and the government in order to minimize the impact on significant conservation values.</p>

The coal reserves and mining activities identified within this Work Plan and those mined before and following 1987, are all in compliance with the LCC recommendations as set out above.

**Figure 2: LCC Map**

3 GENERAL LOCATION PLANS

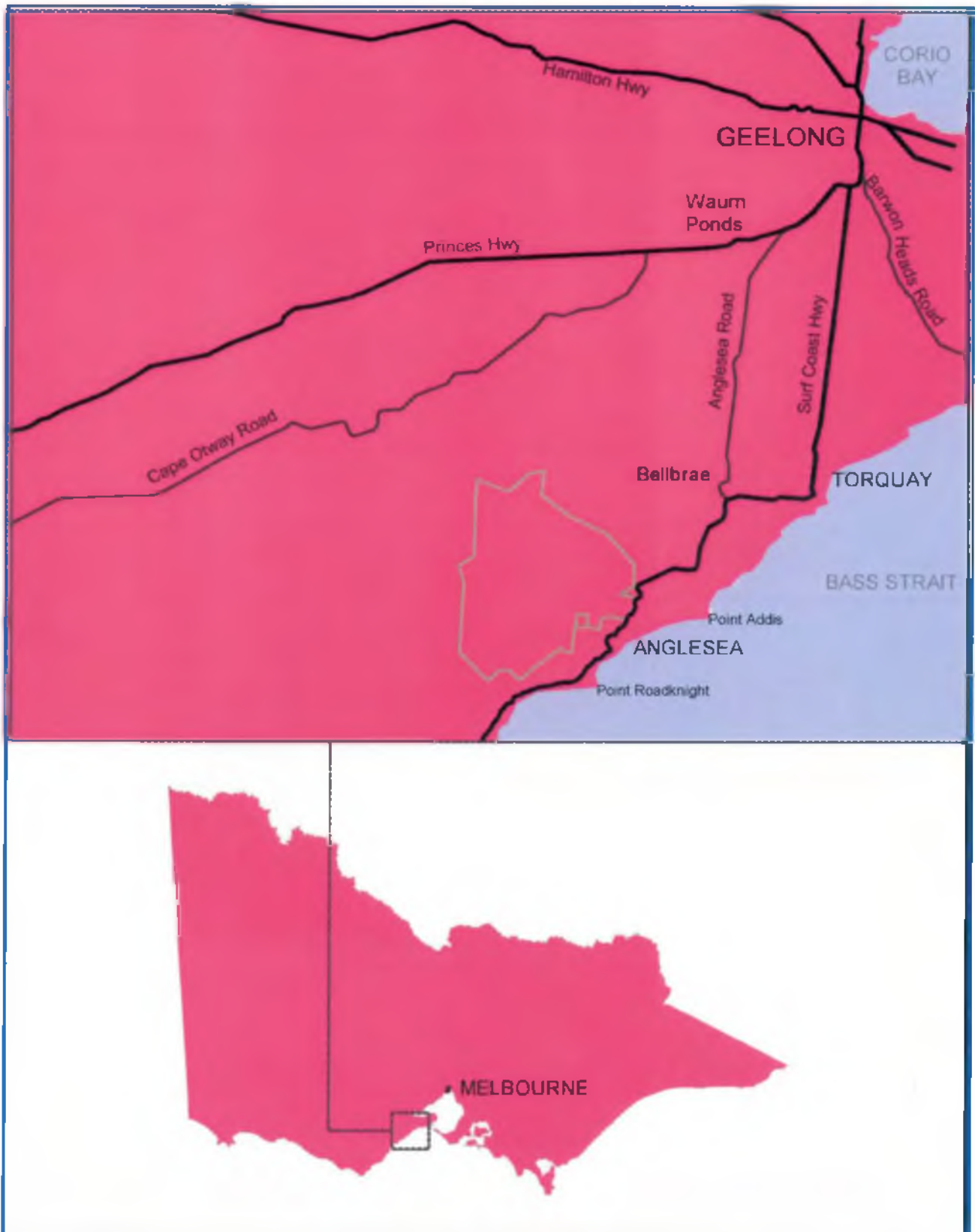


FIGURE 3.



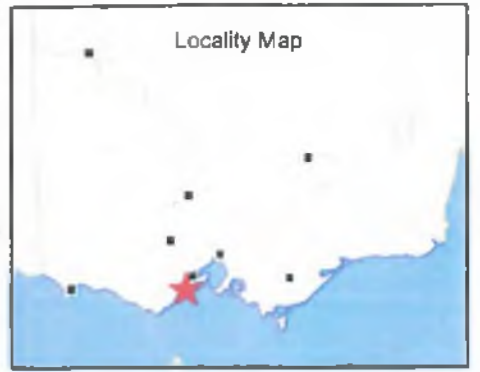
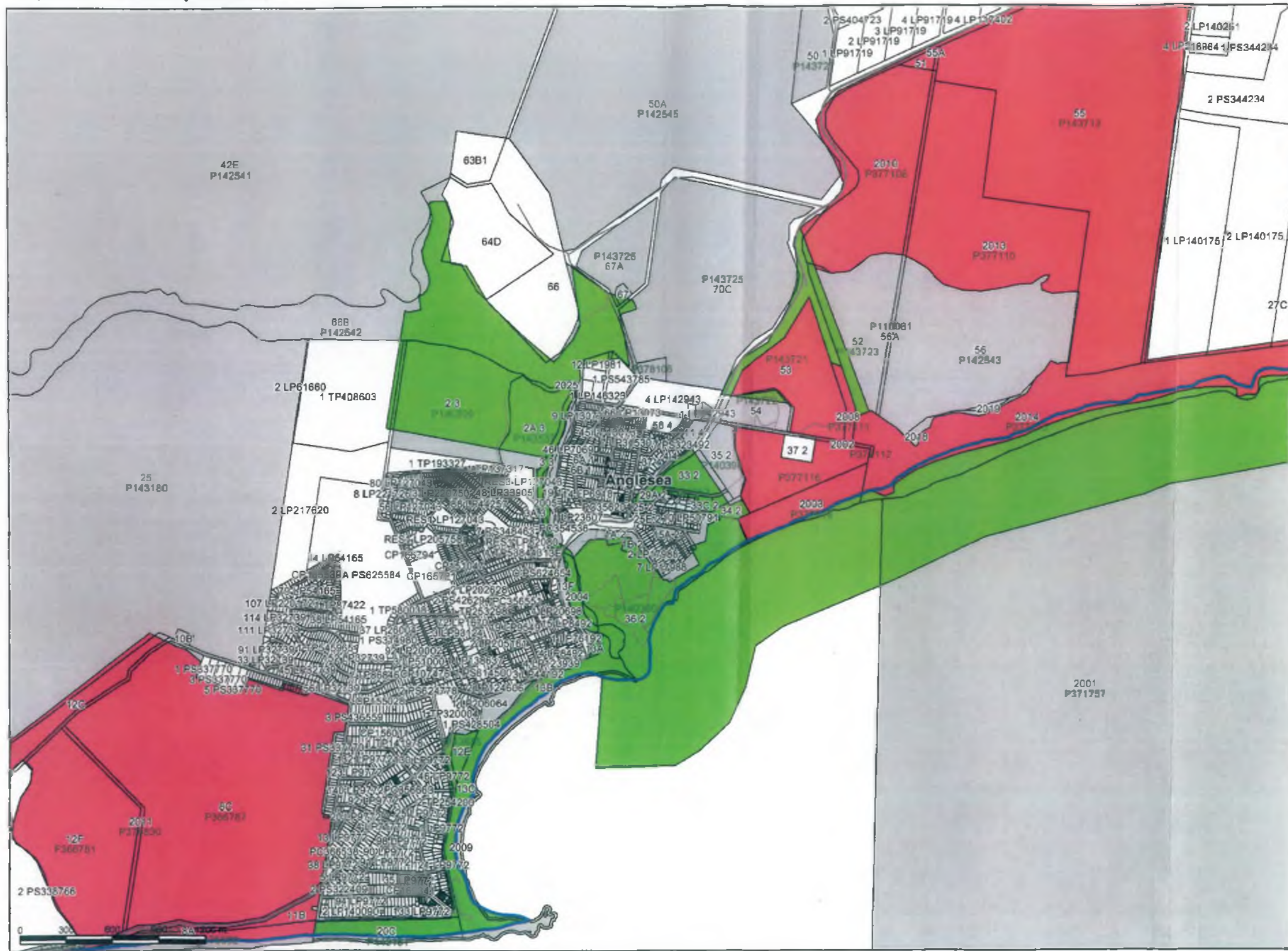
Figure 4.

4 REGIONAL PLANS



Figure 5

Alcoa Anglesea
Department of Primary Industries



Legend

Roads (vminiple)

- Freeway
- Highway
- Main Road
- Other

Property - Parcel Description

- Property - Parcel Description
- Unavailable Crown Land (MRSDA)
- Restricted Crown Land (MRSDA)
- Crown Land



Disclaimer: This map is a snapshot generated from Victorian Government data. This material may be of assistance to you but the State of Victoria does not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for error, loss or damage which may arise from reliance upon it. All persons accessing this information should make appropriate enquiries to assess the currency of the data.

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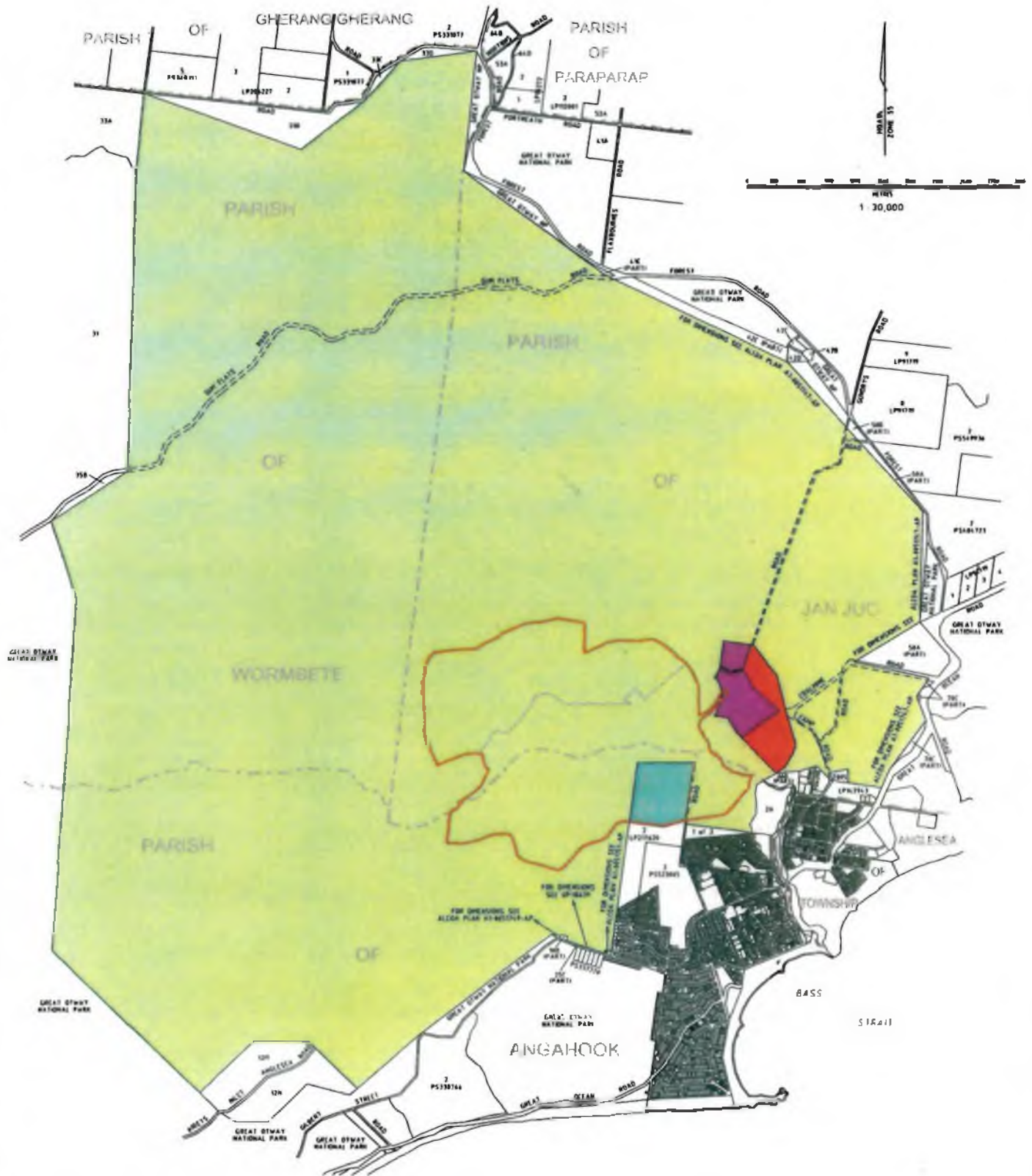
Map Scale 1:25,000
NOT FOR NAVIGATION



Figure 6

PLAN OF ALCOA LEASE AREA

COUNTIES OF GRANT AND POLWORTH
PARISHES OF ANGAHOOK, JAN JUC AND WORMBETE



LEGEND


- | | | |
|--|--|--|
|  LEASED AREA (7145ha ±) |  PURCHASED LAND |  WORKPLAN BOUNDARY (specified area) |
|  FREEHOLD LAND |  PRIOR LAND |  CURRENT MINE AREA (approx) |
| ROADS SHOWN THIS === ARE INCLUDED IN THE LEASED AREA. | | |

NOTE: COPY OF PLAN LODGED AT
CENTRAL PLAN OFFICE
PLAN NUMBER LEGL/11-019

Figure 7

5 SITE PLANS

FIGURE 8

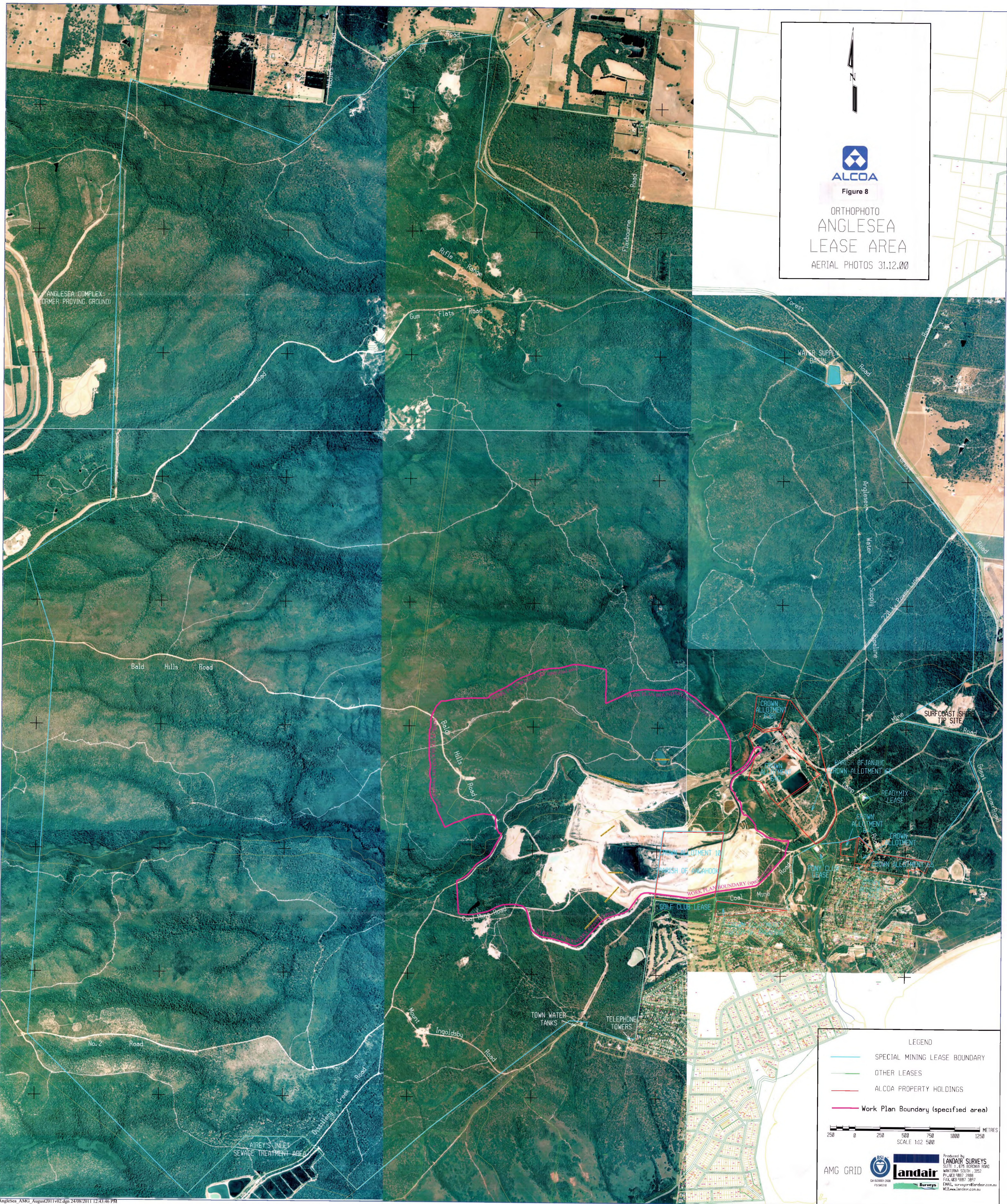


ALCOA

Figure 8

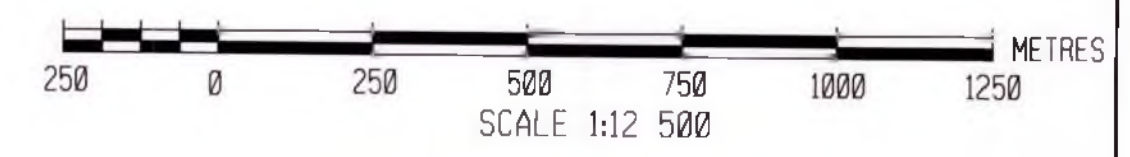
ORTHOPHOTO
ANGLESEA
LEASE AREA

AERIAL PHOTOS 31.12.00



LEGEND

- SPECIAL MINING LEASE BOUNDARY
- OTHER LEASES
- ALCOA PROPERTY HOLDINGS
- Work Plan Boundary (specified area)



Produced by
LANDAIR SURVEYS
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AMG GRID



FIGURE 9





Alcoa Work Plan Area
 Scale 1: 5000
 Map Projection AMG Zone 55

Figure 9

- Work Plan Boundary (specified area)
- Existing Fence Line
- - - Proposed Fence Line



6 MINERAL RECOVERY METHODS

6.1 Mining Sequencing

6.1.1 MINING STAGES

The proposed mining sequence has been separated into six (6) stages, based on the current geological modeling and the requirement to relocate the Salt Creek that crosses the deposit from West to East. A plan of the mining stages is attached in Appendix A.

Stage 1

Current Mine Operations



The current mine operations are based on the original 50 million tonne mine plan that has provided coal to the adjacent power station since 1969. This plan has been concentrated on the main seam and provides sufficient coal reserves to meet the power station demands until 2016.

The coal is currently mined by open cut method, using excavators and haul trucks to load and transport coal to the Primary Crusher and then via a conveyor system to the stockpiles.

The average main seam thickness is 27 metres, with an average stripping ratio of 2.5 m³/tonne coal for the whole field. Due to the nature of the mined materials, no blasting is undertaken.

The mined area is being progressively backfilled, using the overburden from the current strip area, which is typically extracted at between 1.6 and 1.8 Mm³/year (also using a truck and excavator operation).

The mine currently operates on a 12 hour day shift, seven days a week. The operation is currently team based with both operating and team functions shared amongst the team members. Mining is performed during day shift only, to minimize any potential noise and other impacts on the adjacent township of Anglesea.

Stage 2 Pit Extension North, Northwest (NNW)



Following extraction of the main seam from the current pit, the mining operations are proposed to extend north, northwest (NNW) to recover the L1 seam that underlies the main seam. Overburden material would be used to backfill the main pit from East to West to an average Reduced Level of 10mRL.

Stage 3 Salt Creek Diversion



For operations to continue after the extraction of the L1 seam in Stage 2, Salt Creek that flows through the deposit needs to be relocated to maintain the current creek flow and reduce the potential water inflow into mining operations from high rainfall intensity. An area of 68.8 Hectares of Overburden is to be removed from north of the Stage 2 pit and backfilled to a height of 15mRL inside the mined out area of Stage 2 to form an earthen bridge across the deposit. A re-engineered diversion channel will be constructed to transfer the creek flow and reconnect it to the existing drainage on the eastern side of the proposed operations.

Stage 4**Extraction of L3 Seam**

Stage 4 continues the extraction to the north of the Salt Creek diversion removing the L3 seam (lowest) and backfilling overburden north of the diversion behind the advancing coal face. Overburden is proposed to be filled to a maximum height of 40mRL.

Stage 5**Extraction of L1 Seam**

The proposed Stage 5 extension to the northeast is limited by the coal resource model and removes the L1 seam with the lower seams discontinuing north of the Stage 4 pit boundary.

Waste material is backfilled to the 40mRL level behind the advancing coal extraction face.

Stage 6



Main Seam Extraction

Stage 6 proposes the extraction of the main seam to the East of Stage 5 and has the highest strip ratio of all the proposed mining areas. The pit is restricted from the north and west by limited modeled coal reserves and bounded by Salt Creek to the south and Marshy Creek to the east. Waste material is continued to be backfilled to 40mRL until all overburden is placed within mining limits.

The mine sequencing of overburden and coal removal for the current modeled reserves according to the mining stages is included in Table 4.1. The dates included are for the proposed mining sequence, relocating the Salt creek to the south after the extraction of the L1 seam in Stage 2. Further geotechnical and environmental design may affect the proposed schedule as well as any extension or reduction to the coal resource as a result of infill/regional drilling programs.

6.2 Salt Creek Diversion

Diversion of the Salt Creek to recover the coal resources that exist in strata below would be required and it is proposed to create a diversion channel to the south of the current creek location to ensure that the waterway has minimal disruption and can continue to flow after periods of significant rainfall.

The proposed future diversion of the creek will require a full engineering design to ensure geotechnical stability and to reduce the risk of inflow into the mining area.

At least 12 months prior to undertaking any stream diversion work, the above engineering study shall be completed and submitted to the DPI for approval along with an appropriate Work Plan variation. Approval for such work would also need approval from the appropriate authority.

6.3 Stripping Ratio

The strip ratio for all six stages is approximately 1.91:1 (overburden m³:coal tonnes) with the highest strip ratio occurring in the final Stage 6 with 2.79m³:1 tonne of coal. The proposed disturbance area for future mining operations is 409 hectares (346 Ha pit crest area), with a 50metre maximum disturbance boundary from the pit crest that is included in plans (see Appendix A).

Overburden removal for the proposed stages of development is summarised in Table 4.

Table 6.1- Overburden removal by stage

Stage	1	2	3	4	5	6
Approximate Overburden M ³	6,300	17,300	9,500	34,000	18,500	46,000

6.4 Mine Plan and Mine Life

Total coal delivery by stage is characterised below in Table 4.3. The Anglesea mine has reported reserves to maintain production at the current ROM feed rate of 1.1Mtpa till approximately 2071. There is potential to further increase or decrease the resource with regional and infill drilling depending on the strip ratio and economics. Total reserves may also be compromised by optimistic dilution factors used in the design process, given current knowledge of lower seam quality aspects.

Other aspects that give rise to declaring more reserves in the plan than required is around the quality aspect of sulphur which may lead to some high sulphur content coals being unacceptable for use in the adjacent power station. Additionally, some of the drilling data obtained from drilling work done in the 1950s and 1960s depict some gaps in some of the lower seam information and may have an impact on some aspects of the modeling. Infill drilling may be required to fully understand the deposit where there are clear gaps in the original drillhole data.

Table 6.2 - Coal extraction by stage

Stage	1	2	3	4	5	6
Approximate Coal tonnes (000's)	7,700	5,500	3,300	37,500	3,600	15,900

6.5 Mining Method

6.5.1 MINING AND PIT DESIGN

Alcoa's current mining operation at Anglesea utilises a truck and shovel configuration targeting the Main Seam located within the original 50 million tonne mine plan. The mining activities in the current pit have been referred to as Stage 1 and are due for completion of coal extraction activities in 2016 at current productivity levels.

Pit design is based on typical batter designs (see page 24) that have evolved over time and are dependent on standard conditions that may need to be modified dependent on specific issues that may be encountered as the mine develops or the evolution of the mine design based on technical input.

Whereas the depicted Stages above are designed to utilize the maximum amount of known coal reserve, the sequencing may be subject to alteration over time given various cost and sustainability issues that may be encountered.

6.5.2 MINING OVERBURDEN DISPOSAL

Overburden material disposal at Anglesea is designed to be placed within pit boundaries behind the advancing coal face. Once the backfill area reaches the designed height, the area is battered down where necessary and topsoil and subsoil replaced and rehabilitated to ensure minimal impact to the environment and community. The maximum backfill height proposed for the project is 40mRL.

The placement of overburden material is backfilled in the current operating area where the main seam reserves have been extracted. This will continue from east to west at an elevation of 10mRL and then north following the Stage 1 pit. The dump design profiles can be viewed in the mine closure (rehabilitation) profiles in Appendix D

6.5.3 COAL RECOVERY

Coal has been assumed to be unrecoverable for the top and bottom 10cm of the seam and the figures used in Table 4.3 reflect this dilution of the seam reserves. Historically, dilution effects have been averaged at the above design levels however, this may prove to be optimistic when working with multiple seams and so total declared coal reserves are also higher to compensate for this outcome. Working coal batters are extracted at 45° and flattened to the slope design from historical geotechnical investigations. (see Table 8.1 and cross-sections in Appendix C)

6.5.4 FUTURE COAL MINING

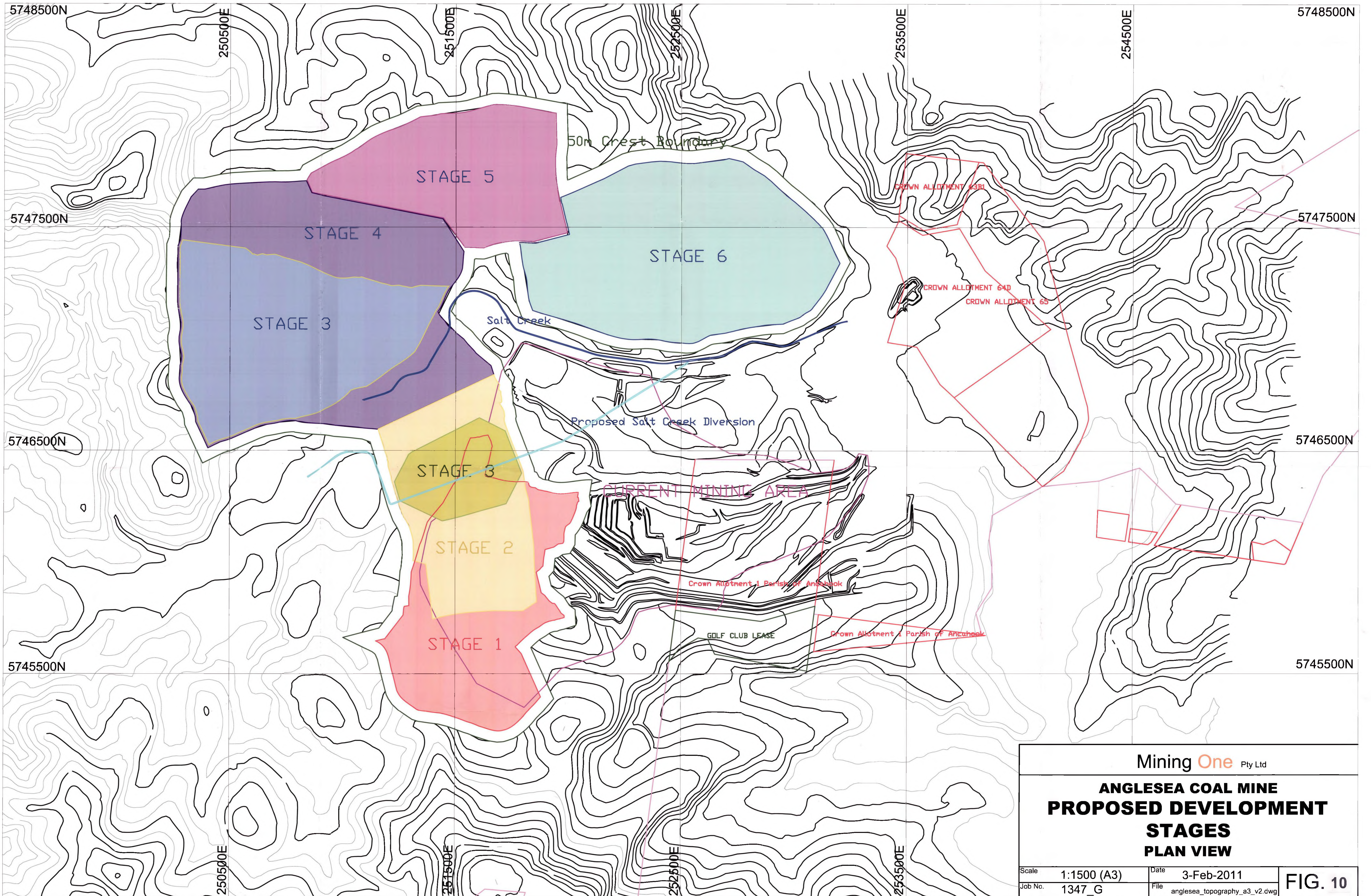
Given the current knowledge of the future coal deposits and the historic mining methods employed, it is envisaged that mining into the future will still utilize excavator, truck and other earthmoving equipment resources. However, over time, the development of the mine and alternative mining methods will undergo periodic review to ensure optimum methodology is applied to the mining operation for cost, efficiency and technical reasons.

6.5.5 DRILLING

Due to some of the resource data gaps described earlier and the potential need for additional geotechnical information, there is a high likelihood that additional drilling will be required within the described mining envelope at some stage through the life of the Work Plan.

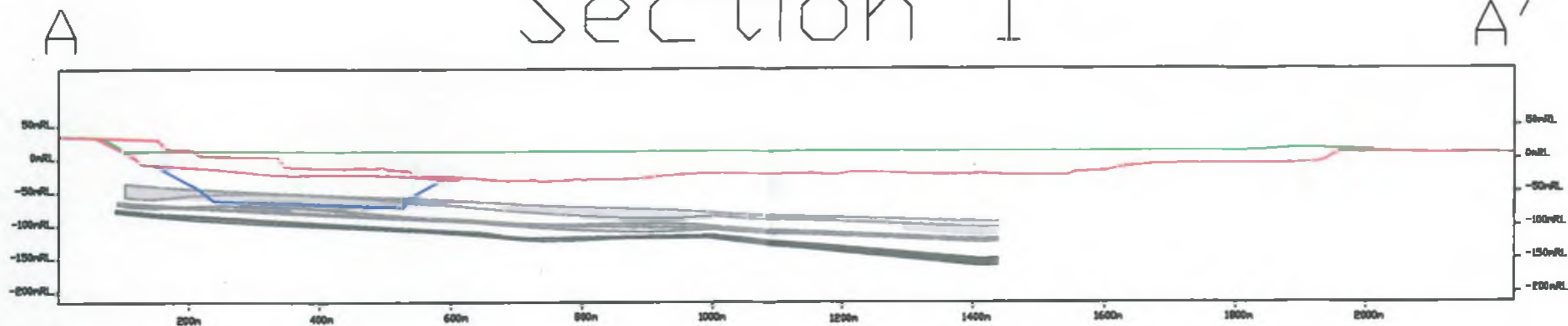
Even though this predicted drilling will occur within the mine plan footprint and is not strictly seen as exploratory in nature, drilling will be undertaken using best practice methods and be aligned to any Code of Practice for Mineral Exploration current at the time of drilling.

FIGURE 10

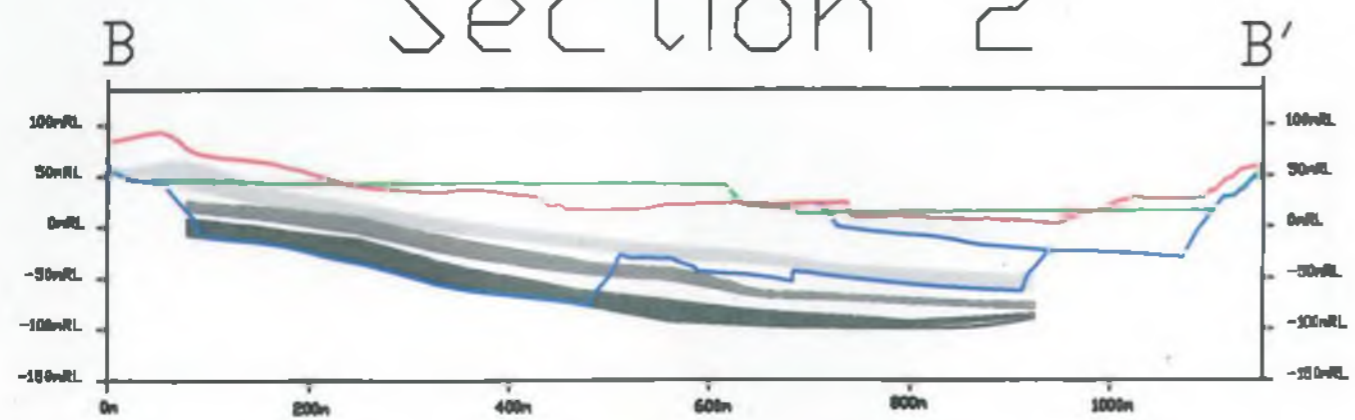


Mining One Pty Ltd			
ANGLESEA COAL MINE PROPOSED DEVELOPMENT STAGES PLAN VIEW			
Scale	1:1500 (A3)	Date	3-Feb-2011
Job No.	1347_G	File	anglesea_topography_a3_v2.dwg
			FIG. 10

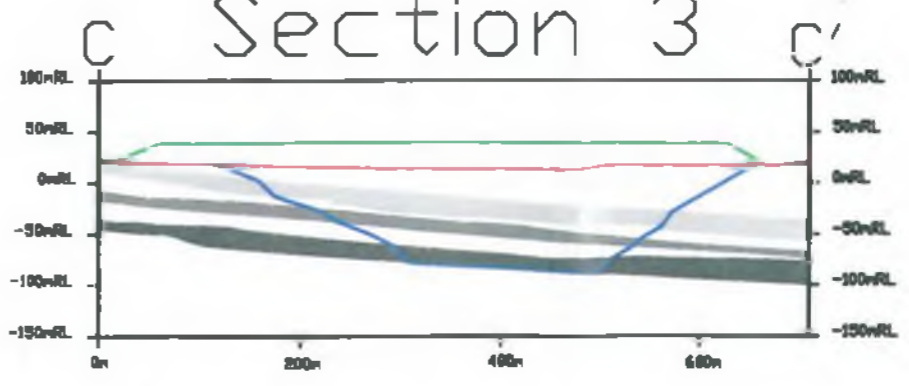
Section 1



Section 2



Section 3



LEGEND

- Current Topography
- Final Topography
- Pit Outline
- Main Coal Seam
- L1 Coal Seam
- L2 Coal Seam
- L3 Coal Seam

CLIENT ALCOA LTD - ANGLESEA POWER STATION

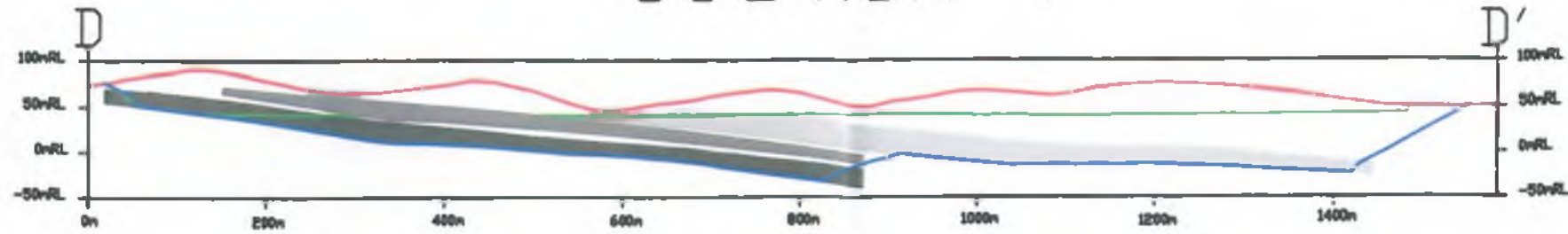
Cross Section of Proposed Mining Operations

MiningOne Pty Ltd

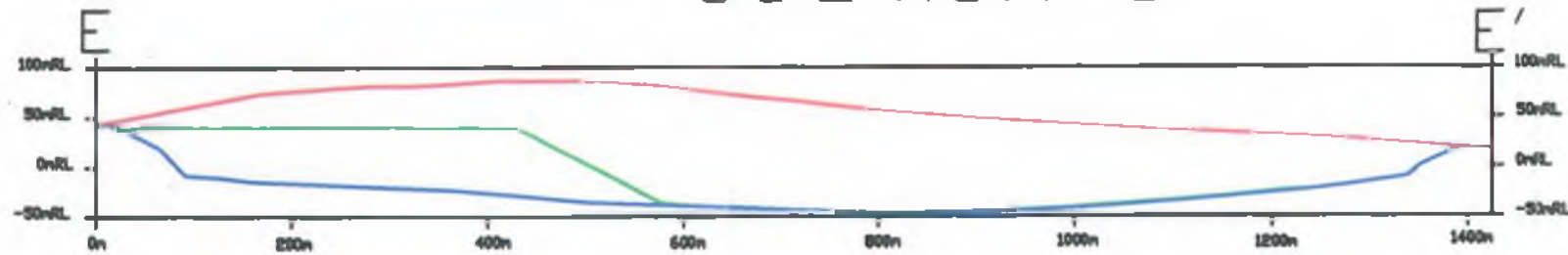
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FIG. 11

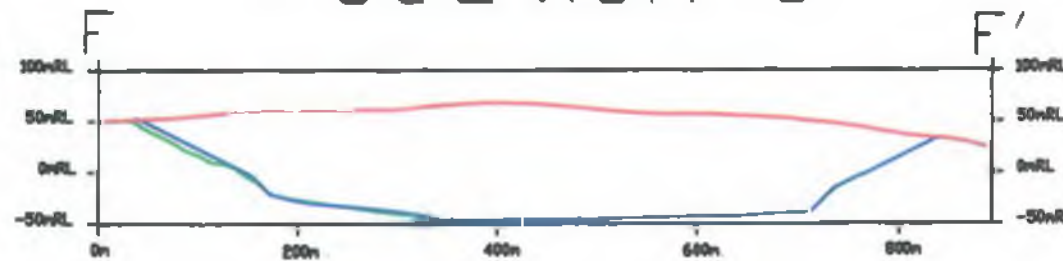
Section 4



Section 5



Section 6



LEGEND

- Current Topography
- Final Topography
- Pit Outline
- Main Coal Seam
- L1 Coal Seam
- L2 Coal Seam
- L3 Coal Seam

CLIENT ALCOA LTD - ANGLESEA POWER STATION

Cross Section of Proposed Mining Operations

MiningOne Pty Ltd

JOB# 1347_G

SCALE 1:100

FILE Anglesea Sections4-6.dwg

DATE 14 Sept 2010

FIG. 12

7 MINE INFRASTRUCTURE

7.1 Access Roads

Haul roads and general access roads provide operational and emergency access for the full range of earthmoving equipment utilized at the mine site, as well as 4WDs and other service vehicles. Roads are generally formed from clay, gravel and sand combinations and where of a more permanent basis, may have a crushed rock wear surface applied. Roads are designed as per generally accepted standards appropriate for the required equipment and purpose. These basic principles will be applied to roads systems introduced and constructed during the period covered by this Work Plan.

7.2 Buildings and Amenities

The current mine buildings are generally considered central to both current and future operations and are not envisaged to be relocated into the future. The current mine workshop, mine amenities and general office buildings are sufficient for current operations and will be reassessed for adequacy at various stages through the mine life with alterations undertaken where appropriate.

7.3 Ash Disposal Areas

Wastes from the adjacent power station ashing system, consisting of ash from the coal fired boiler and blowdown from the water treatment plant, are removed from the power station ash pond areas and deposited into the mine area. Currently this is performed by normal excavator and truck operation that moves the ash to an area in the overburden dump. The ash is then incorporated into the general overburden backfill process.

This work is currently covered by the site Waste Discharge Licence EM32162 (Appendix B), approved by the Environmental Protection Authority (EPA) Victoria. This licence is currently under review and any changes to the licence will be made available to the DPL.

7.4 Mine Fire Service Dam

See Section 8.6

7.5 Lease Roads and Tracks

As the mine develops past Stage 2, there are several roads and tracks that are currently open to public use and will be required to be relocated or closed to facilitate the mine progression. Relocation and closure will only be completed following consultation with and to the specification and satisfaction of Parks Victoria.

7.6 Fencing

Due to the size of the Work Plan area, the predominant fence type in use is a typical 'farm' style post and wire. Historically, as the mine develops and there is an obvious interface between operations and the public, the farm fence has been replaced by a higher (approximately 1.5 metres) post and mesh style that ensures greater public safety and security by way of accidental or purposeful entry to the mine working area. Appropriately spaced signage is also attached to the fence and periodic integrity checks are carried out on a routine basis.

It is envisaged that this process will continue as the mine progresses.

8 MINE MANAGEMENT

8.1 Ground Control Management

8.1.1 Geological Information

Background

The Anglesea Mine is located in an early Tertiary age sedimentary formation; near the coast of Bass Strait.

The major formations at the Anglesea Mine are the Eastern View (Paleocene) and Demons Bluff (Eocene) Formation. General characteristics of the area are marine silts, fine sands clays with fluvial gravel sand, clay and brown coal.

The mining sequence is up to 140 metres thick and hosts two potential seams of brown coal. The Upper Seam is being mined at present and generally exhibits a close to flat dip in the current mining area. The Lower Seam is made up of three separate coal seams, separated by layers of inter-seam clay.

The overburden material consists of fine sands, silty sand, silty clay and clayey silts. The overburden is approximately 70 metres thick and exhibits soil like characteristics.

Material Characteristics

Material characteristics and properties have been derived through limited testing and back analysis of events. Based on Coffey Mining work in 2009, the typical soil profile (used for back analysis of the south-west wall) is representative only of the south-west wall region; however it does give an idealised view of the material layers that may occur in other areas of the mine.

Slope Design

From 1979 there has been an adopted slope design that has been modified based on mining experience and this design is shown in Table 1. The information contained in Table 1 summarises the slope design into batter angle, berm width, batter height and intermediate angle.

Verification

Verification is a process whereby periodic reviews are undertaken to ensure compliance with the design. Verification is undertaken on a regular basis, through tasks such as: prism monitoring, Piezometer and inclinometer monitoring/readings, rain gauge and visual inspections.

Every six months, an external geotechnical engineering consultancy is tasked in ensuring that the geotechnical aspects of the mine are being followed. A GCMP (Ground Control Management Plan) sets out the requirements in regard to ground control and geotechnical issues at the mine. A copy of the current GCMP is included at Appendix F.

8.2 Assessment of Risk

Introduction

Although separated here for clarity, the process for ground control within the Anglesea Mine combines geotechnical and hydrogeological risks. In many cases, the effects of one will not be independent; and should not be treated as such. A change in hydrogeological equilibrium will have consequences on the geotechnical stability.

Geotechnical – Risks

A geotechnical risk can be described as a hazard, relating ground control, being identified and rated in accordance with a recognised system. At Anglesea Mine, there is a process outlined within the GCMP to rate hazards according to their consequence and likelihood.

Hydrogeological – Risks

A hydrogeological risk is similar to a geotechnical risk, in terms of rating and classification. However, a hydrogeological risk pertains to issues such as: ground water changes, dewatering, aquifers and rain fall interaction.

Risk Control

The control of risks is realised through procedures highlighted in the GCMP. The procedures, summarised below, are designed to facilitate the reduction of risk.

Geotechnical Hazard

Before a risk is created, a hazard must first be present. A hazard is identified through a variety of means; this/these range/s from analysis of technical data to visual inspections.

8.3 Risk Assessment Process

After a hazard has been identified, it will be evaluated on a number of parameters. These parameters are based on the likelihood of the hazard becoming an event and the consequences thereof.

The reduction of risks is achieved through lowering the likelihood and/or consequence. The procedure is specific and requires the user to initiate controls through a hierarchy to attain the required reduction of risk.

Risk Mitigation at Anglesea Mine

The current GCMP has outlined a process that formalises the hazard, risk assessment and reduction process. This process is open to all geotechnical risks, for which hydrogeological risks are included, and is to be filled out when any data analysis and/or observation has been made and a hazard is identified.

Risk Register – Site Geotechnical Log

The Site Geotechnical Log is a register that contains a summary of all the geotechnical issues around the mine. As described above, this log is a working document and provides a close out facility for the reconciliation of hazards and related risks.

8.4 Risk Controls

Described above is the process for identifying and documenting hazards and rated risks. The controls put in place at Anglesea Mine are tools that enable constant monitoring of the geotechnical and hydrogeological issues; at frequencies that are determined on past experience at the mine and industry practices.

In the GCMP there is a comprehensive review of the monitoring and reporting undertaken at Anglesea Mine. Listed below is a summation of the process and monitoring systems in place. For further information regarding frequency and data analysis requirements, including reporting, the GCMP must be consulted.

8.4.1 Geotechnical Control

Monitoring

There are numerous geotechnical monitoring and analysis processes in place at Anglesea Mine.

Survey Prisms – Prisms are located throughout the mine and are surveyed at regular intervals. Prism data is used for long trend analysis and for highlighting any changes in movement with respect to both magnitude and vector.

GPS Monitoring Pins – Outside the normal survey area, GPS Monitoring Pins provide coverage to areas where normal survey is difficult. GPS data is similar to Survey Prism data, although often not as accurate.

Inclinometers – Inclinometers are used to measure lateral displacement within boreholes drilled into a slope.

Inspections

Brief visual inspections on a daily basis and detailed analytical inspections at regular intervals are undertaken at the Anglesea Mine. These inspections are recorded and any issues highlighted and moved to the Site Geotechnical Log.

Hydrogeological Control

Piezometers – Piezometers are installed and monitored throughout the Anglesea Mine. Piezometers are used for determination of the ground water level; showing rises and falls within the ground water over time.

Rain Gauges – Rain gauges are used to show rainfall amount; and should be read in conjunction with Piezometer data.

Design Control

The following are non exclusive to either geotechnical or hydrogeological categories; with these controls utilising both forms of data interacting. (should the following then be noted as subsets of this?)

Design Studies

Design studies, often conducted by external geotechnical consultants, are used to provide verification to the current processes being used.

Stability Analysis

In line with the above, stability studies are often used to model areas of concern where a potential for an event to occur is significant. Stability analysis has been undertaken at Anglesea Mine and is a process undertaken in advance of mining development in new areas.

Reviews

External inspections of geotechnical operations at the Anglesea Mine are undertaken by an external Geotechnical Consultant. These inspections are undertaken at a regimented six monthly basis, and on a as needs basis for any other geotechnical issue.

Ongoing Geotechnical Issues – South Wall

The south wall has been the subject of considerable design analysis, regular monitoring and management of the ground movement in that particular area. The area has also been an area of interest to the Department of Primary Industries (DPI) and is currently being managed as per recommendations from the geotechnical consultant and as agreed to with DPI. Essentially, the management method has called for cessation of coal extraction in the area and the placement of a significant toe buttress arrangement at the base of the batter in the area of concern. Monitoring has been increased in scope across the area and will continue to determine the outcome of this strategy before going back to DPI with results or an alternative strategy for clearance of the area.

GPS monitoring has been extended further back from the face to determine any deep seated movement issues. Other additional points have been established further west along the batter at various distances from the crest to enable base monitoring of an area prior to the progression of mining adjacent to those GPS sites. This work will ensure continuity of monitoring as mine progresses and allow specific risk minimization strategies to be deployed and monitored on an ongoing basis.

Historical Data

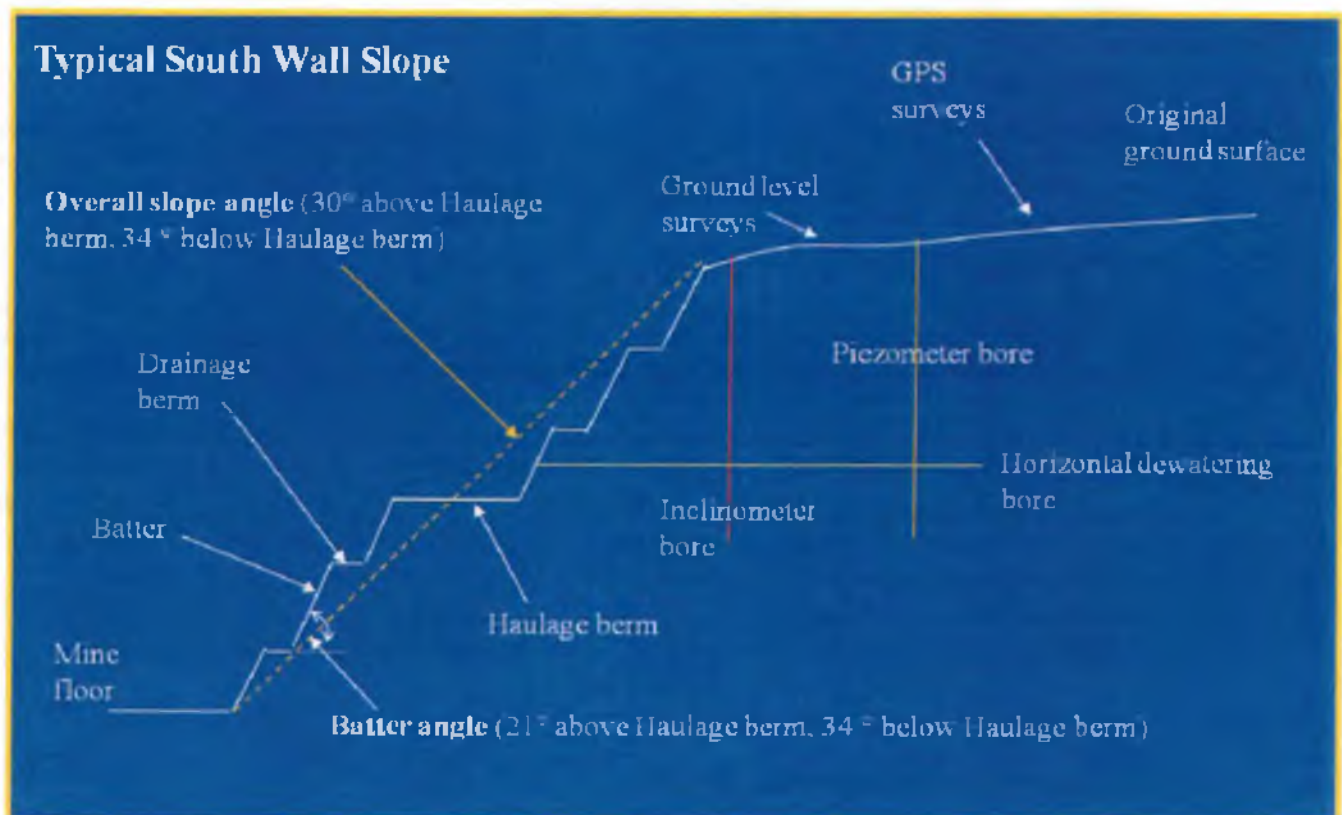
The current Anglesea Mine has been operating since 1960's. Through that period, there has been an understanding gained of the local geology, batter and slope performance, leading to a higher level of geotechnical and hydrogeological understanding. Using historical data in a current context is common and this experiential learning over a long time period is a very important part of the design process. Table 8.1 below sets out the development of certain slope design parameters over time and is a blend of experience and technical recommendations.

Table 8.1 Historic Slope Design, Anglesea Coal Mine

Summary of Overburden Slope Design Parameters, Recommendations & Measurements		Anglesea Coal Mine (1979-1997)	BFP Consultants (1997)	Anglesea Coal Mine (1997 - 2005)	Anglesea Coal Mine Present	2009 Survey	
						Re-entrant No 1	Re-entrant No 2
Batter Angle	Above Haul Road	37	25	30	30	24.3	26
	Below Haul Road	45	45	45	33.7	42.3	34.2
Berm Width	Above Haul Road	5m	5m	Varies	Varies	8.5 & 11.8m	8m
	Below Haul Road	5m	5m	5m	Nil*	3m (silted)	6m
Batter Height	Above Haul Road	12m	12m	Varies	Varies	5, 14 & 18m	12 & 14m
	Below Haul Road	12m	12m	Varies	Varies	13 & 20m	34m
Intermediate Angle	Above Haul Road	29.7	21.3	21.3	21.3	19.5	23.2
	Below Haul Road	35.2	35.2	35.2	33.7	42.3	34.2

- Notes:
1. 1979 design for upper batters was for 5m berms spaced at 12m vertical intervals, graded to run water at 1 in 125. Batter angle was 1 in 1¼ or ~37°. The grade was later steepened to 1 in 100.
 2. At some stage, the grading was reversed to run water to the west. This combined with the varying lengths of the berms resulted in vertical spacing necessarily departing from the original 12m.
 3. As a practical result of the BFP Consultants recommendations, a uniform batter angle of 30° was adopted, and the berm was made variable (that is, greater than 5m) to enable an overall batter angle <25° to be achieved as the height varied with the natural surface topography.
 4. In 2005 it was decided to reverse the drainage direction of the haulage berm again. This was achieved by placing fill on the western end of the berm. It was felt that this was safe as there would still be no significant amount of clay below the berm.
 5. It was found impractical to maintain drainage on the berms below the haulage level. The resulting batter erosion could be effectively repaired as the natural angle of repose of local material is flatter than the 45° batter angle. A slope of 1 in 1.5 or ~33.7° was adopted for planning purposes.

Figure 13.



8.5 Soils Management

Soil management is seen as a critical element of the mine rehabilitation process and is outlined in more detail in the Mine Rehabilitation section of this plan. Essentially, topsoil contains much of the seed required for species return on newly rehabilitated areas and as such, is generally directly transferred from the strip area to the rehabilitation area, as stockpiling will decrease seed viability. Subsoil, both rhizome and rhizome-free layers, can be stockpiled as seed is not present in these layers.

Generally there is currently little need for stockpiling of materials on the mine site and this is anticipated to be the case into the future. Non-rehabilitation stockpiling is usually associated with road making materials, again on a limited basis.

8.6 Water Management

Mine De-watering System

Mine drainage from rainfall and groundwater is currently managed through a series of drainage berms, temporary holding sumps and constructed drains to manage water to the main sump area located at the lowest point in the current operational area in the mine site. This location of the main sump varies over time and this will likely be the basic concept used in the future mining stages. Water is then pumped from the main sump to holding pondages adjacent to the mine, and is used as either mine fire service water or as make up water used in the adjacent power station.

Surface Water

Surface water is generally prevented from entering the mine area in an attempt to minimize subsequent management issues, such as erosion and additional pumping. Where this is not possible, provision must be made for erosion and other management control issues.

Mine Fire Service System

The current mine fire service system is based around an elevated holding dam (Fire Service Dam) located to the north of the current mining area. The fire service dam is filled with water pumped from the mine dewatering system and is at sufficient elevation to provide enough gravity head pressure to act as the emergency fire service ring main for the mine buildings, including the mine workshop, lunch room, amenities and offices. The water is also used for equipment wash down purposes and for use by the water cart for dust suppression and general fire fighting purposes.

An alternative Fire Service System arrangement will only need to be made when Stage 6 of the mining sequence is approached. Further design and planning will be required when this eventuates.

Discharge Points

All discharge points are currently covered by an approved EPA licence and any additional future discharge points will need to be covered by similar EPA licensing.

8.7 Road and Stream Infrastructure

Approvals

Approvals for any modification works to the adjacent stream systems will need to be sought from Southern Rural Water and no works can be undertaken prior to gaining that approval.

Waterway Diversions

Prior to coal mining by Alcoa, starting in 1969, Salt Creek was diverted through a constructed diversion channel to the north. The works were to enable continuity of access to coal reserves that were located under the wide valley section of Salt Creek, just prior to the stream meeting Marshy Creek. The combined flow from the creeks then continues through Anglesea as the estuarine Anglesea River.

As mentioned previously, there is a possibility of either having to re-divert the current diversion channel as part of the mine sequencing Stage 3 or to provide some type of adequate crossing that recognizes both peak creek flows and the size of equipment that would be required to use the crossing. The latter proposition would be required in the event that Stage 3 was abandoned and work continued through Stages 4, 5 & 6. A similar crossing currently exists across Marshy Creek as part of the coal haul road system that links the mine to the Primary Crusher.

9 MINE REHABILITATION AND CLOSURE PLAN

9.1 Introduction

The mine rehabilitation and mine closure elements are detailed in the Alcoa Anglesea Land Management Plan and the Alcoa Anglesea Site Closure Plan and are attached to the Work Plan as Appendix F and G respectively.

9.2 Rehabilitation Objectives and Issues

The current rehabilitation objective for the Anglesea site is to establish a diverse, self-sustaining heathy woodland ecosystem that maintains or enhances the surrounding land use such as conservation, recreation and other natural values.

The method outlined on the following pages provides the principle strategy of mine rehabilitation at Alcoa Anglesea where possible. An alternative strategy may be required in particular circumstances where, for example, there is an absence of topsoil for direct return, the slope is too steep to hold topsoil placement or the slope will be inundated with water. Rehabilitation then may employ the placement of subsoil as a growth medium, the application of a seed mix and/or hydro mulch with supplementary planting of tube stock. Irrespective of the method employed, all strategies will strive to utilise indigenous species and provide habitat functionality contiguous with the surrounding heathy woodland.

The heathland vegetation at Anglesea is established on predominantly sandy soils. These soils are characteristically low in nutrients, and together with limited water availability and unlimited light, growing conditions will only be slightly altered by the first succession of plant species. Therefore, the species that first establish on the site will control the long-term vegetation of the site. For this reason as many species as possible need to be introduced to the site at the establishment phase of mine rehabilitation.

9.3 Mine Closure

The Alcoa Anglesea Site Closure Plan has been developed to outline the decommissioning and rehabilitation of both the Power Station and the Mine. The aim of the plan is to inform interested parties such as state government agencies, local government and community groups on how unwanted facilities and infrastructure will be decommissioned and the areas currently open for mining, roads and infrastructure, rehabilitated and returned to a land use agreed with the State and community. It is also the operating planning tool to be used by Alcoa personnel during the closure of the mine.

9.4 Mine Closure Concept

Due to the extensive nature of the time period covered by this Work Plan, future land uses can only be described as conceptual.

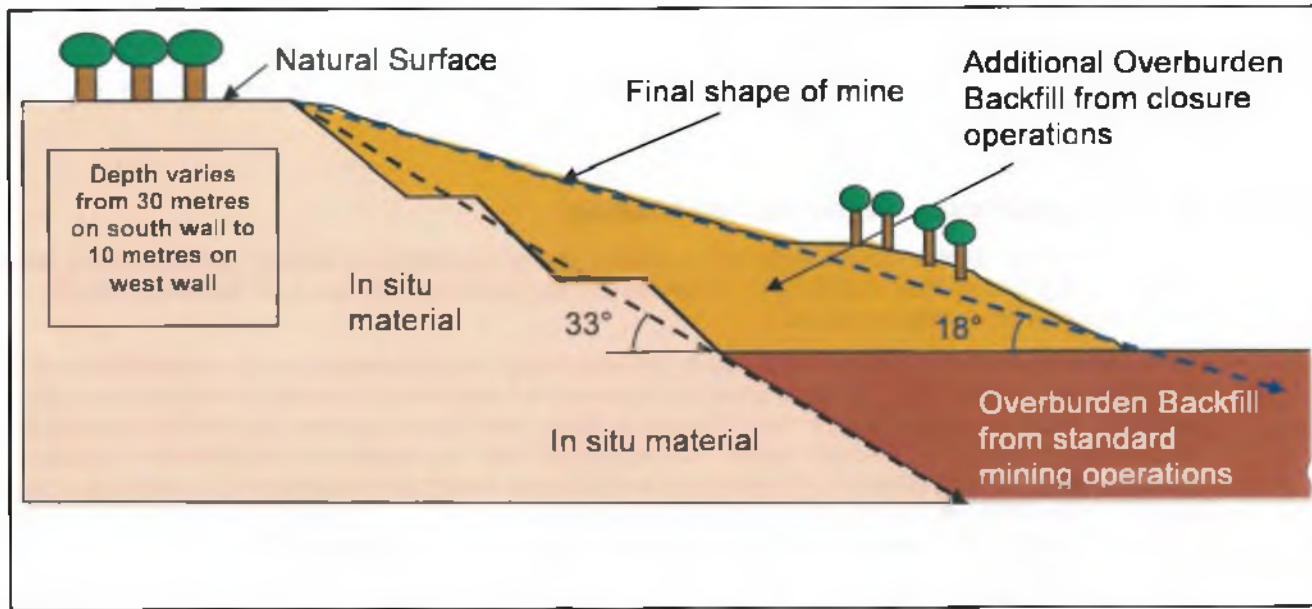
It is understood that the land leased to Alcoa under the provisions of the *Mines (Aluminium Agreement) Act 1961* will most probably be handed back to the Victorian State Government.

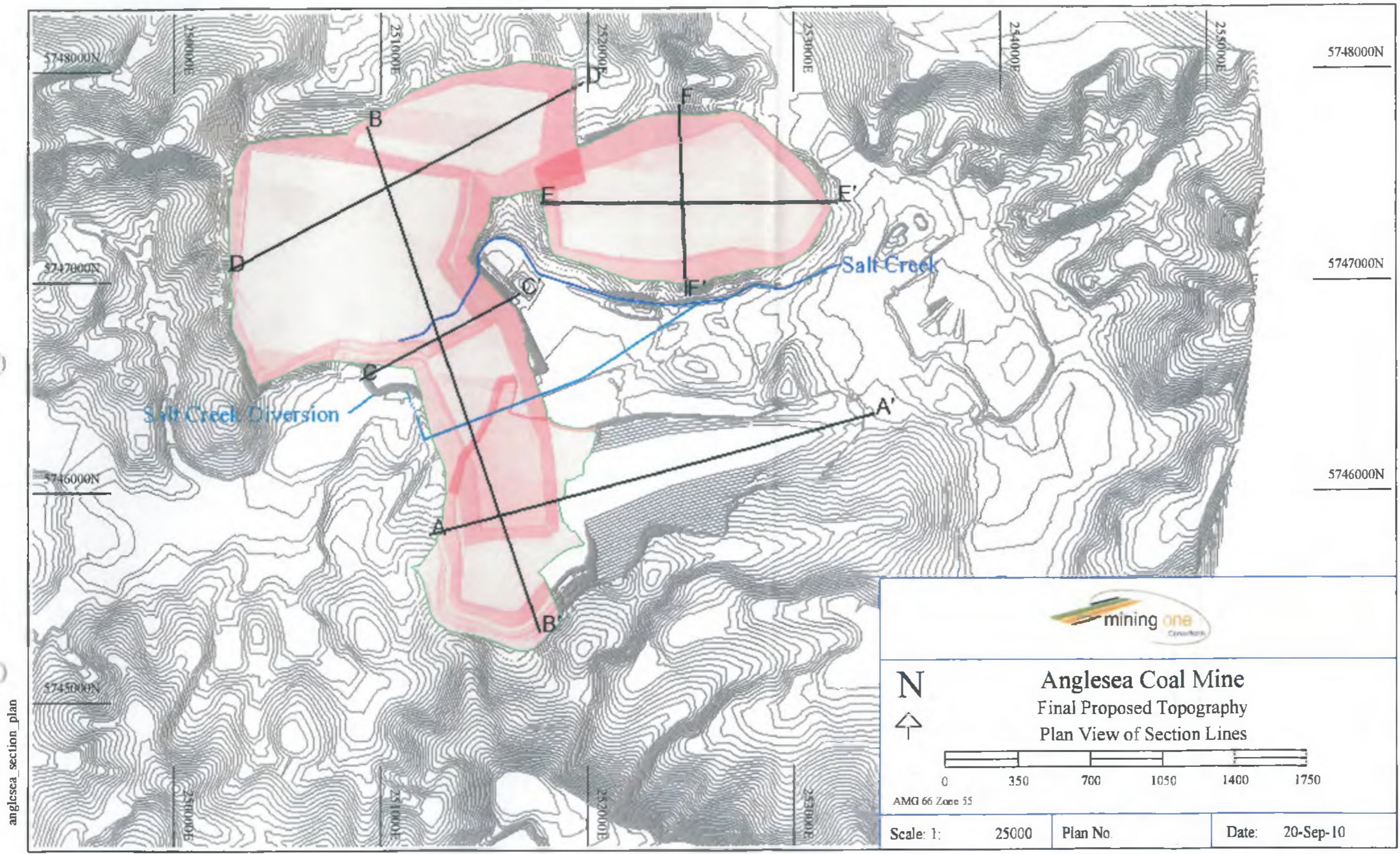
Whilst it is emphasised that no firm decisions have been made regarding future land use, there is potential for the land used by Alcoa at Anglesea to be re-used for a variety of commercial, conservation, educational and recreation activities. It is envisaged that Alcoa would not be directly involved in these future land uses beyond facilitating their implementation as an integral part of the decommissioning, rehabilitation and closure process.

Further discussions will be conducted by Alcoa representatives with relevant State and local government agencies and other interested parties, prior to finalisation of the decommissioning process, to ensure feasible and sought-after land use opportunities are not lost.

The 2061 closure plan generally depicts all high batters being completely filled and redeveloped into rehabilitated slopes that feed down to a flooded void and valley system that disguises the extraction of the coal volumes.

Figure 14 - Typical Cross Section of completed rehabilitation

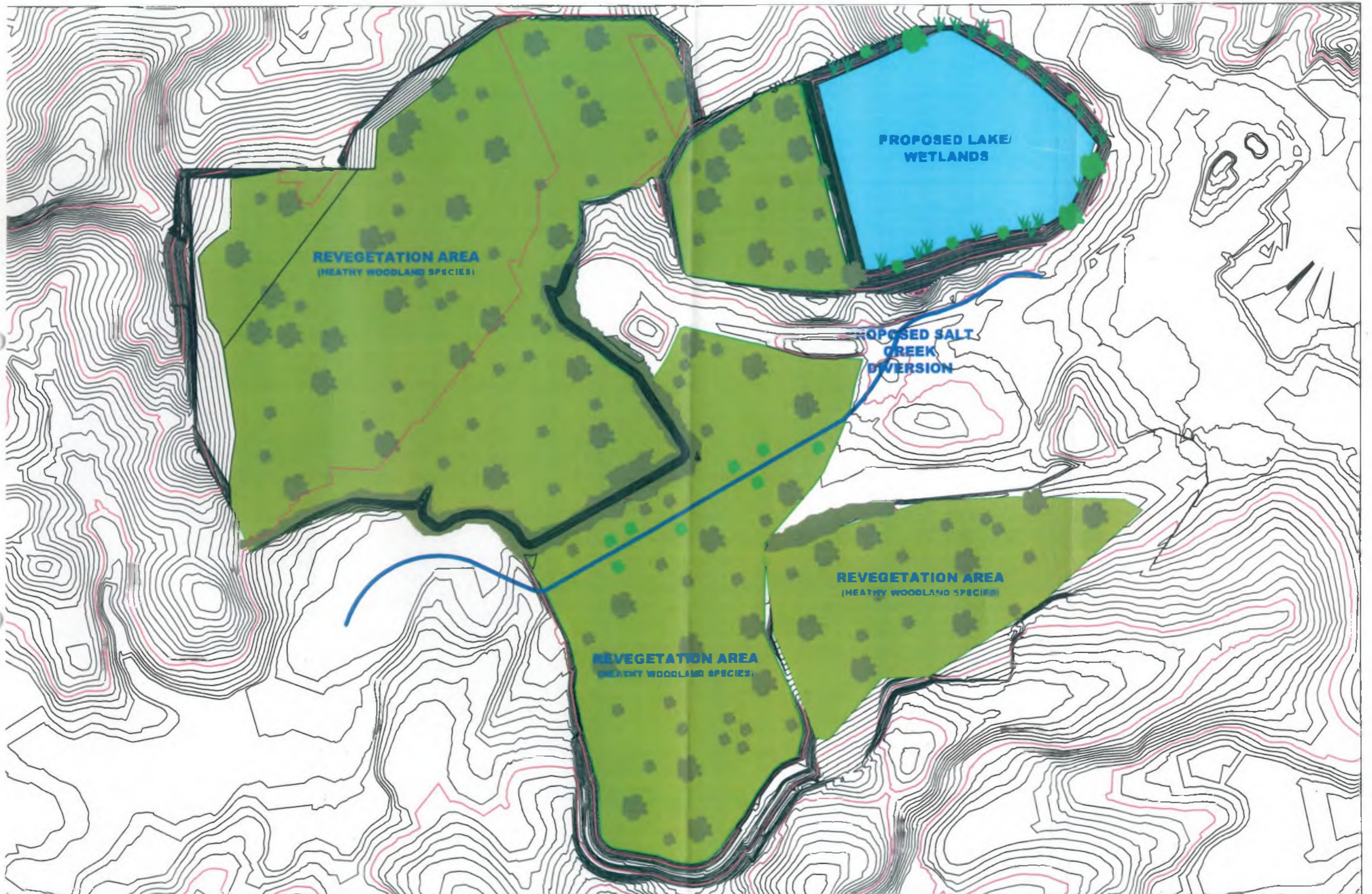




anglesea_section_plan

SURPAC - Mining One Pty Ltd

Figure 15

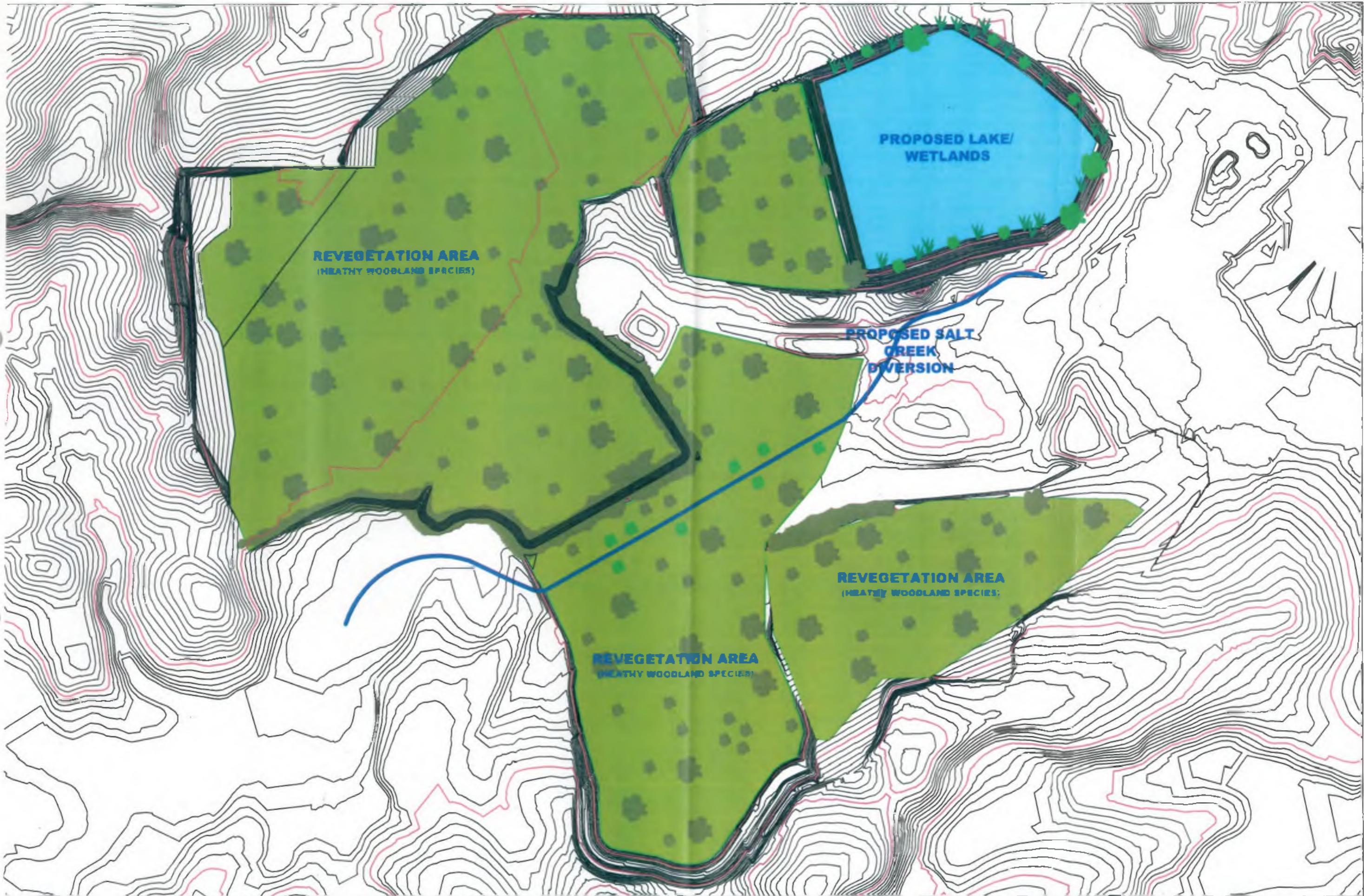


LEGEND

	Topography Contour
	Revegetation Area
	Proposed Salt Creek Diversion
	Proposed Lake/Wetland

CLIENT	ALCOA LTD - ANGLESEA POWER STATION
	Mining One Pty Ltd

Proposed Rehabilitation Plan		
JOB NO.	1347_G	SCALE 1:1000 (A3)
FILE	Rehabilitation Plan.dwg	DATE 27 Jan 2011
		FIG. 16

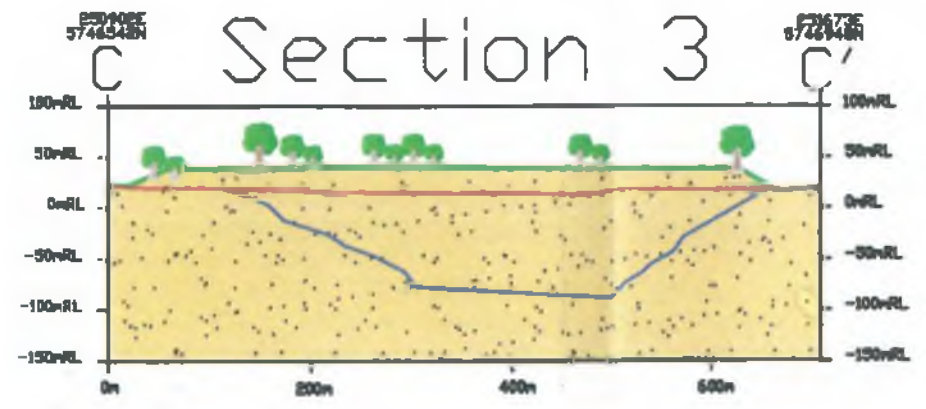
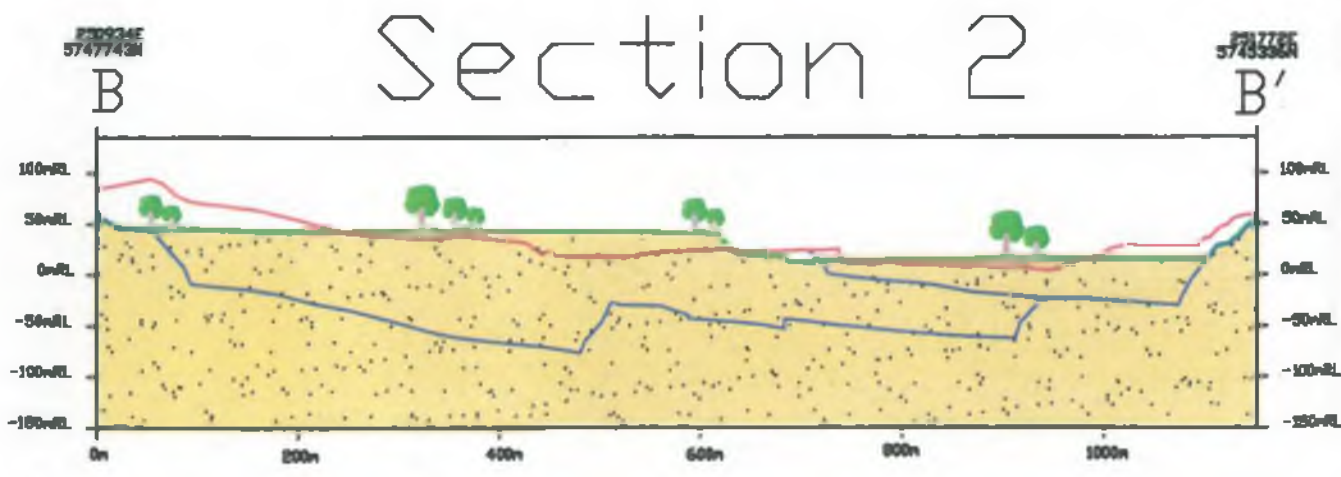
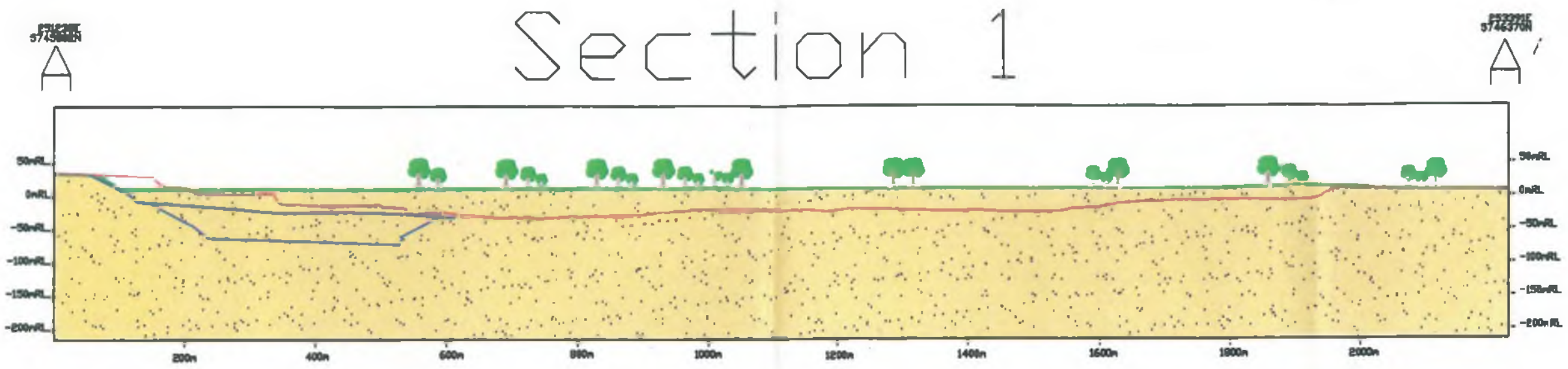


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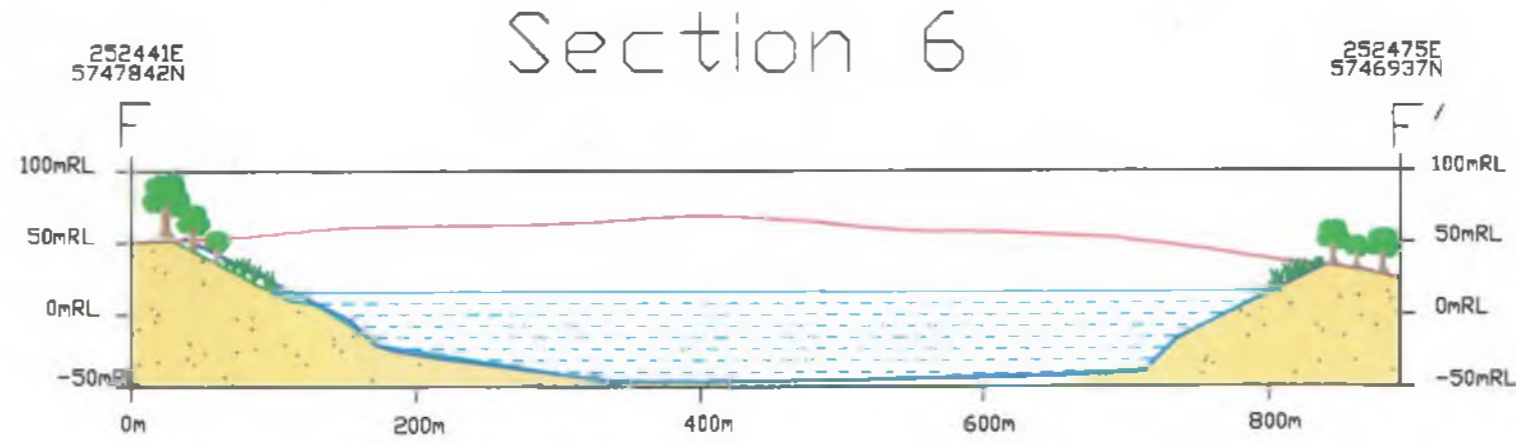
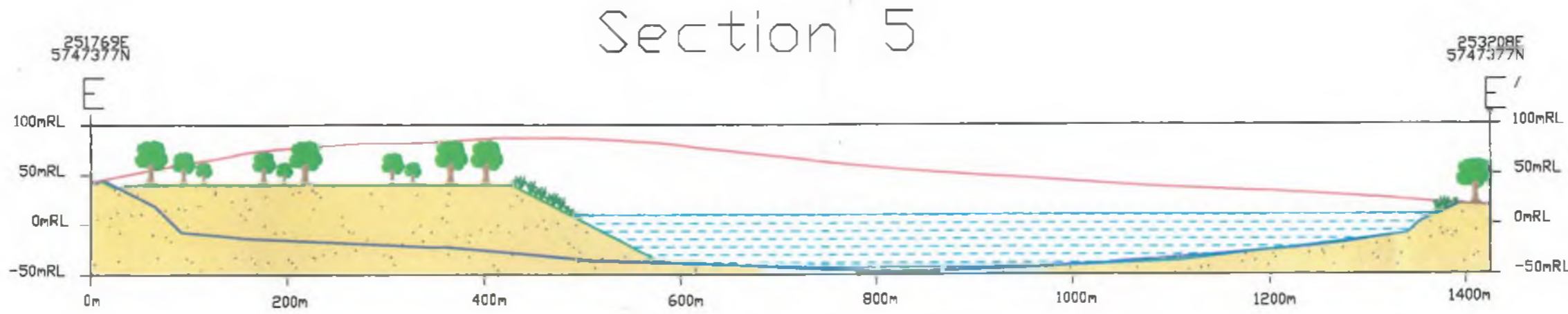
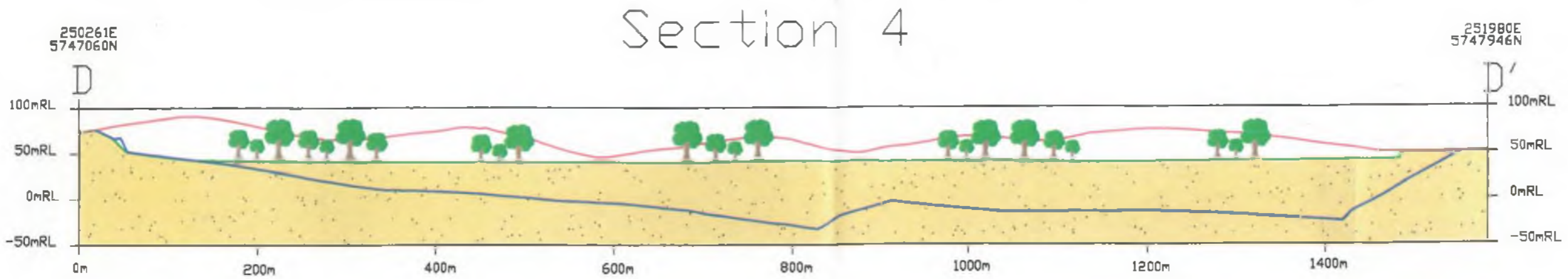
	Topography Contour
	Revegetation Area
	Proposed Salt Creek Diversion
	Proposed Lake/Wetland

CLIENT	ALCOA LTD - ANGLESEA POWER STATION
	Mining One Pty Ltd

Proposed Rehabilitation Plan	
JOB NO.	1347_G
SCALE	1:1000 (A3)
FILE	Rehabilitation Plan.dwg
DATE	27 Jan 2011
FIG. 16	



<p>LEGEND</p> <ul style="list-style-type: none"> Current Topography Final Topography Pit Outline 	<p>CLIENT ALCOA LTD - ANGLESEA POWER STATION</p>	<p>Proposed Rehabilitation Profile</p>	
	<p>Mining One Ply Ltd</p>	<p>JOB# 1347_G</p> <p>FILE Anglesea_Rehab_Sections1-3.dwg</p>	<p>SCALE 1:100</p> <p>DATE 14 Sept 2010</p>



LEGEND

	Current Topography
	Final Topography
	Pit Outline
	Lake/Wetland

CLIENT
ALCOA LTD - ANGLESEA POWER STATION

Mining One Pty Ltd

Proposed Rehabilitation Profile

JOB#	1347_G	SCALE	1:500 (A3)
FILE	Anglesea_Rehab_Sections4-6 v2.dwg	DATE	25 Jan 2011

FIG. 18

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Accreditation and Standards

The Environmental Management System is accredited to ISO14001 (1996). The ISO 14001 scope covers the power station, mine and the Alcoa component of the management of the Anglesea Heath.

10.2 System Procedures

The Anglesea Environment Management System encompasses a range of elements that cover:

- Policy
- Planning
- Implementation & Operation
- Checking & Corrective Action
- Management review

The Anglesea Environment Management System as part of the ISO14001 certification maintains a register of standards and statutory obligations that apply to Alcoa's operations.

A legal counsel system covers all the acts potentially relevant to Anglesea. An external legal firm maintains the system and updates are communicated to environmental personnel quarterly to ensure the sites are kept up to date with new legislation and standards.

10.3 Identification of Significant Aspects & Impacts

Alcoa's environmental policy, improvement plans and management programs are developed to ensure that activities at Anglesea are managed to minimise impacts on the environment. In developing the Environmental Management System a systematic review of all operations was carried out to identify potential environmental impacts.

A risk assessment process was used to rank the environmental aspects and impacts according to potential environmental impact, frequency or likelihood of occurrence, legislative or other requirements, stakeholder concerns (including community and employees) and financial liability.

All potential impacts ranked as 'significant' must have systems in place to mitigate or minimise the impact on the environment.

The potential significant environmental impacts relevant to land management include, but are not restricted to,

- Spread of Phytophthora due to the movement of equipment and soil and drainage of water from Phytophthora-affected to Phytophthora-free areas;
- Disturbance of areas that have heritage values, rare and endangered species and ecosystems;
- Reduced localised biodiversity due to clearing and loss of habitat;
- Increased stream turbidity due to runoff from disturbed areas; and
- Unsustainable revegetation due to ineffective rehabilitation techniques.

The Aspects and Impacts Register is reviewed at least annually and as the future mining operation develops, the continuous improvement and review processes will ensure the Register is kept current.

10.4 Environmental Review

In 2006, Alcoa commissioned Sinclair Knight Merz (SKM) to review three distinct mining options at Anglesea, each to enable continuity of coal supply past 2016 until 2030 (known as the Alcoa Anglesea Lease Extension: Review Stage 1). These three mining options now form the basis of the total mining sequence outlined in this Plan and ensure sufficient available coal reserves out until at least 2061. Even though the boundaries used in this review work are not exactly the same, they are largely representative of the boundaries used within this Work Plan, and the collected data and recommendations are an important contribution into the future management required for long term mining strategy.

The review process was generally based around Environmental Effect Statement (EES) guidelines and incorporated the following aspects:

Physical and Ecological Assessments

- Greenhouse gas assessment
- Landform, Geology and Soils
- Groundwater extraction
- Riverine and Water Quality
- Aquatic Ecology
- Water Use
- Terrestrial Biodiversity and Conservation

Human Communities

- Land Use and Planning
- Air Quality and Dust Emission Assessment
- Noise and Vibration
- Roads, Traffic and Transport
- Aboriginal and Post settlement Cultural Heritage Assessment
- Social Impact assessment
- Economic and Tourism Impact Assessment

The review also covered other aspects such as planning and legal issues, significance of groundwater extraction impacts and a community consultation process.

A further, more comprehensive review was undertaken in August 2007 (Alcoa Anglesea Lease Extension: Review Stage 2) and was focused wholly on one of the identified options, that being lower seam predominantly under the current mining area.

10.5 Water Management

Surface Water

All surface water currently collected in the mine area resulting from rain fall within the mining catchment area, is managed to the mine sump area (generally located at the deepest working section of the mine) and then pumped via an established pipeline to holding ponds adjacent to the mine area. These reclamation ponds are used to manage water quality issues prior to the water being pumped for use at the adjacent power station. Any excess water overflow issue are subject to EPA licence discharge limits.

This basic process is not expected to alter significantly with the various future mine stages. The mine sump will continue to be moved to various locations, generally located in the deepest section of the working mine. Any issues with external water overflows from the mine surface holding ponds would be subject to EPA licence conditions.

Groundwater

Due to the depth of the current mine, shallow aquifer groundwater accumulates at the mine sump area and along with any accumulated surface water, is also pumped from the sump area to holding ponds adjacent to the mine area, as above.

The groundwater component being pumped from the mine is subject to Groundwater Licence conditions applied by Southern Rural Water. Essentially the mine sump is assessed as extracting groundwater, much as if it were a well bore and is part of the licensing applied to the various groundwater bores located adjacent to the power station and used to extract process water for power station use.

Once again, this basic process is not expected to alter significantly with various future mine stages. It is expected that mining of some of the lower coal seam deposits will generate increased volumes of groundwater which will be managed to ensure licence limits are complied with. Similarly, the varying depths of the mine stages will need evaluation to determine if the mine sump retains the requirement of having to be compliant with groundwater licensing.

10.6 Hydrocarbon and Waste Management

The existing fuel, oil and grease facilities are all fully bunded and are located primarily at the mine diesel tanks and at the mine workshop. Bunding is not only supplied for holding tanks, drums and other containers but also covers the distribution areas as well. All earthmoving equipment is fitted with dry-break connections to minimize contamination and spillage issues. Currently, all filters are crushed and the resultant oils treated as waste oil and the metal filters recycled.

All waste oils and heavily contaminated materials are collected by an EPA licensed contractor.

The current facilities and methods are seen as sufficient to cover future operations.

10.7 Dust Control

Currently, dust suppression is managed by water cart and redistribution of water from the Fire Service Dam and periodically from other available water sources. Dust suppression is managed using a hierarchy of controls, which are adequate for most conditions with the exception of extreme north westerly winds.

Monitoring of dust along the mine's southern boundary is undertaken annually and as the mine progressively moves further away from the Anglesea boundary, it is expected that any potential impacts will also reduce.

All boundary dust issues arising from mining activities shall be managed to be in compliance with the State Environment Protection Policy (Air Quality Management) – SEPP (AQM).

10.8 Noise Control

In general, the southern boundary of the mining lease follows a natural ridgeline that gives rise to natural acoustic shielding for the township of Anglesea. Mine sequencing has been developed over time to preserve this aspect. Also in recognition of the mine location with respect to the township of Anglesea, operating hours have been generally restricted to a day shift only regime. Additionally, all equipment has been required to meet stringent noise requirements and is maintained in good working order to retain those qualities.

Over time, there have been several noise studies conducted at the mine to both measure the current noise impacts on the surrounds and to model the expected impact as the mine continues to develop.

It is expected that the current overburden mining area and the areas until 2014 will continue to have minimal impact on the existing background noise levels at the residential boundaries.

As the mine develops further northward and away from the township of Anglesea, the distance will help reduce the noise, however, further noise studies will be required due to the reduced likely effectiveness of the acoustic shielding provided by the natural ridgeline boundary described above.

All boundary noise issues arising from mining activities shall be managed to be in compliance with the State Environment Protection Policy N-1 Noise Policy ("SEPP N-1").

10.9 Cultural Heritage Management Plan

In compliance with the Aboriginal Heritage Regulations 2007, underpinned by the Aboriginal Heritage Act 2006 (Vic) (AH Act), Stage 1 of the sequential mine plan contained in this Work Plan, has an approved Cultural Heritage Management Plan (CHMP) : Plan ID 10885.

For the remaining Work Plan area, Alcoa Anglesea commits to obtaining approval under Part 4 of the AH Act, before any mining activity authorised by the Work Plan is undertaken (except where the mining activity is within an area that has been subject to significant ground disturbance).

10.10 Audit

Compliance and auditing is achieved via the System Audit Procedure. Internal auditing is completed using the Alcoa Self Assessment Tool (ASAT). External verification is conducted by ISO14001 auditors.

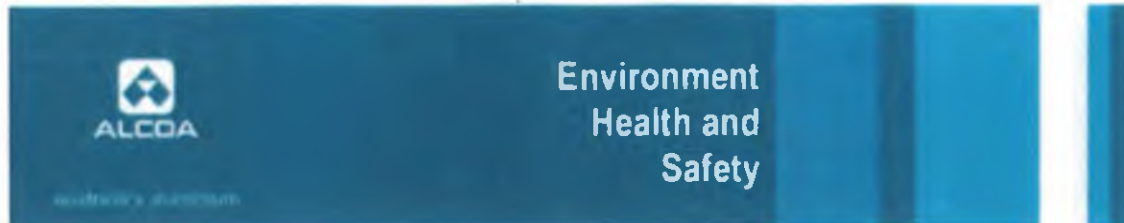
10.11 Environment Improvement Plan

Alcoa prepares a regular Environment Improvement Plan in relation to Anglesea. An Environment Improvement Plan (EIP) is seen as an effective tool for guiding a company's environmental management through a process of continuous improvement. The EIP is intended to give a public commitment to improving environmental performance, by giving an overview of Alcoa's operations at Anglesea, the improvements accomplished in the past and the program of current initiatives.

The EIP is currently a voluntary initiative, and the current EIP is included at Appendix A.

The current EPA waste discharge licence is included at Appendix B.

10.12 EH&S Policy



EHS VALUE

We work safely in a manner that protects and promotes the health and well-being of the individual and the environment

EHS POLICY

It is Alcoa's policy to operate worldwide in a safe, responsible manner that respects the environment and the health of our employees, our customers, and the communities where we operate. We will not compromise environmental, health or safety values for profit or production.

All Alcoans are expected to understand, promote, and assist in the implementation of this policy and the accompanying principles.

EHS PRINCIPLES

- We value human life above all else and manage risks accordingly.
- We relentlessly pursue and continually improve EHS systems and processes to achieve an EHS incident-free workplace.
- We do not compromise our EHS value for profit or production.
- We comply with all laws and set higher standards for ourselves and our suppliers where unacceptable risks are identified.
- We support pollution prevention and sustainable development by incorporating social responsibility, economic success, and environmental excellence into our decision-making process.
- We measure and assess our performance and are open and transparent in our communications.
- We supply and use safe and reliable products and services.
- We use our knowledge to enhance the safety and well-being of our communities.
- We are all accountable for conforming with and deploying our EHS value and principles.

At Anglesea Power Station, we will demonstrate our commitment to this EHS policy and Principle Statement by progressively reducing our environmental, health and safety impacts and the intensity of our resource and energy use by participating in programs to:

- Ensure environmental, health and safety factors are integrated into business planning through the Alcoa Business System as part of the implementation of comprehensive environmental and safety management systems.
- Systematically address key environmental impacts for the power station and mine, such as land management issues, equipment noise, air quality, process water usage and discharge, energy efficiency and greenhouse gas emissions. Working together to actively care for ourselves, our team-mates and other people in our area, our neighbours and the environment.
- Work together to care for ourselves, other people in our work area, and our neighbours.
- Actively share our improvements and achievements with the station, other Alcoa locations and with the community in which we operate.
- Engage and consult with employees and the community on health and safety and environmental issues.

Stephanie Pearce
Location Manager
Anglesea Power Station

May 2010

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11 COMMUNITY ENGAGEMENT PLAN

11.1 Introduction

Alcoa has undertaken community engagement activities throughout the life of the Anglesea operations. These activities are designed to build relationships with the local community and interested stakeholders to promote dialogue and transparency about the operations. In the earlier years of the Anglesea operations this was done through a community sponsorship program and through conversations with the mining and power station managers. Since the late 1990's, and in line with growing community interest in consultation processes, the business has become more sophisticated with its community engagement activities and these are now well developed and have proven to provide an efficient and structured means of communication with local stakeholders.

Community engagement is a core business of Alcoa. All sites nationally have a dedicated Community Relations Officer who is supported by colleagues at the State and National offices to implement community engagement activities. A summary of key elements of Alcoa's Community Engagement Framework for Anglesea follows:

11.2 Stakeholders

Alcoa has developed relationships with its neighbours and other stakeholders. A summary of stakeholders identified as having an interest in the Alcoa Mine plan as described in this Work Plan include:

- Local landowners and residents.
- Affected utility and infrastructure owners.
- Employee and Industry groups.
- Indigenous community.
- Local Government
- Local and regional services and businesses.
- Interest groups and organisations.
- Government agencies.
- Politicians.
- Wider community and the general public.

In general, Alcoa's approach to consultation at Anglesea has been to prioritise contact with local stakeholders and those identified as being directly affected by the operations. This does not and has not excluded individuals or groups that fit outside this demographic but present an interest in Alcoa's business. The following table details Alcoa's Stakeholder Analysis:

Table 12.1 – STAKEHOLDER ANALYSIS

Stakeholder		Issues/Positives	Concern	Influence
Local Government	Surf Coast Shire	<ul style="list-style-type: none"> • Rates and services • Planning (community and infrastructure) • Road maintenance and upgrades • Employment • Emergency Services • Funding of community partnerships • Environmental issues • Extension of Anglesea operations life 	High	High
	City of Greater Geelong	<ul style="list-style-type: none"> • Employment (ongoing sustainability of PTH) • Regional issues around overall community and socio-economic wellbeing 	High	High

Stakeholder		Issues/Positives	Concern	Influence
State Government	Minister for Minerals and Energy	<ul style="list-style-type: none"> Extension of Mines Aluminium Agreement Act Employment at Anglesea operations Employment at Alcoa Point Henry operations Energy security in Victoria 	High	High
	Minister for Environment	<ul style="list-style-type: none"> Environmental Impacts (air, waste, water and land) Potential activism 	High	High
	Minister for Roads	<ul style="list-style-type: none"> Traffic Issues Roads 	High	High
	Treasurer	<ul style="list-style-type: none"> Ongoing viability of our business and associated benefits for the State of Victoria 	High	High
	Minister for Manufacturing, Exports and Trade; Minister for Employment and Industrial Relations	<ul style="list-style-type: none"> Ongoing viability of our business and associated benefits for the State of Victoria Victoria's export market 	High	High
	Minister for Regional Cities	<ul style="list-style-type: none"> Ongoing viability of business and associated benefits for regional Victoria 	High	High
Commonwealth Government Departments	Department of the Environment and Heritage (Environment Australia)	<ul style="list-style-type: none"> EPBC – Environment Protection and Biodiversity Conservation Impact on threatened & migratory species 	High	High
State Government Departments	Department of Primary Industries	<ul style="list-style-type: none"> Work plan Impact on natural environment Anglesea mine operations Rehabilitation Mining licence and work authority Extension of Mines Aluminum Agreement Act 	High	High
	Department of Sustainability & Environment	<ul style="list-style-type: none"> Work plan Impact on natural environment Vegetation removal Protection of environmental values Flora and Fauna 	High	High
	Department of Treasury and Finance	<ul style="list-style-type: none"> Sustainability of ongoing operations Royalties Payroll Tax State exports 	High	High
	Environment Protection Authority	<ul style="list-style-type: none"> Compliance and legislation to protect environmental values Air Quality Assessment Noise Assessment Potential activism 	High	High

Stakeholder		Issues/Positives	Concern	Influence
	Department of Innovation, Industry and Regional Development	<ul style="list-style-type: none"> • Employment • Sustainability of ongoing operations 	High	High
	Parks Victoria	<ul style="list-style-type: none"> • Anglesea Heath Management 	Medium	Medium
	VicRoads	<ul style="list-style-type: none"> • Road traffic from Anglesea Mine to Geelong 	Low	Medium
	Barwon Water	<ul style="list-style-type: none"> • Water security • Impact on groundwater and licensing • Existing channel infrastructure • Impact on existing pipeline and borefields 	High	Medium
	Southern Rural Water	<ul style="list-style-type: none"> • Protection of environmental values • Relocation and restoration of surface water flows • Salinity / Groundwater • Native vegetation 	High	Medium
NGO's	Geelong Environment Council	<ul style="list-style-type: none"> • Impact on natural environment • Vegetation removal • Protection of environmental values • Anglesea Heath Management • Rehabilitation • Eventual land use 	High	High
	Anglesea and Aireys Inlet Society for Protection of Flora and Fauna (ANGAIR)	<ul style="list-style-type: none"> • Impact on natural environment • Vegetation removal • Protection of environmental values • Anglesea Heath Management • Rehabilitation • Eventual land use 	High	High
	Surf Coast Energy Group	<ul style="list-style-type: none"> • Climate change • Alternative energy development • Preservation of the Anglesea Heath 	High	Low
	Alcoa Community Partners (approx 30 in Anglesea and 120 across the region)	<ul style="list-style-type: none"> • Loss of funding if Alcoa is not operating 	Medium	Medium
	G21 Alliance	<ul style="list-style-type: none"> • Regional Development • Employment 	High	High
	Victorian National Parks Association (VNPA),	<ul style="list-style-type: none"> • Impact on natural environment • Vegetation removal • Protection of environmental values • Anglesea Heath Management • Rehabilitation • Eventual land use 	High	Medium
	Australasian Native Orchid Society (ANOS)	<ul style="list-style-type: none"> • Impact on natural environment • Vegetation removal • Protection of environmental values • Anglesea Heath Management • Rehabilitation 	High	Medium

		<ul style="list-style-type: none">• Eventual land use		
	Recreational users e.g. 4WD & trail bike groups	<ul style="list-style-type: none">• Recreational access• Eventual land use• Future mine planning	Medium	Medium

Stakeholder		Issues/Positives	Concern	Influence
Indigenous Affairs	Aboriginal Affairs Vic (AAV)	<ul style="list-style-type: none"> Cultural Heritage Management Plan 	High	Medium
	Registered Aboriginal Party	<ul style="list-style-type: none"> Cultural Heritage Management Plan 	High	Medium
Local MP's - State	Member for Polwarth	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations Benefit to local communities 	High	High
	Member for Bellarine	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations 	High	Medium
	Member for South Barwon	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations Benefit to local communities 	Medium	Medium
	Upper House Member for Western Victoria	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations 	Medium	Medium
	Member for Geelong	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations 	High	Medium
Local MP's - Federal	Member for Corangamite	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Benefit to local communities 	Medium	High
	Member for Corio	<ul style="list-style-type: none"> Anglesea Operations Employment Environmental issues Impact on Alcoa Point Henry operations 	Medium	Medium
Communities	Anglesea & Surf Coast district	<ul style="list-style-type: none"> Noise & Dust Employment Use of local businesses Land values Amenity perceptions 	High	High
	Geelong District	<ul style="list-style-type: none"> Employment Impact on Point Henry operations 	Medium	Medium
Landholders - neighbours		<ul style="list-style-type: none"> Noise & dust generation Visual impacts Rehabilitation Eventual land use Property values 	High	Medium
Landholders - with visual of mine		<ul style="list-style-type: none"> Visual impact of mine area Eventual land use Property values 	High	Medium
Service Providers	Rural Ambulance Victoria	<ul style="list-style-type: none"> Provision of emergency services Access to site Transport safety 	Medium	Medium
	Victoria Police	<ul style="list-style-type: none"> Emergency service management Employee activities 	Medium	Medium
Stakeholder		Issues/Positives	Concern	Influence

	Country Fire Authority - Anglesea	<ul style="list-style-type: none"> • Fire suppression and prevention • Possible assistance at fires – mining, water equipment and/or manpower • Funding of CFA activities 	Medium	Medium
	State Emergency Service	<ul style="list-style-type: none"> • Emergency service provision 	Medium	Medium
	Suppliers	<ul style="list-style-type: none"> • Potential loss of business 	High	Medium
Media	Various local and State media	<ul style="list-style-type: none"> • Socio-economic matters <ul style="list-style-type: none"> ○ Environmental Issues ○ Transport Issues ○ Water Issues ○ Rehabilitation ○ Contributions to community 	Medium	Medium
Interest Groups and organisations	Union Organisations	<ul style="list-style-type: none"> • Employment at Anglesea operations • Employment at Alcoa Point Henry operations 	Medium	High
	Anglesea Primary School	<ul style="list-style-type: none"> • Noise & Visual impacts • Environmental Issues • Perceptions around continued operation 	Medium	Medium
Investors	Shareholders	<ul style="list-style-type: none"> • Potential loss of income 	Medium	Medium

11.3 Engagement Methods

Methods of engagement that Alcoa has and will continue to employ in relation to our operations include:

- Media releases and advertising in local newspapers associated with milestones and activities.
- Company magazines (electronic and print).
- Usage of the Alcoa website and the Alcoa Anglesea microsite
- Alcoa personnel available to speak with, meet with or email interested stakeholders.
- Community Consultation Network meetings (held in the local community since 2001).
- Free tours program to show interested stakeholders our operations.
- Community flyers distributed as required via local post offices.
- Inserts and stories into local community newsletters.
- Letters to key stakeholders.
- Email to key stakeholders.
- Briefings of local politicians, shire officers and interest groups.
- Use of a community survey to gauge community sentiment.
- Speaking to community groups by request (such as Rotary, Lions and sporting clubs).
- Training available to key Alcoa personnel in International Association for Public Participation (IAP2).

11.4 Identifying Community Attitudes and Expectations

Alcoa works with an external service provider to conduct a bi-annual community perception survey to identify issues and preferred methods of engagement in the local community. The issues are identified and reported to Executive Management for analysis.

The Anglesea Community Relations Officer corresponds and meets regularly with key local stakeholders to discuss issues relating to our operations.

The Community Consultation Network meetings are advertised in the local newspaper, held after hours to allow people who work to attend, and are open to any interested person to come and discuss matters of interest regarding our operations.

The Anglesea sponsorship program is an effective way of understanding community activities and priorities as it allows the company to build relationships with local groups as well as understand their priorities.

11.5 Providing Information in Relation to Alcoa's Activities

Methods for dissemination of information in relation to Alcoa's activities include:

- Regular coverage in the company magazines. Printed and electronic versions available.
- Media release on key mining milestones. Mainly disseminated by electronic mail. Copies to key local stakeholders and website.
- Briefings program to local politicians. Structured program for local councillors and Members of Parliament (MPs) and available at request.
- Use of company website.
- Community Consultation Network meetings
- Engagement with Anglesea Community Relations Officer

11.6 Community Feedback on Alcoa's Activities

Alcoa encourages feedback on its activities via the following:

- Anglesea Community Relations Officer employed for encouraging community feedback and prompt answering of any queries.
- Community Consultation Network meets regularly and includes representatives of the community, key regulators and government agencies and, interest groups.
- Bi-annual Stakeholder Perception Survey conducted to gauge community attitudes and issues relating to Alcoa's operations
- Generic email address from company website for queries (angleseaps@alcoa.com.au)

The primary methods of engagement with stakeholders are managed through the work of the Community Relations Officer. This role is responsible for Anglesea's stakeholder relations program, sponsorship program, government relations program, website management, media management and tours program.

Alcoa also has a voluntary Environment Improvement Plan (EIP) for Anglesea that aims to engage stakeholders with an interest in Alcoa's environmental performance. It plays an active role in setting priorities for Alcoa Anglesea to follow and for where Alcoa should direct efforts to minimise environmental impacts at Anglesea. The EIP, Community Consultation Network meetings and the monthly environment report (e-newsletter) are the primary tools for stakeholder engagement on environmental issues related to Alcoa's Anglesea operations.

11.7 Analysing Community Feedback/Considering Concerns/Expectations

Alcoa approach to feedback from the community is to provide prompt responses to all requests for information or analysis of concerns after referral to our technical experts or managers.

Community Consultation Network meetings are minuted and this is a forum that enables ongoing communication with a broad range of stakeholders.

The bi-annual Stakeholder Perception Survey provides detailed feedback and analysis on general community attitudes and the effectiveness of the community engagement activities. These results are used to plan future activities to increase effectiveness.

More generic responses to local issues are based on an approach of managing specific issues through dedicated community engagement plans that tailor the approach depending on the issue.

11.8 Complaints

Alcoa's community complaints procedure ensures a prompt response to any complaints regarding Alcoa's Anglesea operations. Community complaints are logged in a specific database that also includes fields for follow up activities and target dates for these to be completed. All logged complaints are reviewed by the power station manager and the mining manager as well as the person responsible for communicating with the complainant. Findings from the investigations of all complaints are reported to the complainant. Where a complaint raises an issue of significance to the environment, an action plan or environmental project is prepared under the EIP and that matter is included in the annual review of environmental aspects.

11.9 Documentation of Stakeholder Engagement

A stakeholder database of individuals and parties who have contacted Alcoa or registered to receive correspondence from Alcoa is maintained. This database is held by Alcoa in a secure area of its computer network to comply with privacy requirements. There is also a specific database to log and close out community complaints.

Alcoa will continue to review and manage enquiries/complaints generated through contact with the Community Relations Officer and other Alcoa personnel, the website, company email address and in response to company correspondence.

12 APPENDIX A – ENVIRONMENTAL IMPROVEMENT PLAN

environmental improvement plan
published 2008



australia's aluminium

anglesea

For more information on Alcoa's Environmental Improvement Plans, or any aspect of our operations, please contact:

west australian operations

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08 9410 3171
rod.mapstone@alcoa.com.au

Pinjarra Alumina Refinery
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WA Mining Group
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victorian operations

Anglesea Power Station
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Point Henry Aluminium Smelter and Rolling Mill Kate Betts
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kate.betts@alcoa.com.au

Portland Aluminium Smelter
Anna Impey
03 5521 5463
anna.impey@alcoa.com.au

nsw operations

Yennora Rolling Mill and Recycling Facility
Brendan Foran
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You can view the complete set of Alcoa's Environmental Improvement Plans on our website www.alcoa.com.au/eip

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Anglesea power station supplies approximately 40% of the power required by Alcoa's Point Henry aluminium smelter near Geelong.

Cover Photo: The Anglesea power station and coal mine are situated within the Anglesea Heath and adjacent to the Anglesea River.

alcoa of australia anglesea

Environment Improvement Plan

This Environment Improvement Plan (EIP) forms part of Alcoa Anglesea's business plan and has been prepared by Alcoa in consultation with employees and members of the Anglesea community.

An EIP is an effective tool for guiding a company's environmental management through a process of continuous improvement. This document is a public commitment to improving environmental performance. It gives an overview of Alcoa Anglesea's operations, the progress made to date and future initiatives planned for environmental improvement. It also talks more broadly about Alcoa's operations to provide a context for our business at Anglesea.

This is the fourth EIP produced by Alcoa Anglesea since 2003. These documents are distributed widely to community, media and government stakeholders. This version will also be made available online on the Alcoa website, which is a new medium for accessing the EIP.

Every Alcoa operation in Australia has an EIP and continues to find the process a valuable tool to measure progress and gather feedback from those interested in our environmental performance.

At Alcoa Anglesea, we have recorded some significant improvements in our environmental performance during the 2006/07 EIP period with a reduction in town water usage of more than 60% since 2000, significant reductions in waste to landfill and greatly improved land rehabilitation techniques.

Like any business, Alcoa Anglesea must consider environmental strategies alongside business sustainability considerations and set clear priorities. Our community consultation processes help us to identify which issues are important to the community and assist with decisions on where Alcoa must focus effort and resources.

As you read through our action plan, you will note that, while we have set new targets in some areas, in others our aim is to maintain efficiencies achieved to date. In these areas, Alcoa Anglesea strives to maintain its performance levels at the best possible rates whilst being active in the search to discover new ways of operating in the expectation of implementing new methods across our business in the future.

An area we have been achieving good results in is our land rehabilitation work following our mining operations. Improved rehabilitation techniques have resulted in significant species return and richness in our rehabilitation areas. Our focus is to continually improve on these good results and the way we document and plan our rehabilitation work.

As a brown coal-fired power station, we maintain our strong commitment to operating as efficiently as possible in order to manage our emission rates. Alcoa Anglesea has continued to focus heavily on the improved management of SO₂ emissions. This work will continue this year and into the future.

Consultation with the community is an integral part of any EIP. I would like to take this opportunity to thank community members and employees at Alcoa Anglesea who have contributed their time and energy to this document.

Alcoa Anglesea actively seeks opportunities to eliminate waste, conserve resources and reduce pollution. We will report regularly on the progress of the environmental improvement action plan in this publication to the community and our employees through the monthly environment report and regular community consultation meetings.

Our focus is to
continually improve
on these good
results and the
way we document
and plan our
rehabilitation work.



Arnaud Soirat
General Manager
Victorian Operations


Chris Rolland
Power Station Manager
Alcoa Anglesea

external verification

Alcoa Anglesea views the consultation of our local community as an integral step in ensuring sustainable development.

In 2001, a Community Consultation Network (CCN) was formed by Alcoa Anglesea to provide information and a regular forum for any individual or community organisation to raise any concerns they may have in respect to our environmental impact, performance and management, directly with managers or environment team members. This consultative group is made up of local residents, community group representatives, local government, environmental group representatives and the EPA.

The EIP provides a mechanism through which the community is consulted on past and future environmental performance, and provides an opportunity to discuss strategies to address issues. The Alcoa Anglesea CCN provides input into the aims, targets and actions in this EIP document. Importantly, this EIP establishes a benchmark against which the community will assess our future performance.

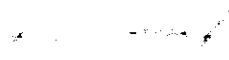
Alcoa Anglesea CCN meetings are held regularly throughout the year. For more information about the EIP or the Alcoa Anglesea CCN contact Dave Ryan in Community Relations on (03) 5263 4249.

Community Endorsement

As members of the community consultative process we acknowledge our participation in the development of the EIP with representatives from Alcoa Anglesea.



Rose Herben
Community Consultative
Partner



Jim Clements
Community Consultative
Partner



Gavan Mathieson
Manager South West
Environment Protection Authority of Victoria

ALCOA

overview of operations



60 tonne trucks deliver brown coal from the open-cut mine to the power station.

alcoa operations in australia

principal operations within western australia

huntly mine
willowdale mine
kwinana refinery/port
pinjarra refinery
wagerup refinery
bunbury port
dampier bunbury pipeline (20% ownership)

principal operations within victoria

portland smelter
anglesea power station
point henry smelter/rolling mill
melbourne alcoa wheel products
oakleigh alcoa fastening systems

principal operations within new south wales

yennora rolling mill and recycling facility



Alcoa Anglesea

Alcoa Anglesea Power Station is located on a 7,221 hectare mining lease, known as the Anglesea Heath. The Power Station began operating in 1969 and operates at world class efficiency levels for brown coal-fired power stations. It supplies approximately 40 per cent of the power required by Alcoa's Point Henry aluminium smelter near Geelong. Each year the Power Station uses approximately 1.1 million tonnes of brown coal, which is mined using open cut mining methods. Crushing and pulverising reduces the coal to a fine dust that is dried and injected into the boiler. The hot gases in the boiler are used to heat the boiler water to generate steam, which in turn produces very high pressure steam to drive a two-cylinder condensing turbine of 160MW capacity to generate electricity. Power is transmitted to the Point Henry plant through a 45km, high voltage line.

After mining, the mine is progressively back-filled using earth being stripped to expose new coal reserves, the topsoil is replaced, the area is mulched and then it is allowed to regenerate naturally. This rehabilitation process results in the restoration of a self-sustaining ecosystem. Alcoa manages the Anglesea Heath together with Parks Victoria, the Victorian Department of Sustainability and Environment, and the local community. Under this unique agreement, over 90% of the mining lease is co-managed by Alcoa and our partners as if it were a National Park. It is the first case in Australia where a conservation agency and industry have come together to form a cooperative partnership to manage an area for conservation.

In 2005, Anglesea was recognised for excellence in natural environmental management with a high commendation in the Victorian State Government Strzelecki Awards. The award was bestowed for Anglesea's mine rehabilitation work. Anglesea was also a finalist in the SaveWater award in 2007.

Other recent environmental milestones for Alcoa Anglesea include its reduction in waste to landfill by more than 50% since 2000 and its decreased town water use by more than 60% since 2000.

Alcoa Anglesea employs close to 100 permanent staff and has strong links with the local community. A Community Consultation Network meets every two months to exchange information and discuss topics of interest to both Alcoa and the community. Alcoa Anglesea has also maintained a strong community partnership program since it began operating, with over 20 community groups currently benefiting each year. Major local partners include Anglesea CFA, Anglesea Surf Life Saving Club, ANGAIR and Anglesea Primary School. Free tours of the operation are available on Tuesdays and Thursdays.

Alcoa Anglesea employs close to 100 permanent staff and has strong links with the local community.



Anglesea power station is slated to generate 160MW of electricity, which is transmitted to the Point Henry smelter via a 45km high-voltage line.

Alcoa of Australia

Alcoa's Australian operations make up an integrated aluminium industry which includes mines, refineries, smelters, rolled products plants and a recycling operation - adding value to Australia's resources at every stage.

Alcoa of Australia Limited operates the mines, refineries and smelters while Alcoa Australia Rolled Products Pty Ltd operates the rolled products plants.

Together, these two businesses directly employ around 6,200 people plus another 1,000 contractors, predominantly in regional Australia.

Alcoa makes a significant contribution to the Australian economy with investment in Australia totalling over \$12 billion. We are one of Australia's leading exporters, exporting almost \$A5 billion of product in 2007. Alcoa is Victoria's largest exporter and accounts for around 8% of Victoria's goods exports. Alcoa is also a leading Western Australian exporter and accounts for around 5% of the State's exports. Around 80 cents in every export dollar earned by Alcoa stays in Australia.

Alcoa distributed over \$3.5 billion in Australia in 2007, including wages, local suppliers, royalties, taxes, rates and dividends.

Alcoa provides around \$6 million each year in sponsorships and partnerships to help build stronger communities and an additional \$8 million a year for community-based apprentices and trainees.

Alcoa Australia Rolled Products Pty Ltd and other Operations

Alcoa Australia Rolled Products has operations at Point Henry in Victoria and Yennora in Western Sydney, producing rolled aluminium products for food and drink packaging, pharmaceutical packaging, building materials, road signs and boats. The Yennora plant is Australia's largest aluminium recycling facility.

Alcoa's other operations in Australia are Alcoa Wheel Products Australia Pty Ltd which distributes aluminium truck wheels and Alcoa Fastening Systems Australia Pty Ltd which manufactures and distributes specialist fasteners.

Alcoa Australia Rolled Products, Alcoa Wheel Products Australia and Alcoa Fastening Systems Australia are owned 100% by Alcoa Inc.

The Aluminium Production Process

The aluminium production process starts in Western Australia where Alcoa operates the Huntly and Willowdale bauxite mines in the Darling Ranges south of Perth, supplying bauxite to Alcoa's alumina refineries at Kwinana, Pinjarra and Wagerup which extract alumina from it. The Huntly Mine is the world's biggest bauxite mine.

Alcoa operates two aluminium smelters in Victoria, at Point Henry in Geelong and at Portland. Portland Aluminium is a joint venture with CITIC Nominees Pty Limited and Marubeni Aluminium Australia Pty Limited. Our Victorian operations also include a coal mine and power station at Anglesea which supply electricity to the Point Henry smelter and rolled products plant.

These operations produced 32 million tonnes of bauxite, 8.7 million tonnes of alumina and 548,000 tonnes of aluminium in 2007. This represents around 47% of Australia's alumina production and 30% of aluminium production.

Alumina production also accounts for 11% of total world demand.

Alcoa owns 20% of the Dampier Bunbury Natural Gas Pipeline and operates dedicated port facilities in Western Australia and Victoria.

Alcoa of Australia Limited is 60% owned by Alcoa Inc. and 40% by Alumina Limited.

environment, health and safety



(Above) The peregrine falcons return to nest at the station each year, successfully laying eggs and raising chicks.
(Right) Working safely to help protect our employees and the environment is promoted widely.

EHS Value

We work safely in a manner that protects and promotes the health and well-being of the individual and the environment.

EHS Policy

It is Alcoa's policy to operate worldwide in a safe, responsible manner that respects the environment and the health of our employees, our customers and the communities where we operate. We will not compromise environmental, health or safety values for profit or production.

All Alcoans are expected to understand, promote and assist in the implementation of this Policy and the accompanying Principles.

EHS Principles

- We value human life above all else and manage risks accordingly.
- We relentlessly pursue and continually improve EHS systems and processes to achieve an EHS incident-free workplace.
- We do not compromise our EHS Value for profit or production.
- We comply with all laws and set higher standards for ourselves and our suppliers where unacceptable risks are identified.
- We support pollution prevention and sustainable development by incorporating social responsibility, economic success and environmental excellence into our decision making process.
- We measure and assess our performance and are open and transparent in our communications.
- We supply and use safe and reliable products and services.
- We use our knowledge to enhance the safety and well-being of our communities.
- We are all accountable for conforming with and deploying our EHS Values and Principles.

At Anglesea Power Station, all employees and contractors will demonstrate our commitment to this EHS Policy and Principle Statement by progressively reducing our environmental, health and safety impacts and the intensity of our resource and energy use by participating in programs to:

- ensure environmental, health and safety factors are integrated into business planning and review through the Alcoa Business System, as part of the implementation of comprehensive environmental and safety management systems;
- systematically address key environmental impacts for the power station and mine, such as land management issues, equipment noise, air quality, process water usage and discharge, energy efficiency and greenhouse gas emissions.
- work together to care for ourselves, other people in our work area, and our neighbours.
- actively share our improvements and achievements within the station and the wider Alcoa Organisation.

history of continuous improvement

1961

Mines (Aluminium Agreement) Act 1961 gives Alcoa rights to mine and explore for brown coal over mining lease.

1963

Point Henry Smelter commences operations.

1969

Anglesea Power Station commences operations.

1972

Initial attempts begin with mine rehabilitation.

1973

Water conservation strategy developed to improve management of water resources used in station.

1992

Approximately 7500ha of public land in the Anglesea area listed on the Register of the National Estate with the Australian Heritage Commission, including approximately 6341ha located within the Land for Conservation section of the Alcoa lease.

1996

Anglesea Heath Consultative Committee was established bringing together individuals and groups with specific expertise and/or management responsibilities within Anglesea Heath.

1998

Alcoa becomes a participant with the Australian Aluminium Industry in the National Greenhouse Challenge. This is a voluntary

agreement that saw the aluminium industry commit to a reduction of greenhouse gas emissions from the 1990 level by 20% by the year 2000. (The power station has also signed a Deed of Generator Efficiency with the Greenhouse Office to develop plans to further improve the greenhouse efficiency of the station).

2000

An additional 190ha of the Mt Ingoldsby area of the Alcoa lease was added to the National Estate Register with the Australia Heritage Commission, taking the area of the Land for Conservation Area of the Alcoa lease on the Register to approximately 6531ha.

New turbine rotating element was installed in the 2000 maintenance outage improving power generation from 150MW to 160MW to increase operational efficiency.

Alcoa Anglesea becomes a signatory to the Minerals Council of Australia Code for Environmental Practice.

Establishment of a Land Management Cooperative Agreement for the Land for Conservation in the Alcoa lease between Alcoa World Alumina Australia (Alcoa) and the Secretary of the Department of Natural Resources and Environment (NRE). The agreement is the first case where a conservation agency and a resources company have come together to form a cooperative partnership to manage an area for biodiversity conservation.

2001

Draft of the Anglesea Heath Management Plan released.

Alcoa Anglesea Heath Management project wins global Alcoa Environment Health and Safety Award.

Ambient air monitor installed at Anglesea Primary School in response to community request.

2002

EcoRecycle Victoria presented Alcoa Anglesea with Waste Wise certification in recognition of waste minimisation achievements. Alcoa is the first Victorian manufacturing company to receive this certification.

Official launch of the completed Anglesea Heath Land Management Plan.

Appointment of Alcoa Anglesea Environmental Project Officer dedicated to mine rehabilitation and land management.

2003

Publication of first ever Environment Improvement Plan for Alcoa Anglesea.

Additional ambient air monitor installed in Anglesea Community House precinct.

Water and Land management plans documented.

Target of 50% reduction in solid waste to landfill from 2000 baseline figure achieved four years ahead of schedule.

2004

2004/05 EIP released.

Awarded global Alcoa Environment Health and Safety Award for on-line asbestos removal program.

Alcoa Anglesea awarded Best Practice for Environmental Communication as part of global Alcoa auditing program.

Peregrine falcon pair establish a breeding territory at the Power Station.

Partnership with Barwon Water developed to reduce water use.

Three more ambient air monitors installed in Anglesea township, taking the number of sites to six.

2005

Awarded Highly Commended in the Victorian Government Strzelecki Award for Management of the Natural Environment.

80% recycled paper introduced at Alcoa Anglesea.

Water Conservation Award from Barwon Water, presented by Victorian Environment Minister.

2006

2006/07 EIP released.

Finalist in the World Environment Day Awards.

60% reduction in town water (potable water purchased from Barwon Water) achieved.

2007

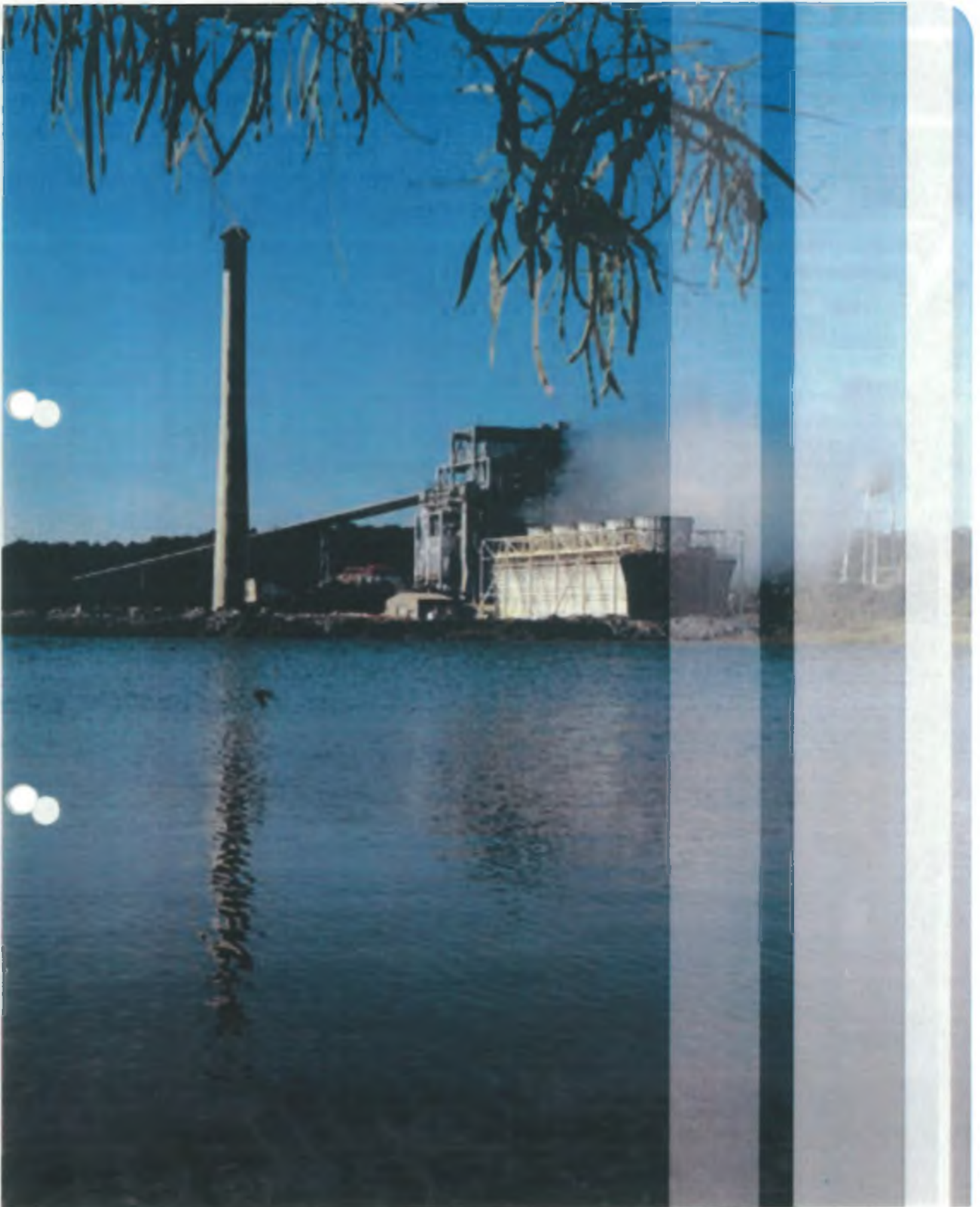
Finalist in the SaveWater Awards.

Webcam images of the peregrine falcon chicks broadcast live on Alcoa internet.

Signing of an Agreement between Alcoa Anglesea and the Wathaurong Aboriginal Cooperative.

Two excellent ratings were issued for Anglesea's Land Management and Environmental Communication during the ISO14001 continuous improvement audit.

All six ambient air monitoring stations fitted with direct telemetry back to Anglesea Power Station.



The Anglesea power station first commenced operations in 1969.

Images of activities



Pulveriser mill wheels crush the coal to a 'talcum-powder' consistency before it's air-blown into the boiler.

2008-09 targets and actions chart

Air Management – Alcoa's aim is to reduce all air emissions and to continue to improve station efficiency.		
Parameter	Targets	Actions
SO ₂	<p>No exceedances of the Air Quality Objective for 1 hourly average (200 ppb).</p> <p>Stack SO₂ emissions are not to exceed licence limits.</p>	<p>Formally document and continue to review the Air Management Plan, including current and future activities and continue investigations into long term plans to reduce SO₂ emissions. (Q2 2008)</p> <p>Further refine the load reduction protocol. (End 2009)</p> <p>Investigate additional meteorological and emissions modelling. (End 2009)</p> <p>Continue annual vegetation surveys. (End 2008 & 09)</p> <p>Continue to progress investigations into clean coal and other emerging technologies that meet triple bottom line objectives (End 2009).</p>
Greenhouse Gas (GHG)	<p>Annual GHG Emissions not to exceed 1.2 t CO₂/MWh.</p>	<p>Implement a Boiler cleaning schedule.</p> <p>Complete the action plan detailed in the Generator Efficiency Standard program.</p> <p>Continue the use of environmentally friendly diesel where available for mine fleet (End 2009).</p> <p>Investigate the use of environmentally friendly diesel for light vehicles (End 2009).</p> <p>Continue investigations into clean coal technologies (End 2009).</p> <p>Investigate improvements in combustion tuning methods (End 2009).</p> <p>Participate in relevant Australian Greenhouse Gas Office or Alcoa Greenhouse Gas audits (end 2009).</p>
Particulate Stack Emissions	<p>Particulate Stack Emissions not to exceed 0.25 g/m³ based on 10 minute averaged data (during normal operations).</p>	<p>Continue stack emissions monitoring program, to meet licence requirements (ongoing).</p> <p>Analyse data obtained from the pilot ambient dust program and determine future improvement options.</p>
Fugitive Dust		<p>Continue annual monitoring program for fugitive dust emissions.</p> <p>Analyse data obtained from the pilot ambient dust program and determine future improvement options (End 2008).</p>
PAH, VOCs etc.		<p>Implement monitoring program (Q1 2008).</p>

2008-2009 targets and actions

Water Management - Alcoa's aim is to continue to improve the efficient use of our natural resources, including water.		
Area	Target	Actions
Water Use and Discharge	Using a 2000 baseline: 70% reduction in town water usage by 2010.	<p>Investigate the installation of further water recycling infrastructure.</p> <p>Develop strategic long term water management plan including surface water discharge reduction targets (Q2 2008).</p> <p>Initiate investigations into ways of eliminating mine water discharges into the Anglesea River (end 2009).</p> <p>Implement a maintenance strategy for surface water channels to optimum flow and minimal erosion of waterways (end 2008).</p> <p>With appropriate partners, continue projects relating to the Anglesea catchment:</p> <ul style="list-style-type: none"> • Healthy Waterways Project with Corangamite Catchment Management Authority, Surf Coast Shire and Environmental Protection Authority. Includes Ecological Risk Assessment on the Anglesea River (partnership with EPA) • Estuary Entrance Management Decision Framework with Deakin University and Western Coastal Board • Anglesea River Masterplan Project with Surf Coast Shire <p>Improve water metering around the station.</p> <p>Continue to review and refine the Alcoa Anglesea Water Management Plan (end 2009).</p> <p>Continue the water loss minimisation strategy that involves the condenser vacuum breaker valve (boiler water) and the water associate panel cooling tank (general service water).</p>
Groundwater		<p>Continue to investigate opportunities for reducing bore water use (end 2009).</p> <p>Perform a gap analysis against the Hydrogeological Assessment (Groundwater Quality) Guidelines (end 2008).</p> <p>Receive and share complete report from Tim Tutt PhD study – "Monitoring and Modelling Hydrogeochemical Interactions with Groundwater: Implications for Mine Dewatering on Groundwater, River and Lake Chemistry".</p> <p>Continue projects relating to the Anglesea catchment:</p> <ul style="list-style-type: none"> • Anglesea Borefield Project with Barwon Water • Southern Rural Water licencing of groundwater. <p>Investigate automating the sand filter back wash system to reduce water use and enhance overall water quality (end 2008).</p>
Land Management - Alcoa aims to establish a diverse healthy woodland ecosystem within mine rehabilitation whilst identifying and protecting archaeological sites, protecting healthy vegetation from Phytophthora cinnamomi, continuing existing vegetation protection strategies, improving habitat and restoring native vegetation within the mining area.		
Area	Target	Actions
Mine Rehabilitation	<p>100% species richness in post 2000 mine rehabilitation areas.</p> <p>Area of land rehabilitated per annum > area of clearing per annum.</p>	<p>Continue to experiment and refine rehabilitation techniques (ongoing).</p> <p>Continue to implement the botanical monitoring program to assess post-2000 rehabilitation areas (ongoing; review ongoing requirement Q1 2009).</p> <p>Continue seed dormancy and mine rehabilitation research for recalcitrant plants (Depth and Quantification of Topsoil Reserves in the Anglesea Health Vegetation [Q3 2008]).</p> <p>Further refine rehabilitation targets in line with Department of Sustainability and Environment's Native Vegetation Framework guidelines (Q4 2009).</p> <p>Formally document rehabilitation procedures (Q4 2009).</p>

Area	Targets	Actions
Mining Area and Freehold Land	To manage the freehold and mining area; to complement land management works in the adjacent lease and private freehold.	<p>Maintain MOU with the Wathaurong Aboriginal Cooperative for identification and protection of archaeological sites in Mining Area (ongoing).</p> <p>Continue to monitor and manage phytophthora in the mining and freehold areas (ongoing).</p> <p>Continue fire management program on freehold parcels and mining area (ongoing).</p> <p>Continue extensive environmental weed removal program within the Mining Area and freehold parcels and revegetate with indigenous species (ongoing).</p> <p>Continue to manage short term goals and long term strategy for freehold parcels (ongoing).</p>

Waste Management - Alcoa's aim is to reduce waste to landfill and reduce the production of waste by our processes. The program for removing asbestos and other hazardous materials from the power station will continue.

Area	Targets	Actions
Waste to Landfill	No targets set	<p>Investigate options for management of prescribed waste ie. Oily water.</p> <p>Continue to find reuse or recycling options for wastes and educate employees on new procedures (end 2009).</p> <p>Continue to actively manage the rehabilitation of contaminated soils and refine associated management procedures (end 2009).</p> <p>Continue to refine and implement the waste oil management education program.</p>

Asbestos	No targets set	<p>Continue to remove asbestos from the plant where appropriate, using licensed contractors for disposal to landfill in compliance with EPA licence conditions (end 2009).</p> <p>Continue the education program for employees regarding transport of asbestos waste offsite (end 2009).</p> <p>Review and consider licence requirements for asbestos landfill rehabilitation plan (and site closure plan) (end 2008).</p>
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Environmental Management - Alcoa's aim is to continually improve our environmental management processes. This would be demonstrated by a reduction in the number of environmental incidents occurring at the site and by receiving external recognition of our efforts.

Area	Targets	Actions
Environmental Management	Complete all EHS Management System and Environmental Audits as per Alcoa auditing schedule (90% compliance to monthly schedule, 100% completion in the annual and two yearly cycles).	<p>Continue to strategically plan for and allocate funds to Alcoa Anglesea's Environmental Management Program.</p> <p>Investigate new or alternative measuring systems for environmental management/ incident performance (Q2 2008).</p> <p>Continued focus on encouraging employees to report 'Environmental Near Miss' incidents.</p> <p>Maintain ISO14001 certification for the Alcoa Anglesea Environmental Management System (continuous).</p> <p>Maintain environmental auditing process at Level 5 (Good) (End 2009).</p> <p>Continue discussions with EPA and other regulatory authorities on licence conditions to ensure shared understanding of environmental management systems (continuous).</p>

Community Engagement - Alcoa's aim is to communicate openly with interested community members on its environmental management.

Area	Targets	Actions
Community Engagement	No targets set	<p>Continue to produce quarterly EIP progress reports against the actions documented in this EIP (published on the internet and distributed via email). (every Quarter).</p> <p>Continue to produce the Alcoa Anglesea Monthly Environment Report (published on the internet and distributed via email) and formally document the Report production procedure (Monthly and documentation by Q1 2009).</p> <p>Continue Community Consultation Network meetings as a public forum for Alcoa to engage with local community members (continuous).</p> <p>Investigate new ways of engaging with people in the local community who are interested in Alcoa Anglesea's environmental management (End 2009).</p>

ALCOA | Environmental



Alcoa Anglesea has had its Environmental Management System accredited to ISO14001 since 2002.

environmental management

Environmental Management at Alcoa Anglesea refers to the administrative processes and mechanisms that support the environmental performance of our operations. Examples include the EPA Licence, ISO14001 accreditation, internal and external auditing, employee training and environmental and incident reporting.

Alcoa Anglesea maintains a database of all environmental incidents, and employees are encouraged to report actual incidents and those with the potential to occur or "near miss" incidents. All incidents, other than "near misses", are reported to the EPA annually and those with any unauthorised discharge to the environment are reported immediately.

Alcoa submits an annual report to the EPA, summarising its environmental performance in all areas. In addition to developing EIPs, the operation develops monthly environmental reports.

Alcoa Anglesea has an Environmental Lead Team that meets monthly to look at the environmental performance of the operation. It deploys an environmental training program, reviews the progress of audits and incidents, identifies improvements to the ISO14001 system and communicates environmental issues across the business.

Alcoa also reports annually to the National Pollutant Inventory (NPI). See www.npi.gov.au.

environmental research and development

Completed Projects

Year	Partnering Organisation	Study	By whom
1995	Melbourne University	A Comparative Study of Plant Communities in the Alcoa Lease Area, Anglesea.	Maria Taranto
2000	Melbourne University	Natural and industrial sources of acidification in natural ecosystems surrounding a coal-fired power station.	Dr Scott Laidlaw
2000	Deakin University	Restoration and management of habitats of threatened species on manufacturing industry land of high conservation value.	Lesley Gibson
2002	CSIRO	Emission modelling in the region around the Anglesea Power Station and Portland Smelter.	Dr Peter Hurley / J. Hill
2003	University of Ballarat	A hydrogeological and geochemical assessment of trace element concentration in the shallow aquifer at the Alcoa Power Station, Anglesea Victoria.	Narelle Beattie
2003	Deakin University	An assessment of the effect of the construction of a proposed weir on biodiversity in the Anglesea Power Station wetlands.	Emma Parker
2005	University of Queensland	Master of Mineral Resources (Environment) Thesis Title: Mulch and smoke effects for mine rehabilitation in heathy woodland of southwest Victoria.	Elise Jeffery
2006	Deakin University	Freshwater influences on hydrology and seagrass dynamics of intermittent estuaries.	Adam Pope
2007	Alcoa Anglesea Vacation Student study	Mapping and quantification of top soil seed reserves in the Anglesea heath vegetation assemblage.	Nerida Anderson

Current Projects

Year	Partnering Organisation	Study	By whom	Expected Completion date
2003	Deakin University	Monitoring and modelling hydrogeochemical interactions with groundwater: Implications for mine dewatering on groundwater, river and lake chemistry.	Tim Tutt	Draft thesis completed and received by Alcoa for review

environmental audit program

The environmental audit program is a key component of Alcoa's overall risk management system. It is designed to ensure that Alcoa's operations are in compliance with all applicable environmental laws and regulations.

1. Integrated Audit

This is managed by Alcoa's Corporate Internal Audit Department located at Alcoa's headquarters in Western Australia. The results of an integrated audit are published to corporate head office and involve a strict management process ensuring all identified risks are properly managed. These are undertaken at least every three years. The process includes interviews, procedure reviews, site verification inspection and a review of the location's self assessment progress.

2. Self-Assessment Audit

This is managed by personnel at each Alcoa location and reported via an Alcoa global web-based reporting tool on an ongoing basis. Each location is required to complete a self-assessment audit using the Alcoa Self Assessment Tool, commonly known as ASAT. These internal audits must be completed every 12 months. The process is similar to that used during an integrated audit.

Areas covered by both audit systems include the plant's environmental management system, waste, water, air emission, chemical and land management systems. The process includes interviews, procedure reviews, site verification inspection and a review of the location's self assessment progress.

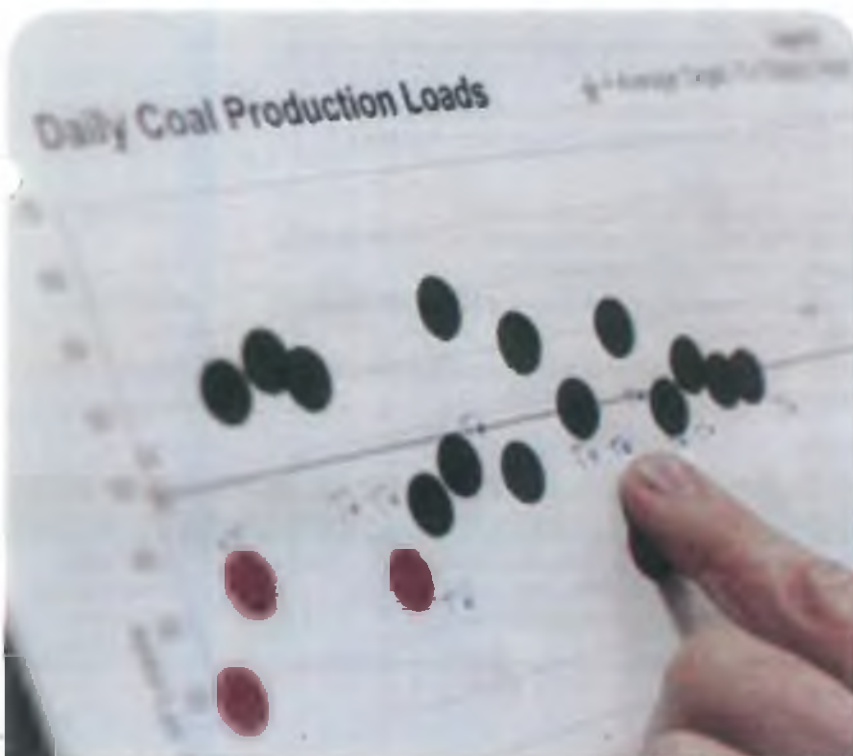
External audit and verification

External audit and verification is also an important management tool for Alcoa. At Alcoa Anglesea, ISO (International Organization for Standardization) certification has provided us with a useful tool to ensure that we meet ISO standards, as well as provide an internal learning mechanism for the business.

ISO is a global network that identifies what International Standards are required by business, government and society, develops them in partnership with the sectors that will put them to use, adopts them through transparent procedures based on national input and delivers them to be implemented worldwide.

ISO14001 is a framework for the overall management of environmental issues for an operation. It includes the opportunity to identify significant environmental aspects and impacts, define the controls in place to manage those risks and develop action plans for improvement. Environmental management is integrated and reflected in all levels of Alcoa Anglesea's operations from standard work instructions to environmental policies. ISO14001 also requires that potential environmental, regulatory and community impacts be addressed.

Alcoa Anglesea has had its Environmental Management System accredited to ISO14001 since 2002. This involves auditing by external parties on an annual basis (at a minimum).



Daily Management Boards track the performance of the mine and power station's operations.



Alcoa Anglesea management team track business performance on a daily basis.

Environmental Objectives

In total 44 environmental objectives are audited including:

EHS Policy & Commitment	EHS Aspects, Risks & Impacts	Legal & Other Requirements
EHS Objectives, Targets & Action Plans	EHS Organisational Structure, Responsibility & Accountability	Training, Awareness & Competence
Chemical Release Reporting Procedures	EHS Management Systems Audit	Emergency Preparedness & Response
Communication	Monitoring & Measurement	Operational Control
Records	Training	Management Review
Waste Identification & Classification	On-site accumulation & storage	Dross and Dross Residue Management
Recordkeeping	Emissions Inventory	Drinking Water
Water Discharge Identification & Characterisation	Wastewater Permitting for Surface Water Discharges	Off-site Waste Disposal & Transport Management
Underground Wastewater Disposal System	Wastewater Treatment Facilities	Discharge To Municipal Treatment Systems
Regulatory Analysis & Managing Requirements	Chemical Management - Allegations And Inventories	Emission & Process Changes
Permit/License Compliance Program	Remedial Assessment & Clean-Up	Reporting & Corrective Actions
Control equipment Operation	Impacts Evaluation	Emergency Response Plan
EHS Management System Documentation & Document Control	Hazardous Chemical Inventory, Pollution Release & Off-Site Transfer Reporting	EHS Incidents & Non-conformance Corrective & Preventative Action
Pcb Management	Aboveground Storage Tanks	Location Land Management
Groundwater Monitoring	Sampling & Monitoring	

The most recent integrated audit for Alcoa Anglesea in 2004 rated the site to have an overall "Good" rating. To obtain a Good rating "all the testing suggestions and minimum expectations must be in place". The overall audit process is designed to ensure minimum standards are being met and that sites are striving to continually improve their performance in each area. Commencing in 2008, ASAT auditing will be an assessment of the combined Point Henry and Anglesea locations. It is expected that the next integrated audit will be conducted during 2008.

Each objective has minimum expectations which are applied to all Alcoa sites globally. Each minimum expectation has a series of testing suggestions against which each site's processes are audited.

national pollutant inventory



Visitors are often surprised to learn that the plume from the cooling towers is steam.

The National Pollutant Inventory (NPI) provides the community, industry and government with free information about substance emissions in Australia.

The NPI is a cooperative program implemented by the Australian, state and territory governments.

The NPI shows emission estimates for 93 substances and the source and location of these emissions. Alcoa Anglesea reports 26 substances to the NPI each reporting period.

Through the NPI, you can find out what substances are being emitted to air, land and water in your community from different sources like cars, power stations and factories.

Around 4000 facilities from a wide range of industry sectors - including the Anglesea Power Station - report annually to the NPI. 2006-07 facility data is now available on the NPI website which is updated each year. www.npi.gov.au

legislation and accreditations

Alcoa Australia operates in accordance with various environmental Acts and Regulations (listed below) in addition to the Clean Air and Regulations, under the provisions:

- Mines (Aluminium Agreement) Act 1961
- Conservation, Forests and Land Act 1987
- Environment Protection Act 1970
- Occupational Health and Safety Act (2004)
- Dangerous Goods (Storage and Handling) Regulations 2000
- Flora and Fauna Guarantee Act 1988
- Environment Protection and Biodiversity Conservation Act 1999
- Archaeological and Aboriginal Relics Act 1972
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984
- Occupational Health and Safety (Asbestos) Regulations 2003
- State Environment Protection Policy (SEPP) – Air Quality Management 2001
- SEPP – Ambient Air Quality 1999
- SEPP – Waters of Victoria 2003
- SEPP – Groundwater of Victoria 1997
- SEPP – Prevention and Management of Contaminated Land 2002
- SEPP – Variation of SEPP – Control of Noise from Commerce, Industry and Trade 2001
- EPA Waste Discharge Licence EM32162
- Surf Coast Shire Local Laws No. 4 & 5

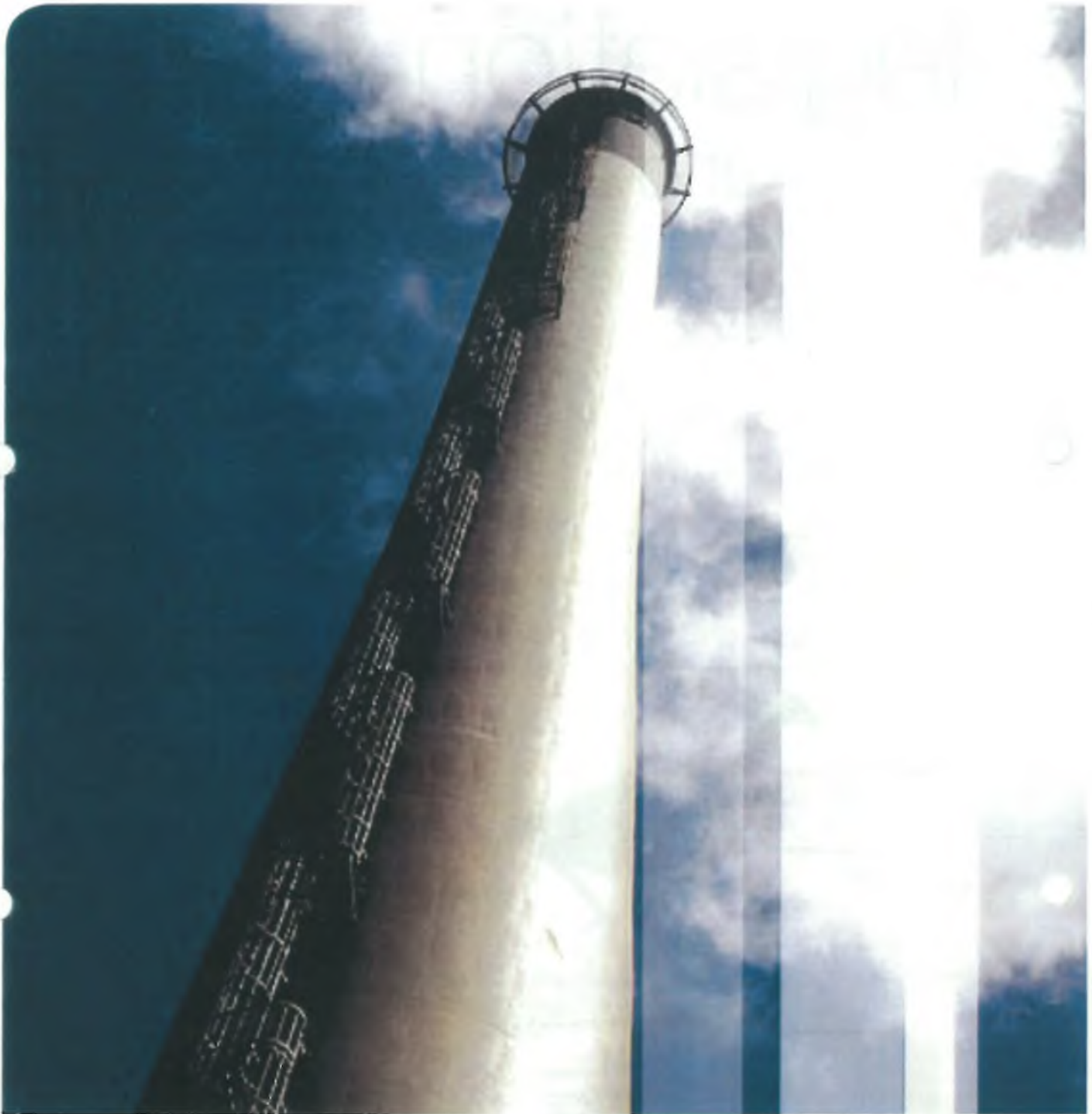
In addition, Alcoa has the following accreditations:

- Accredited to ISO14001 (1996-present)
- Accredited to ISO9001 (2000-present)
- NATA Accredited Laboratory (to ISO17025)



The Anglesea Heath is rich in wildlife and plant diversity.

stack of ashmills



The power station's stack is 108m tall and was designed by Melbourne University in 1969

air emission management



Continuous monitoring of SO₂ ground level concentrations (GLC's) is now conducted at six sites in Anglesea.



Advanced process control systems in the control room provide power station operators with the ability to see and manage the process and potential emissions.

Sulphur Dioxide

Sulphur dioxide (SO₂) is formed by the combustion of materials containing sulphur or sulphur compounds. It is commonly used as a fruit-preserving agent, in wine making, as a bleach and as a fumigant for growing grains, grapes and citrus fruit. It is a colourless, non-flammable gas with the chemical formula SO₂.

Process Source

Sulphur is contained in the brown coal mined at Anglesea. Compared to the coal in the Latrobe Valley, Anglesea has a higher sulphur content averaging approximately 3%. SO₂ is produced when brown coal is burnt in the power station.

Natural sources of SO₂ can be volcanic eruptions and the decay of vegetation.

Limits

SO₂ emitted from the exhaust stack is limited by the Power Station's EPA licence (EM32162) to 100 kg/min. Alcoa Anglesea voluntarily reduced this limit from 111.34 kg/min as part of a recent licence review.

During 2006, the reporting target of the EPA Intervention Level for SO₂ of 210 parts per billion (ppb) was changed to reflect the Air Quality Objective of 200ppb averaged over a one-hour period, emanating from the Victorian EPA State Environment Protection Policy (Ambient Air Quality).

Alcoa Anglesea has adopted stricter internal limits of 170 ppb for hourly averaged data and 60 ppb for 24-hour data.

Minimising and controlling substance emissions

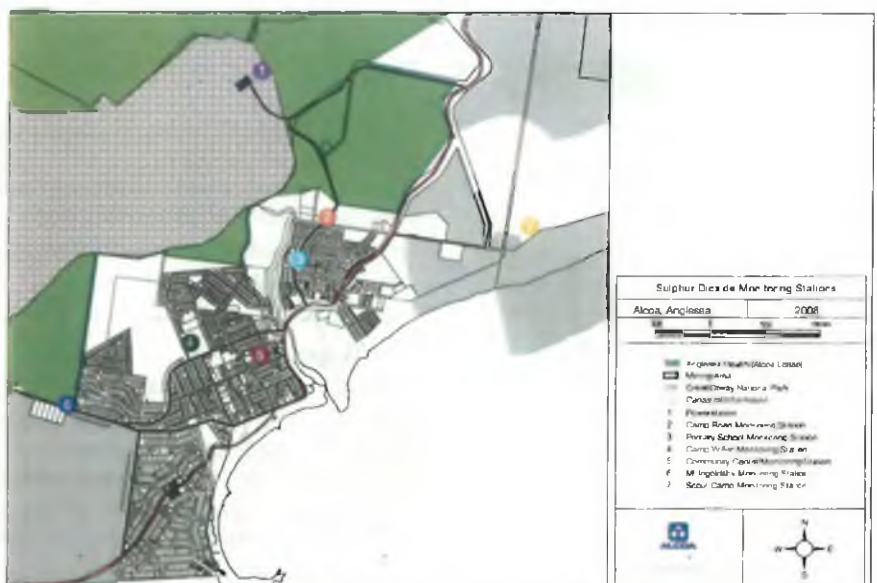
SO₂ is formed at Alcoa Anglesea as the coal is burnt. The coal at Anglesea contains varying levels of sulphur. Blending of the coal as it is delivered to the power station boilers can lower peak concentrations of SO₂ emissions. If SO₂ concentrations exceed internal alarm limits (set at less than 50% of the Air Quality Objective) a load reduction protocol is activated which sees less coal being burnt meaning a decrease of power generation and, in turn, a reduction of SO₂ emission levels.

Monitoring

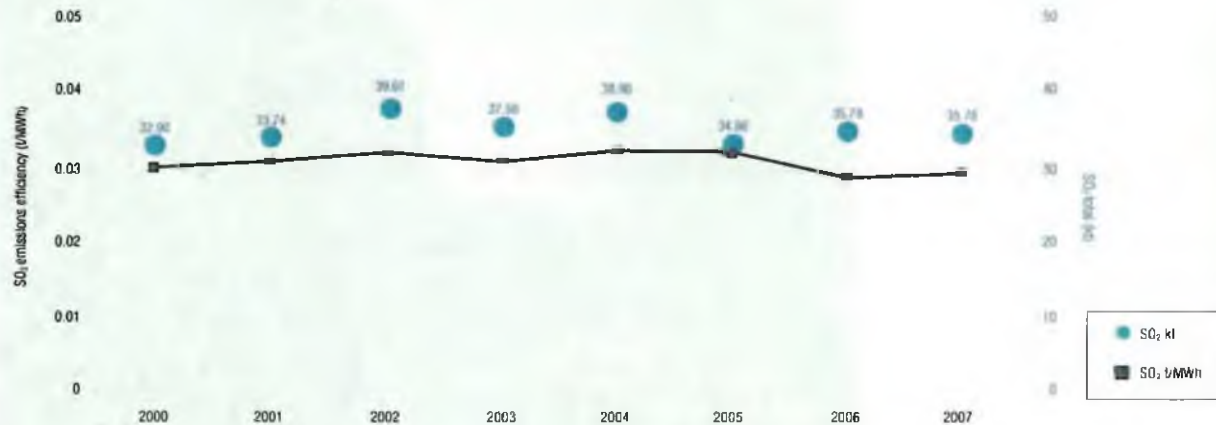
Stack emission levels and concentrations are verified through annual stack testing carried out by an independent qualified organisation. On line stack gas measuring equipment was installed during 2003 and enables Alcoa to monitor variations and trends in SO₂ emissions.

Continuous monitoring of SO₂ ground level concentrations (GLC's) is now currently conducted at six sites in Anglesea.

These are shown in the map below.



monitoring air emissions



During 2007, additional telemetry was installed at the three remaining monitoring sites. All six sites are now equipped with telemetry, which transmits data back to the Power Station Control Room in real time. As explained above, if SO₂ concentrations exceed internal alarm limits, a load reduction protocol is activated to reduce SO₂ emission levels.

In the period of the 2006/07 EIP, occurrences of GLCs exceeding the Air Quality Objective of 200ppb were recorded. Each of these events is reported to the EPA and the local community when it occurs.

A load management protocol developed by operations personnel has been an effective strategy in controlling the majority of events and continues to be further refined. Monitoring has also indicated that the local topography and weather conditions affect readings and Alcoa is currently undertaking climatic modelling to better understand contributing factors.

During 2007, a Sulphur Dioxide Management Plan was developed and submitted to the EPA and as previously communicated to the Community Consultation Network (CCN) a major project has been underway for some time to identify effective ways to improve the management of SO₂ emissions.

Alcoa Anglesea also undertakes an annual assessment of vegetation health and any impacts on the vegetation by power station operations. The 2006 assessment was undertaken by Dr David Doley from the University of Queensland, and in 2007 Professor Alan Davison from the University of Newcastle Upon Tyne, UK due to Dr Doley's unavailability. Both researchers are recognised experts in this field and found that there were no visible symptoms of emission injury to the vegetation at any of the sites.

A monitoring program that records accumulated SO₂ on passive plate samplers continues at eight sites around the Anglesea operations.

Biodiesel Trial in the Mine

During 2007, Alcoa Anglesea trialled an environmentally friendly diesel product – biodiesel – to operate all of the major equipment at its coal mine in a bid to reduce greenhouse emissions across the site. As part of the Alcoa Anglesea's commitment to environmental improvements, the mine trialled biodiesel – commercially known as FLEX Diesel – for approximately 8 months.

Biodiesel has the potential to deliver substantial reductions in emissions, including:

- > 28% reduction in CO₂ emissions;
- > 20% reduction in particulates;
- > 35% reduction in SO₂; and
- > reductions in hydrocarbons and NO_x.

Based on the 1.7 million litres of fuel used by Alcoa Anglesea for its mining operations each year, emission reductions that could be achieved are estimated at 1150 tonnes of CO₂, 51 tonnes of CO, 5 tonnes of particulate matter, together with additional reductions in hydrocarbons, NO_x and SO₂.

During 2007, Alcoa Anglesea achieved the greenhouse gas target set in the previous edition of the EIP, with the help of the reduced emissions from the use of biodiesel.

FLEX is no longer produced in Victoria and the Alcoa Anglesea mining group continues to investigate alternative supplies.

Workshopping Climate Change

Alcoa of Australia decided to focus its 2007 Month of Service activities on climate change reduction through a Climate Change Challenge theme that featured a range of volunteer activities focussed on conservation and sustainability.

Water-wise workshops were organised by Barwon Water at Anglesea. The workshops featured handy hints such as how to reduce water consumption at home, how to create a waste wise garden featuring drought tolerant plants, greywater usage ideas and an overview of the water restriction and rules that are in place in our local region.

Greenhouse gases

Greenhouse gases refer to the range of gases that contribute to the greenhouse effect. They include carbon dioxide, methane, perfluorocarbons, nitrous oxide, hydrofluorocarbons and sulphur hexafluoride. These form a blanket of gas that covers the earth, allowing light energy from the sun to reach the earth's surface, where it is converted to heat and other forms of energy. These gases in the atmosphere trap the heat before it can escape back into space. This is a natural effect, which keeps the earth warm and allows us all to survive.

This process occurs naturally and is accelerated by human activities such as power generation and everyday domestic activities such as use of fuel in cars, wood fires and home energy use. This enhanced greenhouse effect is referred to by scientists as climate change.

Process Source

Carbon dioxide is the predominant greenhouse gas produced by the Anglesea Power Station, although there is a range of other gases that contribute to the greenhouse effect. Carbon dioxide is generated principally by the combustion of carbon-based fuels.

At Anglesea, the power station's fuel is brown coal. Additional greenhouse gas emissions come from the diesel powered mining equipment and the combustion of propane gas for heating.

Monitoring and Reporting Greenhouse emissions

Alcoa has adopted a Greenhouse Gas Reporting System under which Alcoa Anglesea reports its greenhouse gas emissions in an open, transparent and consistent manner.

Alcoa Anglesea is a participant in the Australian Greenhouse Office Generator Efficiency Standard Program, and also annually submits its greenhouse gas emissions in performance reports to the EPA.

Climate change

Alcoa has taken a voluntary global leadership position on addressing climate change and reducing greenhouse gas emissions. In 2003, Alcoa achieved its target of reducing global direct greenhouse gas emissions by 25% from a base year of 1990.

In Australia, Alcoa is addressing greenhouse gas emissions through energy efficiency, productivity improvements and technological innovation. Alcoa has reduced the direct greenhouse intensity – the amount of greenhouse emissions produced per tonne of production – of its operations:

- aluminium smelters – by 60% from 1990 levels
- alumina refineries – by 9.5% from 1990 levels
- rolled product plants – by 5.5% from 1990 levels

Total direct and indirect greenhouse emissions were 16.5 million tonnes in 2006. This was below 1990 levels, despite production increasing during that period.

Alcoa is a member of the Australian Government's Greenhouse Challenge Plus program.

greenhouse gas emissions



Make An Impact

In a first for Australian industry, Alcoa and Greening Australia have partnered to develop a greenhouse footprint reduction program for the families of Alcoa employees and their immediate communities.

Known as 'Make an Impact', the program includes access to a greenhouse calculator and a kit featuring a range of tips on how to lower energy and water consumption and more effectively manage waste.

Australian households generate almost one-fifth of Australia's greenhouse gas emissions through everyday activities. This bold initiative, teamed with employee commitment, will empower local households to address climate change – and find local solutions to this very important global issue.

The Make an Impact program is supported by the Australian Greenhouse Office and was officially launched in June 2006 by Alcoa General Manager Environment Health and Safety, Kim Horne and Victorian Parliamentary Secretary to the Environment, Elaine Carbinas.

The program has been embraced by employees at all of Alcoa's operations in Victoria, NSW and WA.

To read more about the program, visit www.alcoa.com.au.

Dust and Particulate Matter

There are two types of dust emissions from the Alcoa Anglesea operations. The first is particulate matter from the mining operations and is generally referred to as dust. The second is particulate emissions from the Power Station stack and these emissions are generally referred to as ash or fly ash.

Process Source

The primary sources of dust resulting from mining operations are from the movement of large vehicles, loading and unloading soil and coal and the crushing of coal, while other sources of dust in Anglesea come from transport, unsealed roads and the beach.

Fly ash is the very fine ash produced by the combustion of powdered coal with forced draft, and is carried off with the flue gases. It is formed at approximately 1200°C; its chemical components are largely bound together in a glassy state as complex silicates.

Fly ash is grey to tan in colour, odourless and non-flammable. Anglesea coal contains on average approximately 4% ash. A portion of this ash is collected in the furnace hopper along with ground clinker while the greater portion, the fly ash, is entrained in the flue gases.

Limits

The fly ash limit at the stack as per EPA licence (EM 32162) is 4.19 kg/min.

Dust emission limits are determined by the SEPP (Air Quality Management) recommendations for particulate fallout. The SEPP lists the intervention level for PM10 dust as 0.060 mg per cubic metre over a 24-hour period.

Minimising and controlling substance emissions

Alcoa Anglesea regularly monitors dust emissions. Dust suppression is undertaken using water carts to spray water onto road surfaces, particularly in and around the mining area and where excavation activities take place. The water sprayed on to road surfaces is recycled process water and reduces windblown dust, and dust raised by vehicles. This is especially important on haul roads, as poor visibility can be a serious safety hazard. Through considered mine planning, the development of the mine can be designed so that it shields the mine from strong northerly and north-westerly winds and that watering the higher upwind surfaces can also minimise fugitive dust emissions.

Spray lines service the permanent coal stockpile and are activated when weather conditions warrant dust reduction measures. Water sprays are also used to wet down the transfer chute areas on the coal conveyor belts.

Electrostatic precipitators collect the fly ash prior to atmospheric dispersal of the gases via the stack. The fly ash is removed from the precipitators by a pneumatic system and is transported to the ash pond by the ash water system. The precipitators operate at an efficiency of greater than 99%.

EPA Licence (EM 32162) covers periodical removal of sludge from the ash ponds. Sludge removed from the ponds is used as fill in the open cut and is covered with overburden to prevent nuisance dust forming.

Although fly ash is largely insoluble in water, a 20% aqueous suspension can have a pH range of 4–13. Procedures are in place to keep the ash pond discharge to a pH range of 7–9.6.

Ash is a major waste by-product of coal fired power stations and significant effort is required to dispose of this waste. Alcoa is seeking alternative uses for the ash as part of its ongoing waste minimisation strategy.

Monitoring

Discharge from the stack is monitored in a variety of ways, from on-line instrumentation measuring opacity, daily inspections to monthly sampling for water quality compliance to EPA licence (EM 32162). Annual stack testing is undertaken to measure particulate emissions as per EPA licence requirements.

Dust from the mining operations is monitored annually. This monitoring takes place on a number of sites in and around the mine and power station. In April 2007, a fugitive dust characterisation program was initiated. This program sees total dust, particulate matter less than 10 micron and particulate matter less than 2.5 micron collected over a weekly time frame. The results of this will be collated over twelve months and reviewed.

Management of sulphur dioxide emissions is currently Alcoa Anglesea's major environmental initiative.



Management of sulphur dioxide emissions is currently Alcoa Anglesea's major environmental initiative.

RECENT ACTIVITY



Alcoa is continually developing strategies to minimise overall water use.

water management

The major water usage on site is to cool the return steam from the turbine. Other processes include boiler water feed, auxiliary cooling systems and dust suppression for conveyor belts, and coal surfaces.



The Cooling Tower at Anglesea Power Station is one of the major sources of water usage.

Water Usage

The station receives process water from three sources – town water, bore water and recycled water from the mine. Since 2000, Alcoa Anglesea has achieved a greater than 60% reduction in town water consumption.

Water Usage Monitoring

Alcoa Anglesea has a series of strategically placed flow meters to determine water usage from each of its three water sources. More detailed water usage patterns within the plant processes can also be determined.

Water treatment processes

Two water treatment systems are operated at Alcoa Anglesea: the plant sewage system and the bore water treatment plant. The bore water treatment plant is supplied with water from six well bores situated within the Alcoa lease area. The water is pumped to a degasifier, removing carbon dioxide and hydrogen sulphide and aerating the water to partially oxidise the iron. Sodium hydroxide is then added to increase the acidity, causing precipitation of the iron and manganese.

Limits

Alcoa Anglesea's extraction of bore water is limited by Southern Rural Water Authority Number 8706922 to 4000 ML annually.

Water Discharge

Process water and storm water from the site is discharged from the ash ponds. Mine water, not utilised in the station, is discharged from the reclamation pond. The discharge from this pond has been minimal with efforts made to reuse the water in the station.

Both discharges are EPA licensed and flow through a natural wetland mixing zone prior to entering the estuarine section of the Anglesea River via the final EPA licence point.

Anglesea's EPA licence has parameters set on flow, pH, suspended solids, colour, aluminium, iron and zinc.

Water Discharge Monitoring

Discharge from the site is monitored using on-line instrumentation; daily inspections and monthly sampling are conducted for water quality compliance.

water usage monitoring

Note: No target is set for recycled Mine water. The use of this water is maximised in preference to Bore water, and the amount used is dependent on whether conditions and mining operations



waste management

In 1991, the Alcoa's waste management team was formed to explore ways of reducing waste, conserving resources and reducing pollution.



Alcoa has had a proactive recycling program underway now for a number of years.



Alcoa encourages employees to separate recyclable waste at the source by providing separate bins for each type of waste.

The initial Alcoa aim of reducing waste to landfill by 50% by 1995 was achieved much earlier, by 1993. Sound waste management principles have been adopted to minimise the creation of waste and where waste creation is unavoidable, use a waste management hierarchy to consider reuse and recycle options prior to disposal. It is then disposed of in a manner that minimises its impact on the environment.

Alcoa has had a pro-active recycling program underway now for a number of years. This includes:

- All plastic bags and packaging being recycled by a third party;
- Sorting of waste to reduce volume to land fill;
- Grease drums, fluorescent tubes, and waste oil are disposed of at Victorian EPA licensed disposal sites;
- Crushing oil filters and recycling metal and waste oil;
- On site Victorian EPA licensed disposal landfill for asbestos;
- Water from cooling towers is used to remove ash from the precipitators;
- Air cleaners reconditioned for mine heavy vehicles;
- On-site rehabilitation area for oil and fuel contaminated soils; and
- A worm farm is operated to deal with waste such as paper and food scraps.

Minimising and Controlling Waste

Designated, colour-coded, 3-cubic metre skips and 240-litre wheelie-bins are used extensively around the plant to collect and source-separate waste materials. The bins are transported to our Material Recovery Facility (MRF) and fully sorted for reuse by a number of companies. The MRF also packages recyclable material for sale to local recycling companies. Alcoa employees manage this facility and coordinate the delivery and transport within each department.

All cardboard and plastics are recycled through local recycling businesses. Both plastic and cardboard are large volume materials, but Alcoa's supply department has been successful in encouraging suppliers to minimise packaging on deliveries.

Full oil drums of waste oil are placed within a bunded area before transportation off-site for recycling by a local company. Empty drums are also recycled.

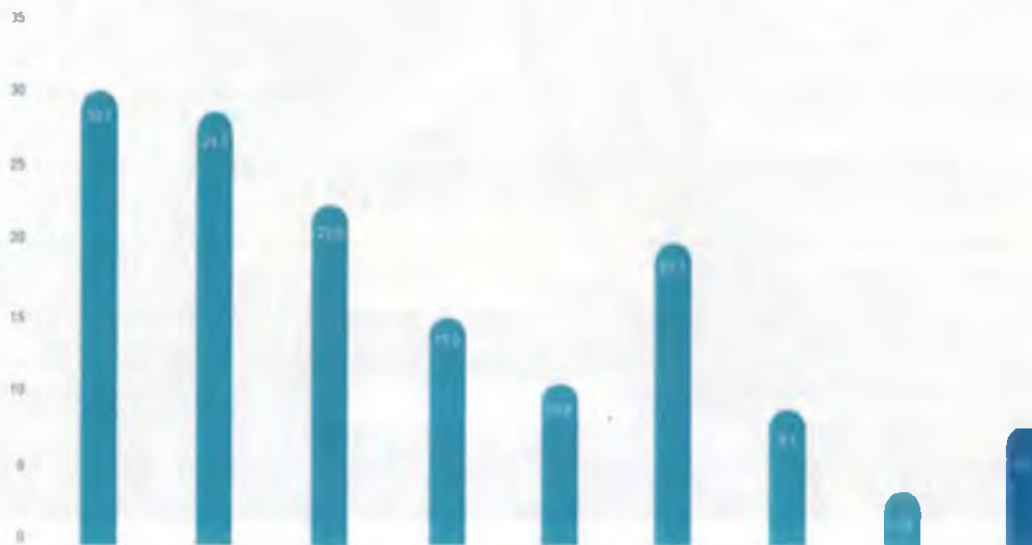
Waste History and Targets

Using a 2000 baseline, Alcoa set a further reduction target involving a reduction in waste to offsite landfill by 50%. This was again achieved ahead of time – by 4 years in fact. During 2006 and 2007, work focussed on reducing and recycling waste resulted in over an 80% reduction in waste from the 2000 baseline. As the Alcoa Corporate target has already been achieved, aggressive reduction targets continue to be set.

Using a 2000 baseline, Alcoa set a further reduction target involving a reduction in waste to offsite landfill by 50%.



monitoring waste



Monitoring

All waste transported on or off site is recorded, regardless of whether the material is to be reused, recycled or sent to landfill. Data is routinely collated and reported internally and to the EPA as part of Alcoa Anglesea's annual performance report.

Hazardous Waste

Alcoa Anglesea manages all hazardous (prescribed) waste as required by the Victorian EPA.

Minor amounts of medical waste and materials contaminated with oils (gloves, rags and cardboard) are sent off site for processing. Oil and water mixtures are also treated off site.

Small quantities of materials contaminated with polychlorinated biphenyls (PCBs) exist at Anglesea. Even though the importing of PCBs was banned in 1976, they are still present in pre-1976 transformers and capacitors in the electrical industry. From December 2001, PCB contaminated materials have been transported from Point Henry and Anglesea for treatment and disposal to BCD Technologies in Queensland. Approval was obtained from both the Queensland and Victorian Authorities to do this. Anglesea will continue to eliminate PCB contaminated materials during 2008/09.

Asbestos

Introduction

Asbestos is the fibrous form of mineral silicates, the most significant being chrysotile, crocidolite and amosite (white, blue and brown asbestos respectively). Generally, fibres below 3 micrometres in diameter and greater than 8 micrometres in length are potentially carcinogenic.

Process source

Asbestos has been used in many products, including heat resistant textiles, asbestos cement products, thermal insulation products such as pipe and boiler insulation, friction materials such as clutch plates and brake linings, gaskets, floor tiles and roofing materials.

Minimising and controlling asbestos exposure

In October 1988, the Anglesea Asbestos Control Management Committee, made up of employees, was formed to safeguard all personnel at the Anglesea Power Station from the risk of exposure to asbestos fibre. The Anglesea Asbestos Management Program was developed by this committee and has been in operation since February 1989.

Monitoring and Waste Disposal

The Power Station has been surveyed for the presence of asbestos, and the results of over 900 sample analyses are recorded in a series of registers on site. An approved occupational hygienist carries out routine air monitoring during asbestos removal jobs.

Asbestos and material contaminated with asbestos is disposed of by placing the material in plastic membrane bags bearing the asbestos warning label. It is double bagged, double tied and transported to the on-site EPA licensed disposal tip.

When the asbestos waste is two metres deep it is covered with 300 mm of dirt and compacted using a bulldozer.

During 2003/04, approximately 300 tonnes of asbestos containing materials was removed from Alcoa Anglesea, at a cost of approximately \$4.2 million. All materials were disposed of into the asbestos landfill, in accordance with licensing requirements.

During 2007, as per the new licence requirement, an Asbestos Landfill Rehabilitation Plan was developed and submitted to the EPA. The plan outlined the current practises and ongoing maintenance of the landfill, in addition to the rehabilitation strategy to be employed at the closure of the landfill site.

All employees received updated asbestos awareness training during 2007.



A unique agreement between Alcoa, DSE and Parks Victoria allows government and industry to jointly manage and protect the non-mining part of Alcoa Anglisea's lease.

land management

The area known as the Anglisea Heath overlays land leased by Alcoa under the Mines (Aluminium Agreement) Act 1961 (7097ha) and additional 124 ha of freehold land owned by Alcoa. It is comprised of the area used for mining and power generation, known as the Mining Area (currently 545 ha) and the remainder known as the Land for Conservation (currently 6676 ha). The current lease agreement expires in 2011, although Alcoa holds a further 50-year option to mine coal until 2061, which it intends to renew.

Anglesea Signs Agreement with Wathaurong Aboriginal Cooperative

In 2007, Alcoa Anglesea and the Wathaurong Aboriginal Co-operative formalised a four year working relationship by signing a Memorandum of Understanding (MOU) in relation to Alcoa's coal mining operations in Anglesea.

The progression of the open cut coalmine requires excavation and therefore has the potential to impact on any Aboriginal sites in surface or subsurface contexts. These sites are not identifiable until the vegetation has been cleared.

Heritage consulting firm Terra Culture was employed by Alcoa Anglesea in 2003 to assist with their first cultural heritage survey process. As part of this process, Alcoa voluntarily approached the Wathaurong Aboriginal Co-operative to ask them to assist in undertaking an archaeological survey of a 35-hectare area of land where Alcoa planned to continue its open cut mine in a westward direction.

This survey found two archaeological sites within the area surveyed on the side of existing tracks and all parties recommended that a Memorandum of Understanding be signed between Alcoa Anglesea and the Wathaurong Aboriginal Cooperative to ensure this process continued.

The Wathaurong Aboriginal Co-operative viewed the MOU and survey work as a way to encourage respect for significant local sites and build working relationships in the local community. Alcoa Anglesea viewed the MOU and survey work as a way to enhance its community and environmental engagement processes.

Both parties have worked together in the intervening years to create the MOU which will assist in protecting any buried archaeological deposits that may be found on the identified archaeological sites at Alcoa Anglesea when brown coal is mined.

Alcoa is pleased to be working with the Wathaurong Aboriginal Co-operative as the process has helped to establish the views of some local aboriginal people and groups interested in archaeology on matters such as the interpretation and significance of the recorded sites.

Land for Conservation

Currently, the Land for Conservation consists of a 6,676-hectare area of public land, located north of the coastal township of Anglesea. The area offers one of the most diverse and spectacular areas for flora, scenic landscape and wildlife communities in Victoria. The National Estate listing of much of the area recognises the area's contribution to significant natural places, not only within Victoria but also in Australia.

A remarkable number of flora species exists within a relatively small area with over 620 species, or approximately one quarter of the total Victorian flora. Over a quarter of Victorian orchid species are found in the Lease area with over 80 species and five hybrid species having been recorded.

A unique agreement between Alcoa and the Department of Sustainability and Environment (DSE), allows government and industry to jointly manage the non-mining part of the lease and ensure that this important area is protected. The entire leasehold has been named the Anglesea Heath and is managed using the Anglesea Heath Management Plan. Alcoa fund a Parks Victoria Ranger and has an Environmental Scientist on staff to implement the strategies and actions of this Management Plan including the protection of threatened species, track rationalisation and rehabilitation.

Mining Area and Alcoa Freehold

The Land Management Cooperative Agreement and the Anglesea Heath Management Plan apply only to the Land for Conservation. The Mining Area is managed solely by Alcoa and although the current lease expires in 2011 Alcoa intends to renew its mining rights to 2061. Both the Agreement and the Management Plan allow continued use and management of the Mining Area and any future expansion of that area in accordance with the requirements of the Mines (Aluminium Agreement) Act 1961.

In addition to the leased land, Alcoa owns freehold land adjacent to Anglesea between the township and mine. This freehold consists of natural heathland and seeks to minimise the impacts of having an open cut mine and power station close to the town. Consistent with the Anglesea Heath that surrounds it, this freehold has flora and fauna values that require active management. It also provides for passive recreational opportunities, including the Anglesea Bike Park, that are not appropriate for the Anglesea Heath.

Land Management Plan

To manage the Mining Area and freehold in a manner consistent with the surrounding lease, a Land Management Plan was developed in 2003 for the mining impacted area including the Alcoa freehold. The plan provides environmental amelioration, aesthetic benefit and biological conservation to lands owned by Alcoa at Anglesea.

The Land management plan includes the following:

- Mine rehabilitation: method, standards and monitoring;
- Vegetation restoration and revegetation works for the mining and freehold areas;
- Protection of flora and fauna values on Alcoa freehold;
- Environmental weed program for the mining and freehold areas; and
- Development of a GIS project to assist in the mapping, monitoring and coordination of tasks within the management plan.



At the end of 2007, the total area of rehabilitated land was approximately 157 ha.

Mine Rehabilitation

- Alcoa began mine rehabilitation at Anglesea in the early 1970s.
- The total area rehabilitated at the end of 2007 is approximately 157ha, including 5ha in 2007.
- The total size of the area 'open' at the end of 2007 is approximately 212ha including 52ha of infrastructure that will remain until decommissioning of the Power Station and includes the 2.9ha cleared in 2007.
- There will be no vegetation cleared in 2008. Consequently there will be no mine rehabilitation in 2008.
- The area to be rehabilitated in 2009 is dependent upon the progress of the mine plan, but the aim is to rehabilitate at a ratio of roughly 1:2. For example, if 3 hectares is cleared, 6 hectares will be rehabilitated.

New Peregrine Falcons for Alcoa Anglesea

The Peregrine Falcons returned again to alcoa anglesea in 2007, the fourth consecutive year.

A purpose-built nesting box was built on top of the Alcoa Anglesea water tower to accommodate the 2004 breeding season and this was once again home to the peregrine family in 2006 and 2007.

Once considered a species on the brink of extinction, the ban on the use of DDT in Australia and diligent efforts from conservationists have seen Peregrine Falcon populations make a strong recovery.

Despite laying four eggs in 2007, only two successfully hatched - the chicks were aptly named by Anglesea Primary School students as Dash and Concorde. There is no explanation for why this happened, a similar scenario occurred in 2006 with only one of the four eggs hatching successfully. There are several reasons why an egg may not hatch - drought, adults may be incompatible or an adult may have left the eggs resulting in a drop in incubation temperature. The positive for having two chicks instead of four is the increased amount of food each chick receives with less sibling competition. The more food the two chicks receive, the stronger they will be, giving them a better chance of survival. This extra benefit was clearly evident when volunteers from the Victorian Peregrine Project took a travel tower to the elevated home this month to check on the chicks. Weighing in at a very healthy 905g was our female, Dash, with all the characteristics to be as formidable as her mother, Sheila. More reserved and weighing in at 590g was our male, Concorde. Sheila made her presence felt during the expedition up to relieve the chicks - hard hats were essential under the circumstances! Whilst both parents exhibited agitated behaviour, Sheila in particular didn't hesitate on getting a close look at the bright yellow duo of our hats. The health assessment and banding of the chicks was completed and the chicks returned to the nest box as quickly as possible so that the parents could rest easy.

The webcam at www.alcoa.com/falcons broadcasts images from the peregrine falcon nest box at Alcoa Anglesea over the internet. Regular updates are also included on the website. During 2007, the website was one of the most popular on the Alcoa system with many people logging on to check the chicks' progress.

ALCOA

amenity

With Alcoa's lease and freehold land providing all of the Anglesea township's northern - and some of the western - boundary the company must observe a duty of care when it comes to matters like noise, visual impact and fire protection.



* Fire prevention is one component of Anglesea power station's comprehensive crisis management plan.

Noise

Noise pollution can be disturbing, especially to residents and holiday makers close to mining or manufacturing industries, such as the Alcoa site at Anglesea. Excessive noise can range from sleep intrusion to general nuisance value.

Process Source

Noise from Alcoa's operations emanate from a number of sources -

- Maintenance of equipment
- Vehicle and transport associated noise
- Coal dumping
- PA systems
- Alarms
- Power Station operations.

Limits

The State Environment Protection Policy N-1 Control of Noise from Commerce, Industry and Trade determines the allowable environmental noise levels.

Monitoring

Personal noise is monitored and noise in work areas mapped at Alcoa's Anglesea operations. Opportunities for noise reduction are investigated and measures such as personal protective equipment (PPE) are put in place to deal with noise.

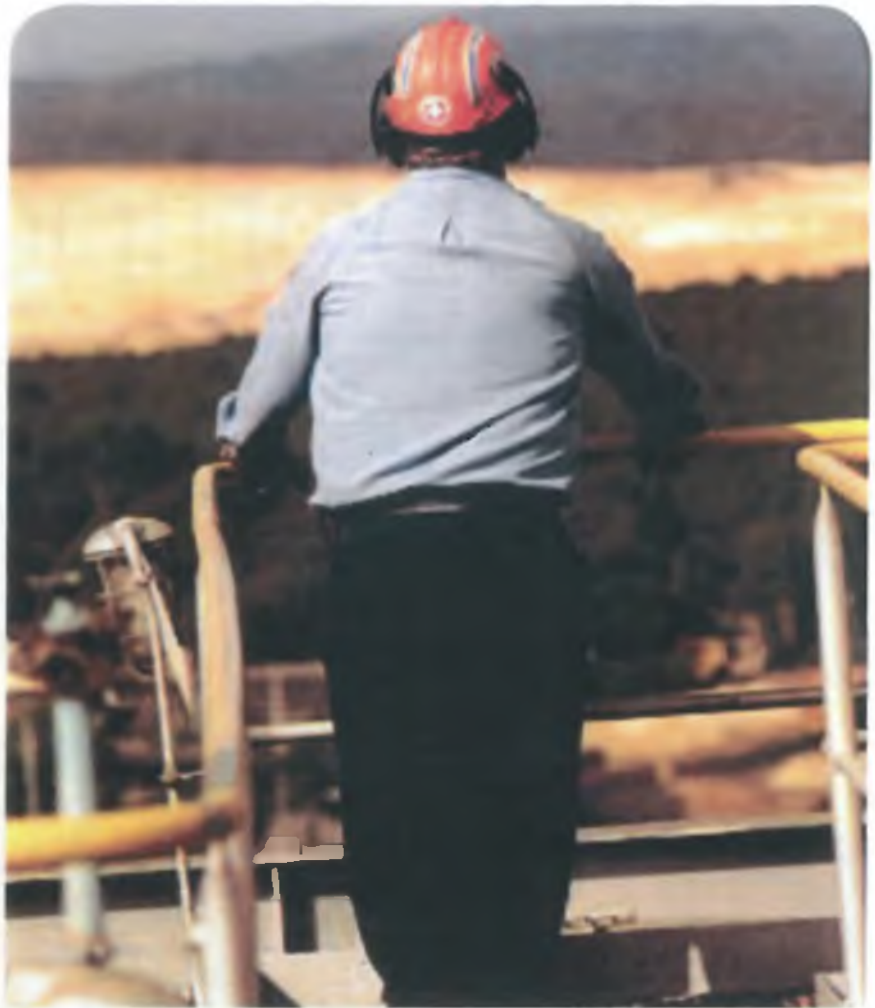
In the early 1990s, the mining operation's work hours were reduced to between 7:00am and 7:00pm, seven days per week. Extensive township noise monitoring and predictive computer modelling have been carried out at Anglesea to assist in the formulation of noise specifications for all new mining equipment entering the site.

As the nearest Anglesea residence is only 200 metres from the southern crest of the mine, ongoing maintenance of equipment also needs to manage noise levels on the various machines. This requires constant vigilance of reverse beeping, engine muffler systems, coal truck tailgate rubbers and noise generated when dumping coal all need to be considered.

The power station is a 24-hour per day operation and although the general operation noise cannot be regulated, attention needs to be applied to intermittent noise sources, such as auto-start alarms on conveyor systems, the PA system and the testing of steam relief valves in shutdown periods.

Alcoa Anglesea has completed noise monitoring assessments that indicate compliance with the SEPP.

Our slashing program is strategic and satisfies all fire prevention requirements whilst not compromising the integrity of the significant heathland communities.



Alcoa is serious about reducing the visual impact of our mining operations.

Visual Impact

Alcoa is mindful of the visual impact of its operations in Anglesea. The establishment of the Land Management Plan for the Alcoa mining and freehold areas encompasses mine rehabilitation, revegetation of denuded areas and the planting of indigenous species along Coalmine Road to reduce the visual impact of the open cut mine.

Fire

Alcoa plays an important role in assisting with the protection of Anglesea from wildfires with either the Lease (Anglesea Heath) or Alcoa freehold present on three sides of the township. For the freehold areas, Alcoa maintains a series of slash breaks adjacent to assets and property. Our slashing program is strategic and satisfies all fire prevention requirements whilst not compromising the integrity of the significant heathland communities. The program has been reviewed by DSE, Parks Victoria, Surf Coast Shire, Powercor, Vegetation Management Company and the Country Fire Authority (CFA).

DSE is responsible for fire management within the Anglesea Heath. Current fire protection measures are in accordance with the Otway Fire Protection Plan (DCNR 1995) and the Code of Practice for fire management of Public Land in Victoria (DCNR 1995).

The risk of fire spreading from open campfires is a significant threat to the Anglesea Heath and the adjoining the Great Otway National Park. This risk is minimised through the prohibition of open fires in conjunction with increased visitor awareness and ranger patrols. DSE also has a summer fire crew stationed at Anglesea to assist with fire protection works and respond to a wildfire in the Anglesea Heath.

In the event of a Total Fire Ban Day, a sign is displayed entering the Power Station. Signs displaying the status of the Fire Risk are also found at the CFA shed when entering Anglesea and picnic grounds in the adjoining the Great Otway National Park.

The Anglesea power station has a comprehensive crisis management plan in place that seeks to prevent fire occurring in the first place. Alcoa Anglesea has a long standing commitment to building the strength and capacity of the Anglesea CFA through its "Partnering Stronger Communities" program and will continue to support the Anglesea CFA financially and through the use of our facilities for training purposes. The Power Station has ready sources of water and the ponds on-site are available for use to CFA and DSE fire management.

EIP progress reporting



Tours are one of many ways in which Alcoa Anglesea communicates with the community.

Alcoa Anglesea regularly updates interested community members and Alcoa employees on the status of the actions contained in the EIP.

The Community Consultation Network (CCN) is a consultative group made up of representatives from the local community, local government, industry neighbours, environment groups and the EPA.

The CCN creates a forum for two-way communication between the Power Station and the broader community regarding issues that both Alcoa Anglesea and the Anglesea community can work on together. The EIP is regularly discussed and reported on at these meetings.

This group meets regularly to discuss a broad range of issues relating to all aspects of Alcoa Anglesea's operations and minutes are circulated from each meeting to all interested community members.

In addition, a regular environment report is produced for employees, which outlines the key environmental activities and reporting for the site including the progress of the EIP.

For more information about the EIP or the CCN, contact the Community Relations Department on (03) 5263 4249.

For Alcoa Anglesea EIP Status reports, go to: www.alcoa.com.au/anglesea



summary of key actions items from 2006/07 EIP

Environmental Management

Successful Continued Assessment for ISO14001 Environmental Management System in November 2007.

Maintained Alcoa's internal environmental auditing process at Level 5 (Good) 100% to schedule in 2006 and 2007.

Air Emission Management

- As part of the new EPA Licence, an Air Management Plan was submitted to EPA at the end of January 2008.
- The Load Reduction Protocol was revised in April 2007 and alarm set points lowered. All six monitoring stations are now equipped with direct telemetry back to the control room.
- Initial attempts at predictive modelling using weather conditions that may cause a potential exceedance of ambient ground level SO₂ concentrations showed highly inaccurate results. Further investigations will be undertaken to attempt to improve the accuracy of this modelling.
- EPA issued a revised licence in March 2007 with the SO₂ limit reduced from the previous licence.
- Annual vegetation survey conducted in 2006 and in 2007.

Greenhouse Gas (GHG)

- Alcoa Anglesea joined Challenge Plus as Associate Member. A GHG Action Plan was submitted to Australian Greenhouse Office (AGO) and is currently being assessed.
- The business case for investigating the boiler cleaning upgrade is being reviewed.
- Coal drying technologies are being investigated. Other alternatives regarding renewable energy or waste energy recovery are the subject of a research program with Deakin University.

Dust

- The particulate monitoring (ambient air) program was implemented.
- The dust load is continuously monitored.
- The annual stack air emissions monitoring program was completed and all tests were within licence limits.

Water Management

- The final plan from the Healthy Waterways Project was adopted by the Surf Coast Shire council in April 2006 and now forms the basis for management of the Anglesea River.
- Alcoa Anglesea is currently not targeting zero water discharge as a result of recommendations from Healthy Waterways Project.
- Regular meetings were held with Barwon Water to discuss aquifer storage and recycling opportunities.
- Meetings are currently being held regarding the Water Management Plan, developed and submitted to the EPA in October 2007, in relation to accessing lower aquifer for potable water.
- Demineralisation plant modification to save 10kL every demineralisation cycle, or the equivalent of between 200,000 and 250,000 L per year.
- The Estuary Entrance Management Support System (EEMS) released for the Anglesea River Estuary.
- Final plans for the Anglesea River Masterplan Project have been approved by the Surf Coast Shire council.
- No mine water was discharged during 2007.
- Regular update for Tim Tutt's PhD study "Monitoring and Modelling Hydrogeochemical Interactions with Groundwater: Implications for Mine Dewatering on Groundwater, River and Lake Chemistry" provided. Draft thesis is currently being reviewed by Alcoa Anglesea.
- Additional groundwater wells installed August 2006.

Waste Management

- Improved processes were established around rehabilitation of contaminated soils. The operation of the land farm was reviewed during 2007, and a routine schedule was developed to maintain the area.
- Category 4 – 7 plastics are now recyclable. Communicated to workforce through "Environmental Angle" and Waste Minimisation refresher training.
- Investigating opportunities to reuse flyash.
- Delivered refresher waste management training to all employees.
- Asbestos management procedures were reviewed.

Land Management

- The final report was received for the 2006 and 2007 botanical monitoring programs completed for the 2002, 2003, 2005 and 2006 rehabilitation areas.
- A new topsoil seed research program with SA Botanic Gardens was initiated in the second quarter of 2007. The report was received in the first quarter of 2008.
- A summer vacation student was employed for 2006/2007 to investigate topsoil and subsoil depths and the location and depth of seed propagules and rhizomes.
- A summer vacation student was employed for 2007/2008 to investigate the physical and chemical properties of topsoil, subsoil and overburden suitable for plant growth.
- Rehabilitation targets were developed including investigation of rehabilitation similarity index standard.
- Rehabilitation procedures were documented and reviewed by an ISO14001 external auditor during the fourth quarter of 2007 with Land Management rated Excellent.
- Formalised rehabilitation/clearing targets.
- A Memorandum of Understanding (MOU) was finalised between Alcoa and the Wathaurong Aboriginal Cooperative. Advice is required for future survey and site protection under new archaeological legislation.
- Signage and protection of Phytophthora free areas maintained
- Fire management program on freehold parcels continued. Annual slashing was completed in the fourth quarter of 2007. Ecological burns were completed at Coalmine Road and Ixodia Track during 2006/2007.
- The annual pest plant removal program was completed in the fourth quarter of 2007.
- The long term strategy for freehold (Alcoa owned) parcels of land was finalised.
- Regular Land Management Meetings were held.
- Horse agistment ceased in December 2005.
- Lease of freehold land to the Surf Coast Shire for the Anglesea Bike Park was finalised in the second quarter of 2006 with construction of the new facility completed during the fourth quarter of 2006.

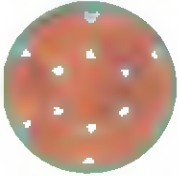
Community Issues

- A comprehensive environmental noise monitoring program was completed in the first quarter of 2007.
- 800 trees were planted along denuded Coal Mine Rd in 2006.
- Manual lighting was installed on the cooling tower to reduce visibility at night.
- Landscape and visual analysis was completed in the first quarter of 2007.

from dirt to aluminium

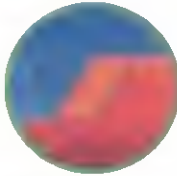
Aluminium is endlessly recyclable and Alcoa runs the largest aluminium recycling operation in Australia at our plant at Yennora in Western Sydney.

mining and rehabilitation



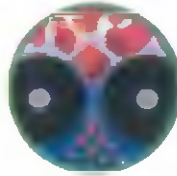
preparation of mining area

After clearing of timber and other material, topsoil and overburden are carefully removed and returned after mining when the areas are being rehabilitated.



bauxite mining

A 4-5 m layer of caprock and bauxite is removed using large excavators or loaders and haul trucks.



crushing plant

Ore is taken to a crusher where it is crushed into smaller pieces.



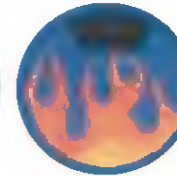
ore conveyors

The ore is then transported by conveyor belt and rail to the refineries for processing.



rehabilitation

After mining, topsoil and overburden are returned to the area and the site is prepared for revegetation.



refining process

digestion

Finely ground bauxite is mixed with hot caustic soda solution to dissolve the alumina from the bauxite. Every six tonnes of bauxite makes two tonnes of alumina.

smelting process



dissolving alumina

Alumina is dissolved in an electrolytic bath of molten cryolite within a large lined furnace known as a "pot". There are hundreds of pots at a typical smelter.



chemical process

Alumina is made up of aluminium and oxygen, which need to be separated to produce the metal. Every two tonnes of alumina makes one tonne of aluminium.



calcination

The alumina hydrate is washed, then heated to remove water, leaving a pure dry alumina in the form of a fine white powder. This is cooled and stored, then shipped to smelters for processing.



precipitation

The liquid containing alumina hydrate is then cooled in large open tanks and seed crystals added, causing the alumina to crystallise out of solution.



clarification

Insolubles, such as sand and mud, are settled and filtered out, leaving a solution of dissolved alumina hydrate.



reduction process

A high electric current is passed through pots via carbon blocks. The current flows continuously from the carbon block (positive) through the alumina/cryolite mix to the lining of the pot (negative), and then on to the next pot.



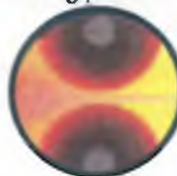
forming aluminium

Electricity maintains the temperature of the process at about 950°C and enables the alumina to split into aluminium and oxygen, with aluminium settling to the bottom of the pot.



casting

The molten aluminium is cast at a temperature of just over 700°C to form ingots.



hot rolling

Aluminium ingot is reheated to around 600°C, then passed through a hot finishing mill where it is reduced in thickness to 3-6mm.



coiling

The aluminium strip from the hot rolling mill is coiled and cooled before being sent to the cold rolling mill.



recycling process



final processing and casting

Molten aluminium is transferred to a holding furnace and then cast into ingots. Recycling aluminium consumes only five per cent of the energy required to make new aluminium, with no loss in quality.



initial processing

Coated aluminium (painted or lacquered) is processed through a gas fired rotary furnace before being sent to a "meter" where it is mixed with uncoated or new aluminium.



classification

Upon receipt at the Alcoa Australia Rolled Products' Yennora recycling centre, the recycled aluminium is classified so the optimal end use and processing path can be determined.



preparation

Recycling aluminium starts with preparation for transporting, which involves compaction to improve the density of the aluminium and to reduce freight, storage and handling costs.



sheet finishing

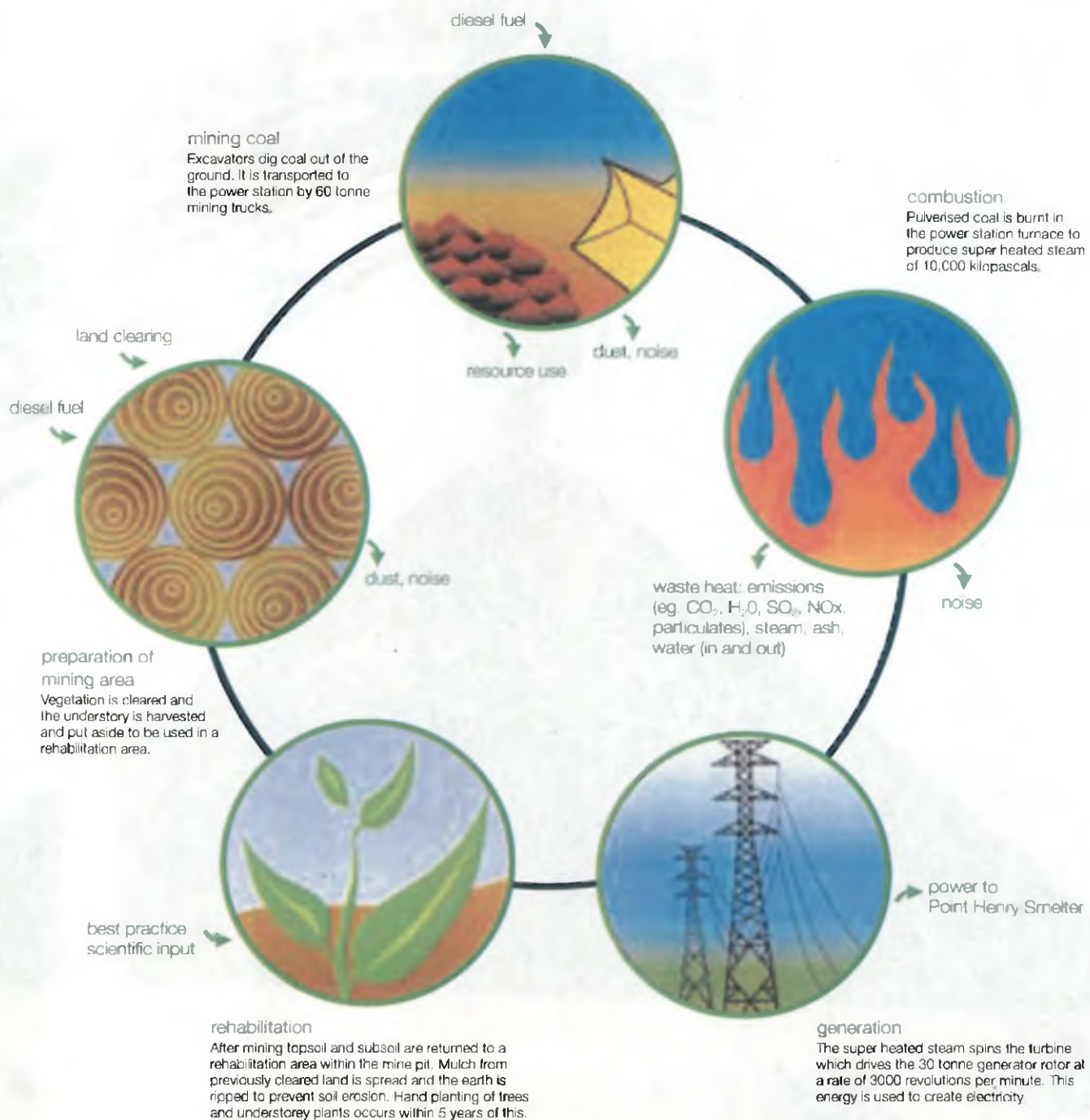
Most sheet products require a finishing step such as cleaning, coating and slitting. All products are trimmed to customer specified widths.



cold rolling

The aluminium coil is further reduced (to as thin as 0.24 mm) by three passes through a cold rolling mill. Exit speeds of cold rolling mills are as high as 1000 metres per minute.

alcoa anglesea power station's process steps



www.alcoa.com



Approximately 1.1 million tonnes of brown coal is mined at Anglesea each year.

glossary

of terms and abbreviations

Action	Environmental or process improvement projects which will be completed during the timeframe of the EIP to achieve a Target.	MW	An abbreviation for megawatt (one million watts), a measure of electrical power generated at power stations.
Aim	The long term strategy which Alcoa will strive to meet through setting Targets and completing Actions.	NOx	NOx is an abbreviation for the oxides of nitrogen. Formed as a combustion product, generally when nitrogen in the air is oxidised in the presence of oxygen. NOx are largely emitted by motor vehicles and energy generators but can also be produced by lightning, forest fires and the use of fertiliser in agriculture.
Ambient	The surrounding environment.	NPI	An abbreviation of National Pollutant Inventory, Australia's national database of pollutants emitted into the environment.
Anglesea Heath	Overlays land leased by Alcoa from the state government under the Mines (Aluminium Agreement) Act 1961 (7097ha) and an additional 124ha of freehold land owned by Alcoa. A unique agreement with state government allows Alcoa to co-manage the area with Parks Victoria as if it were a state park.	Opacity	A measure of the particulates in stack gas emissions.
Asbestos	The fibrous form of mineral silicates, the most significant being chrysotile, crocidolite and amosite (white, blue and brown asbestos respectively). Fibres below 3 micrometres in diameter and greater than 8 micrometres in length are potentially carcinogenic.	Particulate Matter (PM10)	Particulate matter (PM10) is a term used to describe dust particles of less than one hundredth of a millimetre. They are emitted by industry where there are any activities involving the movement of raw materials and combustion of fuels. They are also caused by lawn mowing, wood stoves, fires and cigarette smoke.
Carbon	Occurs naturally in the environment. Is a product dioxide of complete combustion (burning) of carbon-containing (CO ₂) materials. Imperative role in animal and plant life respiration (breathing). Contributes to the greenhouse effect.	PCBs	Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colourless to light yellow. Some PCBs can exist as a vapour in air. PCBs have no known smell or taste. At Alcoa, PCBs were historically used as coolants and lubricants in transformers, capacitors, and other electrical equipment, such as light bulbs. These are no longer used and Alcoa Anglesea is working towards being PCB free.
DSE	An abbreviation for the Department of Sustainability and Environment, partners with Alcoa Anglesea in the Anglesea Heath agreement.	SEPP	State Environment Protection Policy.
EHS	An abbreviation for Environment, Health and Safety.	Sulphur dioxide (SO₂)	A colourless, non-flammable gas with the chemical formula, SO ₂ . It is commonly used as a fruit-preserving agent, in wine making, as a bleach and as a fumigant for growing grains, grapes and citrus fruit. Natural sources of SO ₂ can be volcanic eruptions and the decay of vegetation. It is emitted by the combustion of coal at Alcoa Anglesea.
EIP	An abbreviation for Environment Improvement Plan.	Target	A Target is a measurable goal or objective set in the EIP. It is achieved by the completion of Actions.
EPA	An abbreviation for the Environment Protection Authority, a statutory body established under an Act of the Victorian Parliament in response to community concern about pollution.		
GLCs	An abbreviation for ground level concentrations. The GLCs of SO ₂ are measured by Alcoa's ambient air monitors in the Anglesea community.		
Greenhouse gases	Gases that contribute to global warming such as carbon dioxide and perfluorocarbons. These gases trap the radiant heat of the sun, allowing less of the radiation to be reflected back into space.		
ISO 14001	The international standard for environmental management systems (EMS) and a framework for the overall management of environmental issues at an operation.		

we welcome your feedback

We regard community engagement and external input as the most important part of our EIP. In order to allow us to further improve on the content and development of our future EIPs, we would greatly value your thoughts and feedback. Please take the time to consider the following points and feel free to add any additional comments that you feel necessary.

Were you satisfied with the information contained in the EIP?

1 = not satisfied 2 = somewhat satisfied
3 = satisfied 4 = exceeded expectations

Could you explain what information you found useful? _____

What information would you like to see included in future? _____

Was the EIP easy to read/follow?

1 = it was difficult to read/follow 2 = some areas were easy to read/follow
3 = most areas were easy to read/follow 4 = it was easy to read and follow

Please explain why you felt this way? _____

What would improve the EIP to enable you to read/follow it easier in the future? _____

Did the EIP give you a better understanding of the environmental initiatives at Alcoa Anglesea?

1 = no it did not improve my understanding 2 = it detailed environmental initiatives, but I did not learn anything new
3 = it improved my understanding of environmental initiatives
4 = I feel confident to discuss the quality of environmental initiatives at Alcoa's operations

Please explain why you felt this way? _____

What would you like to see included in future? _____

Would you consider being involved in Alcoa's community engagement processes in the future? _____

Are you happy for Alcoa to contact you regarding your comments or specific query? Yes No

Name: _____

Phone: _____

Address: _____

Email: _____

Further comments: _____

Please send your comments to:

Dave Ryan
Community Relations Officer

Alcoa Anglesea
Camp Road
Anglesea VIC 3230

david.ryan2@alcoa.com.au

Alcoa Anglesea
Camp Road
Anglesea 3230
Victoria

03 5263 3209
www.alcoa.com.au/anglesea

anglesea environmental management contacts

Stewart Esdale
Power Station Manager
(Nb. As at June 2008 – Acting Point Henry Smelter Manager)

Chris Rolland
Mine Manager
(Nb. As at June 2008 – Acting Power Station Manager)

Elise Jeffery
Mine Environmental Scientist
(Nb. As at June 2008 – Acting Mine Manager)

Nicci Marris
Environmental Scientist

Dave Ryan
Community Relations Officer

Maryann Thorp
Station Chemist

designed by chameleon creative

13 APPENDIX B – ENVIRONMENT PROTECTION AUTHORITY (EPA) LICENCE

20 March 2007

Mr Gerard Kennedy
 Manager Eastern Operations
 Environmental Health & Safety
 Alcoa Power Station
 Camp Road
 ANGLESEA VIC 3230

Our Ref: 32162

Dear Mr Kennedy

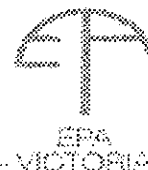
AMENDMENT OF WASTE DISCHARGE LICENCE

I enclose our notice of amendment and the amended licence number EM32162 for the coal fired power station at premises situated at Camp Road, Anglesea.

The licence held by Alcoa of Australia Ltd (Alcoa) for the power station has been amended as follows:

- Table 1 has been amended to reduce the maximum emission rate of oxides of sulfur;
- Condition 2.38 has been added to require a rehabilitation plan for the asbestos landfill;
- Conditions 2.8-2.12 have been added to require development of a Sulfur Dioxide Management Plan; and
- Conditions 2.13-2.17 have been added to require the development of an Air Emissions Management Plan.

If Alcoa objects to any of the conditions of its amended licence, it may have the decision reviewed by applying in writing, to the Registrar, Planning Division, Victorian Civil and Administrative Tribunal, 7th Floor, 55 King Street, Melbourne within 21 days of the date of issue. An application fee



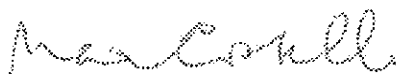
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may be applicable when lodging an appeal with VCAT. Contact VCAT on (03) 9628 9777 for further details on fees associated with the appeal. A copy of the appeal should also be forwarded to the Executive Director of Regional Services, Environment Protection Authority, GPO Box 4395QQ, Melbourne, 3001, within 7 days of lodgement of any appeal.

The amended conditions of the licence do not come into effect until any appeal is resolved and the existing licence applies until that time. Alcoa's licence fee is being assessed and will be forwarded shortly.

If you need additional information or assistance, please contact Matthew Natonewski on 5226 4825.

Yours sincerely



MAXWELL KEITH COSTELLO
MANAGER, AUTHORITY DECISIONS

NOTICE

**ENVIRONMENT PROTECTION ACT 1970
SECTION 20(9) (b) and (c)
NOTICE OF AMENDMENT OF LICENCE**

TO: ALCOA OF AUSTRALIA LTD

OF: CNR DAVEY ST & MARION ST, BOORAGOON WA

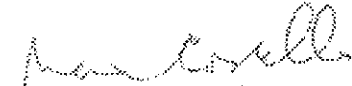
WHEREAS a licence number EM32152 was issued to **ALCOA OF AUSTRALIA LTD** by the Environment Protection Authority ("the Authority") on 26 June 1997 in respect of premises situated at Camp Road Angiesea ("the premises") pursuant to the Environment Protection Act 1970 ("the Act")

NOW TAKE NOTICE that the Authority pursuant to section 20(9)(b) of the Act **HEREBY REVOKES** all the conditions to which the licence is subject

AND TAKE FURTHER NOTICE that the authority pursuant to section 20(9)(c) of the Act hereby attaches to the licence the new conditions, contained in the attached amended licence.

DATED

20 March 2007



MAXWELL KEITH COSTELLO
MANAGER, AUTHORITY DECISIONS

NOTE:

IF FOUND GUILTY OF CONTRAVENING A CONDITION TO WHICH THE LICENCE IS SUBJECT, YOU MAY BE ORDERED TO PAY A FINE OF UP TO \$257,832 (SECTION 27(2) OF THE ACT).



FOR INFORMATION DESIRE

in City Road Southbank Victoria 3006 tel: (03) 9593 7333 fax: (03) 9593 3186

www.epa.vic.gov.au

Environment Victoria 1997

LICENCE

issued under Section 20 of the Environment Protection Act 1970

This licence allows the licence holder to discharge waste to the environment from the premises subject to the attached conditions.

LICENCE HOLDER: ALCOA OF AUSTRALIA LTD (ACN: 004 879 298)

REGISTERED ADDRESS: CNR DAVEY ST & MARION ST, BOORAGDON WA 6154

PREMISES ADDRESS: ANGLESEA POWER STATION, CAMP RD, ANGLESEA VIC 3230

LICENCE NUMBER: EM32162

DATE OF ISSUE: 26 JUNE 1997

DATE OF AMENDMENT: 20 MARCH 2007



 MAXWELL KEITH COSTELLO
 MANAGER, AUTHORITY DECISIONS



because that is our home
 EPA INFORMATION CENTRE

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EPA Waste Discharge Licence No. EM32162

Plant Activities	This licence applies to a premises where brown coal is mined and electricity is generated in a coal-fired power station. The licence covers: air discharges; mine, ash pond and sewage water discharges; and ash, asbestos and solid inert waste disposal.
Licence Objectives	<p>The licence holder shall adopt the following objectives for the protection of the environment:</p> <ul style="list-style-type: none"> • meet environmental quality requirements for all segments of the environment. This includes meeting the general provisions of the <i>Environment Protection Act 1970</i>, State environment protection policies, and Industrial waste management policies. In particular, <ul style="list-style-type: none"> • <i>Industrial waste management policy (Prescribed Industrial Waste);</i> • <i>State environment protection policy (Waters of Victoria);</i> • <i>State environment protection policy (Groundwaters of Victoria);</i> • <i>State environment protection policy (Air Quality Management);</i> • <i>State environment protection policy (Prevention and Management of Contamination of Land)</i> • operate in accordance with good environmental practice at all times; and • take opportunities to minimise waste and continuously improve environmental performance.
Licence Structure	<p>The licence consists of the following parts.</p> <ol style="list-style-type: none"> 1. <i>Waste Management</i> <ul style="list-style-type: none"> • specifies the general requirements under which wastes may be discharged to the environment. • specifies which wastes may be stored, treated or otherwise disposed of and the general requirements under which this may occur. 2. <i>Operational Controls</i> <ul style="list-style-type: none"> • includes operating requirements for good waste management and protection of the environment under both normal and plant upset conditions. 3. <i>Monitoring and Reporting</i> <ul style="list-style-type: none"> • specifies the monitoring requirements and the arrangements for submission of reports to EPA. 4. <i>Plan of Premises</i> <ul style="list-style-type: none"> • plan of the premises covered by this licence, including discharge points.
Definitions	"EPA" or "the Authority" means the Environment Protection Authority.



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1. WASTE MANAGEMENT**General**

1.1. Odours offensive to the senses of human beings must not be discharged beyond the boundaries of the premises.

DISCHARGES TO AIR

1.2. All wastes specified in Table 1 discharged to air from the premises must be discharged:

- a) only at discharge point 1, the location of which is indicated on the attached Plan of Premises;
- b) vertically upwards by means of a stack which must not terminate at a height above ground level less than that specified in the Table;
- c) at a rate not exceeding that specified in the Table;
- d) at a velocity not less than that specified in the Table; and
- e) so that there are no visible emissions excluding water vapour.

1.3. Wastes other than those specified in Table 1 must not be discharged from the corresponding discharge points specified in the Table.

1.4. The licence holder must maintain a device that continuously monitors and records the concentration of sulfur dioxide and the flow rate in Discharge Point 1.

TABLE 1: Emission Limits and Discharge Requirements

DISCHARGE POINT IDENTIFICATION		DISCHARGE REQUIREMENTS		EMISSION LIMITS		MONITORING FREQUENCY ¹
DP No.	Discharge Point Description	Min. Stack Height (m)	Min. Velocity (m/sec)	Compound	Maximum Rate (kg/min)	
1	Precipitator	108	8	Particles	4.19	All 4 times a year, (once per quarter) ⁴
	Exhaust			Oxides of Sulfur ²	100	
	Stack			Oxides of Nitrogen ³	10	
				Carbon Monoxide	2	

Notes

1: To be sampled after the electrostatic precipitator

2: "Oxides of Sulfur" mean the sum of all oxides of sulfur expressed as Sulfur Dioxide.

3: "Oxides of Nitrogen" mean the sum of all oxides of nitrogen expressed as Nitrogen Dioxide.

4: In addition to the requirement in condition 1.4.



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DISCHARGES TO WATER AND LAND**Sampling Points**

- 1.5. The licence holder must install and maintain water sampling points at the points described below and shown on the attached Plan of Premises:
- SP1: approximately 1100 metres upstream of the point where Marshy Creek flows under the Coalmine Road Bridge;
 - SP2: approximately 1000 metres upstream of the point where Marshy Creek flows under the Coalmine Road Bridge;
 - SP3: at the weir approximately 100 metres upstream of the Coalmine Road Bridge;
 - SP4: approximately 500 metres upstream of the point where Marshy Creek flows under the Coalmine Road Bridge;
 - SP5: at the pumpwell alongside the pumphouse pumping pond effluent to the irrigation area; and
 - SP6 at the Coalmine Road Bridge.
- 1.6. The sampling points referred to in condition 1.5 must be:
- as near as practicable to the discharge point;
 - such that samples may be easily obtained and are representative of the waste discharged; and
 - easily accessible at all times to authorized officers of EPA.

Water discharges

- 1.7. The wastes specified in Table 2 may be discharged from the premises at:
- from discharge point numbers SP1 and SP4 to Marshy Creek as shown on the Plan of Premises;
 - at a rate not exceeding that specified in the Table; and
 - at a concentration not exceeding that specified in the Table.

Table 2 Waste discharge limits

Parameter	Unit	SP1	SP4
Average Flow	Ml/day	2.9	1.5
pH	Units	4-10	3-9
SS	mg/L	100	100
Colour	Pt-Co Units	50	50
Al	mg/L	10	10
Fe	mg/L	10	20
Zn	mg/L	0.4	2.0
B	mg/L	TBD ¹	TBD

¹ TBD means "to be determined"

- 1.8. Notwithstanding anything to the contrary in this licence the wastewater from the premises must only be discharged to Marshy Creek at SP3 if the wastewater meets the quality criteria specified in Table 3.
- 1.9. Notwithstanding anything to the contrary in this licence, where the background or upstream levels measured at SP2 meet the values in Table 3 (rate of discharge excluded), the wastewater from the premises must only be discharged



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to Marshy Creek if the wastewater meets the water discharge limits specified in Table 3 at SP3.

- 1.10. Notwithstanding anything to the contrary in this licence, where the background or upstream levels measured at SP2 exceed the values in Table 3 (rate of discharge excluded), the wastewater from the premises must only be discharged to Marshy Creek:
- the pH at SP3 not being lower than the pH at SP2; and
 - the measured values at SP3 not exceeding the measured values at SP2 for the other parameters in Table 3.

Table 3: Water Discharge Limits¹

Parameter	Unit	Maximum Value	Sampling Frequency
Rate of Discharge	ML/day	32.9	All monthly
Suspended Solids	mg/L	30	
Colour	Pt-Co units	50	
Iron	mg/L	4.0	
Aluminium	mg/L	5.5	
Zinc	mg/L	0.3	
Boron	mg/L	TBD ²	
Parameter	Unit	Range	
pH		5-9	

1: Sampled at SP3.

2: "TBD" means "to be determined".

Mixing Zone

- 1.11. The mixing zone applicable to the discharges shall be those waters of the Marshy Creek between SP1 and SP3 indicated on the attached Premises Plan.
- 1.12. The pH and metals objectives for the General segment, *State environment protection policy Waters of Victoria*, do not apply to the waters contained in the mixing zone specified in Condition 1.11.
- 1.13. Within the mixing zone specified in Condition 1.11, the waste discharge must not cause:
- the level of dissolved oxygen to be less than 6 milligrams per litre;
 - objectionable odours;
 - visible floating foam, oils, grease, scum, litter or other objectionable matter; or
 - mortality of fish or other motile species.

Ashing wastewater discharges

- 1.14. Wastewater from the twin ash ponds must only be discharged:
- to the power station as ashing return water; or



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b) to Marshy Creek subject to the conditions specified in Table 2.

Sewage effluent discharges

- 1.15. Sewage effluent from the power station must only be discharged to sewage ponds as identified on the attached Plan of Premises subject to the conditions specified in Table 4.
- 1.16. Wastewater from the sewage ponds must only be disposed by spray irrigation to the area of land identified as "sewage sprays" on the attached Plan of Premises.

Table 4: Sewage Water Limits¹

Parameter	Unit	Maximum Value	Sampling Frequency
Biochemical Oxygen Demand	g/m ³	40	January, April, July and October
Flow	m ³ /day	15	N/S ²

¹ At SPS.

² N/S means "Not Specified".

- 1.17. The waste as sampled at SPS must not contain visible floating oil, grease, scum, litter or other objectionable floating matter.

Asbestos and Solid Inert Waste landfill

- 1.18. Waste deposited at the premises within the area identified as "Asbestos Dump" on the attached Plan of Premises must only consist of:
- asbestos and asbestos products;
 - material contaminated with asbestos; and
 - solid inert waste including man-made mineral fibres;
 - that have been removed from the power generation plant at the premises.
- 1.19. Asbestos must be handled such that dust containing asbestos fibres is not generated.
- 1.20. The handling and disposal of waste asbestos must be conducted in accordance with the most recent EPA Publication 364 *The Transport and Disposal of Waste Asbestos*.

Ash disposal to Mine

- 1.21. Wastes from the power station ashing system, consisting of ash from the coal fired boiler and blowdown from the water treatment plant, must only be discharged into the twin ash ponds.
- 1.22. Any sludge removed from the twin ash ponds must be deposited into the mine unless otherwise approved in writing by the Authority.



2 OPERATIONAL CONTROLS

Discharges to Air

- 2.1 The stack serving discharge point 1 must be fitted with a device to continuously measure and record the opacity of the exhaust gas stream.
- 2.2 The device referred to in condition 2.1 must activate an audible alarm whenever the opacity of the discharge exceeds 0.25 grams per normal cubic metre.
- 2.3 The licence holder must ensure that the monitoring, recording and alarm equipment referred to in condition 2.1 is properly maintained and calibrated.
- 2.4 The exhaust air stream must pass through an electrostatic precipitator prior to discharge from discharge point 1.
- 2.5 The electrostatic precipitator referred to in condition 2.1 must be maintained in good operating condition at all times.
- 2.6 The electrostatic precipitator referred to in condition 2.1 must be energised at all times when the boiler associated with the discharge point number 1 is operating on brown coal.
- 2.7 Except for the products of combustion of oil produced during start-up using fuel oil, no gaseous and particulate matter leaving the boiler must be passed through a cell of the electrostatic precipitator in which all three fields have been de-energised by electrical or mechanical failure or for maintenance purposes.

Sulfur Dioxide Reduction

- 2.8 By the 25 May 2007 the licence holder must submit to EPA for approval, a Sulfur Dioxide Management Plan to ensure that sulfur dioxide emissions are managed in accordance with the requirements of the *State environment protection policy (Air Quality Management)*.
- 2.9 The Sulfur Dioxide Management Plan referred to in Condition 2.8 must include:
 - a) measures to reduce sulfur dioxide emissions using industry best practice, pollution control equipment and management procedures;
 - b) the projected maximum and average concentrations and mass rates of sulfur dioxide that would be emitted following the application of industry best practice pollution control and management procedures;
 - c) a timetable for the implementation of the measures proposed in 2.9(a) above;
 - d) demonstration of how the objectives of the *State environment protection policy (Air Quality Management)* will be met at all times under normal operating conditions; and
 - e) a review of the Load Reduction Protocol including any proposed amendments that are necessary to ensure that the objectives of the *State environment protection policy (Ambient Air Quality)* will be met at all times.
 - f) The report referred to in condition 2.8 must include a Community engagement plan and procedures to ensure the Anglesea community is appropriately informed on the sulfur dioxide reduction strategy including community notification procedures for exceedance of *State Environment Protection Policy (Air Quality Management) (SEPP AQM) environmental objectives*.



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- 2.10 By the 1 May 2010 the licence holder must install pollution control equipment and implement management procedures as identified in the Sulfur Dioxide Management Plan referred to in condition 2.9 as approved in writing EPA.
- 2.11 The licence holder must manage and operate the premises in accordance with the current version of the Sulfur Dioxide Management Plan approved in writing by EPA.
- 2.12 The licence holder must provide progress reports to EPA in relation to the Sulfur Dioxide Management Plan. These reports must be supplied by 1 January 2008, 1 July 2008, 1 January 2009 and 1 July 2009.

Air Emissions Management Plan

- 2.13 By the 1 July 2007, the licence holder must submit to the Authority for approval a premises-wide Air Emissions Management Plan further detailing the nature of air emissions from the power plant.
- 2.14 The report referred to in Condition 2.13 must include an assessment of the emission(s) of:
- a) PM₁₀;
 - b) PM_{2.5};
 - c) PAHs (including benzo (a) pyrene);
 - d) VOCs (including benzene);
 - e) sulfur trioxide;
 - f) chlorine compounds;
 - g) fluorine compounds; and
 - h) Metals (including mercury and class 3 indicators)
- 2.15 The report referred to in condition 2.13 must include an EPA-approved monitoring program that will allow for the establishment of EPA licence limits for the compounds.
- 2.16 The report referred to in condition 2.13 must demonstrate that the licence holder is minimising any adverse environmental impact caused by air emissions from the power plant by the application of:
- a) industry best practice for class 3¹ indicators and reduced to the maximum extent achievable for any class 3² indicators;
 - b) appropriate pollution control equipment; and
 - c) appropriate management procedures.
- 2.17 The report referred to in condition 2.13 must include a Community engagement plan and procedures to ensure the Anglesea community is appropriately informed about the Air Emission Management Plan including community notification procedures for exceedance of State Environment Protection Policy (Air Quality Management) (SEPP AQM) environmental objectives.

¹ As defined in the State environment protection policy (Air Quality Management)

² As defined in the State environment protection policy (Air Quality Management)



DISCHARGES TO WATER AND LAND**Sewage Effluent Ponds**

- 2.18 The pond system must be maintained so as to prevent any discharge through the beds or banks from adversely affecting the beneficial uses of surface or underground waters.
- 2.19 The inlet pipe to the primary pond must enter below water level.
- 2.20 The pond system must be operated and maintained in such a way as to ensure that the banks are not overtopped by waste.
- 2.21 The inner batters of all the ponds must be kept clear of grass and weed growth.
- 2.22 A secure fence of not less than post and wire standard must be maintained around the pond to restrict access by persons or cattle.

Sewage Effluent Irrigation

- 2.23 Effluent from the sewage lagoon must only be disposed of at the premises referred to in condition 1.13 by spray irrigation.
- 2.24 No spraying or irrigation must take place while the irrigation area is open to the public.
- 2.25 A standby pump must be provided at the site for use in the event of failure of the irrigation pump.
- 2.26 "In service" and "Standby" irrigation sprays must be alternated monthly.
- 2.27 Adequate bunding and cut-off drains must be maintained around the irrigation area to prevent entry of run-off from adjacent land and to prevent waste leaving the premises.
- 2.28 The licence holder must undertake appropriate soil conservation measures where necessary in order to avoid soil erosion occurring as a result of the irrigation activities.
- 2.29 Irrigation of effluent must be carried out in such a manner that no spray drift is detectable beyond the boundaries of the premises.
- 2.30 Irrigation of effluent must be carried out in such a manner that no spray drift is detectable beyond the boundaries of the premises.
- 2.31 Spray irrigation must not take place within 50 metres of the property boundary.
- 2.32 The waste collection, treatment and disposal facilities must be regularly inspected and maintained by the licence holder, or a person nominated by the licence holder.

Asbestos and Solid Inert Waste Landfill

- 2.33 Seepage of waste to groundwater at the premises must not cause any groundwater quality objective, as specified in State environment protection policy (*Groundwaters of Victoria*), to be exceeded.
- 2.34 No waste must be deposited into water.



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- 2.35 The landfill site must be staffed at all times when it is open for the receipt of asbestos waste.
- 2.36 All waste must be tipped or deposited in layers not exceeding a vertical height of 2 metres.
- 2.37 Compaction of asbestos waste must only take place immediately after the waste is covered with no less than 300 mm of soil.
- 2.38 All asbestos waste or asbestos contaminated materials must be placed in double, heavy duty polyethylene bags and sealed with adhesive tape or wrapped securely with one or two layers of polyethylene sheeting.
- 2.39 Packages containing asbestos waste must be properly and clearly labelled, "Caution - Asbestos - Do Not Inhale Dust".
- 2.40 Asbestos waste must be deposited at the base of the tipping area in a manner which prevents the rupturing of polyethylene bags or wrapping containing asbestos waste for disposal at the premises.
- 2.41 The licence holder must keep a written record of the type, amount and location of all asbestos waste and waste materials contaminated with asbestos deposited at the premises.
- 2.42 The licence holder must maintain a two metre high chain mesh fence and lock-up gates around the perimeter of the landfill.
- 2.43 Signs must be prominently displayed at the entrance to the asbestos landfill indicating:
- a) the EPA waste discharge licence number;
 - b) the types of wastes which may be deposited;
 - c) that fires must not be lit on the premises;
 - d) where wastes may be deposited;
 - e) emergency contact phone numbers; and
 - f) a sign warning operators at the tipping area used to deposit asbestos which reads "Asbestos Disposal Site - Do Not Inhale Dust".
- 2.44 All surface drainage must be diverted away from the tipping area used for the disposal of asbestos waste.
- 2.45 Litter arising from the landfill operations must at all times be confined within the boundaries of the landfill.
- 2.46 No waste must be permitted to be discharged beyond the boundaries of the landfill.
- 2.47 An all weather access road must be provided and maintained to the tipping area at the landfill.
- 2.48 The final surface of the landfill site must be graded, drained and vegetated to minimise erosion and to prevent ponding of stormwater on the landfill.
- 2.49 By 1 July 2007 the licence holder must provide a landfill rehabilitation plan which includes:
- a) a map delineating the extent and location of the landfill and the Tipping areas;
 - b) final contour plans at the completion of waste filling; and
 - c) proposed landfill cap design and specifications for the construction of the cap.



3. MONITORING AND REPORTING**GENERAL**

- 3.1. All samples must be obtained by or under the instruction of a qualified analyst.
- 3.2. The licence holder must:
- a) ensure that the date, time and results of all sampling, analyses, inspections and maintenance works are accurately recorded in writing and signed by a responsible officer; and
 - b) make the results of the monitoring program available to an authorised officer of EPA upon any request to do so.
- 3.3. All samples for analysis must be submitted to an analytical laboratory accredited by the National Association of Testing Authorities (NATA) to undertake the analyses specified in this licence, unless the publications referred to in conditions 3.6 or 3.8 recommend in-situ testing.
- 3.4. The licence holder must ensure that the record of analysis results bears a NATA stamp endorsement.
- 3.5. The licence holder must ensure that all of the records required by this licence are accessible at all times for inspection by any authorized officer of the Environment Protection Authority.

Discharges to Air

- 3.6. The wastes discharged from discharge point 1 listed in Table 1 must be tested in accordance with the most recent edition of EPA Publication No 440 *A Guide to the Sampling and Analysis of Air Emissions* at a frequency of not less than that specified in the Table.
- 3.7. The licence holder must maintain a written record of all breakdowns or failures of, and inspections and maintenance carried out on, the electrostatic precipitator associated with Discharge Point number 1.

Water Discharges

- 3.8. The wastes discharged from the discharge points listed in Tables 2, 4, and 5 must be tested in accordance with EPA Publication No 441, *A Guide to the Sampling and Analysis of Water and Wastewater* at a frequency of not less than that specified in the Tables.



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Additional Water Monitoring Program

3.9. The following parameters must be monitored at the sampling sites and at the sampling frequencies indicated in Table 5.

Table 5: Additional Water Monitoring Requirements

Sampling Point		Parameters	Unit	Sampling Frequency
SP2	1000 metres upstream of Coalmine Road Bridge	Suspended Solids	mg/L	All Monthly
		Iron	mg/L	
		Zinc	mg/L	
		Aluminium	mg/L	
		Temperature	°C	
		pH	pH units	
SP6	Coalmine Road Bridge	Suspended Solids	mg/L	All Monthly
		Iron	mg/L	
		Zinc	mg/L	
		Aluminium	mg/L	
		Temperature	°C	
		pH	pH units	

Complaint Recording

- 3.10. The licence holder must keep a written record of all complaints received concerning the environmental impact of the premises which includes:
- name and address of complainant;
 - date and time of complaint;
 - location from which complaint arose;
 - general description of the nature of the complaint;
 - approximate wind direction and temperature at the time of the complaint;
 - the likely source of the cause of the complaint; and
 - action taken by licence holder.

Exception Report

- 3.11. The licence holder must notify the Authority's Geelong office immediately by fax of any incidents that may lead to an unlicensed discharge of waste or an environmental hazard.
- 3.12. The licence holder must notify the Authority's Geelong office as soon as practicable in writing of any performance monitoring result which indicates a



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breach of any condition of this licence or any State environment protection policy.

3.13. The notifications required by conditions 3.6 and 3.8 must include:

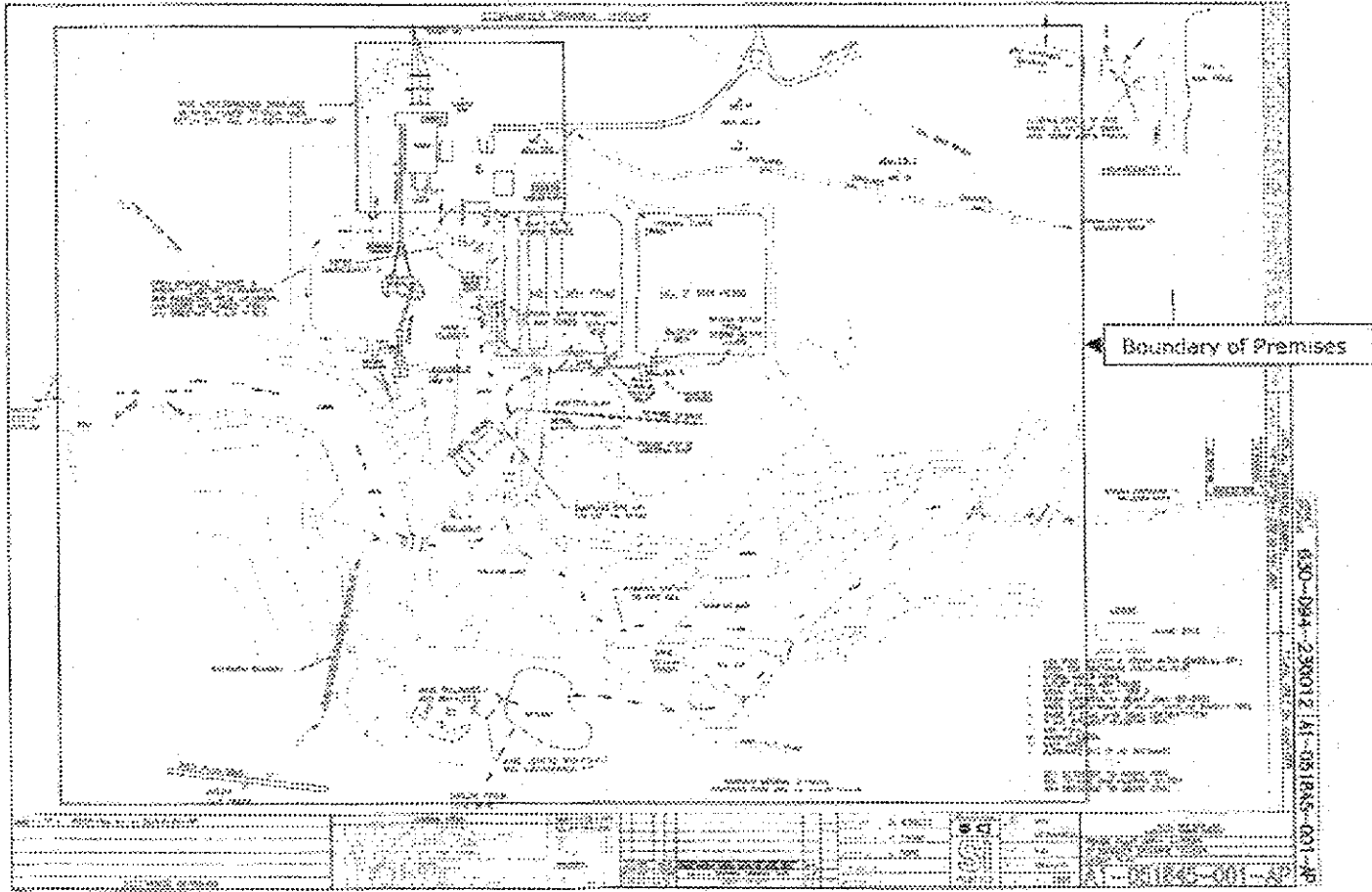
- a) the actual monitoring result and all maintenance and inspection records related to the incident; and,
- b) an explanation of what caused the incident and details of the measures taken to rectify the problem and prevent a recurrence.

Annual Performance Report

3.14. By 28 February each year, the licence holder must submit a performance report to the Authority for the preceding calendar year, prepared in a form agreed to by the Authority. The performance report must be authorised by the licence holder's managing director.



4. PLAN OF PREMISES



Alcoa of Australia - Alcoa Anglesea Mine Work Plan

Confidential - Alcoa

14 APPENDIX C – LAND MANAGEMENT PLAN

LAND MANAGEMENT PLAN

ANGLESEA



Location of Hard Copies

Copy No	Anglesea	Western Australia
1	MINE Environmental Scientist	Environmental Manager
2	Mine Manager	
3	PowerStation Manager	
4		
5		
6		
7		
8		

Production Mining/Land Management



Land Management Plan

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Land Management Plan

Introduction

Location

The Anglesea site is situated on unreserved Crown Land, 41 kilometres southwest of Geelong, and two hundred metres north of the town of Anglesea.

The site consists of Alcoa freehold and a 7097-ha area of Crown Land leased under provisions of the *Mines (Aluminium Agreement) Act 1961* which grants Alcoa of Australia Ltd exclusive right to explore and extract coal found within the area for 50 years, until 2011, with the right of 50 years renewal.

Alcoa mines brown coal in an open cut mine to fuel its 160-MW Anglesea PowerStation located within the lease area. The electricity produced is transmitted via a 35-km high voltage power line to Alcoa's aluminium smelter and fabricating mills at Point Henry, near Geelong. The PowerStation supplies approximately 40% of Point Henry's power requirements.

Site description

Originally referred to as the Alcoa Lease, the site at Anglesea is now the Anglesea Heath. The Anglesea Heath consists of two main areas:

Mining Area: Coal Mine & PowerStation: 545 ha of lease and freehold where mining and power generation areas and administration offices are located.

Land for Conservation: 6676 ha of lease.

There are also 22 ha of additional freehold, currently supporting a variety of land uses, located between the Mining area and the Anglesea township.

Mining Area

Exploration for brown coal began here in the late 1950's to supplement dwindling brown coal reserves from mines in the Barwon region.

Results of exploratory drilling by the then Mines Department, Roche Brothers and later Western Mining Corporation indicated a large economically-viable coal deposit immediately to the north of Anglesea. Roche Brothers commenced open cut mining operations with two small pits at the western end of this deposit in 1959. Later control of the deposit passed to Western Mining Corporation - who after approaching Alcoa became part of Alcoa of Australia Ltd - and in 1961 Alcoa was granted a long-term lease over the deposit.

As drilling information at the time was largely incomplete, the Roche Brothers open cut was established in error on the lower of two coal seams instead of the thicker upper main seam. With the major customer base shifting to alternate fuel sources, the output from the Roche Brothers open cut dwindled from 169,000 tonnes in 1959 to 14,300 tonnes in 1968. The coal reserve in this section of the lower seam was all but exhausted when Alcoa commenced open cut mining operations in 1969.

Since 1969 Alcoa has mined approximately 1.1 million tonnes of brown coal each year from the main upper seam within the open cut.

Land for Conservation

The area offers one of the most diverse and spectacular areas for flora, scenic landscape and wildlife communities in Victoria. A remarkable number of flora species exists here with over 620 native plant species including 79 species of orchids. This represents approximately one-quarter of Victoria's complement of flora species and half of the State's orchid flora. The heathy woodland community appears to be the richest and most diverse found in Victoria probably only exceeded by some heathy communities in southwestern Western Australia (LCC, 1987), which the listing of much of this area on the National Estate Register recognises.

The heathy woodland complex in the study area is of exceptional quality with only serious disturbance or degradation occurring in a few locations. The entire lease area was burnt by wildfire on Ash Wednesday, 16 February 1983 and several ecological burns have been carried out since.

Production Mining/Land Management



Land Management Plan

A unique agreement between Alcoa and NRE, allows government and industry to jointly manage the Land for Conservation and ensure that this important area is protected. This area has been named the Anglesea Heath and is managed using the Anglesea Heath Management Plan. Alcoa employs an MINE Environmental Scientist and funds a Parks Victoria Ranger to implement the strategies and actions of this Management Plan including the protection of threatened species, track rationalisation and rehabilitation. Both the Agreement and the Management Plan allow continued use and management of the Mining Area and any future expansion of that area in accordance with the requirements of the *Mines (Aluminium Agreement) Act 1961*.

Freehold

In addition to the Mining area and Land for Conservation, Alcoa has 22 hectares of freehold land adjacent to the Anglesea township.

The Environment

Climate

Anglesea has a Mediterranean type climate, with a hot, dry summer and a cool, wet winter. The site receives an average of 600-700 mm of rain each year, most of it falling between May and October.

Temperatures are warm to hot in summer and mild in winter, with occasional frosty mornings. A typical daily range in January is 15 to 30°C with average maximum temperatures reaching 23 to 25°C, and a typical daily range in July is 5 to 15°C with the average minimum temperatures down to 4 to 5°C.

Geology and Soils

Soils developed on the Tertiary sediments of the Anglesea area generally exhibit acid duplex profiles from three distinct profile types developed from differing parent materials. The main characteristic of the vast majority of soils in the area is the distinct texture contrast between the light-textured sandy surface soil and the clay subsoil.

Sandy podzols and podsollic soils tend to be developed on older Tertiary sediments and therefore tend to be more prevalent on the lower sections of slopes. These highly leached acidic soils are characterised by sandy topsoils and low fertility with deficiencies in Phosphorus, Potassium, Nitrogen, Copper, Zinc and Molybdenum.

Lateritic podsollic soils are generally developed on the plateau remnants of the Tertiary peneplain. The A horizons of these soils have a loamy texture with a organic A1 and bleached A2 horizon, changing sharply to well structured silty clay at around 40 cm depth. Ironstone blocks and nodules are ubiquitous at around 1.0 metre depth. Deficiencies in Phosphorus, Potassium, Copper and Molybdenum are common in these soils (Pitt, 1977).

Acid peaty soils are developed in local creek beds and may be up to several metres in depth. Although nutrient levels are high, they are not freely available to plants due to a pH less than 4 (Kentish and Bourne, 1983).

Vegetation

The vegetation of the area consists of dry heathlands and heathy open forests and woodlands. Marshy Creek and Sall Creek flow south and east respectively through the area and are characterised by broad swampy areas dominated by shrublands of *Melaleuca squarrosa* (Scented Paperbark) (LCC, 1987).

Land Management Plan

This Land management plan outlines the current management strategies for the PowerStation, Mining area and freehold that is managed by Alcoa of Australia Ltd. This includes the rehabilitation strategy for the open cut mine in addition to land management issues associated with the mining area and freehold including liability, environmental protection, pest plant control, fire management and protection of indigenous flora and fauna. The Land management plan concentrates on environmental impact, appropriate land-use, community use of Alcoa freehold, being a 'good neighbour' and increasing active management of the area to maintain the natural values of the area.

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Land Management Plan

The management of the Land for Conservation will not be addressed here as this area is managed cooperatively by Alcoa and Parks Victoria with the Anglesea Heath Management Plan. Reference to the Anglesea Heath will occur, as it is the intention of this plan to manage the Mining Area and freehold in a manner consistent with the surrounding lease.

References

- [D0076435 Land Conservation Council Melbourne Area District 1 Review Final Recommendation](#)
- [D0075635 Anglesea Heath Management Plan](#)
- Kentish, K.M. and Bourne, A.R. (1983) Mine Rehabilitation: A study of revegetation and fauna return at Anglesea, Victoria. Submitted by K.M.Kentish for MSc. Deakin University
- Pitt, A. (1977) Soils of the Otway Ranges and Surrounding Coastal Plain. Proceedings of the Royal Society of Victoria. Vol 89: 69-75
- Rolland, C. (19??) The ongoing rehabilitation of the Anglesea Brown Coal Mine

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Environmental Management Overview

Anglesea's Environmental Management System is based on the ISO14001 standard. The lead component of the system is the Environmental Health and Safety Policy, which sets the overall direction for environmental performance for the site. This section of the Land Management Plan describes the key elements of the Environmental Management System that are relevant to the area of Land Management.

Alcoa's Environmental, Health and Safety Policy

Anglesea has embraced the Corporate Environmental, Health and Safety Policy as it's own. In addition to the Corporate EHS policy, Anglesea has added a number of principles committing the site to continuously improve it's EHS performance.

The EHS policy is available internally on all computers via the [intranet](#), on all noticeboards or from administration. Externally the policy is available from the Community Relations Officer at Anglesea or from Alcoa Australia's [web site](#).

This policy supports the Alcoa EHS Value that we will work safely in a manner that promotes the health and well being of the individual and the environment.

Policy

It is Alcoa's policy to operate worldwide in a safe, responsible manner which respects the environment and the health of our employees, our customers and the communities where we operate. We will not compromise environmental, health or safety values for profit or production.

All Alcoa employees and contractors are expected to understand, promote and assist in the implementation of this policy and the accompanying principles.

Principles

In support of Alcoa's Environmental, Health and Safety Policy, the following principles have been developed to provide additional direction on accountability and on specific issues.

- We value human life above all else and manage risks accordingly.
- We relentlessly pursue, and continually improve EHS systems and processes to achieve an EHS incident-free workplace.
- We do not compromise our EHS value for profit or production.
- We comply with all laws and set higher standards for ourselves and our suppliers where unacceptable risks are identified.
- We support pollution prevention and sustainable development, by incorporating social responsibility, economic success and environment excellence into our decision making process.
- We measure and assess our performance and are open and transparent in our communications.
- We supply and use safe and reliable products and services.
- We use our EHS knowledge to enhance the safety and well being of our communities.
- We are all accountable for conforming with and deploying our EHS value and principles.

At Anglesea Power Station, all employees and contractors will demonstrate our commitment to this EHS Policy and Principle Statement by progressively reducing our environmental, health and safety impacts and the intensity of our resource and energy use by participating in programs to:

- ensure environmental, health and safety factors are integrated into business planning through the Alcoa Business System as part of the implementation of comprehensive environmental and safety management systems;
- systematically address key environmental impacts for the power station and mine, such as land management issues, equipment noise, air quality, process water usage and discharge, energy efficiency and greenhouse gas emissions.

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- working together to actively care for ourselves, our team-mates and other people in our area, our neighbours and the environment;
- actively share our improvements and achievements within the station, other Alcoa locations and with the community in which we operate.
- Engage and consult with employees and the community on health and safety and environmental issues.

References

- [D0089618 Anglesea Environmental Health and Safety Policy](#)

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Identification of Significant Aspects & Impacts

Anglesea's environmental policy, improvement plans and management programs are developed to ensure that activities at the site are managed to minimise impacts on the environment. In developing the Environmental Management System a systematic review of all operations was carried out to identify potential environmental impacts.

A risk assessment process was used to rank the environmental aspects and impacts according to potential environmental impact, frequency or likelihood of occurrence, legislative or other requirements, stakeholder concerns (including community and employees) and financial liability.

All potential impacts ranked as 'significant' must have systems in place to mitigate or minimise the impact on the environment.

The potential significant environmental impacts relevant to land management include, but are not restricted to,

- Spread of Phytophthora due to the movement of equipment and soil and drainage of water from Phytophthora-affected to Phytophthora-free areas;
- Disturbance of areas that have heritage values, rare and endangered species and ecosystems;
- Reduced localised biodiversity due to clearing and loss of habitat;
- Increased stream turbidity due to runoff from disturbed areas; and
- Unsustainable revegetation due to ineffective rehabilitation techniques.

References

- [D0024281 Victorian Operations Aspects and Impacts – Identification and Evaluation Procedure](#)
- [D0055198 Identification of Significant Environmental Aspects](#)
- [D0055446 Master Index Aspects and Impacts Register for Anglesea PowerStation](#)
- [D0055319 Significant Environmental Aspects and Impacts Register – Mine + Land Management](#)



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Legal and other requirements

The process for identifying and accessing legal requirements and other environmental standards, guidelines and voluntary signatory agreements to which the Alcoa subscribes is described within the reference documentation of this section.

The identification, review and communication of legal and other requirements such as Government guidelines, Corporate standards and voluntary agreements is also assisted by an external legal consultancy who conduct a quarterly review. Any changes or new legislation is then communicated to the environmental personnel.

Regulatory Requirements

The Anglesea Environment Management System as part of the ISO14001 certification maintains a register of standards and statutory obligations that apply to Alcoa's operations.

A legal counsel system covers all the acts potentially relevant to Anglesea. An external legal firm maintains the system and updates are communicated to environmental personnel quarterly to ensure the sites are kept up to date with new legislation and standards.

The following are some principal Acts and Regulations that apply to the area of Land Management for Anglesea.

Fire Management

- Country Fire Authority Act 1958

This Act governs the management and extinguishment of fires in the country area of Victoria and establishes the Country Fire Authority, Regional and Municipal Fires/ Prevention Committees and the Country Fire Authority Appeals Commission.

This Act controls the lighting of fires at Anglesea for the control of undergrowth fuel sources.

Flora and Fauna Management

- Environment Protection and Biodiversity Conservation Act 1999

The purpose of the Legislation is the protection of the environment and conservation of biodiversity. The Act establishes a regime of inter-governmental agreements, management plans, approvals and permits for certain actions to be taken in, or affecting, the environment in general, or particular aspects of the environment.

- Flora and Fauna Guarantee Act 1988 & Flora and Fauna Guaranteed Regulations 2001

The purpose of this Act is to establish a legal and administrative structure to enable and promote the conservation of Victoria's native flora and fauna and to provide for a choice of procedures that can be used for the conservation, management or control of flora and fauna and the management of potentially threatening processes.

- Wildlife Act 1975 & Wildlife Regulations 2002

The purposes of this Act are:

(a) to establish procedures in order to promote:

- (i) the protection and conservation of wildlife; and
- (ii) the prevention of taxa of wildlife from becoming extinct; and
- (iii) the sustainable use of and access to wildlife; and

(b) to prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife.

The Act establishes the framework for the protection and conservation of wildlife and regulates the conduct of persons engaged in activities concerning or related to wildlife. The Regulations establish a framework for the protection of wildlife in Victoria and a licensing system in relation to wildlife.

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Cultural Heritage

- **Aboriginal Heritage Act 2006**

The main purpose of this Act is to provide for the protection of Aboriginal cultural heritage (Aboriginal places, objects or human remains) in Victoria.

The Act regulates high impact developments with the potential to harm Aboriginal cultural heritage by requiring that a Cultural Heritage Management Plan be prepared prior to development commencing. The Act also regulates smaller developments by prohibiting certain activities without a permit.

- **Aboriginal and Torres Strait Islander Heritage Protection Act 1984**

This Act makes provision for the preservation and protection from injury or desecration of areas, places and objects in Australia and in Australian waters, being areas, places and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition.

This Act establishes a general regime applying to all States and a regime to protect Aboriginal places and objects in Victoria.

The Act provides for the declaration of protected places, areas and objects, which gives rise to obligations and responsibilities.

- **Heritage Act 1995**

This Act provides for the protection and conservation of places and objects of cultural heritage significance and the registration of such places and objects, and establishes the Heritage Council and a Victorian Heritage Register.

A site within the Anglesea lease area is listed on the Heritage Register, whilst archaeological sites have not yet been identified.

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- **Conservation, Forests and Lands Act 1987 and regulations (including the Conservation, Forests and Lands (Anglesea Heath) Regulations 2000)**

The purposes of this Act are--

(a) to create a body corporate called the Director-General of Conservation, Forests and Lands, to define its powers and to transfer to it the functions of the Forests Commission, the Soil Conservation Authority and the Vermin and Noxious Weeds Destruction Board, and to abolish those bodies;

(b) to provide a framework for a land management system and to make necessary administrative, financial and enforcement provisions;

(c) to establish a system of land management co-operative agreements;

(d) to make consequential amendments to various Acts.

- **Planning & Environment Act 1987**

The purpose of this Act is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

This Act includes the Victorian Planning Provisions to assist in providing a consistent and coordinated framework for planning schemes in Victoria. Native Vegetation Retention Controls and the need for a planning permit to clear native vegetation have been in place since 1989 in all Victorian Planning Schemes through these Provisions.

Mineral and Stone extraction

- **Mines (Aluminium Agreement) Act 1961**

This act describes the agreement between Alcoa and the State to establish Alcoa's lease.

- **Mineral Resources (Sustainable Development) Act 1990**

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The purpose of this Act is to encourage an economically viable mining industry which makes the best use of mineral resources in a way that is compatible with the economic, social and environmental objectives of the State.

The objectives of this Act are:

- a) to encourage and facilitate exploration for minerals and foster the establishment and continuation of mining operations by providing for:
 - i) an efficient and effective system for the granting of licences and other approvals; and
 - ii) a process for co-ordinating applications for related approvals; and
 - iii) an effective administrative structure for making decisions concerning the allocation of mineral resources for the benefit of the general public; and
 - iv) an economically efficient system of royalties, rentals, fees and charges; and
- b) to establish a legal framework aimed at ensuring that:
 - i) mineral resources are developed in ways that minimise impacts on the environment; and
 - ii) consultation mechanisms are effective and appropriate access to information is provided; and
 - iii) land which has been mined is rehabilitated; and
 - iv) just compensation is paid for the use of private land; and
 - v) conditions in licences and approvals are enforced; and
 - vi) dispute resolution procedures are effective; and
 - vii) the health and safety of people is protected in relation to work being done under a licence; and
- c) to recognise that the exploration for, and mining of, mineral resources must be carried out in a way that is not inconsistent with the Native Title Act 1993 of the Commonwealth and the Land Titles Validation Act 1994.

- Extractive Industries Development Act 1995

The main purposes of this Act are to:

- (a) provide a co-ordinated assessment and approvals process for extractive industries;
- (b) ensure that extractive industry operations are carried out with safe operating standards and in a manner that ensures the rehabilitation of quarried land to a safe and stable landform;
- (c) provide a procedure for notification of proposed extractive industries to licence holders under the Mineral Resources (Sustainable Development) Act 1990;
- (d) provide for the payment of royalties for stone extracted from Crown land.

For the purposes of this Act land in the leased area within the meaning of the definition of 'leased area' in the agreement set out in the Schedule to the *Mines (Aluminium Agreement) Act 1961* is deemed to be private land of which Alcoa of Australia Proprietary Limited is the owner for any purpose other than the determination and payment of royalty to the Crown.

Pest plant and animal management

- Catchment and Land Protection Act 1994

This Act aims, amongst other things, to set up a framework for the integrated management and protection of catchments and to set up a system of controls on noxious weeds and pest animals. The Act establishes and set up the powers of the Victorian Catchment Management Council and Regional Catchment and Land Protection Boards. However, it also imposes certain positive obligations, which are potentially relevant to Alcoa.

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The Act includes provisions, which impose obligations to control the spread of noxious weeds and established pest animals. Alcoa has implemented weed control measures at all of its Victorian sites.

References

- [D0022980 Identification and access to Legal and other environment requirements](#)
- [D0044859 Legal Requirements – ISO14001](#)
- [D0042662 Environmental Management Legal, Regulatory and Guidance document register](#)
- [D0032156 Environmental Related Legislative Requirements](#)
- Environmental Legal Manual for Victoria at [U:\ENVIRONM\Legal\](#)

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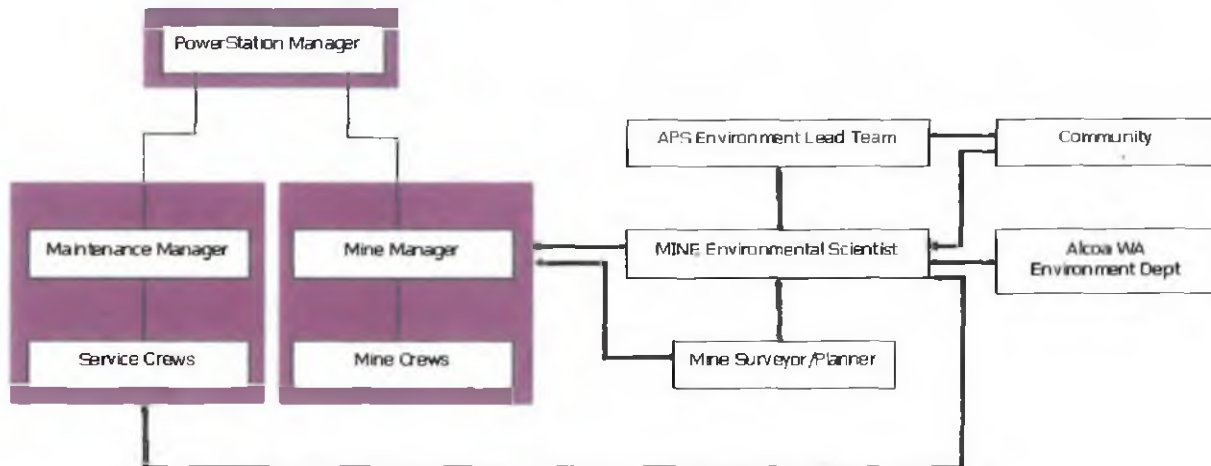


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Land Management Structure & Responsibility

The environmental performance of the Anglesea site is the responsibility of the PowerStation manager. The mine staff and Environmental Lead Team act as a support group and the MINE Environmental Scientist is accountable for implementing and maintaining the sites land management programs.

The following diagram summarises the Anglesea's land management structure in support of the MINE Environmental Scientist.



The MINE Environmental Scientist is responsible for:

- Ensuring that the site's environmental management system requirements are established, implemented and maintained in accordance with the ISO 14001 standard
- Assisting with the setting of environmental goals for the mine.
- Coordinating the mine's environmental activities
- Implementing corporate environmental policies

All employees and contractors are expected to understand and apply Alcoa's Environmental Policy and the Environmental Values of Alcoa.

References:

- [D0072789 Victorian Operations Environmental Responsibilities](#)

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Environmental Communication

Anglesea is committed to communicating promptly and openly with employees, stakeholders and the community. Communication on land management and environmental issues is undertaken in several different ways.

Internal Communication

Environmental communication is undertaken within Alcoa at various levels and via various methods. Communication not only occurs within the site, but between Alcoa operations world wide and with the Corporate Department in Pittsburgh.

Anglesea has a monthly Environmental Lead Team meeting involving environmental staff, the Mine Manager and other department supervisors where appropriate. These meetings discuss environmental issues such as incidents, performance, new legislation or other requirements, audit findings and actions and any new projects that may require environmental input.

Internal reports are used to communicate to management. Environment staff submit weekly bullets and monthly reports to the PowerStation Manager and quarterly reports on environmental performance to the Corporate office.

The Environment Report, produced every month, contains environmental data and environmental information of interest. The newsletter is directed at employees but is also read by Alcoa environment staff at other locations, external stakeholders including the EPA and community members.

Environmental Incident Reporting

All employees are required to report environmental incidents. Environmental incidents are to be captured in the [EHS Incident Management System](#) under the Environmental Incidents menu. Incidents are entered into the system in accordance with the Environmental Incident Reporting Guidebook, accessed from this site.

All employees have access to the system either directly or through their supervisor. The report covers what happened, what was done immediately to rectify or control the situation, and corrective actions to be undertaken to prevent recurrence of the incident.

The EOH Consultant approves all incidents. Environmental Incidents are reviewed at daily morning meetings and weekly site management meetings. Outstanding corrective actions appear on the user's screen as a reminder and remain until the action is completed.

An incident matrix is used to determine the category of incident and the internal and external reporting requirements. Incidents classed as major are communicated to all Alcoa facilities to highlight to other sites the potential for environmental impact and actions taken.

External Reporting Requirements

Alcoa is required to submit external reports, as part of legal and other external requirements. Reporting on the site's operations is an important component of the site's environmental communication processes. The Environmental Reporting Requirements Register lists the key routine reports generated to communicate both internally and externally with key stakeholders.

References:

- [D0031004 Environmental Incident Reporting](#)
- [D0066815 Environment Metrics Reporting](#)
- [D0069046 Environmental Reporting Requirements Register](#)
- [Anglesea Monthly Environment Reports](#)
- [Anglesea Environmental Angle](#)

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Training and Inductions

Environmental training is undertaken to ensure that personnel whose work may have a significant impact on the environment have received training appropriate for their job and are suitably competent.

The main sources of environmental training are:

- Inductions
- Environmental Training
- Operational Training

Minimum competencies for key job functions are established in the Learning Management System (LMS). This system contains profiles to define the training required for each position. LMS is also used to access training packages and record when training is completed. LMS can be used to run reports to identify when retraining is due.

Employees and Contractors Inductions

All new employees and contractors receive an induction that covers Alcoa's Environmental, Health and Safety policy and the environmental management systems for significant impacts such as Phytophthora, spills and waste.

Environmental Training

Employees receive formal and informal training in areas relevant to their duties, as well as general environmental awareness training. Training requirements for personnel in the management of significant environmental impacts such as Phytophthora, hydrocarbon management and spill cleanup, turbidity and noise management are identified, scheduled and managed as per the training needs identification process. The aim of this training is to raise awareness of the impact and ensure that people understand how their actions can minimise or prevent that impact from occurring.

Operational Training

Procedures and standard work instructions (SWIs) are written for critical activities that may have a significant impact on the environment. A computer based document management system (Paradigm) contains all procedures and SWIs which have been adopted by the mine. Operational training is undertaken using these procedures via the LMS system.

The aim of this training is to ensure that all personnel understand their roles and responsibilities and the importance of following SWIs and procedures. The training focuses on ensuring that personnel understand the potential impacts on the environment their activities may have if they do not follow these standardised procedures.

References

- [D0093573 General Plant EHS Induction](#)
- [D0073238 Environmental Training Matrix](#)
- [D0061776 Environmental Awareness Training](#)

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Mine Rehabilitation

The current rehabilitation objective for the Anglesea site is to establish a diverse, self-sustaining heathy woodland ecosystem that maintains or enhances the surrounding land use such as conservation, recreation and other natural values.

The method outlined on the following pages provides the principle strategy of mine rehabilitation at Alcoa Anglesea where possible. An alternative strategy may be required in particular circumstances where, for example, there is an absence of topsoil for direct return, the slope is too steep to hold topsoil placement or the slope will be inundated with water. Rehabilitation then may employ the placement of subsoil as a growth medium, the application of a seed mix and/or hydro mulch with supplementary planting of tube stock. Irrespective of the method employed, all strategies will strive to utilise indigenous species and provide habitat functionality contiguous with the surrounding heathy woodland.

The heathland vegetation at Anglesea is established on predominantly sandy soils. These soils are characteristically low in nutrients, and together with limited water availability and unlimited light, growing conditions will only be slightly altered by the first succession of plant species. Therefore, the species that first establish on the site will control the long-term vegetation of the site. For this reason as many species as possible need to be introduced to the site at the establishment phase of mine rehabilitation.

Pre-stripping Management

The value of the seed bank within the topsoil in the rehabilitation process means that some attention to the management of the area is required prior to stripping.

Ongoing weed control is necessary to minimise the build-up of undesired species in the topsoil.

Management of fire is also important in the years prior to stripping. Whether it is wildfire or ecological burns, care needs to be taken with fire to ensure that the seed bank is not depleted and has adequate years post-fire for the soil seed bank to be replenished. Areas directly in front of the mine path will need time after fire to replenish a depleted seed bank.

Disturbance to the pre-stripping area can also be detrimental to bradysporous species that have the potential to be harvested as mulch. The seed in persistent woody fruits on species such as Banksia and Leptospermum may represent many years of seed production. Disturbance in the immediate years prior to harvesting can compromise this source of seed.

Access directly in front of the mine path in unmined vegetation will be restricted to minimise the risk of spreading *Phytophthora* throughout the area. The presence of *Phytophthora* has lethal effects on a number of indigenous species including *Xanthorrhoea*, *Isopogon*, various pea species and most plants in the Proteaceae family. *Phytophthora* can remove these species from the ecosystem and remove the propagules (seed, rhizomes, woody fruits) that would be used to reestablish these species in the rehabilitation area as well as infect the soil to be used in the rehabilitation areas and prevent the growth of these species in the rehabilitation area indefinitely.

Botanical Survey

The area that is scheduled for clearing each year to enable mining of the annual mine plan is subject to a pre-mining flora survey. Following the method for the botanical monitoring, this information is used as a benchmark of what can be expected with regard to species diversity and abundance for the mine rehabilitation area that utilises the area's mulch and topsoil.

Clearing

Area Cleared

At Anglesea approximately 2 to 4 hectares is cleared annually. The area 'open' (including open cut mine, haul roads and PowerStation infrastructure) will vary each year depending on the area of new clearing and the area rehabilitated.

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Disposal of Vegetation

The understorey is harvested for mulch to be utilised later in the rehabilitation process. Timber debris and logs are reclaimed to be utilised for the track closure and rehabilitation program within the Anglesea Heath or within the Mine Rehabilitation Area itself.

Landscaping

After the return of overburden is completed, a minimum one metre of clay/gravel that is found naturally below the topsoil/subsoil layer is returned. The slope is then smoothed to blend the mined area into the surrounding landscape. Topsoil/subsoil is then returned to the landscaped surface.

Soil Handling

The soil layer varies from almost nothing to several hundred mm in gullies and low-lying areas. Typical soil depths are in the range 100 to 200mm. The top 50 - 100 mm is topsoil, and contains most of the seeds and other propagules, as well as much of the soil's organic matter. The soil beneath the topsoil and above the overburden is referred to as subsoil and while it may contain some organic matter and be a suitable substrate for plant establishment, the amount of seed and other propagules is significantly less than the topsoil.

The soil is double stripped, to keep the seed and organic matter rich topsoil separate from the subsoil, and the soil is re-spread in the reverse order - subsoil first with topsoil on top. In 2007 the subsoil itself was double stripped separating the first 100mm from below the topsoil from the remaining subsoil. This followed on from a research project looking at rhizome propagules depth within the soil (Anderson, 2007). Monitoring in 2008 will indicate whether this has contributed to species diversity and or abundance.

Soil handling is most efficient if the amount of soil stored in stockpiles is minimised and the amount of soil re-spread immediately on landscaped areas ('direct return') is maximised. Direct return also has benefits for the quality of the rehabilitation. There are many species where seed collecting for propagation and broadcast seed is impractical, very expensive or even impossible. For many of these species, the natural seed in the returned topsoil is the best way to re-establish these species in the rehabilitated areas. Further, these species may only be present in rehabilitation areas with direct return of fresh topsoil. As well as encouraging the regeneration of native plants from propagules in the soil, damage to the soil's structure and loss of organic matter and nutrients are minimised with direct return.

If soil handling is undertaken in summer, when the soil is at its driest, the number of plant species which re-establish in the returned soil is maximised.

Mulch

Immediately prior to clearing and topsoil stripping, the vegetation of the heathland is harvested for application as mulch. The woody vegetation will contain the seeds of species that hold mature seed as persistent woody fruits in the canopy and is a possible source of seed for re-establishing heathland communities. The mulch can be harvested in a similar manner to 'slashing' an area with the 'slash' material collected. The mulch should not be applied at any great depth, otherwise it may compromise seedling emergence from the topsoil. Rather it should be lightly scattered across the surface. Mulch should be applied in drier months to allow the sun to dry out the woody fruits releasing the seeds prior to the autumn rainfall.

Rehabilitation Ripping

Ripping breaks up the compaction of the area that result from heavy rubber tyred mining equipment. It also reduces water runoff on slopes by increasing the soil's surface and sub-surface water storage capacity. After soil return, the entire surface is ripped on contour to a minimum depth of 1.5 metres. A trial in 2007 will look at the value of double ripping with the first ripping prior to subsoil/topsoil return.

Recalcitrant Plants

The heathland that re-establishes in rehabilitated areas is primarily of species arising from the topsoil. Trials in the 2003 rehabilitation indicated that there was no significant increase in species diversity or

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species abundance with the application of mulch (Jeffery, 2005). At this stage, broadcast seed is only applied for a selected few species.

Propagation of some plants has been initiated as some species do not appear to be coming back in sufficient quantities into the rehabilitation. All the seed collected for propagation is collected from the area around the mine so that it is provenance correct. As rehabilitation techniques are refined it is envisaged that the number of species that require propagation and planting into rehabilitation areas will be reduced. Planting of recalcitrants will occur in the autumn/winter of following years after the botanical monitoring of the rehabilitation area has been completed.

Fauna Return to Rehabilitated Areas

All fauna are displaced during mining because their habitat is removed.

The heathy woodland vegetation surrounding the mining area has very little timber debris on the surface. Therefore the active introduction of timber from the stripped area in to the rehabilitation area is not currently pursued.

The presence of *Xanthorrhoea australis* plays a pivotal role in the provision of habitat for the small mammals of the heathland communities. The successful establishment of this species in the rehabilitation areas is crucial to the long-term viability of the area for fauna as part of the Anglesea Heath. In addition to the application of broadcast seed and planting of 2 year-old seedlings, trails continue for the establishment of mature grass trees salvaged from the mining area.

Monitoring of fauna return to rehabilitated areas has not been undertaken since Kentish assessed early rehabilitation areas in 1983. It is envisaged that a long-term program will need to be initiated to monitor mammals, birds, reptiles and invertebrates once a suitable vegetation structure is established. An investigative study was conducted in 2009 examining the invertebrate community of four mine rehabilitation sites, an un-mined heathy woodland site and a site that had been recently burnt (McKenzie, 2009).

Recording/Reporting

The MINE Environmental Scientist records the location of all soil removal, landscaping, soil return, ripping and seeding. These records are collated, transferred to maps and entered into the GIS system. From this system, details of each operation, and the location and date that it occurred can be recalled and used to explain differences in rehabilitation species numbers.

Rehabilitation Monitoring

The rehabilitated area established in 2002 was the first rehabilitation area to be monitored for biological diversity and comparison to undisturbed heathland. Each rehabilitation area is monitored at 18 months post-establishment to check that botanical diversity targets are met and to locate and identify areas that require any remedial treatment to control weeds or repair erosion damage.

References

Standards

- [Corporate Standard - Bauxite Mine Rehabilitation Standard and Guidelines](#)
- [D0116295 Mine Rehabilitation Targets](#)
- [D0170184 EVC Benchmark Heathy Woodland](#)

Reports

- [D0075636 2003 Mine Rehabilitation Activity Summary](#)
- [D0113607 2005 Mine Rehabilitation Activity Summary](#)
- [D0133501 2006 Mine Rehabilitation Activity Summary](#)
- [D0170643 2007 Mine Rehabilitation Activity Summary](#)



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- [D0179544 2009 Mine Rehabilitation Activity Summary](#)
- [D0087513 2003 Assessment for the presence of *Phytophthora cinnamomi*](#)
- [D0087515 2003 Archaeological Survey](#)
- [D0108571 2005 Archaeological Investigation Survey](#)
- [D0145127 2006 Archaeological Investigation Survey](#)
- [D0146022 2007 Archaeological Investigation Survey](#)
- [D0147441 2007 Memorandum of Understanding Alcoa and Wathaurong Cooperative](#)
- [D0208450 2010 Cultural Heritage Management Plan \(CHMP\)](#)
- [D0100639 2005 Pre-Mining Survey \(2003\)](#)
- [D0151134 2005 Pre-Mining Survey Draft \(2004\)](#)
- [D0120532 2006 Pre-Mining Survey \(2005\)](#)
- [D0149509 2007 Pre-Mining Survey \(2006\)](#)
- [D0084565 2002 Mine Rehabilitation Botanical Monitoring \(2003\)](#)
- [D0151133 2002 Mine Rehabilitation Botanical Monitoring Draft \(2004\)](#)
- [D0120729 2002 Mine Rehabilitation Botanical Monitoring \(2005\)](#)
- [D0120730 2003 Mine Rehabilitation Botanical Monitoring \(2005\)](#)
- [D0145401 Mine Rehabilitation Botanical Monitoring \(2006\)](#)
- [D0170192 Mine Rehabilitation Botanical Monitoring \(2007\)](#)
- [D0176476 Mine Rehabilitation Botanical Monitoring \(2008\)](#)

Research

- Anderson, N. (2007) [Mapping and quantification of topsoil seed reserves in the Anglesea Heath vegetation assemblage](#). Vacation Student Report prepared for Alcoa World Alumina Australia
- Botanic Gardens of Adelaide (2008) [Depth and quantification of topsoil seed reserves in the Anglesea Heath vegetation assemblage](#). Prepared for Alcoa World Alumina Australia
- Jeffery, E.M. (2005) [Mulch and smoke effects for mine rehabilitation in heathy woodland of southwest Victoria](#). Submitted by E.M. Jeffery for MMinRes. University of Queensland
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- McKenzie, J. (2009) [Regeneration of invertebrate communities in the Anglesea Heath: comparing coal mine rehabilitation with previously burnt heathy woodland](#). Vacation Student Report prepared for Alcoa World Alumina Australia
- Palmer, E. (2008) [Characterisation of soil and overburden materials for rehabilitation of the Anglesea Heath vegetation assemblage](#). Vacation Student Report prepared for Alcoa World Alumina Australia

Presentations

- [D0097988 2005 Mine Rehabilitation Training](#)
- [D0115700 2006 Mine Rehabilitation Training](#)
- [D0133567 2007 Mine Rehabilitation Training](#)

Procedures

- [D0110020 Describe Mine Rehabilitation](#)
- [D0170782 Mine Rehabilitation Operator Checklist](#)

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- D00?? Describe Landscaping
- [D0110073 Clearing Process – Roles + Responsibilities](#)
- D00?? Describe Topsoil handling
- [D0110097 Describe Mine Rehabilitation Riprap](#)
- [D0110092 Seed Collection Schedule](#)
- D00?? Describe Seed Collection
- [D0118853 Sending Seed for Research](#)
- D00?? Describe Mulch Collection and Application
- D00?? Describe Supplementary Planting
- [D0088386 Seedling Storage and Care](#)
- D00?? Botanical Monitoring

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Land Management Program

Management Zones

The zoning scheme has been modelled on those used in the Anglesea Heath Management Plan. The purpose of the zoning scheme is to:

- provide a geographic framework for management;
- indicate which management directions have priority, and
- provide a basis for assessing the suitability of future activities.

Five management zones will apply to the Mining Area and freehold: the Conservation I Zone, Interim Conservation I Zone, Conservation II Zone [Waterways & Wetlands], Conservation III Zone and the Conservation IV Zone.

Conservation I Zone

The Conservation I Zone is designated to protect sensitive natural environments and to provide for minimal-impact recreation activities subject to ensuring minimal interference with natural processes. Conservation I Zone is applied to areas containing sensitive natural environments or ecosystems, which are unable to sustain the impact of significant levels of dispersed recreation activity and other land use. The Zone includes areas within the mining area not included in the 2014 mine plan, rehabilitation areas from 2002 onwards and several parcels of Alcoa freehold.

Interim Conservation I Zone

The Interim Conservation I Zone is designated with the same level of protection as the Conservation I Zone with the knowledge that this area will be incorporated into the open cut mine with the 2014 mine plan.

Conservation II Zone [Waterways & Wetlands]

The Conservation II Zone is designated to protect the waterways and wetlands within the Mining Area.

Conservation III Zone

The Conservation III Zone is designated to protect less-sensitive natural environments and to provide for sustainable recreation activities or other land use without significant impact on natural processes. The zone comprises natural areas that are significantly modified and accessible to the community.

Conservation IV Zone

The Conservation IV Zone is the area designated to the open cut mine, power generation and pre-2002 mine rehabilitation areas.

References

- [D0204847 Management Zone Map](#)
- [D0082587 Land Management A3](#)
- [ANG Land Management Agenda and Minutes](#)

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Flora

The high diversity of vegetation types and the diversity of species within them are the primary reason why the majority of Anglesea Heath surrounding the Mining Area and freehold is listed as a significant natural place on the National Estate Register.

In 1986, the Land Conservation Council commissioned Charles Meredith to produce a floristic vegetation map of the Anglesea Heath showing the distribution of flora communities. Meredith observed that there were two broad vegetation categories: heathy communities and forest communities (LCC, 1987). The heathy communities occur on infertile sandy soils and contain five separate sub-communities, namely: Heathy open forest I, Heathy woodland I, Bald Hills heathland, Urquhart Bluff heathland and Closed shrubland. The forest communities occur on more fertile clay soils and contain three separate sub-communities, namely: Riparian open forest I-II, Fern gully, and Damp open forest.

In 2003 the Department of Sustainability and Environment Native vegetation in Victoria has been classified according to Ecological Vegetation Classes (EVCs). There are approximately 300 EVCs statewide.

The Mining Area and freehold is characterised by Heathy woodland I with Closed shrubland present along the Salt Creek, Marshy Creek and Anglesea River systems.

The impact on flora that will not be mined within the Mining area and on the freehold has been unregulated. The flora communities' integrity will decrease if measures are not taken to control threatening processes. These threatening processes include an unregulated track network, soil erosion, pest plant invasion and unmanaged land use including recreation. Any impacts on vegetation communities are likely to flow on to other values such as fauna habitat and diversity.

Botanical Surveys

The area has been well investigated by botanists. Within the Mining Area, Alcoa has completed a flora survey for the Mt Ingoldsby area adjacent to Coalmine Road. This survey was used to map the vegetation types, and to find listed flora. No listed flora species were located in the area to be mined in the flora survey undertaken by Ecology Australia (Carr *et al.*, 1995).

Aims

- Protect indigenous flora and vegetation communities
- Maintain flora diversity
- Reduce and eliminate fragmentation of vegetation and other threats to flora

Strategies

- Minimise the impact of an industrial site on flora
- Minimise the impact of recreational activities, introduced species and other uses upon the flora
- Rationalise the road and track network to reduce fragmentation of vegetation communities
- Develop appropriate management programs to protect intact vegetation and significant flora species including operational training, communication with employees and on ground activities

Actions

General

- Implement the recommendations of the Recovery Plan for *Grevillea infecunda* (Anglesea Grevillea)

Conservation I Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Implement action plans where necessary for the protection of quality vegetation, threatened, significant and localised flora species which may include the following activities: fencing, restrict

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access of employees, restrict recreational opportunities and community access, revegetation of degraded areas and pest plant removal.

- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Interim Conservation I Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Include in mine rehabilitation plan, action plan for protection of quality vegetation, threatened, significant and localised flora species
- Implement action plans for protection of threatened, significant and localised flora species which may include the following activities seed collection, plant propagation, salvage and transplant of particular species and pest plant removal.
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation II Zone (Waterways and Wetlands)

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Implement action plans where necessary for the protection of threatened, significant and localised flora species which may include the revegetation of degraded areas and pest plant removal.
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation III Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.

Conservation IV Zone

- Identify and map sites of quality vegetation, threatened, significant and localised flora species
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.
- Planting within established garden beds in built up areas must adhere to the Surf Coast Shire Urban Planting guide list for Anglesea.

References

- [D0082587 Land Management A3](#)
- [D0076435 Land Conservation Council Melbourne Area District 1 Review Final Recommendation](#)
- [D0072571 Flora, Fauna and Biological Significance of the Mt Ingoldsby Section of the Alcoa Anglesea Lease Area, Victoria.](#)
- [Department of Sustainability and Environment and Government of Australia National Recovery Plan for the Anglesea Grevillea *Grevillea infecunda*](#)
- [D0082890 Surf Coast Shire Urban Planting Guide](#)

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Fauna

The wide range of plant communities in Anglesea Heath and their species diversity provide habitat for a range of fauna. Twenty-nine native mammal species have been recorded in Anglesea Heath including the New Holland Mouse (*Pseudomys novaehollandiae*), which is critically endangered in Victoria, and the rare Swamp Antechinus (*Antechinus minimus*).

The waterways in Anglesea Heath, particularly those close to the Anglesea River mouth, provide habitat for a rare fish, the Spotted Galaxias (*Galaxias truttaceus*).

There is only very limited information on the distribution, abundance and habitats of reptiles, amphibians and invertebrates.

Management actions undertaken for the protection of fauna in the Mining Area and freehold will focus on the conservation of habitat.

Aims

- Conserve indigenous fauna and maintain species diversity and genetic diversity
- Maintain and/or enhance the integrity of fauna habitat

Strategies

- Ensure habitats are established/managed to provide the optimum requirements for a range of species
- Minimise the impact of pest animals, pest plants and other threatening processes

Actions

General

- Implement the recommendations of the Action Statements for New Holland Mouse and Rufous Bristlebird
- Work in conjunction with the recovery team, as required, for the New Holland Mouse

Conservation I Zone

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Construct fauna habitat in rehabilitation areas (timber, logs, Xanthorrhoea)
- Monitor fauna return into rehabilitation areas

Interim Conservation I Zone

- Preserve and salvage elements of fauna habitat (timber, logs, Xanthorrhoea) for relocation into rehabilitation areas

Conservation II Zone (Waterways and Wetlands)

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Establish additional habitat for avian fauna i.e. nestboxes

Conservation III Zone

- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation

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- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)

Conservation IV Zone

- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)

Procedures

- D00?? Fauna Habitat Description
- D00?? Fauna Monitoring Schedule
- D00?? Xanthorrhoea Establishment Description

References

- [D0082587 Land Management A3](#)
- [D0072571 Flora, Fauna and Biological Significance of the Mt Inghelby Section of the Alcoa Anglesea Lease Area, Victoria.](#)
- [Department of Sustainability and Environment Action Statement No. 49 Rufous Bristlebird](#)
- [Department of Sustainability and Environment Action Statement No. 74 New Holland Mouse](#)
- Kentish, K.M. and Bourne, A.R. (1983) Mine Rehabilitation: A study of revegetation and fauna return at Anglesea, Victoria. Submitted by K.M.Kentish for MSc. Deakin University

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Pest Plants

The infestation and spread of pest plants is a major management issue. Pest plants pose a considerable risk to the natural values of the area by depleting the diversity and integrity of flora and fauna that occur there. Sixty-three pest plant species are known to occur in Anglesea Heath. Many are environmental weeds that are native to Australia (a native plant species is classified as a weed if it is planted or germinates where it does not naturally occur).

The infertile soils of Anglesea Heath are not particularly conducive to exotic weed species. This, coupled with the fact that many disturbed areas within Anglesea Heath are surrounded by indigenous vegetation, means that large sections of Anglesea Heath are relatively weed-free. However, areas of disturbance act as dispersal points for pest plants threatening otherwise intact vegetation communities.

Numerous pest plant species in Anglesea Heath have escaped from adjoining areas previously planted with species that are now known to be environmental weeds. Areas such as along Coalmine Road were revegetated and landscaped with non-indigenous species, some of which are now known to be environmental weeds. These species have the potential to spread beyond existing boundaries, providing a seed source that potentially allows pest plants to germinate and spread into Anglesea Heath.

In general woody weeds are the most threatening pest plants in Anglesea Heath, as the woody weed species that occur in Anglesea Heath are particularly invasive, including Coast Wattle (*Acacia longifolia* var. *sophorae*) and Boneseed (*Chrysanthemoides monilifera*).

Other environmental weeds in the area include: Coast Tea-tree (*Leptospermum laevigatum*), Sweet Pittosporum (*Pittosporum undulatum*), Giant Honey Myrtle (*Melaleuca armillaris*), Green Honey Myrtle (*Melaleuca diosmifolia*), Wirilda (*Acacia retinoides*) and Myrtle Wattle (Western Australian province) (*Acacia myrtifolia*) (Carr, 1995).

Depletion of the natural values of Anglesea Heath is probable without appropriate management of pest plants. This management needs to be cooperative, involving all land management agencies in the region.

A preliminary list of major environmental weeds of the area has been compiled (see Appendix ?).

Aims

- Maintain biodiversity
- Minimise the introduction and spread of pest plants
- Minimise the impact of pest plant control programs on indigenous flora and fauna

Strategies

- Control and where possible eradicate pest plants through the employment of an integrated program
- Monitor and evaluate the effectiveness of all pest plant control programs

Actions

General

- Continue to support community groups in their activities to control the spread of weeds
- Develop, implement and maintain a GIS weed-mapping and weed-monitoring program
- Maintain representation on the Flora and Fauna Action Unit – regional unit consisting of representatives of Surf Coast Shire, VicRoads, Department of Sustainability and Environment, Parks Victoria and local interest groups for an integrated and cooperative approach to pest plant management

Conservation I Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
 - prioritise protection of areas of high biodiversity

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- prioritise control of weeds with a high potential to spread and become uncontrollable
- prioritise works to reduce fuel load for fire protection
- identify and control new or isolated infestations before they spread
- prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Interim Conservation I Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
 - prioritise protection of soil seedbank
 - prioritise control of weeds with a high potential to spread and become uncontrollable in rehabilitation areas
 - identify and control new or isolated infestations before they seed
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Conservation II Zone (Waterways and Wetlands)

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
 - prioritise protection of areas of high biodiversity
 - prioritise control of weeds with a high potential to spread and become uncontrollable
 - identify and control new or isolated infestations before they spread
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities

Conservation III Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
 - prioritise works to reduce fuel load for fire protection
 - prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria
- Consultation with the MINE Environmental Scientist is required for any revegetation activities

Conservation IV Zone

- Develop and implement a yearly pest plant control strategy incorporating the following principles:
 - prioritise works to reduce fuel load for fire protection
 - prioritise works to complement adjacent stakeholders pest plant programs i.e. Parks Victoria
- Consultation with the MINE Environmental Scientist is required for plant selection for any revegetation activities.
- Planting within established garden beds in built up areas must adhere to the Surf Coast Shire Urban Planting guide list for Anglesea.

References

- [D0082587 Land Management A3](#)
- [D0082890 Surf Coast Shire Urban Planting Guide](#)

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Phytophthora Cinnamomi

Phytophthora cinnamomi (Cinnamon Fungus or Dieback) is an introduced pathogen that invades plant roots, of susceptible species preventing water transport in the root systems, which results in death or severe drought effects. It is responsible for extensive 'dieback' of native vegetation and is widespread in forests, woodlands and heathlands, ranging from Western Australia to Queensland.

Phytophthora has been listed as a threatening process under the *Victorian Flora and Fauna Guarantee Act 1988*, and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In Anglesea Heath, Phytophthora has lethal effects on a number of indigenous species including Grass Trees, Horny Cone Bush, various pea species and most plants in the Proteaceae family.

The occurrence of Phytophthora within the Mining Area and Alcoa freehold has been mapped, indicating it is widespread. The pathogen is most frequently spread downhill with drainage water. Zoospores swim or are carried in this water. It is commonly spread and transported in gravel and other road construction materials, on vehicle tyres, horses' hooves and people's shoes. Native animals may also transport the pathogen as they move from an infected area to an uninfected area. The greatest risk of spread of the disease is likely to be any large-scale earth works that involve the movement of soil.

The most effective and appropriate control method for reducing the spread of Phytophthora at this stage is by protecting uninfected areas from contamination by restricting access.

The dieback control strategy is to prevent healthy areas from becoming infested; and to prevent disease intensification in existing infestations. The majority of the heathland at Anglesea is dieback affected and hence a dieback mining system must be put in place where dieback management practices restrict the access to dieback-free areas.

Dieback management needs to be considered in all aspects of mine planning, from exploration drilling to rehabilitation after mining.

Aims

- Protect healthy vegetation from infection
- Minimise the spread of *Phytophthora cinnamomi*

Strategies

- Prepare a comprehensive Cinnamon Fungus management strategy that:
- maps the incidence of Cinnamon Fungus in Anglesea Heath;
- outlines detailed measures to manage and control infestations and protect non-infected sites.

Actions

Conservation I Zone

- Access in pre-mining areas is restricted.
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Mining equipment is not permitted to leave haul roads and mining areas to minimise the risk of spreading dieback in unmined heathland.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback in unmined heathland
- The occurrence of dieback will be mapped using symptoms in heathland areas. Boundaries will be marked in the field between areas classified as 'dieback-free'.

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Because *Phytophthora cinnamomi* spores are water borne, drainage must be considered in all operations from exploration to rehabilitation. The following points summarise the activities to be used to minimise the risk of spread of the disease:

- Dieback areas are detected in the field prior to mining development. Dieback boundaries are marked in the field and on maps
- Movement of machinery and other vehicles across dieback boundaries is restricted
- Timely information on dieback occurrence is collected, field operations are scheduled so that they are carried out at times unfavourable to disease spread.
- Vehicles are cleaned when moving between dieback and dieback-free areas, using brushes or compressed air to remove dust, or portable high pressure water pumps to remove mud
- Soils of different dieback status are kept separate during stripping, stockpiling, soil return and road building
- Most dieback-free soil is handled in dry conditions, at a time least favourable to the fungus
- Where dieback-free areas must be crossed with roads, the road surface and drains are constructed to ensure there is no runoff of water into the dieback-free area
- Runoff from dieback areas is prevented from draining onto roads or dieback-free areas

Interim Conservation I Zone

- Minimise *Phytophthora* spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation II Zone (Waterways and Wetlands)

- Minimise *Phytophthora* spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation III Zone

- Minimise *Phytophthora* spread through a process of track rationalisation and rehabilitation
- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

Conservation IV Zone

- Minimise *Phytophthora* spread through a process of track rationalisation and rehabilitation

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- Unnecessary tracks will be assessed and rationalised and those that are left open are classified as either "all weather" or "limited access" tracks. All weather tracks, most of which are low in the landscape and traverse dieback areas may be used at all times, while limited access tracks, most of which are higher in the landscape and traverse dieback-free areas may be used only in dry soil conditions by clean vehicles.
- Vehicles are not permitted to leave formed roads and tracks to minimise the risk of spreading dieback

References

- [National Threat Abatement Plan for *Phytophthora cinnamomi*](#)
- [D0082587 Land Management A3](#)
- [D0087513 Assessment for the presence of *Phytophthora cinnamomi*](#)

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Hydrology

Anglesea Heath is drained by Marshy Creek and Salt Creek flowing southeast into the Anglesea River estuary to Bass Strait. For most of their length, these waterways exist as *Melaleuca squarrosa* [Scented Paperbark] swamps. These unique swamps, on a porous peaty soil, are of State significance for the conservation of threatened species, including the Grey Goshawk. The waterways close to the Anglesea River mouth provide habitat for a rare fish, the Spotted Galaxias (*Galaxias truttaceus*).

The convergence of these two creek systems into the Anglesea River takes place in the Mining Area. Salt Creek has been diverted around the mine in a constructed channel for part of its length and joins with Marshy Creek just north of the mine haul road. The Anglesea River between the haul road and Coalmine Road is termed the 'mixing zone' and has been partially modified to receive wastewater from the ash pond system and mine reclamation pond. While its function in this instance is to remove contaminants from the wastewater before it leaves the Alcoa site, it remains an important area of significant vegetation and wildlife habitat.

Aims

- Maintain riparian and wetland ecology and health

Strategies

- Ensure siltation and turbidity do not detrimentally effect water quality
- Develop appropriate management programs to protect intact vegetation for aquatic and riparian fauna

Actions

Conservation II Zone (Waterways and Wetlands)

- Implement control measures where water quality is compromised by soil disturbance and road crossings
- Enhance existing fauna habitat through revegetation works and pest plant removal
- Develop procedures to protect fauna habitat (fallen timber, hollow trees, dead trees)
- Implement action plans where necessary for the protection of threatened, significant and localised flora species which may include the revegetation of degraded areas and pest plant removal
- Establish additional habitat for avian fauna i.e. nestboxes

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Cultural Heritage

Anglesea falls within an area originally occupied by the Wathaurong tribe and traditionally under the terms of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, the Wathaurong Aboriginal Cooperative Ltd has been the appropriate liaison organisation for all issues pertaining to aboriginal cultural management. However since the introduction of the *Aboriginal Heritage Act 2006* it is a requirement that Aboriginal organisations or groups become Registered Aboriginal Party (RAPs) in order to manage and protect Aboriginal cultural heritage in Victoria. The Wathaurong have not yet been accepted as a RAP therefore liaison defaults to Aboriginal Affairs Victoria (AAV).

Brendan Marshall (Austral Heritage Consultants) was commissioned by the Department of Conservation and Natural Resources to undertake an archaeological survey of the Angahook-Lorne State Park and Anglesea Heath in 1995. The study area was approximately 6,000 hectares but included only a small part of Anglesea Heath.

The legislation and consent for the *Mines (Aluminium Agreement) Act 1961* does not require Alcoa to undertake archaeological surveys for incorporation into the mine planning process. However current corporate standards requires the completion of an archaeological survey as part of the collation of pre-mining baseline data.

Aims

- Protect the aboriginal cultural heritage
- Protect significant archaeological sites

Strategies

- Encourage further archaeological studies within Anglesea Heath to identify sites requiring management and protection
- Develop site protection mechanisms in conjunction with the Wathaurong Aboriginal Cooperative Ltd for existing and newly identified sites
- Protect and manage Aboriginal sites in consultation with Wathaurong Aboriginal Cooperative Ltd and the Heritage Services Branch of Aboriginal Affairs Victoria (AAV)
- Establish and maintain close and cooperative communications with the Wathaurong Aboriginal Cooperative Ltd and AAV

Actions

Conservation I Zone

- Restriction on earth works without completion of an archaeological survey or inspection by a representative of the Wathaurong Cooperative

Interim Conservation I Zone

- Restriction on earth works without completion of an archaeological survey or inspection by a representative of the Wathaurong Cooperative
- Implement an archaeological survey for 2014 Mining Area
- Develop Procedures to ensure protection of archaeological sites identified from survey
- Develop memorandum of understanding with Wathaurong Aboriginal Cooperative for area to be cleared and further archaeological sites that may be identified

References

- [D0082587 Land Management A3](#)
- Marshall, B. (1995) An Archaeological Survey of the Angahook-Lorne State Park and the Alcoa Lease Area, Anglesea, Victoria, Department of Conservation and Natural Resources

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- [D0087515 2003 Archaeological Survey](#)
- [D0108571 2005 Archaeological Investigation Survey](#)
- [D0145127 2006 Archaeological Investigation Survey](#)
- [D0146022 2007 Archaeological Investigation Survey](#)
- [D0147441 2007 Memorandum of Understanding Alcoa and Wathaurong Cooperative](#)
- [D0208450 2010 Cultural Heritage Management Plan \(CHMP\)](#)

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Fire Management

Fire has played an integral part of the biological evolution in Australia. Our vegetation has evolved with fire and many species have adapted either to survive fire or re-colonise after fire. Some species depend on fire to maintain or increase population levels.

Within the Mining area, Alcoa has adopted protocols from 'Building in a Wildfire Management Overlay' (CFA documentation) for asset protection. This protocol addresses vegetation management based upon vegetation type, aspect and slope to reduce the risk from wildfire.

Alcoa plays an important role in assisting with the protection of Anglesea from wildfires with either the Lease (Anglesea Heath) or Alcoa freehold present on three sides of the township. For the freehold areas, Alcoa maintains a series of slash breaks adjacent to assets and property. A review of our slashing program has ensured our activities are strategic and satisfy all fire prevention requirements whilst not compromising the integrity of the significant heathland communities. This review was in consultation with Department of Sustainability and Environment, Parks Victoria, Surf Coast Shire, Powercor, VEMCO and the CFA.

The Department of Sustainability and Environment is responsible for fire management within Anglesea Heath. Current fire protection measures are in accordance with the Otway Fire Protection Plan (DCNR 1995) and the Code of Practice for Fire management of Public Land in Victoria (DCNR 1995).

Aims

- Protect human life, property and natural values from the adverse effects of fire
- Minimise the adverse effects of fire protection and suppression activities on floristic values

Strategies

- Establish and maintain strategic firebreaks to protect assets
- Manage understorey fuel load with selective pest plant removal

Actions

With reference to the [Fire Management Zone Map](#) for the Power Station and Mine:

Inner zones:

- Grass must be no more than 100mm in height;
- Leaf litter must be less than 10mm deep; and
- There must be no elevated fuel on at least 50% of the Inner zone. Begin with the removal of all Coast Wattle (dominant elevated fuel) and other pest plant species. Reevaluate to assess remaining elevated fuels.

Outer zones:

- Grass must be no more than 100mm in height;
- Leaf litter must be less than 20mm deep; and
- There must be no elevated fuel on at least 50% of the Outer zone. Begin with the removal of all Coast Wattle (dominant elevated fuel) and other pest plant species. Reevaluate to assess remaining elevated fuels.

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In addition:

Conservation I Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection
- Maintain 25m slash break at strategic locations as agreed to by CFA, DSE and Surf Coast Shire i.e. the boundary of Alcoa freehold and residential areas of Anglesea and boundary of mining area
- Reestablish emergence/fire access only on road between Fraser Avenue and Coalmine Road
- Maintain fire access only roads through Alcoa freehold off Wilkin Street

Interim Conservation I Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation II Zone [Waterways and Wetlands]

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation III Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection

Conservation IV Zone

- Implement pest plant removal (primarily Coast Wattle) to significantly decrease understorey fuel load for fire protection
- Maintain 25m slash break at strategic locations as agreed to by CFA, DSE and Surf Coast Shire i.e. the boundary of Alcoa freehold and residential areas of Anglesea and along diversion channel

References

- [D0083020 Otway Fire Protection Plan \(DSE 2003\)](#)
- Code of Practice for Fire management of Public Land in Victoria (DCNR 1995)
- [D0082587 Land Management A3](#)
- [Alcoa Critical Incident Management Manual](#)

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Community Use

Many individuals and groups use parts of Alcoa freehold for recreation. Recreational users have varying levels of impact on environmental values, however each of the activities, depending on their nature and volume, can lead to environmental degradation if not managed appropriately. While Alcoa freehold utilised by an array of recreational users, the main use is by trail bike riders, horse riders, four-wheel drivers, cyclists and walkers. These popular activities rely on the use of a road and track network within the Alcoa freehold, the surrounding Anglesea Heath and council managed land. The largely unmanaged recreational use of Alcoa freehold, especially the creation and use of informal tracks, has resulted in detrimental impact on the heath's values, and is currently unsustainable.

Aims

- Provide opportunities for appropriate recreational use
- Protect environmental and cultural values of Alcoa freehold land

Strategies

- Promotion of responsible use of Alcoa freehold land
- Establish walking track linkages with Anglesea Heath and the Surf Coast Walk
- Promote permitted passive recreational opportunities (walking only)

Actions

Conservation I Zone

- Community access on areas of Conservation I Zone freehold only
- Permitted Recreation

Walking: Many vehicle tracks within Alcoa freehold and Anglesea Heath are used by walkers who enjoy the area's natural attractions. There are currently no designated walking-only tracks in Anglesea Heath. A section of the Surf Coast Walk traverses the eastern and northern boundaries of Alcoa freehold and this section of the walk is on a vehicle track. Threatening processes such as Phytophthora, pest plants and erosion will need to be considered during the investigation of a network of walking tracks.

Dog Walking: Currently some visitors to Anglesea Heath walk their dogs along vehicle tracks. To protect the fauna and other natural values of Anglesea Heath, dogs are permitted on a lead in the Conservation and Recreation Zone only. Dogs are not permitted in the Conservation Zone that borders Alcoa freehold land. Dog will be permitted on the Alcoa freehold land and encouraged to be kept on a lead.

- Provide on-site information and signage at strategic points to orientate and inform recreational users of permitted recreational opportunities on Alcoa freehold
- Create an walking track circuit utilising existing well maintained tracks
- Continue to promote vehicle tracks as the primary location for walking opportunities
- Minimise habitat fragmentation through a process of track rationalisation and rehabilitation
- Develop an action plan (A3) for the management of the Alcoa freehold adjacent to Fraser Avenue and the Anglesea River
- Implement action plan (A3) for the management of the Alcoa freehold adjacent to Fraser Avenue and the Anglesea River which may include the following activities: fencing, signage, rehabilitation of eroded tracks, revegetation of degraded areas and pest plant removal.

Interim Conservation I Zone

No community access

Production Mining/Land Management

Land Management Plan



Conservation II Zone (Waterways and Wetlands)

No community access

Conservation III Zone

• Permitted Recreation

Current arrangements involve the utilisation of the Alcoa freehold adjacent to Camp Road for horse agistment and part of a BMX track.

The level of past disturbance and the absence of significant natural values provide an opportunity for community use of Alcoa freehold land, as long as provision is made for other actions stated within this management plan i.e. pest plant removal, fire protection.

- Develop an action plan (A3) for the management of the Alcoa freehold adjacent to Camp Road
- Implement action plan (A3) for the management of the Alcoa freehold adjacent to Camp Road which may include the following activities: fencing, signage, rehabilitation of eroded tracks, revegetation of degraded areas and pest plant removal.

Conservation IV Zone

No community access

References

- [D0204847 Management Zone Map](#)
- [D0082587 Land Management A3](#)
- [D0079261 Horse Paddocks A3](#)
- [D0082588 BMX Track A3](#)
- [D0082589 Fraser Avenue A3](#)

15 APPENDIX D – ANGLESEA HEATH MANAGEMENT PLAN



MANAGEMENT PLAN - NOVEMBER 2002

ANGLESEA HEATH



This Management Plan for Anglesea Heath contains information on the natural values of the heath and a review of past and present uses. Its primary purpose is to direct management of the Anglesea Heath until the Management Plan is reviewed. A Draft Management Plan was published in February 2001; 25 submissions were received.

Copies of this Plan can be obtained from:

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86 Polwath Road
Lorne, Victoria 3232

Level 10/535 Bourke Street
Melbourne 3000

Alcoa World Alumina Australia
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This plan is prepared without prejudice to any negotiated or litigated outcome of any native title determination applications covering land or waters within the plan's area. It is acknowledged that any future outcomes of native title determination applications may necessitate amendment of this plan; and the implementation of this plan may require further notifications under the procedures in Division 3 of Part 2 of the *Native Title Act 1993* (Commonwealth).

The plan is also prepared without prejudice to any future negotiated outcomes between the Government/s and Victorian Aboriginal communities. It is acknowledged that such negotiated outcomes may necessitate amendment of this plan.

Every effort has been made to ensure that the information in this report is accurate. Parks Victoria does not guarantee that the publication is without flaw of any kind and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in the publication.

ANGLESEA HEATH - PARTNERS IN CONSERVATION

Alcoa World Alumina Australia

Parks Victoria

Department of Natural Resources
and Environment**Compiled by:**

Parks Victoria in partnership with the local community.

On Behalf of:

Alcoa World Alumina Australia (Alcoa) and the Department of Natural Resources and Environment (DNRE).

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Anglesea Heath Management Plan November 2002

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- I. Parks Victoria. II. Alcoa of Australia Limited.

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(Photos: ANGAIR Inc.).

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ANGLESEA HEATH

MANAGEMENT PLAN NOVEMBER 2002



FOREWORD

Anglesea Heath is an important remnant of a once more widespread vegetation type and habitat. Heathlands are species-rich, fire-dependent communities of which detailed ecological knowledge is generally limited. There is much more to learn of the regeneration requirements for some heathland species, the effects of the season of burn, and of the management requirements of many threatened species.

It is important that Anglesea Heath is managed on the basis of the best available information. This has been achieved in this planning process by drawing upon the collective understanding of the local community, conservation groups, tertiary institutions, and conservation agencies. The Anglesea Heath Management Plan, prepared by Parks Victoria, serves the purpose of documenting this collective understanding and translating it into appropriate management strategies and actions.

The Plan provides an agreed way forward for the co-managers of Anglesea Heath: Alcoa, Parks Victoria, and the Department of Natural Resources and Environment. I am confident that key issues affecting the conservation and use of this diverse and important heathland can now be addressed in a coordinated and considered manner for the benefit of both current and future generations.

Sherryl Garbutt MP
Minister for Environment and Conservation

APPROVED MANAGEMENT PLAN

This Management Plan provides the basis and direction for the future management of Anglesea Heath in accordance with the Cooperative Land Management Agreement (2000) between Department of Natural Resources and Environment and Alcoa of Australia Limited. The Agreement was prepared under part 8, section 69 of the Conservation Forests and Land Act 1987, and provides for the co-management of Anglesea Heath by Alcoa and Parks Victoria, to protect Anglesea Heath's natural and cultural values, whilst providing access for appropriate recreation and industry use.

The 25 submissions received on the Draft Plan were taken into consideration in the finalisation of the plan.

Chloe Munro

Secretary to the Department
of Natural Resources and Environment.

Mark Stone

Chief Executive
Parks Victoria.

Chris Rolland

Mine Manager
Alcoa World Alumina Australia

On Behalf of:

Philip Cooke

Power Station Manager
Alcoa of Australia Limited,
trading as Alcoa World Alumina Australia.

ANGLESEA HEATH

Millions of years ago heathlands covered huge areas of Australia, but sadly very little remains today. Anglesea Heath is one of the remnants of natural vegetation in South Western Victoria that have escaped farming and urbanisation. While heathland communities exist in other areas of Australia, they are all in some sense unique. The Anglesea Heath is different from any other Australian heathland. Nowhere else can we see the plant species that combine to form the vegetation communities found in this area.

In spring, a blanket of bushes and windswept vegetation erupts into a dazzling mosaic of colour. Week by week Anglesea Heath changes; the bluish-cream of the Smoke Bush, the yellows and reds of the Bush Peas and the red, pink and white of the Common Heath combine to form a spectacular wildflower display.

Orchids are an outstanding feature of the heathlands, from the

tiny Helmet Orchid to the Great Sun Orchid. Seventy-nine orchid species occur in Anglesea Heath, making it one of the most orchid-rich sites in Australia.

Panoramic views of heathy woodlands are divided by moist river valleys that contain thickets of Scented Paperbark and Tea-tree.

This naturally sculptured tapestry of heathlands and woodlands provides a haven and food source for numerous birds, mammals, insects and other animals that all share a special relationship with the heathland vegetation.

This remarkable biological diversity is the reason for listing most of the area on the Register of the National Estate.

First-time visitors to Anglesea Heath may not be aware of the floristic richness and brilliance that exists beneath the apparently drab exterior. However, those who take the time for a closer look are richly rewarded.

ABOUT THE PARTNERSHIP

Anglesea Heath overlays the land leased by Alcoa under the Mines (Aluminium Agreement) Act 1961 (7141 ha) and 80 ha of freehold land owned by Alcoa. It comprises the area used for mining and power generation, known as the Mining Area (currently 490 ha) and the remainder known as the Land for Conservation (6731 ha). See Map 2 - Boundaries (section A.3.4).

The local community has shown a strong and diverse range of interests in Anglesea Heath. This caring and commitment have been the key impetus behind the establishment of a Land Management Cooperative Agreement for the Land for Conservation between Alcoa of Australia Limited (Alcoa) and the Secretary to the Department of Natural Resources and Environment (DNRE).

The Agreement was established and signed on 8th November 2000 to protect the biodiversity, landscape, water catchments, and cultural heritage of the Land for Conservation, while providing opportunities for public appreciation and sustainable enjoyment of the area.

The Land Management Cooperative Agreement and this management plan apply only to the Land for Conservation. The Mining Area will be managed solely by Alcoa, whose mining rights extend to 2061. Both the Agreement and the Management Plan allow continued use and management of the Mining Area and any future expansion of that area in accordance with the requirements of the *Mines (Aluminium Agreement) Act 1961*.

For the purposes of this Management Plan the Land for Conservation is referred to as Anglesea Heath, except where specified otherwise.

The aim of the Land Management Cooperative Agreement is to ensure that Anglesea Heath is managed in a like manner to the Angahook-Lorne State Park, and in accordance with the International Union for the Conservation of Nature (IUCN) protected area management guidelines. This management approach aims to protect the internationally significant Anglesea Heath as an entire ecosystem, whilst providing access for appropriate recreation and industry use. It is fundamental to the Agreement that this aim is achieved

through the highest possible level of cooperation in conservation management.

Australia's statutory system of protected areas contains only a small proportion of ecosystem biodiversity. In some instances, key ecosystems, plant or animal species and their habitats (such as those represented in Anglesea Heath) occur on leasehold and private lands, and as such remain outside the system. Incorporation of Anglesea Heath into the Victorian reserve system can only be achieved by the voluntary inclusion of these lands by Alcoa; an unlikely outcome in the near future, due to Alcoa's mining requirements. However, by entering into the Agreement and implementing the Management Plan, Alcoa will enable similar conservation outcomes for Anglesea Heath that would result from inclusion in the protected area system.

The partnership is one of three co-management initiatives occurring on leasehold land in Victoria. It is an excellent example of government, industry and community cooperation, where State agencies have actively collaborated with industry, community organisations and individuals, to respond to the State's need to preserve biodiversity outside its own reserve system. It is the first case in Australia where a conservation agency and a mining company have come together to form a cooperative partnership to manage an area for biodiversity conservation, consistent with international (IUCN) guidelines for the management of protected areas.

Under the Land Management Cooperative Agreement, DNRE and Alcoa will fund park management services for Anglesea Heath on an annual basis. As the agency responsible for day-to-day management of Anglesea Heath, Parks Victoria will manage funded projects in conjunction with Alcoa staff and with advice from nominated working groups with interests in natural heritage, cultural heritage, research, tourism, recreation and community relations. Parks Victoria, together with Alcoa, DNRE and community groups will be responsible for implementing this plan.

The role of the local community is integral to the success of the partnership; future management of Anglesea Heath will aim to combine local interests and expertise with conservation and protection.

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Introduction to The Anglesea Heath

INTRODUCTION TO THE ANGLESEA HEATH

A.1 LOCATION

Located in southwestern Victoria, approximately 100 km from Melbourne, Anglesea Heath is a substantial natural area covering 6731 hectares to the north of the coastal township of Anglesea (refer to Map 1, Locality).

Anglesea Heath forms the easternmost component of a continuum of natural and protected areas in the Surf Coast region, abutting the Angahook-Lorne State Park to the south and west, and the Anglesea Flora Reserve and Otway State Forest to the north.

Anglesea Heath's proximity to Geelong, the Great Ocean Road, and to the nearby towns of Anglesea and Aireys Inlet means that there is high accessibility and recreational use of the land. In addition, many roads and tracks within Anglesea Heath extend into the Angahook-Lorne State Park. As a result, many visitors to Angahook-Lorne State Park also visit Anglesea Heath and vice-versa.

Anglesea Heath offers one of the most diverse and spectacular areas for flora, scenic landscape and wildlife communities in Victoria.

A.1.1

See Location Map A.1.1 overleaf.

A.2 ANGLESEA HEATH TO BE MANAGED AS A PROTECTED AREA

A.2.1 INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (IUCN) PROTECTED AREA STATUS

A protected area is an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (IUCN, 1994).

Australia is a signatory to the Convention on Biodiversity, which requests countries to:

- establish a system of protected areas to conserve biodiversity;
- develop guidelines for the selection, establishment and management of protected areas; and
- promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species.

A key element of the Land Management Cooperative Agreement between Alcoa and the DNRE is the intent to manage Anglesea Heath in a manner consistent with the general principles established in the IUCN Guidelines for Protected Area Management Categories. There are seven IUCN internationally recognised protected area Categories, namely:

Category	Description
Ia Strict Nature Reserve	protected Area managed mainly for science.

Ib Wilderness Area	protected area managed mainly for wilderness protection
II National Park	protected area managed mainly for ecosystem conservation and recreation
III Natural Monument	protected area managed for conservation of specific natural features
IV Habitat/Species	protected area managed mainly for Management Area conservation through management intervention
V Protected Landscape/Seascape	protected area managed mainly for landscape/seascape conservation and recreation
VI Managed Resource	protected area managed mainly for the Protected Areas sustainable use of natural ecosystems

The protected area system on public land is a central part of the overall strategy for achieving conservation of biodiversity in Victoria. The system is strengthened by protective measures taken on other public land and is further complemented by conservation of private land with appropriate natural values.

A.2.2 MANAGEMENT OBLIGATIONS

Whilst the IUCN has no powers to manage or influence the management of Anglesea Heath, the parties to the Agreement mutually agree that management of the Land for Conservation should, as far as possible, be consistent with that of a Category II National Park. The primary management obligations for this are:

- to protect, conserve and present the natural and cultural values of Anglesea Heath (section C.2);
- to integrate the protection of the area into a comprehensive planning program;
- to give the area a function in the life of the Australian community;
- to strengthen appreciation and respect of the values of Anglesea Heath, particularly through educational and information programs (section D.8.1), and to keep the community broadly informed about the condition of the values of Anglesea Heath; and
- to take appropriate scientific, technical, legal, administrative and financial measures necessary for achieving the foregoing objectives.



INTRODUCTION TO THE ANGLESEA HEATH

A.3 ENABLING LEGISLATION

A.3.1 OVERARCHING LEGISLATION

Alcoa's lease over Anglesea Heath was established under the provisions of the *Mines (Aluminium Agreement) Act 1961*, when the State Government granted Alcoa access to Anglesea Heath for the purposes of coal exploration and mining. Alcoa's power station and mining operations in Anglesea Heath are governed in a broad sense by the *Mines (Aluminium Agreement) Act 1961*. Specific on-ground mining operations are regulated under the *Mineral Resources Development Act 1990*.

The passing of the *Mines (Aluminium Agreement) Act 1961* granted Alcoa access (via a lease) to explore for and mine coal within Anglesea Heath until 2011, with a right of renewal for a further 50 years. It is expected that Alcoa will exercise this option to retain access to the coal reserves beyond 2011.

The *Conservation, Forests and Lands Act 1987* (Part 8, section 69) provides the legislative basis for the Land Management Cooperative Agreement under which Alcoa and Parks Victoria will manage Anglesea Heath for the primary purpose of conservation of biodiversity and consistent with general principles established in the IUCN World Conservation Union guidelines for protected area management categories. A management plan to guide the strategic and operational management of Anglesea Heath is a requirement of the Agreement.

A.3.2 ANGLESEA HEATH REGULATIONS

A specific set of regulations, the *Conservation, Forests and Lands (Anglesea Heath) Regulations 2000*, have been developed for the preservation, care and protection of Anglesea Heath and to regulate the conduct of the public in Anglesea Heath. These Ministerial regulations were published in the *Government Gazette* on 4 January 2001 (page 14) and amended in the *Government Gazette* on 1 February 2001 (page 139). The Regulations are broadly based on those set out in the *Park Regulations 1992*, so as to support the aim to achieve a consistent management approach between Anglesea Heath and the adjacent *Angahaak-Lorne State Park*.

A.3.3 ADDITIONAL LEGISLATIVE OBLIGATIONS AND OPPORTUNITIES

Anglesea Heath will be managed in accordance with the relevant federal and State legislation that regulates various aspects of natural resources management. A comprehensive list of these Acts and guidelines is attached (see Appendix 4).

The former Land Conservation Council (LCC) in its Final Recommendations for the Melbourne Area District 1 Review (1987) outlined specific recommendations for Anglesea Heath. The recommendations revolved around

the division of Anglesea Heath into four management areas, with the principal recommendations including:

- most of the land continuing to be available to Alcoa for the purpose of coal mining and power generation;
- that fire protection policies would continue to be implemented in the area;
- that the land continue to be accessed by the public and contain a series of (rationalised) linked roads for motorised recreation;
- that a particularly biologically significant area (corresponding closely with the Marshy Creek Special Protection Overlay D.2.7) be excised from the Anglesea Heath and to be included into Victoria's parks and reserves system.

All recommendations of the LCC for the Anglesea Heath are consistent with the aims, strategies and actions of this Plan, however, the recommendation to excise a section of Anglesea Heath for inclusion into Victoria's reserve system was not adopted. Instead Alcoa and NRE entered into the Cooperative Land Management Agreement (2000) (pg 6) to provide a holistic approach to accomplishing the conservation outcomes advocated by the LCC. The resultant co-management partnership between Alcoa and the Government, means that the entire Land for Conservation will be managed as a protected area, in a like manner to Angahaak-Lorne State Park. These management arrangements will be more effective in protecting Anglesea Heath in its entirety than would have been gained by dividing the area into two (or four) separately managed areas.

Other relevant planning instruments influencing the management of Anglesea Heath include:

- the Otway Fire Protection Plan (DCNR, 1995a);
 - the Code of Practice for Fire Management on Public Land (DCNR, 1995b);
 - the Corangamite Regional Catchment Strategy (Corangamite Catchment and Land Protection Board, 1997); and
 - the Victorian Coastal Strategy (Victorian Coastal Council, 1997).
- the Angahaak-Lorne State Park Management Plan

A.3.4

See Map 2 - Boundaries, overleaf.





The Planning Process

The Planning Process

The Hon. Izabela Garbiñe,
Minister for Environment and Conservation
Margaret MacDonnell, ANGAIR Inc.
Peter Burgess, Victorian Operations Manager,
Alcoa World Alumina Australia

THE PLANNING PROCESS

B.1 WHY PREPARE A MANAGEMENT PLAN

Anglesea Heath is a valuable natural community asset, which for many people provides a setting for recreation and enjoyment. However, some forms of recreation and utilisation present a threat to the heath's noted biodiversity. The Management Plan has primarily been prepared to guide conservation of the heath's natural values and to provide strategies for a balanced outcome in a complex range of resource management issues.

By developing and communicating aims, strategies and actions in key management areas, this Management Plan outlines which activities are appropriate in aiding the achievement of sustainable management of Anglesea Heath. It is envisaged that the implementation of this Management Plan will reduce the impact of recreational and other pursuits currently threatening the Heath's biodiversity.

In addition, the preparation of this Management Plan has encouraged communication between Parks Victoria, DNRE, Alcoa and the community. This Management Plan advocates, where appropriate, a management approach consistent with that of the adjacent Angahook-Larne State Park.

B.2 A BRIEF HISTORY

In 1996 Alcoa and DNRE jointly called upon key stakeholders and environmental experts to discuss proposed additions to the National Heritage listed area within Anglesea Heath. During these discussions it was agreed there was a need for a more strategic approach to the management of Anglesea Heath as a whole entity. It was proposed that a Management Plan be drafted for the area, so as to guide decision making across a range of issues and key management areas. The proposal to draft an Anglesea Heath Management Plan, as a result of these discussions, was the first phase in the planning process.

A Consultative Committee was established (section C.4.4), bringing together individuals and groups with specific expertise and/or management responsibilities within Anglesea Heath. Representatives from Parks Victoria, Surf Coast Shire, Anglesea and Aireys Inlet Society for the Protection of Flora and Fauna (ANGAIR Inc.), the Geelong Environment Council (GEC), and staff from the School of Biology and Chemical Sciences, at Deakin University, Geelong, were included on this committee.

The Consultative Committee worked together to identify information required to develop a Management Plan. Alcoa employed a Project Officer to coordinate the process, collate information and develop a Draft Management Plan.

The Consultative Committee's first task was to assist in gathering all relevant background information, which was collated to form Anglesea Heath Resource Inventory. From the Resource Inventory, the Consultative Committee identified significant values of Anglesea Heath from available information. At this early stage initial contact with key stakeholders was made. A series of working parties (made up of the Consultative Committee members and user groups) was convened to develop some of the aims and strategies for management.

B.2.1 FIGURE 1: PLANNING PROCESS FOR ANGLESEA HEATH MANAGEMENT PLAN *See Flow Chart overleaf.*

B.3 PUBLIC CONSULTATION

Each stage in the development of this Management Plan has involved the community, either through the Consultative Committee (section C.4.4), various working parties, Issue Workshops (section C.4.5) and consideration of the 24 submissions received on the Draft Plan.

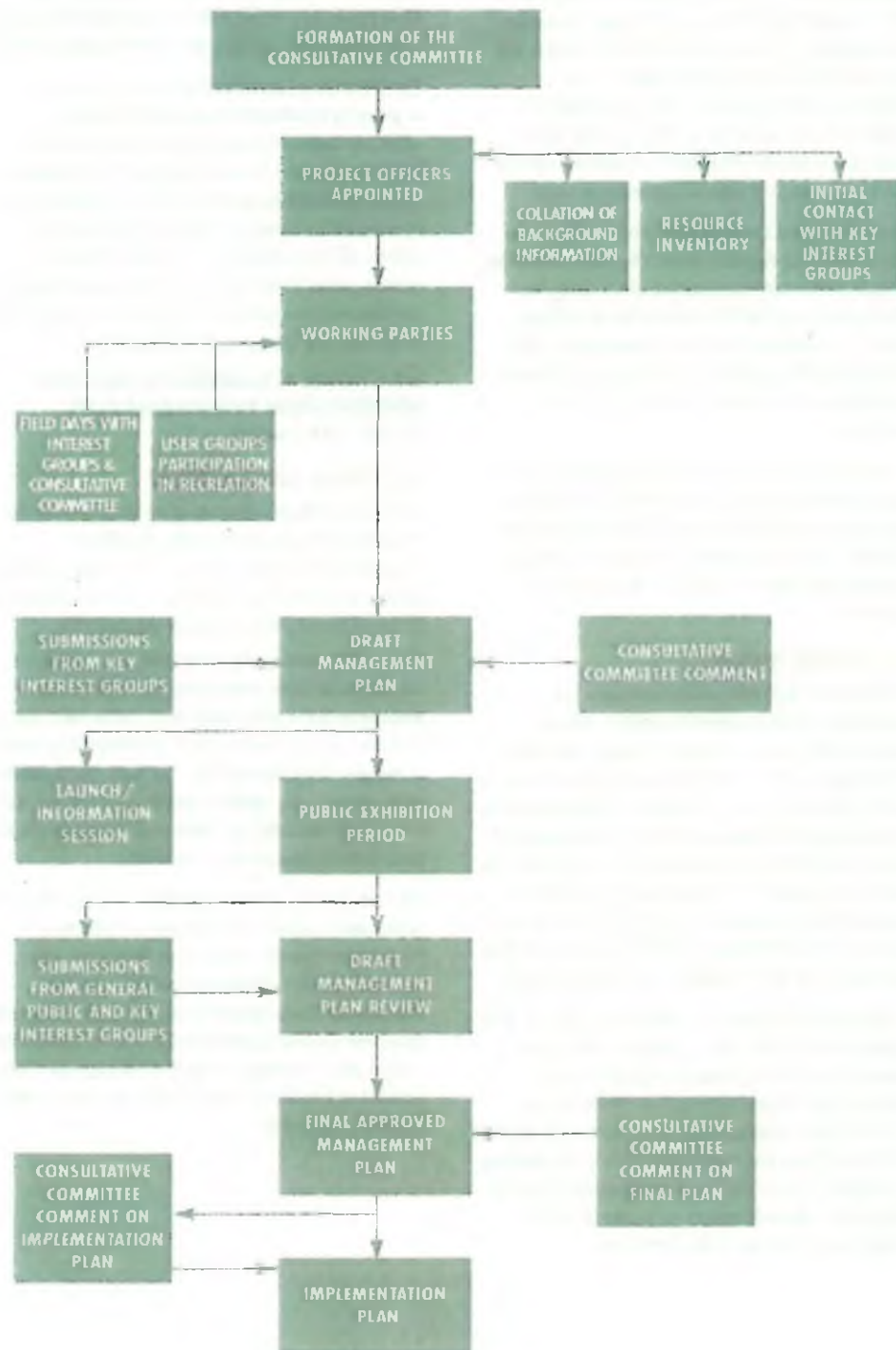
During 1996, notices requesting public submissions relevant to the future management of Anglesea Heath were advertised in local newspapers. Letters were sent to known users of Anglesea Heath outlining the intention to prepare a Management Plan. The Draft Plan underwent many reviews, with significant public input, but was then put on hold until DNRE and Alcoa could substantiate a legal basis for their management partnership.

The Consultative Committee (section C.4.4) and interested parties again reviewed the draft plan in 1999 so as to bring it to completion. Further Issue Workshops were convened and the Consultative Committee and the Management Group researched and discussed management issues that required supplementation and/or updating from the first draft. Publication of the Draft Management Plan provided opportunity for wider community comment that has been incorporated.



THE PLANNING PROCESS

B.2.1 Figure 1: Planning Process for Anglesea Heath Management



THE PLANNING PROCESS

B.4 PREPARATION OF THE MANAGEMENT PLAN

The process of preparing and reviewing the Anglesea Heath Management Plan is detailed in B.2.1, Planning Process for Anglesea Heath Management Plan.

In 1999, DNRE and Alcoa engaged Parks Victoria to finalise the Management Plan for Anglesea Heath. A revised set of aims and strategies was developed using existing information, specialist knowledge and that gained from the extensive consultative process. This Management Plan has been completed by Parks Victoria in accordance with the terms of the Land Management Cooperative Agreement entered into by DNRE and Alcoa.

This Management Plan will form the basis for the future co-management of Anglesea Heath. It concentrates on conservation, bolstering natural and cultural heritage, rationalising recreation opportunities, increasing community awareness and improving management expertise within that area. The success of the Plan will be contingent on the commitment by all participants, including DNRE, Alcoa, Parks Victoria and the community, to work cooperatively so as to achieve mutually acceptable and positive outcomes.

On release of the Draft Management Plan, new administration and management planning arrangements for Anglesea Heath were put in place (section C).

This action was taken in recognition of the urgent need for more strategic and long-term arrangements for the management of Anglesea Heath and the requirement for a community-based approach to the Management Plan. To implement the Plan actions in order of priority, the Management Group (section C.4.3), with input from the Consultative Committee (section C.4.4), will prepare an Implementation Plan.

The Implementation Plan will be reviewed annually by considering the major issues and available funding. Annual works programs will be developed from the implementation plan. This Management Plan will be updated based on an evaluation of the effectiveness of management actions, and further knowledge gained about Anglesea Heath and its environs. The plan will be reviewed, including renewed public input, every ten years, or as otherwise agreed among the Management Group.

B.5 ABOUT ANGLESEA HEATH MANAGEMENT PLAN

This Management Plan is, in some ways, an unconventional plan. This is because:

- It has been written using a collaborative approach in which the State Government, conservation agencies, local government, industry, and the local community have actively participated.
- It contains five core sections, each consisting of a number of sub-sections. The five core sections will be: the Introduction to Anglesea Heath, The Planning Process, The Basis for Management, Strategic Plan (management issues, strategies and actions) and Appendices. The sections will be interrelated but designed to be relevant for a different length of time and for a different audience.





The Basis for Management

The Basis For Management

Thelymitra aff. pauciflora Anglesea Slender Sun Orchid
Antechinus minimus Swamp Antechinus

THE BASIS FOR MANAGEMENT

C.1 OVERVIEW

The basis for management is derived from three areas:

- The inherent values of Anglesea Heath;
- The overarching management vision and guiding principles; and
- The special co-management arrangements.

The values of Anglesea Heath form the first part of the basis for management and underpin the entire Management Plan. By firstly identifying the relative values of Anglesea Heath, the subsequent sections of the Plan can be related back to the heath's important values.

The vision and guiding principles form the second part of the basis for management. The vision defines the inspiration behind the Partnership, whilst the guiding principles are the forward-looking foundations that link the vision with the management strategies and actions. The third and final part of the basis for management relates to the administrative arrangements that have been put in place to provide sustainable and cooperative management of Anglesea Heath.

C.2 VALUES OF ANGLESEA HEATH

C.2.1 NATIONAL ESTATE LISTING

The Register of the National Estate is Australia's national inventory of natural and cultural heritage places that are worth keeping for the future (Australian Heritage Commission, 2001). The Australian Heritage Commission identifies and maintains the Register of the National Estate and advises the Commonwealth Government on its protection. Places listed on the Register are assessed by the Commission and are deemed to contain components of Australia's natural and cultural environment, having aesthetic, historic, scientific or social significance or other special value for future generations or the present community (Department of Natural Resources and Environment 1998). Places listed on the Register may come from all parts of Australia and can be owned by Commonwealth, State and local governments, by businesses and private landholders. Entry into the Register is not a management decision and the way owners manage listed land is not directly affected by its listing. However, under section 30 of the *Australian Heritage Commission Act 1975*, the Commonwealth Government is prohibited from taking any action which would adversely affect a place in the Register.

Listing on the National Estate Register means that a place has met various criteria of national significance. The majority (6600 hectares) of Anglesea Heath is listed on the Register because of its noteworthy natural (particularly botanical) values, see Map 2 - Boundaries. The values included in Anglesea Heath's Statement of Significance (Australian Heritage Commission) and additional known values have been categorised for planning purposes into: natural heritage values; biodiversity conservation values; cultural heritage values; economic values; social values, and research and education values. A summary of these major values is listed below.

C.2.2 NATURAL HERITAGE VALUES

- The natural plant communities of the area, including Bald Hills heath, heathy woodlands and closed shrublands are important for the presence of rare species and are of ecological value as viable examples of vegetation types that occur naturally in the region.
- The native vegetation is important for maintaining the natural habitats of associated plants and animals, in protecting the soil surface, and helping to maintain natural landforms.
- The area contains seven different vegetation communities, namely: riparian open forest (deep shaded gullies), riparian open forest (river flats and open streams), heathy open forest, heathy woodland, Bald Hills heath, Urquhart Bluff heathland and closed shrubland.
- An exceptional wildflower display occurs in Spring.
- Spectacular landscapes can be observed, particularly in the Bald Hills area.
- Significant geological, geomorphological and palaeontological features exist. Leaf fossils found within the coal mine are of international significance.
- Anglesea Heath forms part of the natural continuum between the ecosystems of the Otway Ranges and helps to protect the integrity of this biogeographical unit.



THE BASIS FOR MANAGEMENT

C.2.3 BIODIVERSITY CONSERVATION VALUES

- The heathy woodland in Anglesea Heath is the richest and most diverse vegetation community recorded in Victoria (Australian Heritage Commission, 1992).
- The native plants and animals of the area are important parts of the region's biodiversity.
- A remarkable number of flora species occur within a relatively small area: over 620 species, or approximately one-quarter of the total Victorian flora (Conservation, Forests and Lands, 1989).
- Over 100 species of native birds have been recorded in Anglesea Heath. The range of species which is attributable to the wide range of habitats in the area includes Powerful Owl (*Ninox strenua*) and Rufous Bristlebird (*Dasyornis broadbenti*).
- Twenty-nine native mammal species have been recorded in Anglesea Heath including one Victorian critically endangered species, the New Holland Mouse (*Pseudomys novaehollandiae*), and rare species including the Swamp Antechinus (*Antechinus minimus*) and the White Footed Dunnart (*Sminthopsis leucopus*).
- Significant flora includes eight species that are rare or threatened at the national level, and twenty that are rare or threatened at the State level. Two species, Anglesea Grevillea (*Grevillea infecunda*), and Anglesea Slender Sun Orchid (*Thelymitra* sp. aff. *pauciflora*), are endemic to the area (see Appendix 2).
- Over a quarter of Victoria's orchid species are found in Anglesea Heath. Over 80 species and five hybrid species have been recorded. Accordingly, the heath claims not only State, but also national significance, for its orchid flora.
- The Anglesea River valley with its biggest tributary, Salt Creek, contains spectacular stands of swamp plants; in particular Scented Paperbark (*Melaleuca squarrosa*). These swampy heaths are also significant for the unusual aquatic habitat they provide, the number of rare and restricted species found and the unusual peaty soils draining acidic waters during periods of flow.
- The waterways in Anglesea Heath provide habitat for a rare fish, Spotted Galaxias (*Galaxias truttaceus*), and the Southern Pygmy Perch (*Nannoperca australis*), which has not been recorded in any other Otway catchments east of the Gellibrand River.

C.2.4 CULTURAL HERITAGE VALUES

- Numerous significant archaeological sites are contained in Anglesea Heath.
- Anglesea Heath remains in a natural state, providing a spiritual connection between past, present and future generations of the Wathaurong Community and its territory.
- Anglesea Heath contributes significantly to the continuity and integrity of the South West and Wimmera Cultural Heritage Region and specifically to the Wathaurong area boundary.

C.2.5 ECONOMIC VALUES

- Anglesea Heath makes a significant contribution to the 'naturalness' of the Great Ocean Road experience, a drawcard that attracts tourism expenditure of an estimated \$241 million per annum.
- The high-quality economic brown coal reserves, which total approximately 80 million tonnes, have low water content and high calorific value compared to coal mined in the Latrobe Valley.
- Anglesea Power Station output is a significant contributor to Alcoa's Point Henry Smelter power supply and that company's total aluminium export business requirements.
- Anglesea Heath is likely to have a similar economic contribution to the region as Angahook-Lorne State Park. For example, Angahook-Lorne State Park had 539,518 visitors who spent an estimated \$10.73 per person per visitor day in 1998. This amounts to \$5.79 million dollars per year to the local economy (Reed Sturgess 1998).

C.2.6 SOCIAL VALUES

- The area offers opportunities that complement other features along the Great Ocean Road. In particular, it offers the opportunity for visitors to experience a sense of remoteness.
- People who visit Anglesea Heath value the range of recreational and leisure activities that are available.
- Anglesea Heath contributes to an enhanced quality of life for the permanent and non-permanent population of Anglesea and environs, now and for future generations.
- Both the Mining Area and Anglesea Heath contribute to employment opportunities in the local community.

THE BASIS FOR MANAGEMENT

C.2.7 RESEARCH AND EDUCATION VALUES

- The area provides an outstanding opportunity to study an internationally renowned and diverse series of ecosystems at a relatively close distance from major universities and research institutes.
- The information arising from scientific research in the area has the potential to provide land managers with the latest findings and methodologies in natural resource management.
- Anglesea Heath allows researchers an invaluable opportunity to attain greater understanding of protected area management, where innovative Park Management initiatives may be trialed.
- The area provides an opportunity to promote greater co-operation and understanding between conservation agencies, the mining industry, scientists, and the wider community.
- The area offers opportunities for community education and interpretation of the natural values of Anglesea Heath.

C.3 VISION AND COOPERATIVE PRINCIPLES

The vision inspiring the establishment and management of Anglesea Heath is:

“Enhance, restore and sustain biodiversity and ecosystems integrity in Anglesea Heath through cooperative management”.

The Department of Natural Resources and Environment (DNRE) and Alcoa aim to set a precedent for protected area management in Victoria by combining industry, government organisations and the community as partners in cooperative decision making. Central to achieving this vision is the Land Management Cooperative Agreement; under which State agencies, industry and local community groups are actively collaborating with one another to more effectively provide conservation and biodiversity outcomes. In pursuing this vision for Anglesea Heath, the parties will give due regard to four guiding principles:

- allowing continued use that does not threaten the area's values and integrity;
- recognising the roles of current management agencies;
- involving the local community in planning and management; and
- providing for continued access for Alcoa to coal reserves on its mining lease.

Under these principles, the conservation and biodiversity values will be upheld, and will be promoted as an asset to be appreciated by current and future generations. Protection and enhancement of biodiversity will be ensured through careful planning and consultation. Active management, including increased ranger presence will control activities that threaten the heath's biodiversity. Monitoring and evaluation will continue to assist management and protection of the heath's values.

Most of Anglesea Heath will remain in an undeveloped state to provide the visitor with a sense of remoteness, and an appreciation of its natural values. Recreational opportunities will be provided for on open, named tracks. Communication with key user groups will ensure that natural values will be maintained. Visitor facilities will be minimal, in keeping with the natural character of Anglesea Heath. High quality information will assist visitors to enjoy and gain an understanding of the interesting and diverse environments within Anglesea Heath.

Volunteers and user groups will be encouraged to actively participate in protection and maintenance of Anglesea Heath. The scientific community has an important role and they will be encouraged to increase knowledge and understanding of the heath. Active and collaborative management will ensure that visitor use does not detrimentally impact on Anglesea Heath's significant values, so that these values are sustained for future generations.

Cooperative management will ensure the sustainability of environmental, social and economic values of Anglesea Heath, which will offer the community and visitors a range of interesting and enjoyable experiences. This is expected to generate public support for the continued conservation of Anglesea Heath.



THE BASIS FOR MANAGEMENT

C.4 ADMINISTRATIVE ARRANGEMENTS AND PLANNING OUTPUTS

Since the recognition of Anglesea Heath through National Estate listing and the formation of the Consultative Committee, Alcoa, the lessee, has worked cooperatively with Parks Victoria to develop this Management Plan.

The Land Management Cooperative Agreement between Alcoa and DNRE outlines rights, undertakings and institutional arrangements among the parties and Parks Victoria. Under the agreement, the parties undertake to manage Anglesea Heath (Land for Conservation) (refer Map 2) for the primary purpose of conservation, and as consistent with this purpose, for public recreation, education and enjoyment.

The Secretary to the DNRE and Alcoa agree to meet annual management and maintenance costs on a proportional basis to be agreed between the parties from time to time. Alcoa will contribute to the works program, establishment of infrastructure, sponsorship of research and educational initiatives and the provision of land rehabilitation expertise.

The Agreement indicates the Secretary's intention to assign day-to-day management of Anglesea Heath to Parks Victoria including the authority and responsibility to enforce regulations.

Alcoa will retain control and management of the Mining Area. The coal reserves will be mined and rehabilitated, in keeping with the values of Anglesea Heath, the adjoining land utilisation and this Management Plan.

The allocation of resources for managing Anglesea Heath will be based on:

- the long term strategies and actions agreed to in this Management Plan;
- an annual works program to protect Anglesea Heath from immediate threat; and
- the principle of cost sharing for agreed priority areas, assessed and agreed to on an annual basis.

C.4.1 THE MANAGEMENT PLAN

The Management Plan is based on the protection of conservation values and provides guiding principles, aims and strategies for management and use of Anglesea Heath. The Plan indicates what needs to be done and provides a framework for managers, visitors and other stakeholders.

C.4.2 OPERATIONAL STRATEGY

The strategies identified in the Management Plan will be prioritised and implemented in accordance with the three year implementation plan prepared and reviewed annually by the Management Group with input from the Consultative Committee (section C.4.4).

Annual Works Programs derived from the implementation plan will outline required works and include costings for the implementation of priority actions.

THE BASIS FOR MANAGEMENT

C.4.3 THE MANAGEMENT GROUP

The Management Group is a 'cooperative partnership' between Alcoa and Parks Victoria. This group will directly and regularly liaise with the Consultative Committee.

C.4.4 THE CONSULTATIVE COMMITTEE

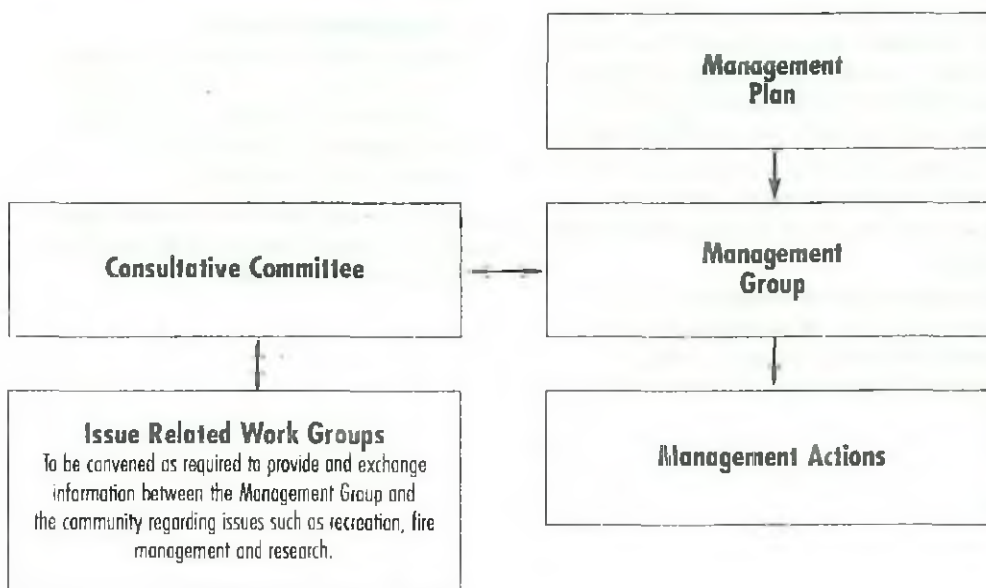
The function of the Consultative Committee is to assist the Management Group by providing expertise, local knowledge and advice on management actions proposed for Anglesea Heath.

The Consultative Committee includes representatives from: Alcoa, Parks Victoria, Deakin University; Anglesea Airreys Inlet Society for the Protection of Flora and Fauna (ANGAIR Inc.); Geelong Environment Council (GEC); and the Surf Coast Shire. The Consultative Committee will represent

community interest in Anglesea Heath and assist and encourage wider community consultation and involvement in management of the area. By liaison with key people, the Consultative Committee will obtain the necessary information to assist in decision making for Anglesea Heath. The Consultative Committee will also assist with guiding the direction of the Issue Related Workgroups.

C.4.5 ISSUE RELATED WORKGROUPS

Issue Related Workgroups will be formed and convened to enhance community and specialist involvement in management of Anglesea Heath. These groups will address issues and provide the Management Group with feedback on their area of focus.





Strategic Plan Management Issues
and Strategies

Strategic Plan - Management Issues
and Strategies

Karriegenhead Australia - Kaitoi Grass Tree
Peter Burgess - Regional Operations Manager
Alice Marie Alameda Australia
Kari Millahan - Ranger Park Victoria

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

D.1 MANAGEMENT ISSUES, STRATEGIES AND ZONING.

To conserve and protect the highly significant natural and cultural values of Anglesea Heath, an important function of this Management Plan is to identify and clearly set out, aims, strategies and actions relating to the numerous management issues relevant to the area (with the exception of section D.5.5 Coal Mining, which relates to the Mining Area). The following strategic plan outlines aims, strategies and actions in each key management area and describes management zones. The strategic plan is a valuable tool for land managers and users of Anglesea Heath.

The process of identifying and categorising issues was undertaken by the Consultative Committee and the Management Group (sections C.4.3 and C.4.4). Together they identified and categorised issues by:

- Identifying significant values;
- Identifying threats to values;
- Identifying desired outcomes;
- Identifying management issues, and organising them into key management areas; and
- Drafting relevant background material, aims, strategies and actions for each key management area and sub-area.

The format of the strategic plan is to identify aims, strategies and actions for each key management area and sub-area. Aims can be described as a set of identified desired outcomes, strategies are agreed management responses to each issue and actions are steps taken to implement strategies.

Key management areas were analysed and divided into sub-areas that encompass a full range of management aims, strategies, and actions required to be achieved. It is expected that the majority of actions and strategies will be implemented over the next ten years. The implementation of strategies and actions will be prioritised to conserve the most threatened and significant biological values within Anglesea Heath subject to the constraint of funding realities.

D.2 MANAGEMENT ZONES

The zoning scheme developed for Anglesea Heath is values-based and has been modelled on those used in other protected areas in Victoria. Primary management zones and overlays were designated with reference to the Australian Heritage Commission's Statement Of Significance for the Anglesea Heath, the LCC Melbourne Area District 1 Review, Final Recommendations, the Victorian Flora Information System, the Victorian Wildlife Atlas and local knowledge. The purpose of the zoning scheme for the Anglesea Heath is to:

- provide a geographic framework for managing Anglesea Heath;
- indicate which management directions have priority in Anglesea Heath; and
- minimise conflicts between recreational use and conservation of high biodiversity values, and to provide a basis for assessing the suitability of future activities.

D.2.1 PRIMARY MANAGEMENT ZONES

Two underlying management zones will apply to Anglesea Heath, these are: the Conservation Zone and the Conservation and Recreation Zone.

D.2.2 CONSERVATION ZONE

The Conservation Zone is designated to protect sensitive natural environments and to provide for minimal-impact recreation activities and simple visitor facilities subject to ensuring minimal interference with natural processes. Conservation zones are applied to broad areas containing sensitive natural environments or ecosystems, which are unable to sustain the impact of significant levels of dispersed recreation activity and other uses. The vast majority of Anglesea Heath will be zoned Conservation to protect the sensitive and highly significant natural areas.

D.2.3 CONSERVATION AND RECREATION ZONE

The Conservation and Recreation Zone is designated to protect less-sensitive natural environments and to provide for sustainable recreation activities and small-scale recreation facilities without significant impact on natural processes. This zone is generally applied to Parks, unless there is a reason to apply a more specific zoning. The zone usually comprises broad natural areas that can sustain significant levels of dispersed recreational activities without significant impact on these areas' natural values. An area of approximately 20 ha located on Gum Flats Road will be zoned Conservation and Recreation. This area is significantly modified and is highly accessible to visitors.

D.2.4 MANAGEMENT OVERLAYS

In addition to the underlying zones, two categories of overlays have also been applied to Anglesea Heath. These overlays are Special Protection Areas (section D.2.5) and Special Management Areas (section D.2.6). The overlays have been applied to areas within Anglesea Heath where specific or additional management actions are required.

D.2.5 SPECIAL PROTECTION AREAS

Special Protection Areas are designated to protect specific areas and sites where a special management focus is required. Special Protection areas are applied to specific areas where known natural or cultural values require a special management focus to ensure their protection.



STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

In addition to the underlying zoning scheme special protection overlays are used to provide for further protection of particularly significant and sensitive catchments within Anglesea Heath.

These overlays are designated to highlight additional requirements to those of the underlying conservation and recreation zones.

The Marshy Creek Catchment and Heathlands and the Salt Creek Catchment and Heathlands are areas which contain natural values of State significance. A summary of these values is outlined below.

D.2.5.A MARSHY CREEK CATCHMENT AND HEATHLANDS

This area contains unique and regionally significant Scented Paperbark swamps; relatively intact expanses of heathy woodland with extremely high species richness (160 species per hectare).

It contains a high density for threatened species, including identified areas of optimum habitat for one rare and one critically endangered mammal species.

D.2.5.B SALT CREEK CATCHMENT AND HEATHLANDS

The area also contains regionally significant Scented Paperbark swamps that in this location are of State significance for the conservation of threatened species, including the Grey Goshawk. The species rich heathland and forest communities within, contain seven nationally, four State and many regionally significant flora species; intact and healthy Grass Tree stands; known occurrence of and habitat for three fauna species of State significance, and five species of regional significance.

D.2.6 SPECIAL MANAGEMENT AREAS

Special Management Areas are designated to highlight areas where special management actions are needed for non-standard uses. Special Management Areas apply to sites where active, non-standard activities will take place. Special Management Area overlays will cover the land currently used by the Geelong Rifle Club (section D.7.9) at Gum Flat Road and the transmission line and easement extending north-east through Anglesea Heath from Alcoa's Anglesea Power Station.

D.2.6.A GEELONG RIFLE CLUB

The Geelong Rifle Club will manage the Gun Club area (20 ha) as a rifle range facility until December 2003, when the current lease expires.

D.2.6.B ALCOA TRANSMISSION LINES

The transmission line is owned and managed by Alcoa, but the line is maintained by Powercor in accordance with the Code of Practice for Electric Line Clearance (vegetation) (OCEI, 1999).

D.2.7

See Zoning Map overleaf.

D.3 KEY MANAGEMENT AREA: BIODIVERSITY CONSERVATION

Enactment of the *Minas (Aluminium Agreement Act)* in 1961 enabled Alcoa's lease over the Anglesea Heath for coal mining and power generation. However, with the exception of the Mining Area (see Map 2 - Boundaries) the area remains relatively intact and is widely recognised as a significant biological area.

Management and recreational access in conjunction with other threatening processes have divided significant vegetation communities within the Heath. This fragmentation, caused by creation of recognised and informal tracks increases the level of threat to biodiversity in Anglesea Heath by providing for dispersal of pest plants and animals, increasing the extent of soil erosion and resultant altered hydrology and dividing plant communities and fauna habitats. Many of the aims, strategies and actions set out in this plan are targeted towards reducing fragmentation of Anglesea Heath and improving the areas condition, while providing necessary access for management and visitors.

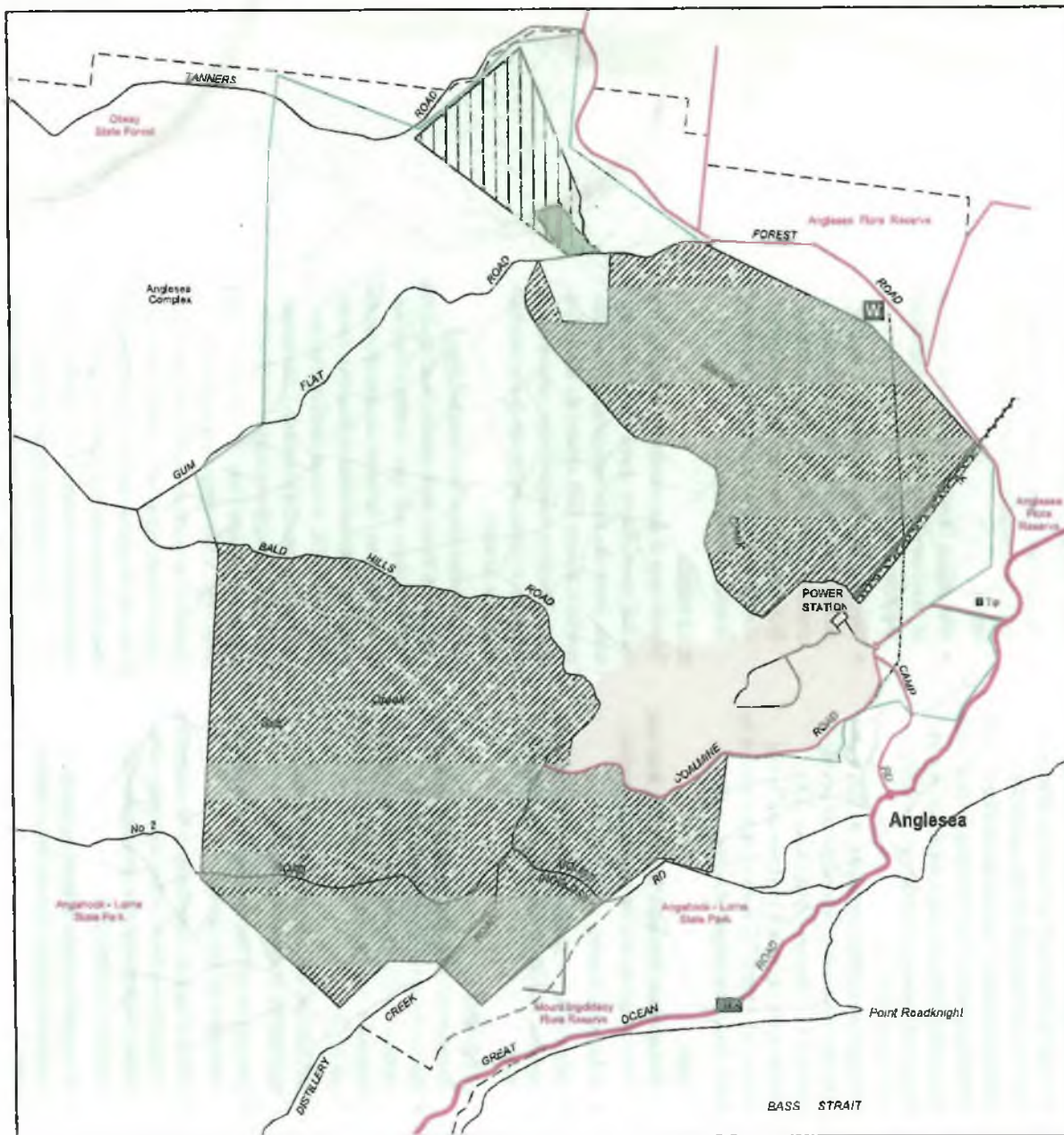
D.3.1 FLORA

The high diversity of vegetation types and the diversity of species within them are the primary reason why the majority (6600 hectares) of Anglesea Heath is listed as a significant natural place on the National Estate Register (see Map 3).

Anglesea Heath contains an outstanding diversity of flora. Over 620 species, or approximately one quarter of the total Victorian flora, are represented there (Conservation, Forests and Lands, 1989).

Significant flora include three species, which are rare or threatened at a national level, and eight, which are rare or vulnerable at a State level. Two species, Anglesea Grevillea (*Grevillea infecunda*) and Anglesea Slender Sun Orchid (*Thelymitra* sp. aff. *Pauciflora*) are endemic to the Anglesea area (see Appendix 2).

Over 80 orchid species including five hybrid species have been recorded in Anglesea Heath. Accordingly, the area is of State and national significance for its orchid flora. In addition to its floristic significance Anglesea Heath demonstrates spectacular landscape and scenic values; the wildflower displays in Spring are especially noteworthy. In 1986, the former Land Conservation Council (LCC) commissioned C. Meredith (Biosis Research Pty Ltd) to produce a floristic vegetation map, showing the distribution of flora communities within Anglesea Heath. Meredith observed that there were two broad vegetation categories: heathy communities and forest communities (LCC 1987).



ANGLESEA HEATH

Map 3 ZONING



-  Mining Area
-  Powerline & Easement (Alcoa)
-  Pipeline (Barwon Water)
-  Water Reservoir (Barwon Water)
-  Conservation Zone
-  Conservation & Recreation Zone
-  Special Protection Areas
-  Special Management Area - Geelong Rifle Club
-  Special Management Area - Powerlines
-  Other Protected Areas



STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

The heathy communities occur on infertile sandy soils and contain five separate sub-community types, namely: heathy open forest I, heathy woodland I, Bald Hills heathland, Urquhart Bluff heathland and closed shrubland.

The forest communities occur on more fertile clay soils. They contain three separate sub-communities, namely: riparian open forest I-II, fern gully, and damp open forest.

Some sites of significance have been identified, recorded and mapped by community groups with assistance from DNRE. This survey work has produced a preliminary 'Sites of Significance' map for the Anglesea Area. Further work of this nature in broader areas of Anglesea Heath will continue to provide valuable information to managers. The impact on flora of past and current use of Anglesea Heath has been substantial. The flora communities' integrity will decrease if measures are not taken to control threatening processes. These threatening processes include fragmentation, Cinnamon Fungus, soil erosion, pest plant invasion and unmanaged recreation (sections D.4.1, D.4.2, D.5.3 and D.7.1).

Any impacts on vegetation communities are likely to flow on to other values such as fauna habitat and diversity (section D.3.2). This plan addresses issues such as vehicular access, use of roads and tracks, and hygiene (sections D.5.3 and D.7.2) to ensure the protection of the floristic diversity and integrity of Anglesea Heath.

AIMS

Management Outcomes for this Key Area are:

- Protect indigenous flora and vegetation communities;
- Maintain flora diversity;
- Reduce and where possible eliminate fragmentation of vegetation and other threats to flora within Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Minimise the impact of recreational activities, introduced species and other uses upon the vegetation communities in Anglesea Heath (sections D.5.1, D.5.2 and D.7.1);
- Rationalise the road and track network to reduce fragmentation of vegetation communities;
- Encourage research into significant or rare vegetation communities and flora species;
- Acquire an improved understanding of the requirements of vegetation and threats to flora communities within Anglesea Heath through close communication with researchers (section D.1D.1);
- Use acquired knowledge to develop appropriate management programs to protect flora of Anglesea Heath.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Continue to identify and map sites of threatened, significant and localised species in Anglesea Heath;
- Fence and gate off areas as required to assist in minimising disturbance to significant species and communities;
- Revegetate degraded areas with indigenous plant species and prevent recreational access into disturbed areas;
- Conduct ecological burning programs that promote species diversity (section D.5.4);
- Map Cinnamon Fungus (section D.5.3) and assess its impact on vegetation communities and significant species;
- After mapping Cinnamon Fungus, revisit further use of control measures to protect rare and significant vegetation communities;
- Investigate and where applicable use controls to protect known rare and significant plants and communities from Cinnamon Fungus infection eg. by isolating from nearest infection, enabling direct drainage from infected vegetation and, if approved, spraying with phosphonate.

D.3.2 FAUNA

The wide range of plant communities in Anglesea Heath and their species diversity provide habitat for a range of fauna. Twenty-nine native mammal species have been recorded in Anglesea Heath including the New Holland Mouse (*Pseudomys novaehollandiae*), which is critically endangered in Victoria, and the rare Swamp Antechinus (*Antechinus minimus*).

The New Holland Mouse has a restricted, disjunct distribution in Victoria and is presently found at only four localities: Anglesea, Loch Sport, Providence Ponds and Wilsons Promontory. The species was originally recorded in Anglesea Heath west of the Anglesea River (Kentish, 1982). Since 1982, its known distribution has been restricted to an area of approximately 2,300 hectares, east of the Anglesea River in Anglesea Heath and the Anglesea Flora Reserve (Lock, 1995; Mills, 1992; Wilson, 1990, 1991, 1994, 1996). Management actions identified to recover the species include: reduction and control of habitat fragmentation, enhancement of habitat at key sites through management of fire (section D.5.4), restriction of access and high impact recreation in important habitat; cat and fox control (sections D.5.2, D.7.1, D.7.2); captive breeding and possible re-introduction of captive-bred animals to Anglesea Heath.



STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

The survival of the New Holland Mouse in Anglesea Heath depends largely on the conservation and health of suitable plant communities (section D.3.1). Protection of such habitat within Anglesea Heath is therefore a high priority for land managers.

A predictive spatial model for the distribution of optimum habitat for the New Holland Mouse in the Anglesea area has been developed using a Geographical Information System (GIS) (Wilson, 1997a,b; O'Callaghan, 1998; Slattery, 1998). The habitats revealed by this study will be managed to protect important habitat for the New Holland Mouse within Anglesea Heath. The Marshy Creek Special Protection Area (section D.2.5) includes sites where the New Holland Mouse has historically been recorded. These areas have also been revealed by the GIS model to be important habitat. This Marshy Creek Special Protection Area will be managed to provide habitat of optimal successional age, that is between three to seven years post fire (Wilson, 1999).

Ecological burning has been, and will continue to be, undertaken within the Anglesea Heath and adjoining areas, to provide a mosaic of optimum conditions in areas of critical habitat for threatened species (section D.5.4).

Over 100 species of native birds have been recorded in Anglesea Heath, of which seven are significant (see Appendix 3). The range of species is attributable to the wide range of habitats in the area.

The waterways in Anglesea Heath, particularly those close to the Anglesea River mouth, provide habitat for a rare fish, the Spotted Galaxias (*Galaxias truttaceus*) (section D.4.2). The Southern Pygmy Perch (*Nannoperca australis*), which has also been recorded in the Anglesea Heath, is not found in any other Ohway catchments west to the Gellibrand River. The unusual distribution for the Southern Pygmy Perch could possibly be associated with the last glacial epoch (Atkins and Bourne, 1983; Koehn and O'Connor, 1990).

There is only very limited information on the distribution, abundance and habitats of reptiles, amphibians and invertebrates within Anglesea Heath. One known rare reptile species known to occur in the area is the Swamp Skink (*Egernia coventryi*).

Two species that occur in Anglesea Heath are listed under the *Flora and Fauna Guarantee Act 1988*. These species are the New Holland Mouse (*Pseudomys novaehollandiae*) and Rufous Bristlebird (*Dasyornis braadanti*). Action Statements have been prepared for both. Further information on the distribution, ecological and management requirements of fauna, especially significant fauna, will continue to be sought. Information revealed by

studies on the requirements of threatened fauna will then be used to guide management of important habitat. Continuing surveys and research (section D.10.1) are increasing knowledge and understanding of significant fauna and their habitat requirements within Anglesea Heath.

Management actions undertaken in Anglesea Heath for the protection of fauna will focus on the conservation of habitat, in particular critical habitats for rare and threatened species such as the New Holland Mouse.

AIMS

Management Outcomes for this Key Area are to:

- Conserve indigenous fauna and maintain species diversity and genetic diversity;
- Protect endangered species and maintain and/or enhance the integrity of their habitats.

STRATEGIES

Management Strategies for this Key Area are to:

- Ensure the habitats of New Holland Mouse and Rufous Bristlebird are managed to provide the optimum requirements for those species;
- Encourage and promote research on significant fauna species and communities (section D.10.1);
- Develop an ecological burning program that promotes species diversity and protects habitats of significant fauna and their communities (section D.5.4);
- Minimise the impact of pest animals, pest plants and other threatening processes on the fauna of Anglesea Heath (section D.5).

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Implement the recommendations of the Action Statements for New Holland Mouse and Rufous Bristlebird;
- Develop and implement a coordinated pest animal control program involving Deakin University, adjacent land managers and other interested parties (section D.5.2);
- Work in conjunction with the recovery team, as required, to ensure the highest possible likelihood of success and continued vigour of the New Holland Mouse.

D.3.3 RESEARCH

Significant information and knowledge about the natural values of Anglesea Heath have been gained through research. Continued support by the Management Group (section C.4.3) in the pursuit of further understanding about the ecology of Anglesea Heath will be integral to the conservation of the Heath's biodiversity.

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

Anglesea Heath has been the subject of continuous research for over a decade. The main advocates of this research have been Deakin University, Alcoa, Parks Victoria/Department of Natural Resources and Environment, ANGAIR Inc. and the Australian Heritage Commission. In the case of Alcoa and Parks Victoria, the research has often been commissioned to scientists and consultants. Recent research has been substantial and has assisted in the listing of most of Anglesea Heath on the National Estate Register.

Due to its past contribution, and the importance of research in the future management of Anglesea Heath, a Research Workgroup will be convened to exchange information with the Management Group regarding research (sections C.4.3 and C.4.5). Close liaison is required between the Management Group and the Research Issue Workgroup to ensure that the most needed and relevant research is undertaken in Anglesea Heath. This liaison will also ensure that management actions are undertaken with a sound understanding of the findings of current research. It is intended that the Research Issue Workgroup will play an active role in the coordination of research within Anglesea Heath to increase the knowledge and effectiveness of management.

Protection of the natural values and conservation significance of Anglesea Heath will, in the future, depend greatly on research into the areas of Cinnamon Fungus identification and control, pest plant and animal control, and fire ecology (sections D.5.1, D.5.2 and D.5.4). For example, Cinnamon Fungus was identified in Anglesea Heath in 1972, and represents a serious threat to its nationally significant flora and fauna. Current studies into possible control methods for Cinnamon Fungus may have major implications for the management of Anglesea Heath. Research in Anglesea Heath involves people, use of vehicle tracks and, in some cases, work away from tracks (section D.7.2). It is important that whilst doing research, people are not causing an unacceptable impact. A code of conduct for all researchers within Anglesea Heath is required. It is expected that the Research Workgroup will develop this policy for researchers and other users.

AIMS

Management Outcomes for this Key Area are to:

- Encourage research within Anglesea Heath;
- Acquire research information that is lacking, or most required, to maintain the biodiversity and other values of Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Support research into key biodiversity conservation areas including: Cinnamon Fungus, pest plant and animal control, soil conservation, and threatened

species conservation and management (sections D.3.1, D.3.2, D.5.1, D.5.2 and D.5.4);

- Utilise current research findings and recommendations for innovative management of biodiversity conservation and cultural protection in Anglesea Heath.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Develop a library of all study documents at an accessible site;
- Establish a Research Issue Workgroup (section C.4.5);
- Coordinate and target research projects to protect the most significant and threatened values within Anglesea Heath (sections D.3.1 and D.3.2).

D.4 KEY MANAGEMENT AREA: PROTECTION OF NATURAL VALUES.

D.4.1 SOIL CONSERVATION AND EROSION

The soil types present in Anglesea Heath reflect the various soil-forming factors such as climate, parent material, position in the landscape, age of formation and vegetation. Variations in these factors have led to a range of soil types occurring in Anglesea Heath. The main characteristic of the vast majority of soils in the area is the distinct texture contrast between the relatively light-textured surface soils and clay subsol.

The shallow surface soils are highly erodible; this erodibility is a major threat to the vigour, distribution and diversity of flora of the area (section D.3.1).

The retention of a healthy vegetative cover is the only way to protect and hold in place the shallow light textured surface soils, therefore the conservation of vegetation and re-vegetation of denuded sites are imperative management actions within Anglesea Heath. The relatively low rainfall of the area (approximately 700 mm annually) restricts the ability of vegetation to quickly re-establish once lost.

The area's soils and vegetation, in their natural condition, are generally stable. When soil is deprived of its protective vegetation cover, it is particularly susceptible to a variety of soil deterioration processes. Soil erosion is a problem that is most prevalent on some of the roads and tracks (section D.7.2) and the loss of soil can have consequences for many natural values of Anglesea Heath. For example, as Geoff Carr (*Ecology Australia*) suggests, 'disturbances such as soil erosion can facilitate weed invasion, as opportunistic species colonise disturbed sites. In addition, eroded material moving downslope can change site conditions where it is deposited ultimately in drainage lines, causing smothering of ground cover vegetation, altering soil structure, nutrient status, and siltation and turbidity of waterways'. (Carr, 1995).



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Within Anglesea Heath these effects are often localised by the natural filtering characteristics of the Scented Paperbark swamps. Many creek crossings create sites of localised erosion where pools of water are formed that do not freely drain.

Widespread erosion is a problem that land managers cannot easily address without costly and visually intrusive earthworks and therefore prevention is essential.

Soil erosion caused by recreation and poorly located tracks is a continuing major issue in the Anglesea area (sections D.7.1 and D.7.2) and has led to degradation of values and threatened soil stability. Identifying causes, monitoring effects and implementing measures to prevent, control and rehabilitate soils are imperative.

AIMS

Management Outcomes for this Key Area are to:

- Protect soils from erosion;
- Maintain natural fertility levels and structure of the soil.

STRATEGIES

Management Strategies for this Key Area are to:

- Minimise vegetation and soil disturbance associated with recreation and management actions;
- Develop an erosion-monitoring program that identifies causes and locations of erosion;
- Ensure erosion control works do not further contribute to threatening processes including the spread of Cinnamon Fungus.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Stabilise and rehabilitate known eroded sites;
- Physically restrict public access to areas assessed to be Erosion Hazard Areas, and enforce the Land Conservation (Vehicle Control) Act 1972;
- Rationalise the road and track network to reduce fragmentation and minimise disturbance of soil, following the track audit (section D.7.2);
- Implement erosion monitoring, identifying, documenting and assessing locations of erosion as part of the track audit (section D.7.2);
- Conserve topsoil during any development works and re-use in Anglesea Heath;
- Identify creek crossings that are causing excessive modification of aquatic habitats (section D.4.2) and undertake programs to ensure such sites are rehabilitated and maintained;
- Test soil for Cinnamon Fungus prior to any significant soil movement (section D.5.3);

- Construct new fire control lines, where possible on appropriate grade, and rehabilitate tracks after use (section D.5.4).

D.4.2 WATER RESOURCE MANAGEMENT

Anglesea Heath is drained by the Anglesea River (Marshy Creek) and Salt Creek flowing southeast into an estuary that is intermittently open to Bass Strait. For most of their length the waterways within Anglesea Heath exist as Tea-tree swamps on a porous peaty soil with the flow alternating between surface and sub-surface seepage (Atkins and Bourne, 1983). The waterways in the lower Anglesea Heath provide habitat for a rare fish, the Spotted Galaxias (*Galaxias truttaceus*) (McCarraher, 1986). Another aquatic species, Southern Pygmy Perch (*Nannoperca australis*) is found in Anglesea Heath; this species is not recorded in any other Otway Catchments (section D.3.2).

If the unique Paperbark Swamps and aquatic values of Anglesea Heath are to be upheld, then threatening processes that alter hydrology, must be mitigated through management.

AIMS

Management Outcomes for this Key Area are to:

- Maintain natural hydrological systems and regimes;
- Maintain riverine and wetland ecology and health.

STRATEGIES

Management Strategies for this Key Area are to:

- Ensure siltation and turbidity do not detrimentally effect water quality;
- Ensure that all management actions are undertaken to minimise detrimental effects on hydrological systems and are generally in accordance with the Code of Forest Practices (sections D.5.4 and D.7.2);
- Investigate and mitigate processes that threaten aquatic values or alter hydrology.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- implement erosion control measures where water quality is being compromised by soil disturbance and erosion (section D.4.1);
- Monitor ground water quality and surface water quality;
- Rationalise river/creek crossings and remove those that are not identified by Appendix 1, Map 4, or the track audit, as being open to the public.

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D.5 KEY MANAGEMENT AREA: IMPACT MANAGEMENT

D.5.1 PEST PLANTS

The infestation and spread of pest plants is a major management issue within Anglesea Heath. Pest plants pose a considerable risk to its natural values by depleting the diversity and integrity of flora and fauna that occur there (sections D.3.1 and D.3.2).

Sixty-three pest plant species are known to occur in Anglesea Heath. Many are environmental weeds that are native to Australia (a native plant species is classified as a weed if it is planted or germinates where it does not naturally occur).

Environmental weeds are a category of pest plants that have detrimental impacts on indigenous vegetation. The invasion by environmental weeds is of particular concern in Anglesea Heath as their infestation threatens the regeneration and survival of indigenous flora and fauna (sections D.3.1 and D.3.2).

The infertile soils of Anglesea Heath (section D.4.1) are not particularly conducive to exotic weed species. This, coupled with the fact that many disturbed areas within Anglesea Heath are surrounded by indigenous vegetation (section D.3.1), means that large sections of Anglesea Heath are relatively weed-free. However, fragmentation of vegetation communities caused by excessive roads and tracks can increase invasion by pest plants as roads provide dispersal points penetrating otherwise intact vegetation communities.

The vegetation within Anglesea Heath has the potential to be invaded and seriously degraded by pest plants that exist both within its boundaries and that have been planted on adjacent land. This is demonstrated by the prevalence of weed infestations in sections of Anglesea Heath and nearby Parks and Reserves that have large areas of residential interface.

Numerous pest plant species in Anglesea Heath have escaped from adjoining areas previously planted with species that are now known to be environmental weeds. Some areas adjacent to Anglesea Heath have been revegetated and landscaped with non-indigenous species, some of which are now known to be environmental weeds. These species have the potential to spread beyond existing boundaries, providing a seed source that potentially allows pest plants to germinate and spread into Anglesea Heath.

The Anglesea town itself, the waste disposal site, and freehold properties abutting Anglesea Heath are also a source of pest plants; for example, garden escapees such as Bluebell Creeper (*Sollya heterophylla*) can smother indigenous vegetation and reduce flora diversity (section D.3.1).

In general woody weeds are the most threatening pest plants in Anglesea Heath, as the woody weed species that occur in Anglesea Heath are particularly invasive. Included in this group is Coast Wattle (*Acacia longifolia* var. *sophorae*), which is most widespread around the town of Anglesea and in the Mount Ingoldsby area and Boneseed (*Chrysanthemoides monilifera*). Boneseed is rapidly extending its range in the healthy woodlands near the town; it smothers native species reducing local plant diversity.

Introduced pine species are widespread in Anglesea Heath; many parent plants originate from softwood trials undertaken during the 1930s. The spread of pines throughout Anglesea Heath is not only an environmental problem, but also creates a visual intrusion from vantage points throughout the area.

Birds can disperse the seeds of pest plants, sometimes transporting them kilometres from the source plant. Seed dispersal by birds creates new infestations that need to be targeted swiftly while they are small.

Prescribed burning and wildfire events (section D.5.4) can result in seed germination on an immense scale, increasing the size and density of weed infestations. Boneseed, for example, germinates readily after fire. These effects need to be considered when planning weed control and fire strategies.

Other environmental weeds in the area include: Coast Tea-tree (*Leptospermum laevigatum*), Sweet Pittosporum (*Pittosporum undulatum*), Giant Honey Myrtle (*Melaleuca armillaris*), Green Honey Myrtle (*Melaleuca diosmifolia*), Wirilda (*Acacia retinoides*) and Myrtle Wattle (Western Australian province) (*Acacia myrtifolia*) (Carr, 1995).

Depletion of the natural values of Anglesea Heath is probable without appropriate management of pest plants. This management needs to be cooperative, involving all land management agencies in the region, 'unless managed, plant communities will become floristically impoverished and indigenous species will ultimately be unable to regenerate due to competition from non-indigenous species' (Carr et al, 1992).

Local community groups have worked tirelessly to control pest plants in Anglesea Heath (section D.9.1); this involvement should be encouraged and supported by larger scale programs undertaken by land managers. A preliminary list of major environmental weeds of the area has been compiled (see Appendix 5).

AIMS

Management Outcomes for this Key Area are to:

- Maintain biodiversity within Anglesea Heath;
- Minimise the introduction and spread of pest plants;



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- Minimise the impact of pest plant control programs on indigenous flora and fauna (sections D.3.1 and D.3.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Control and where possible eradicate pest plants through the employment of an integrated program;
- Monitor and evaluate the effectiveness of all pest plant control programs. Vary programs as necessary to improve effectiveness and discontinue ineffective programs;
- Raise community awareness (section D.8.1) in relation to the role individuals can play in the spread and control of pest plants;
- Consider the implications of the possible increase of infestations due to seed germination following prescribed burns and attempt to control any resulting infestations (section D.5.4).

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Continue to control the key invasive weeds within Anglesea Heath, before an integrated pest plant control strategy is developed;
- Develop and implement a pest plant control strategy for Anglesea Heath incorporating the following principles:
 - prioritise protection of areas of high biodiversity;
 - prioritise control of weeds with a high potential to spread and become uncontrollable;
 - identify and control new or isolated infestations before they spread;
- Continue to support community groups in their activities to control the spread of weeds in and around Anglesea Heath (section D.9.1);
- Implement a GIS weed-mapping and weed-monitoring program;
- Liaise with the Surf Coast Shire, the Corangamite Catchment Management Authority, VicRoads, local interest groups and landowners to develop an integrated and cooperative approach to pest plant management in and around Anglesea Heath;
- Liaise with adjacent landowners and the Surf Coast Shire to seek reductions in the planting of invasive species near Anglesea Heath. Promote public awareness of the impacts of environmental weeds (section D.8.1).

D.5.2 PEST ANIMALS

Pest animals are introduced species that occur in an environment with few, if any, natural predators or biological controls. This imbalance often results in a rapid

increase in their populations, which can cause a range of problems for the natural environment. Some pest animals, such as feral cats, are escaped domestic animals; others such as rabbits and foxes were introduced for hunting.

The impact of pest animals upon the biodiversity of Anglesea Heath is not fully understood, although the problems they cause can be generally summarised as:

- competing with native animals for food, nesting sites and other resources;
- preying on native animals (section D.3.2);
- dispersing seed of weed species;
- increasing soil erosion (section D.4.1); and
- carrying disease, which can be transmitted to native animals (section D.3.2).

A study by Sue Hutchings of Deakin University at Geelong (Hutchings, 1996) has confirmed that, in Anglesea Heath, the major pest animal threats are from foxes and cats, which are widespread and are known to prey on native fauna.

Sue Hutchings' research on cats and foxes in Anglesea Heath has provided an increased understanding of the specific behaviours of cats and foxes and their impacts on native mammals. The density of foxes in Anglesea Heath is extremely high, with between five and seven foxes every square kilometre (Hutchings, 1996). A wide range of native fauna is eaten by foxes in Anglesea Heath, including Swamp Wallaby, Eastern Grey Kangaroo, Common Ringtail Possum, Southern Brown Bandicoot and Bush Rats (Hutchings, Wilson and Wolridge, 2000). Investigations into fox control programs show that they need to be conducted regularly, and over a long term, to reduce fox numbers and improve the survival rate of mammals (Hutchings, 1996; Wolridge et al, 1996). The effects of foxes on rare and endangered fauna are unclear. However the prevention of predation on species such as the New Holland Mouse is a priority (section D.3.2).

Research on the behaviour and predation habits of cats in Anglesea Heath is currently underway (Hutchings, 1999). Results from studies so far confirm that the Anglesea waste tip supports a large population of cats.

Rabbits are common around the periphery of Anglesea Heath, while they are less abundant in the dense intact vegetation communities. The impact of rabbits on the ecology of the area is not well understood.

Four exotic bird species are present in Anglesea Heath. The introduced Starling, which is widespread, is known to soil and inkeover tree hollows that may otherwise be used by native species. Spotted (Indian) Turtledoves, Sparrows and Blackbirds are also quite common in and around the town of Anglesea. The Indian Mynah has been sighted at Anglesea, and has the potential to displace native bird

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species by out competing for nesting sites (Troynor, pers. comm.). The Indian Mynah's spread into the Anglesea area is a major environmental concern. There are at this stage no safe or effective control methods for exotic bird species on public land.

Members of the public have reported sightings of feral pigs and goats to Parks Victoria staff. Follow-up patrols undertaken by Parks Victoria to trial control measures have not been successful in confirming the presence of pigs and goats in Anglesea Heath or Angahook-Lorne State Park. Because of their ability to cover large areas, monitoring of the occurrence of pigs and goats will require a continuing and coordinated approach between land management authorities.

The dense heathy vegetation predominant in Anglesea Heath restricts the activity of some pest animal species by reducing their mobility. This protection is temporarily lost if an area is burnt by wildfire or prescribed burning (section D.5.4). Follow-up control measures may be required at these times, especially where significant flora and/or fauna are known to occur.

AIMS

Management Outcomes for this Key Area are to:

- Maintain biodiversity within Anglesea Heath;
- Minimise the introduction and spread of pest animals;
- Minimise the impact of pest animal control programs on native fauna (section D.3.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Control and where possible eradicate pest animals through the employment of an integrated program;
- Raise community awareness (section D.8.1) in relation to responsible pet ownership and the threat of pest animals to Anglesea Heath;
- Monitor and evaluate the effectiveness of all pest animal control programs. Vary programs as necessary to improve effectiveness and discontinue ineffective programs.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Liaise with Deakin University regarding the pest animal control programs required for the protection of the New Holland Mouse and implement recommended strategies (section D.3.2);
- Implement a pest animal control program that is targeted to:
 - protect significant flora and fauna species and their habitats (sections D.3.1 and D.3.2);
 - reduce predator numbers in recently burnt or

slashed areas, or where significant fauna are more vulnerable to predation;

- complement adjoining landowners, and managers' control programs;
- Liaise with other land managers, Deakin University and the Surf Coast Shire, to develop an integrated and cooperative approach to pest animal management in and around Anglesea Heath;
- Liaise with the Surf Coast Shire to reduce the numbers and impact of feral cats around the Anglesea waste tip;
- Continue to assist and support research programs for pest animals and their impacts on native flora and fauna (section D.10.1).

D.5.3 CINNAMON FUNGUS (*PHYTOPHTHORA CINNAMOMI*)

Cinnamon Fungus (*Phytophthora cinnamomi*) is an introduced pathogen that invades plant roots, of susceptible species preventing water transport in the root systems, which results in death or severe drought effects. It is responsible for extensive 'dieback' of native vegetation and is widespread in forests, woodlands and heathlands, ranging from Western Australia to Queensland. In severely affected localities, large areas have been denuded of colourful nectar and pollen producing indigenous species that are replaced by resistant grasses and sedges. The resultant change in species composition reduces flora and fauna diversity. In addition, steep sites may undergo severe erosion and a more widespread loss of indigenous flora and fauna.

Cinnamon Fungus has been listed as a threatening process under the Victorian Flora and Fauna Guarantee Act 1988, and the Endangered Species Act of Australia 1992.

Depletion of vegetation diversity caused by Cinnamon Fungus often has detrimental effects on habitat quality and can reduce mammal and invertebrate populations and communities (Wilson et al, 1997, 1999).

In Anglesea Heath, Cinnamon Fungus has lethal effects on a number of indigenous species including Grass Trees, Horny Cone Bush, various pea species and most plants in the Proteaceae family.

Evidence of Cinnamon Fungus damage was initially observed in Anglesea Heath in 1972. However, the pathogen was not there until recently (Wilson et al, 1997). The pathogen represents a serious threat to the nationally significant flora and fauna communities that exist there (section D.3.1 and D.3.2). The occurrence of Cinnamon Fungus within Anglesea Heath has not fully been mapped. However, field observation suggests it is widespread (Wilson et al, 2000).

The pathogen is most frequently spread downhill with drainage water. Zoospores swim or are carried in this



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water. It is commonly spread and transported in gravel and other roading materials, on vehicle tyres, horses' hooves and people's shoes. Native animals may also transport the pathogen as they move from an infected area to an uninfected area. The greatest risk of spread of the disease is likely to be large-scale earth works such as roadworks and construction of fire breaks during wildfires or prescribed burns (section D.5.4). It is clear that tracks, roading, vehicles and people have contributed substantially to its spread, (Wilson et al, 1997, 2000). Its growth and distribution are influenced by temperature, soil type, nutrient status and water availability (Wilson, 1996). Cinnamon Fungus is most active when moisture levels in the soil are high and temperatures are moderate (between 12-32 degrees Celsius). Field sampling for the pathogen needs to be undertaken during such conditions to increase the probability of detection (Aberton and Wilson, 1998).

The most effective and appropriate control method for reducing the spread of Cinnamon Fungus at this stage is to control the spread of the disease from infected to non-infected areas. This can be achieved in Anglesea Heath by protecting uninfected areas from contamination by restricting access. Widespread testing and mapping for the occurrence of Cinnamon Fungus is urgently required to enable an effective hygiene plan to be implemented. Hygiene procedures for management works that involve earthmoving have been developed and recently implemented. These measures will be used in Anglesea Heath to ensure management activities do not increase the incidence of Cinnamon Fungus within Anglesea Heath and to other areas that machinery may be transported to after operating in Anglesea Heath. These measures include hosing down all off-road vehicles, equipment, machinery, tools and boots before they leave a diseased area. It is important that only pathogen-free gravel is used in future road works.

An assessment of Cinnamon Fungus was undertaken by Ian Colquhoun (Alcoa) and he subsequently wrote a report on the implications of Cinnamon Fungus in large areas of Anglesea Heath in 1996. The recommendations in this report form part of the basis for the strategies to be implemented at Anglesea Heath.

Deakin University, Geelong is currently undertaking research to investigate major factors contributing to the spread of Cinnamon Fungus (section D.10.1) and possible control methods. These studies are trialing the application of phosphonate as a foliage spray to control the disease. The results of this research will be monitored for their potential applicability to Anglesea Heath. Results will need to prove the application of phosphonate is effective in killing and preventing the spread of the pathogen, while not adversely affecting other plants and animals, including

beneficial soil organisms. Deakin University is also undertaking the mapping of Cinnamon Fungus in the area.

AIMS

Management Outcomes for this Key Area are to:

- Protect healthy vegetation from infection;
- Minimise the spread of Cinnamon Fungus in Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Prepare a comprehensive Cinnamon Fungus management strategy that:
 - maps the incidence of Cinnamon Fungus in Anglesea Heath;
 - outlines detailed measures to manage and control infestations and protect non-infected sites.
- Monitor and evaluate the effectiveness of all Cinnamon Fungus minimisation strategies in Anglesea Heath. Vary measures as necessary to improve effectiveness and discontinue ineffective programs.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Encourage and support research into the occurrence of Cinnamon Fungus, possible control methods and further investigation into susceptible species (section D.10.1);
- Increase the awareness of Cinnamon Fungus among user groups and visitors to Anglesea Heath and in particular educate users about the impacts and ways to prevent the spread of Cinnamon Fungus (section D.8.1);
- Enforce Anglesea Heath Regulations to ensure all recreational users stay on open named roads and tracks, in accordance with Appendix 1;
- Continue to attempt to minimise the risk of spread of Cinnamon Fungus in Anglesea Heath by implementing the following strategies, before a comprehensive Cinnamon Fungus control strategy is developed:
 - identify non-infected sites and give priority to ensuring the long-term protection of these areas against the spread of the disease;
 - minimise or where possible exclude access to non-infected sites;
 - undertake slashing rather than grading, road and track batters (section D.7.2);
 - erect signs at entrance points within Anglesea Heath alerting visitors to the threat of Cinnamon Fungus and basic control measures;
 - conduct Cinnamon Fungus surveys before any works that will involve substantial soil disturbance;

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- maintain roads and tracks within Anglesea Heath to ensure most efficient drainage, including regular clearing of drains and culverts (section D.7.2);
- avoid moving or relocating infected gravel or soil during road and track construction and maintenance works (section D.5.6);
- ensure that road gravel relocated within Anglesea Heath is taken from a source that is free from Cinnamon Fungus, by testing samples and ensuring surrounding vegetation is green and healthy downhill from the source;
- wherever possible, use existing roads and tracks and slashed breaks, rather than mineral earth breaks for fire control lines (section D.5.4);
- avoid constructing control lines during burns that pass between infected and uninfected areas (section D.5.4);
- if for any reason works are undertaken off-track in Anglesea Heath ensure vehicles, plant, tools and boats are effectively disinfected before and after works;
- ensure that testing for Cinnamon Fungus is undertaken at times when the pathogen is most likely to be detected if present;
- in conjunction with user groups, identify and implement suitable hygiene measures to reduce the spread of Cinnamon Fungus into uninfected areas;
- liaise with Surf Coast Shire to minimise the risk of spread of Cinnamon Fungus during road maintenance works;
- in all track maintenance prioritise the draining and/or raising of waterlogged areas that favour Cinnamon Fungus (use uninfected gravel).

D.5.4 FIRE MANAGEMENT

Fire has played an integral part of the biological evolution in Australia. Our vegetation has evolved with fire and many species have adapted either to survive fire or re-colonise after fire. Some species depend on fire to maintain or increase population levels (Carr, 1995).

As Carr suggests, 'while current prescribed burning is done from the point of view of public and assets safety, it is not necessarily the optimal fire regime for indigenous vegetation or fauna.

The frequency, timing and intensity of prescribed burns need to be considered in the maintenance of biological values'.

The Department of Natural Resources and Environment (DNRE) is responsible for fire management within Anglesea Heath. Current fire protection measures are in accordance

with the Otway Fire Protection Plan (DCNR, 1995a) and the Code of Practice for Fire Management on Public Land in Victoria (DCNR, 1995b). The whole of Anglesea Heath was burnt during the 1983 Ash Wednesday fires.

The Otway Fire Protection Plan aims to protect life, property and natural resources from fire by frequent burning of small areas close to towns and other assets. This document sets out fuel reduction burning zones for all public land within the Otways. The fuel reduction burning zones for the Otways (DCNR 1995b) are categorised into four zone types. The zones range from providing the highest level of protection of life, property and public land values and assets (Zone 1) to areas where fire protection requirement is lower (Zone 4) and where environmental constraints necessitate a different frequency (DCNR, 1995).

While fire protection takes priority over ecological management in all Burning Zones within Anglesea Heath, both are considered. Priority 4 Burning Zones allow for flexibility to incorporate ecological management practices into burning regimes. The Otway Fire Protection Plan includes, as an aim for Burning Zone 4, that ecological management of significant flora and fauna be considered and allowed for. Recent fuel reduction burning efforts in Anglesea Heath have been undertaken with the dual purpose of township protection and enhancement of habitat for rare species. Ecological burns are planned for the 2002-2003 season to provide areas of optimum post-fire conditions for the New Holland Mouse (section D.3.2). All prescribed burns impact on landscape values, pose the risk of escape and increase the risk of soil erosion. Prescribed burning in Anglesea Heath will be planned to minimise these impacts. Known information about the vegetation of Anglesea Heath could be used to further determine the sensitivity or dependence of vegetation communities on fire (section D.3.1). Research that will determine the vital attributes of species within Anglesea Heath should be encouraged, as this information could help to guide future ecological management of fire for the area (section D.10.1).

The risk of fire spreading from open campfires is a significant threat to Anglesea Heath and the adjoining Angahook-Lorne State Park. This risk will be minimised through the prohibition of open fires in conjunction with increased visitor awareness and ranger patrols (section D.8.1).

The risk of spread of Cinnamon Fungus (section D.5.3) from fire management vehicles is present whenever fire fighting or prevention works occur off-road in Anglesea Heath. This risk will be minimised by the implementation of washdown procedures.



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AIMS

Management Outcomes for this Key Area are to:

- Protect human life, property and Anglesea Heath's natural values from the adverse effects of fire;
- Minimise the adverse effects of fire protection and suppression activities on Anglesea Heath values;
- Maintain ecologically appropriate fire regimes.

STRATEGIES

Management Strategies for this Key Area are to:

- Promote public awareness of the fire danger within Anglesea Heath and the rationale behind fire management actions;
- Coordinate fuel reduction and ecological fire management so that, wherever possible, they complement one another;
- Develop a heathland Fire Management Plan for Anglesea Heath that determines ecologically appropriate fire regimes and integrates relevant aspects of fire management;
- Promote the key measures of the Fire Management Plan for Anglesea Heath to be included, where appropriate, in the Otway Fire Protection Plan, when it is reviewed.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Provide interpretative material regarding fire safety and management (section D.8.1);
- Prohibit open fires and fuel stoves in Anglesea Heath;
- Patrol sites of highest visitor use, particularly in periods of high fire danger;
- Enforce fire regulations and restrictions on the use of fire within Anglesea Heath;
- Use, where possible, the following least disturbance strategies for wildfire suppression in Anglesea Heath (in accordance with the Code of Practice for Fire Management on Public Land in Victoria, (DCNR, 1995a):
 - fireline construction using hand crews;
 - air attack to drop fire retardant, water or foam;
 - back burning from existing roads and tracks;
 - using existing roads and tracks or topographic features as control lines;
 - where possible avoid the use of bulldozers within the Heritage Area;
 - where possible avoid the use of bulldozers in areas infected with Cinnamon Fungus;
- Undertake washdowns and other available measures to prevent the introduction and/or spread of pest plants

and Cinnamon Fungus (section D.5.3) during prescribed burning activities;

- Close and revegetate any new control lines after fire in accordance with the Code of Practice for Fire Management on Public Land in Victoria;
- Develop Anglesea area ecological burn strategy,

D.5.5 COAL MINING

This Management Plan has been developed to guide the management of the Land for Conservation, as distinct from the Mining Area, which is managed by Alcoa (refer to Map 2). Coal mining is recognised in this Management Plan as an impact that requires management due to the close geographic and legal relationship between the Mining Area and the more extensive Land for Conservation.

The current Mining Area comprises the open cut mine, power station buildings and other associated infrastructure, an area covering 490 hectares in total (of which some 80 hectares is freehold land owned by Alcoa). The Anglesea Power Station was commissioned in 1969 and has been operated since then by Alcoa and is essential to the production of aluminium at Alcoa's Point Henry Smelter, near Geelong. Alcoa's mining rights extend to 2061 and this Management Plan allows Alcoa continued use and management of the Mining Area and any future expansion of that area, in accordance with the requirements of the *Mines (Aluminium Agreement) Act 1961*.

The aims, strategies and actions listed below are and will remain the responsibility of Alcoa. Where possible, opportunities will be sought to utilise the post-mined area for the future benefit of Anglesea Heath, possibly through research and/or recreation opportunities. In addition, any rehabilitation works undertaken within the Mining Area will be undertaken to be consistent with, and complement the values and management strategies of, the surrounding Anglesea Heath.

AIMS

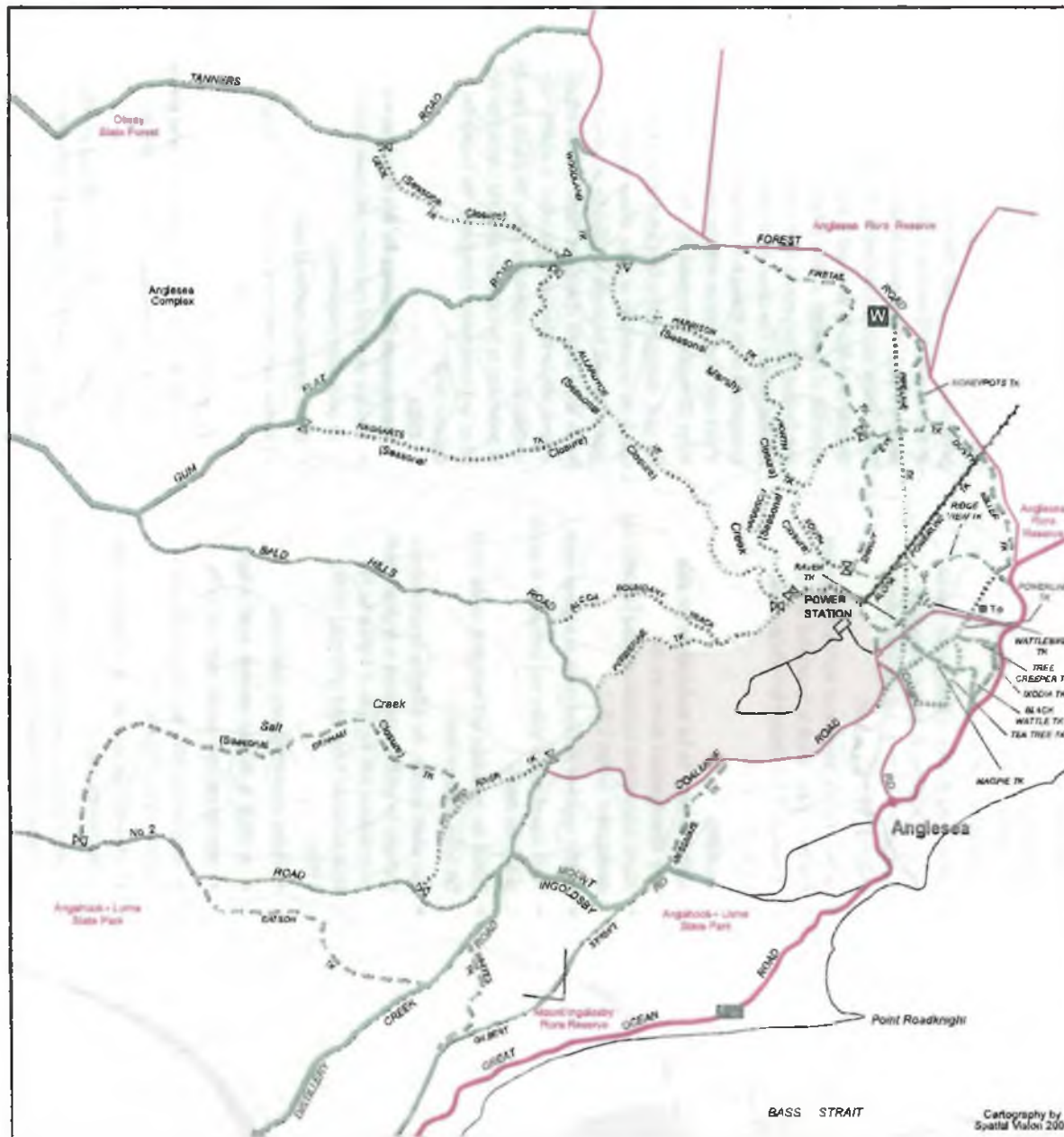
Management Outcomes for this Key Area are to:

- Minimise impact of coal mining and power generation on surrounding environment;
- Utilise economic reserves of coal;
- Restore post-mined areas to meet community and legislative requirements.

STRATEGIES

Management Strategies for this Key Area are to:

- Coordinate mine planning to minimise impact on Anglesea Heath;
- Investigate viability of the post-mined area providing for recreational and other activities as an alternative to the Anglesea Heath;
- Investigate the suitability for post-mined areas to be used as a venue for trialing environmental monitoring



ANGLESEA HEATH



Parks, Reserves & State Forest

Land for Conservation

- Mining Area
- Powerline & Easement (Alcoa)
- Pipeline (Barwon Water)
- Water Reservoir (Barwon Water)

- Seasonal closure track
(May contain Class 4 or Class 5 tracks)
- Class 1 - all weather, two lanes
- Class 2 - all weather, one lane
- Class 3 - dry weather only, minor road
- Class 4 - dry weather only, 4WD, unsurfaced tk
- Class 5 - dry weather only, 4WD, vehicle tk



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Cartography by Spatial Vision 2001

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

and research (e.g. Cinnamon Fungus control (section D.5.3));

- Utilise accumulated rehabilitation knowledge for restoration of other degraded sites on Anglesea Heath (section D.5.6);
- Use the site to trial fund-generating initiatives that can be used to support the management of Anglesea Heath.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Monitor impact of operation on the surroundings and the community;
- Investigate the provision of an appropriate water body for community use as part of the mine closure;
- Provide opportunities for further study into leaf fossils uncovered in the mining process.

D.5.6 GRAVEL EXTRACTION

Within Anglesea Heath several former gravel extraction sites exist, most of which are only partly rehabilitated. Revegetation efforts that have been undertaken have not been completely successful due to disturbance by illegal vehicle traffic and loss of topsoil (sections D.4.1 and D.7.2). Further works are necessary at former gravel extraction sites to arrest further soil loss and re-establish vegetative cover. For successful rehabilitation of these areas it is important that the sites are effectively closed off to vehicles and that this strategy be enforced. Also it is essential that sound principles be utilised, including revegetating with indigenous plants and strategically controlling water run off. Monitoring the success of rehabilitation and reviewing methods should be part of the rehabilitation strategy.

AIMS

Management Outcomes for this Key Area are to:

- Rehabilitate former gravel extraction sites;
- Prevent further commercial gravel extraction from the Anglesea Heath (refer to Map 2).

STRATEGIES

Management Strategies for this Key Area are to:

- Close off and rehabilitate extractive sites, and then restrict vehicle access to sites (section D.7.2);
- Utilise knowledge already gained by Alcoa in future rehabilitation actions;

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Prohibit commercial sand and gravel extraction from within the Anglesea Heath;

- Investigate minor sand and gravel extraction as an element of a restoration strategy and an opportunity to provide track maintenance material;
- Utilise the principles for rehabilitation within Anglesea Heath as follows:
 - drainage works;
 - indigenous plants of local provenance only;
 - pre-rehabilitation weeding and, where necessary, follow-up weeding;
 - consultation with conservation groups and individuals in planning of rehabilitation;
 - assessment of soil type and aspect to determine appropriate species mix;
 - monitor success rates and, when necessary, review methods.

D.5.7 APICULTURE

There are five designated apiary sites in Anglesea Heath, issued under one apiculture permit. In addition, there are a number of sites available for apiculture in Otway State Forest to the northwest of Anglesea Heath (refer to Map 2).

The effect of introduced bee species on indigenous flora, fauna and natural processes is not fully understood (sections D.3.1 and D.3.2). The existing permit will continue to be allowed to operate, and will be managed to minimise physical impacts to surrounding vegetation until monitoring or research indicates that apiculture should be modified or terminated.

AIMS

Management Outcomes for this Key Area are to:

- Minimise the effect of apiculture on Anglesea Heath values.

STRATEGIES

Management Strategies for this Key Area are to:

- Provide for apiculture at existing levels, pending the outcome of relevant monitoring and research;
- Assess the appropriateness of apiculture within Anglesea Heath based on findings.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Limit apiculture to the five designated sites;
- Take action following the outcomes of monitoring.



STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

D.5.8 MANAGEMENT OF UTILITIES AND EASEMENTS

An underground pipeline maintained by Barwon Water, runs north-south through Anglesea Heath. Several water supply dams are maintained throughout the area by DNRE, primarily for fire suppression activities. Trigonometric survey points are located at Warmbete Road, Mount Ingaldsby, Bald Hills Road, Coalmine Road and Forest Road. The major power transmission line in Anglesea Heath is a high-voltage line, running from the Alcoa Power Station in an easterly direction through Anglesea Heath. This line runs 35 km to Point Henry, Geelong. A minimum 30 m wide easement is maintained beneath the line. Powercor Australia currently maintain this utility.

Telstra operates and maintains a repeater tower near Mount Ingaldsby, on the northwestern edge of Anglesea town. Underground Telstra lines radiate from the tower and run along the southern Anglesea Heath boundary and into Anglesea.

Public utility and service providers will be informed about Anglesea Heath values and issues so that maintenance and new works are consistent with maintaining these values. It is expected that this information will be used by utility and service providers to enable careful environmental considerations to be included in the planning of maintenance and new works.

AIMS

Management Outcomes for this Key Area are to:

- Provide for necessary public utilities within Anglesea Heath;
- Minimise the environmental and/or cultural impact of maintenance and new works associated with installation of utilities.

STRATEGIES

Management Strategies for this Key Area are to:

- Encourage bundling and undergrounding of cables, where appropriate, to reduce the visual intrusion;
- Ensure minimal visual impact by encouraging selective vegetation removal along powerline easements;
- Rigorously assess any proposal to install and operate utilities to minimise environmental and/or cultural impacts.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Liaise with utility and service providers to ensure that conservation, biodiversity and scenic values are considered in the planning of maintenance and new works, subject to environmental assessment;
- Ensure service providers operating utilities within

Anglesea Heath undertake maintenance and new works in a manner consistent with conserving Anglesea Heath values. For example, by retaining low-growing indigenous species below powerlines;

- Liaise with utility and service providers to identify suitable track access, use and maintenance;
- Ensure utility service providers employ proper hygiene procedures (section D.5.3).

D.6 KEY MANAGEMENT AREA: CULTURAL RESOURCE MANAGEMENT

D.6.1 ABORIGINAL CULTURE

Anglesea Heath falls within an area originally occupied by the Wathaurong tribe and under the terms of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, the Wathaurong Aboriginal Cooperative Ltd is the appropriate liaison organisation for all issues pertaining to aboriginal cultural management in Anglesea Heath.

B. Marshall (Austral Heritage Consultants) was commissioned by the Department of Conservation and Natural Resources to undertake an archaeological survey of the Angahook-Lorne State Park and Anglesea Heath in 1995. The study area was approximately 6,000 hectares but included only a small part of Anglesea Heath. The survey revealed the presence of significant archaeological sites both in Anglesea Heath and in Angahook-Lorne State Park. The accompanying report written by Marshall (1995) states: 'Anglesea Heath contains the Anglesea River and this river is likely to have been the major focus of past aboriginal occupation, both for subsistence and transport throughout the hinterland. Therefore, it is likely that topographic units such as gullies and swamps will have relatively high site densities and are more likely to be better sampled than they were in Angahook-Lorne State Park'. Marshall's report makes a series of recommendations that need to be followed, especially with regard to road and track construction and maintenance.

The Wathaurong Aboriginal Cooperative Ltd has, in conjunction with Aboriginal Affairs Victoria (AAV), recently appointed a Cultural Heritage Officer to liaise with land management agencies regarding proposed development and site identification and protection. Alcoa has appointed a Corporate Relations Officer with specific responsibilities for Aboriginal liaison and consultation. The Officer is based in Perth, but is available to support cultural liaison activities in Anglesea Heath.

AIMS

Management Outcomes for this Key Area are to:

- Protect the Aboriginal cultural heritage within Anglesea Heath;
- Protect significant archaeological sites.

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

STRATEGIES

Management Strategies for this Key Area are to:

- Encourage further archaeological studies within Anglesea Heath to identify sites requiring management and protection. Develop site protection mechanisms in conjunction with the Wathaurong Aboriginal Cooperative Ltd for existing and newly identified sites;
- Protect and manage Aboriginal sites in consultation with Wathaurong Aboriginal Cooperative Ltd and the Heritage Services Branch of Aboriginal Affairs Victoria (AAV);
- Establish and maintain close and cooperative communications with the Wathaurong Aboriginal Cooperative Ltd and AAV.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Liaise with the Wathaurong Aboriginal Cooperative Ltd prior to any excavation works in Anglesea Heath;
- Seek advice from the Wathaurong Aboriginal Cooperative Ltd in the continuing management of culturally significant sites in Anglesea Heath;
- Involve the Wathaurong Aboriginal Cooperative Ltd in any works required to protect archaeological sites.

D.6.2 EUROPEAN HERITAGE

European settlement of the area commenced with pastoral occupations by settlers originating from Geelong. By 1846, squatting runs covered most of the lands along the coast from Barwon Heads to Aireys Inlet. The first townships were established along the Otway coast to accommodate timber exploitation.

The hardwood forests that extended down to the foreshore were considered to be a good quality timber resource; the main commercial species being Blue Gum. Successful mills and settlements operated in the Lorne-Apalla Bay area. However, the forests of Anglesea Heath were not of sufficient economic quality to warrant this type of exploitation (Department of Conservation and Natural Resources, 1991). As a result, Anglesea Heath was virtually untouched until the early 1920s, when the then Forests Commission considered the area to be poor waste country, which may be fit for a softwood plantation. Attempts to establish softwood plantations within Anglesea Heath have all been unsuccessful (Hill, pers. comm., 1996).

AIMS

Management Outcomes for this Key Area are to:

- Protect significant historic sites.

STRATEGIES

Management Strategies for this Key Area are to:

- Encourage studies within Anglesea Heath to identify

historic sites requiring management and protection;

- Encourage historical societies within the region to assist in the management of historic sites;
- Encourage historical societies involvement in the protection and management of historic sites through consultation with Parks Victoria's National Parks Policy and Strategy Division.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Maintain a register of known historic sites for management purposes;
- Identify and register any newly revealed historic sites within Anglesea Heath.

D.7 KEY MANAGEMENT AREA: RECREATION AND TOURISM MANAGEMENT

D.7.1 RECREATIONAL USE AND MANAGEMENT.

Many individuals and groups use Anglesea Heath for recreation, including:

bird observers	horse riders
field naturalists	mountain bike riders
photographers	trail bike riders
bushwalkers	four-wheel drivers

Recreational users have varying levels of impact on Anglesea Heath values. Each of the activities listed above, depending on their nature and volume, can lead to environmental degradation if not managed appropriately.

While Anglesea Heath is utilised by an array of recreational users, the main use is by trail bike riders, horse riders, four-wheel drivers, cyclists and bush walkers (sections D.7.3, D.7.4, D.7.5 and D.7.6). These popular activities rely on the use of a road and track network within Anglesea Heath (section D.7.2). The largely unmanaged recreational use of Anglesea Heath, especially the creation and use of informal tracks, has resulted in detrimental impact on the heath's values, and is currently unsustainable.

All recreation in Anglesea Heath will be managed for sustainable use. It is intended that the Management Plan shall assist in promoting responsible use through information exchange and the involvement of all recreational groups (section C.4.5).

Recreation in Anglesea Heath will be monitored, assessed for impact and managed accordingly for sustainable use. For example, it is possible that the management of Cinnamon Fungus may require areas to be closed to all recreational users to reduce its spread to 'clean' areas within Anglesea Heath.

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunities for recreational use on designated network of roads and tracks (section D.7.2);
- Protect environmental and cultural values of Anglesea Heath (section C.2);
- Promote responsible use of Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Encourage information exchange between the Management Group and Anglesea Heath users; especially with regard to environmental impacts; sustainable use and recreational needs (section C.4.5);
- Develop voluntary codes of conduct for recreational activities through the Recreation Issue Workgroup, (section C.4.5) encouraging self-regulation;
- Minimise conflict between user groups through information exchange, the promotion of responsible use ethics and where necessary enforcement of regulations.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Encourage, assist and facilitate the formation of a Recreational Issue Workgroup (section C.4.5);
- Liaise with recreational clubs regarding track and area closures;
- Permit recreational use of a designated network of tracks in accordance with Appendix 1 and provide information on conditions of use to maintain sustainability;
- Prohibit and enforce through regulations, illegal recreation in Anglesea Heath;
- Provide on-site information at strategic points to orientate and inform recreational users (section D.8.1);
- Provide all user groups with Anglesea Heath Visitor Guides (section D.8.1).

D.7.2 ROADS AND TRACKS - VEHICLE ACCESS

Anglesea Heath contains an extensive network of formal and informal vehicle roads and tracks. The majority of tracks were originally constructed for management purposes or were created by recreational users. These tracks now provide many entry points along the perimeter and within Anglesea Heath but are suitable for four-wheel drive access only (section D.7.3). Recreational activities undertaken within Anglesea Heath, including trail bike riding, horse riding, cycling, four-wheel driving, and bush walking (sections D.7.3, D.7.4, D.7.5 and D.7.6), rely on roads and tracks for access.

The Great Ocean Road, Forest Road, Camp Road and the

eastern section of Gum Flat Road are the only sealed access roads to Anglesea Heath. VicRoads and Surf Coast Shire maintain these roads. DNRE and Alcoa have intermittently maintained the unsealed roads and formal, named tracks. The network of unnamed informal tracks throughout Anglesea Heath have not been properly constructed or maintained. Infrequent maintenance and inappropriate location of many tracks have resulted in them being subject to extensive erosion and waterlogging (section D.4.1). Highly destructive vehicle activities (section D.7.3) occurring over a number of years, have resulted in devastating effects on track conditions and undermining revegetation efforts. For example, track edges and batters that frequently provide habitat for orchids (section D.3.1) are destroyed or damaged by vehicles deviating from tracks. In some instances, poorly located tracks have also impacted on the natural and aesthetic values of Anglesea Heath, particularly in steep or sandy areas where soil erosion has resulted (section D.4.1).

While it is necessary to provide a network of roads and tracks for management and visitor access, informal roads and tracks create unnecessary fragmentation of intact vegetation, threatening biodiversity in the Anglesea Heath. A complete audit of track conditions is required to assess the current state and required maintenance of the formal, named roads and tracks within Anglesea Heath. Future management of vehicle access (section D.7.2) will be guided by the outcome of this audit, the occurrence of Cinnamon Fungus and the extent of erosion and water logging (sections D.4.1 and D.5.3). Some tracks will be upgraded and more frequently maintained (see Appendix 1, Management of Roads and Tracks).

Uncontrolled use of the informal track network has resulted in detrimental impacts on the values of Anglesea Heath, fragmenting vegetation communities, reducing floristic and habitat values, spreading Cinnamon Fungus and exacerbating erosion. Inadequate orientation information has contributed to confusion and inappropriate use of informal tracks. To conserve the natural values of the Anglesea Heath it is essential that the informal track network be closed and rehabilitated.

AIMS

Management Outcomes for this Key Area are to:

- Provide access into and through Anglesea Heath for visitor use and management purposes;
- Minimise the impact of vehicle use on Anglesea Heath's conservation, biodiversity and other natural values.

STRATEGIES

Management Strategies for this Key Area are to:

- Manage and permit the use of roads and tracks in accordance with Appendix 1;

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- Encourage accountability by user groups in the use and maintenance of roads and tracks;
- Encourage communication with, and involvement of, user groups in decision making regarding road and track use, works and closures (section D.9.1);
- Undertake an audit of the formal, named roads and tracks within Anglesea Heath to identify management issues and maintenance requirements;
- Rationalise the road and track network to reduce fragmentation of vegetation communities.
- Improve directional signage within Anglesea Heath.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Close and rehabilitate the network of informal tracks;
- Monitor the effects of vehicle use on all tracks;
- Monitor and protect track barriers where significant orchids or cultural sites are present (section D.3.1 and Appendix 2);
- Continue to upgrade and standardise road and track signage throughout Anglesea Heath;
- Communicate with user groups if audit identifies the need to alter or close roads or tracks indicated as open in Appendix 1;
- Implement restrictions on use of roads and tracks where required to reduce erosion and or the spread of Cinnamon Fungus (sections D.5.3 and D.7.2);
- Provide on-site maps at strategic points within Anglesea Heath (section D.8.1).

D.7.2.1

See Map 4 - Vehicle Access, overleaf.

D.7.3 FOUR-WHEEL DRIVE (4WD) AND TRAIL BIKE USE

Anglesea Heath has a history of 4WD and trail bike use and the area's numerous roads and 4WD tracks are popular among these users (section D.7.2). Open named roads and tracks in Anglesea Heath are available for touring use by registered vehicles and licensed riders, and therefore, 4WD and trailbike riding are recognised as legitimate activities within Anglesea Heath if undertaken legally and responsibly. The use of any road or track within Anglesea Heath, not indicated on Appendix 1 - Management of Roads and Tracks is illegal.

There are a number of management difficulties associated with 4WD and trail bike activity including noise pollution, soil erosion, fire hazard, the spread of Cinnamon Fungus, fragmentation of plant communities and habitat values and conflict with other recreational users (sections D.3.1, D.3.2, D.4.1, D.5.3, D.5.4 and D.7.1).

In addition, the current expansion of the track network

by some indiscriminate four-wheel drive and trail bike enthusiasts is not sustainable. Off-road four-wheel drive and trail bike use is an inappropriate use of Anglesea Heath because of the detrimental effects it has on the biodiversity of the area.

Four-wheel drivers and trail bike riders must use Anglesea Heath in a responsible way. As major users of the area, it is important that they participate in and have representation on the Recreational Issue Workgroup (section C.4.3). The principal idea behind the Recreational Issue Workgroup is that recreational users are able to develop and present ideas, suggestions and recommendations to the Management Group and Consultative Committee (sections C.4.3 and C.4.4). By participating in Recreational Issue Workgroups, four-wheel drivers and trail bike riders will be able to communicate with managers and other users of Anglesea Heath.

To date, the most successful strategy in dealing with 4WD and trail bike use has been the 'Track Watch' Program which ran in 1994. This approach included 4WD and trail bike groups in the road and track decision-making process and focused on collaboration rather than regulation. The program addressed some of the problems associated with these activities. Members from the Otway Trail Riders Club and Geelong 4WD Club were actively involved in the program, part of which involved walking along tracks to discuss and assess proposed track closures. This was followed by a working bee involving members from ANGAIR Inc. (section D.9.1) and Parks staff. The work carried out during this program has been disturbed and is in need of re-establishment.

Vehicle access tracks may be permanently or temporarily closed on various tracks to mitigate the extent of these and other threats to the biodiversity of Anglesea Heath.

AIMS

Management Outcomes for this Key Area are to:

- Restrict four-wheel drive vehicle and trail bike access in Anglesea Heath to the designated network of roads and tracks, i.e. in accordance with Appendix 1 (section D.7.2);
- Control the impact of vehicles on the conservation and biodiversity values (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Promote responsible use of Anglesea Heath;
- Increase ranger presence in the Anglesea Heath;
- Control fragmentation and other environmental impacts by prohibiting off-road use by four-wheel drive vehicles and trail bikes within Anglesea Heath;
- Encourage 4WD and trail bike club involvement in management of roads and tracks.



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ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Prohibit 4WD's and trail bikes from all closed roads and tracks, within Anglesea Heath, (section D.7.2 and Appendix 1);
- Ensure compliance with Anglesea Heath Regulations through enforcement to discourage 'motorcross' trail bike use;
- Install on-site maps at strategic points in the Anglesea Heath to inform user groups of open roads and tracks in Anglesea Heath, in accordance with Appendix 1;
- Assist the Recreational Issue Workgroup (section C.4.5) with the development of specific and Voluntary Codes of Conduct for 4WD and trail bike users that encourage sustainable use and self-regulation.

D.7.4 CYCLING

Cycling is permitted on formal, named tracks that are open to other vehicles (see Appendix 1 - Management of Roads and Tracks). Cycling is not currently permitted on Management Vehicle Only tracks. It is recognised that bicycles do not have as much impact on tracks as other vehicles (section D.7.3), but due to their speed and lack of noise, pose a potential conflict with other users, particularly walkers (section D.7.6). Cyclists can damage vegetation and exacerbate erosion and spread of Cinnamon Fungus by riding off formal tracks.

Cycling has steadily increased in popularity in Anglesea Heath with local clubs regularly holding mountain bike events there. These 'special events' involve riders meeting in one location and racing on a pre-planned course. Large groups of cyclists can damage vegetation growing along the edges of infrequently-used tracks. Proposals to conduct special events (section D.7.12) are assessed to minimise impacts on natural and cultural values and other users. Where appropriate, permits with necessary conditions are issued.

Parks Victoria has administered these permits over recent years. It is expected that the Recreation Issue Workgroup (C.4.5) will develop proposals to minimise potential conflicts between cyclists and other recreational users.

AIMS

Management Outcomes for this Key Area are to:

- Maintain opportunities for cycling within Anglesea Heath;
- Minimise the impact of cycling on the conservation and biodiversity values (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Permit the use of bicycles on designated roads and tracks in accordance with Appendix 1 (section D.7.2);

- Permit cycling events where environmental conditions are such that events will have low impact (section D.7.12);
- Increase ranger presence in Anglesea Heath;
- Promote responsible use of Anglesea Heath by cyclists;
- Control environmental impact by prohibiting off road use by cyclists within Anglesea Heath;
- Encourage cycling clubs' involvement in maintenance works and monitoring of tracks.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Prohibit cycles from roads and tracks within Anglesea Heath that are closed to public vehicles (section D.7.2 and Appendix 1);
- Ensure compliance with Anglesea Heath regulations through enforcement where necessary;
- Monitor and assess impacts of cycling on designated tracks;
- Assist with the development of a Voluntary Code of Conduct and conditions of use for mountain bike riding, encouraging self-regulation.

D.7.5 HORSE RIDING

Anglesea Heath's scenic landscape has made it popular among horse riding enthusiasts. Many horse riding routes in Anglesea Heath can be combined with routes along Shire roads, roads and tracks in Angahook-Lorne State Park and Otway State Forest, to provide for longer rides.

A local adult riding club and three commercial horse riding tour operations use the area (section D.7.11), as do many individual recreational riders. Horse riding is permitted on formal, named tracks; but horses are not permitted on roads and tracks that are closed to the public. Horse riding on closed and informal tracks is illegal (section D.7.2 and Appendix 1).

Commercial horse riding operators in Anglesea Heath operate in accordance with permits administered by Parks Victoria. Permits contain individual and specific conditions of use for operators (section D.7.11). It is envisaged that the Consultative Committee (section C.4.4) will advise the Management Group (section D.4.3) in relation to developing permits and use conditions in the future.

The potential impacts of horses on the conservation values of Anglesea Heath include the spreading of weeds, (carried and dispersed in horse feed and droppings), trampling of ground plant species, the spreading of Cinnamon Fungus and increased soil erosion; especially in wet weather (sections D.3.1, D.4.1, D.5.1 and D.5.3). There is also the potential for conflict with other recreational users; for example, horse droppings can reduce the enjoyment for

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walkers (section D.7.6). Therefore, it is necessary that horse riding be confined to formal, named vehicle tracks only (section D.7.2).

Commercial horse riding operators and clubs have a responsibility to operate in a sustainable manner. These groups can assist in minimising the impact of horses on conservation values by informing clients about Anglesea Heath's significance and responsible use ethics.

AIMS

Management Outcomes for this Key Area are to:

- Maintain opportunities for horse riding in appropriate areas in Anglesea Heath;
- Minimise the impact of horse riding on the biodiversity values of Anglesea Heath (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Permit horse riding on formal named tracks in accordance with Appendix 1;
- Encourage an increased exchange of information between the Management Group (section C.4.3) and horse riders;
- Increase ranger presence in Anglesea Heath;
- Foster an accountable and sustainable use ethic among commercial horse riding operators, clubs and individuals;
- Encourage local clubs to promote information and education about Anglesea Heath to the riders.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Prohibit horse riding on closed tracks, i.e. tracks not in Appendix 1;
- Ensure compliance with regulations, through issuing Penalty Infringement Notices and prosecution where necessary;
- Assist the Recreational Issue Workgroup with the development of a Voluntary Code of Conduct and conditions of use for horse riding in Anglesea Heath, encouraging self-regulation;
- Monitor and assess impacts of horse riding on formal, named roads and tracks;
- Encourage a horse riding representative to participate in the Recreational Issue Workgroup (section C.4.5);
- Encourage involvement of horse riding clubs in track management.

D.7.6 WALKING

Many vehicle tracks within Anglesea Heath are used by walkers who enjoy the area's natural attractions, including

remoteness, coastal views and diverse landscape. There are currently no designated walking-only tracks in Anglesea Heath. A section of the Surf Coast Walk traverses the southwest boundary of Anglesea Heath and this section of the walk is on a vehicle track. Walking clubs such as the Geelong Bushwalking Club, and ANGAIR Inc, frequent Anglesea Heath for organised recreational walks. A network of walking tracks could heighten the walking experience through Anglesea Heath and the Management Group (section C.4.3) will investigate opportunities for disused and informal vehicle tracks to form a network of walking tracks. Threatening processes such as Cinnamon Fungus, weeds and erosion (sections D.4.1, D.5.1 and D.5.3) will need to be considered during the investigation of a network of walking tracks. Potential conflict with other users and safety issues will also need to be considered. The Recreational Issue Workgroup (section C.4.5) is expected to suggest ways in which potential conflict with other users and safety issues could be minimised. Therefore, it would be advantageous if a bushwalking representative were to be involved in this workgroup.

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunities for bushwalking in Anglesea Heath;
- Minimise the impact of walkers on Anglesea Heath values (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Investigate the feasibility of establishing walking track linkages with Angahaak-Lorne State Park and the Surf Coast Walk on disused and informal vehicle tracks;
- Encourage bushwalking clubs' involvement in maintenance works and monitoring usage of tracks.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Continue to promote vehicle tracks as the primary location for walking opportunities;
- Monitor and assess impacts of walkers on current and any proposed tracks;
- Undertake an environmental assessment of any proposed walking track development and proceed according to outcomes;
- Encourage a bushwalking representative to participate in the Recreational Issue Workgroup (section C.4.5);
- Assist the Recreational Issue Workgroup in the development of a voluntary Code of Conduct for walkers in Anglesea Heath.



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D.7.7 CAMPING

There are no developed camping facilities in Anglesea Heath; dispersed camping in the area has been informal and has been discouraged. Anglesea Heath Regulations (section A.3) prohibit camping within the area. Visitors undertaking activities such as bushwalking over a number of days usually stay overnight in Anglesea or in the Angahook-Lorne State Park, where bush camping is provided for.

The impacts of informal camping include the spread of rubbish, indiscriminate collection of firewood (DCNR, 1991), the potential for accidental fire, vegetation disturbance, increased erosion, spread of weeds and Cinnamon Fungus (sections D.3.1, D.5.1, D.5.3 and D.5.4). The consequences of a fire in Anglesea Heath are taken very seriously and open fires pose a high risk to life and property. Due to the high fire danger in Anglesea Heath and surrounding areas, the use of open fires and fuel stoves have been prohibited.

The demand for camping in Anglesea Heath is difficult to gauge. Dispersed camping is currently occurring, but these campers may believe they are in the Orway State Forest (refer to Map 2) or may be unaware that camping is prohibited in Anglesea Heath. A camping area in Anglesea Heath may be investigated in the future, if a suitable modified site becomes available. Any investigation would rely on the availability of an accessible site that required minimal disturbance to native vegetation (section D.3.1). Should a site be considered for camping, the investigation will be subject to a full environmental assessment.

Opportunities for camping outside Anglesea Heath on private land should also be explored and environmentally sensitive ecotourism ventures of this nature should be encouraged.

AIMS

Management Outcomes for this Key Area are to:

- Ensure camping does not impact on the values of Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Change current use and behaviour through education and enforcement to reduce and ultimately eliminate camping in Anglesea Heath;
- Increase ranger presence in Anglesea Heath;
- Investigate the future provision of a camping area within Anglesea Heath, if an appropriate site becomes available.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Patrol known illegal camping sites, particularly in periods of high visitor-use;
- Enforce regulations pertaining to camping, open fires and wood/fuel stoves within Anglesea Heath.

D.7.8 DAY VISITOR FACILITIES AND SERVICES

Picnicking and day-visitor use within Anglesea Heath is moderately popular, with visitors enjoying the natural values and scenic landscape that the area offers. Day visitors utilise an extensive road and track network to gain access to the heath (section D.7.2) and many of these tracks provide opportunities for walking and picnicking. Day visitors to Anglesea Heath are largely unmanaged. There are no formal picnic or information facilities for day visitors within Anglesea Heath but there are developed facilities close by in Angahook-Lorne State Park.

It is important for the protection of the natural values of Anglesea Heath, that the day visitor's experience is guided and managed.

A suitable site for picnicking and the provision of information and interpretation will be investigated (section D.8.1). A designated day-visitor site could provide a venue for interpreting the natural values of Anglesea Heath to visitors (section C.2).

Any investigation and subsequent development of a day-visitor and/or picnicking facility would be subject to the availability of a previously modified site and subject to an environmental assessment.

Fuel fires will not be permitted in any designated day-visitor or picnicking area due to the threat of wildfire (section D.5.4) and the potential damage to vegetation caused by collection of firewood.

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunities for picnicking and day-visitors in Anglesea Heath;
- Minimise any impact of picnicking and day-visitors on conservation and biodiversity values (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Promote responsible day-visitor use of Anglesea Heath;
- Investigate the provision of a strategically positioned day-visitor area that could be used as a picnic area and to provide information and interpretation to visitors;
- Locate any new day-visitor facilities on an already cleared or modified area and subject to an environmental assessment.

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ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Establish low impact and environmentally sustainable picnic and day-visitor facilities, if developed;
- Adopt and enforce a no-bins (take rubbish home) policy for any visitor sites;
- Provide on-site interpretation (section D.8.1) for day-visitors and picnickers about the values and threats to Anglesea Heath;
- Prohibit open fires at any picnicking and day-visitor sites within Anglesea Heath.

D.7.9 SHOOTING

A rifle range is situated within Anglesea Heath off Gum Flat Road. The rifle range is occupied by the Geelong Rifle Club, who are licensed to hold training and events at the site. The Geelong Rifle Club plans to operate the range until December 2003, when it will relocate to a facility at Lara. The Geelong Rifle Club is required, as a condition of its licence, to remove any structures from the site upon vacating the area.

The rifle range and facilities are sometimes utilised by other groups for their activities. As with other groups using Anglesea Heath, the Geelong Rifle Club's activities will be monitored for their effects on the area's values while they continue to operate at Gum Flat Road.

Throughout Anglesea Heath, the use of firearms will be restricted to Geelong Rifle Club members (and other affiliated shooters) at the rifle range only.

A Special Management Area Overlay (section D.2.2) exists over the rifle club grounds and cone area (refer to Map 3, Zoning).

AIMS

Management Outcomes for this Key Area are to:

- Minimise the impact of the activities on and the infrastructure of the rifle range on Anglesea Heath values;
- Minimise any risks to Anglesea Heath visitors imposed by use of the rifle range.

STRATEGIES

Management Strategies for this Key Area are to:

- Restrict the use of firearms to the existing rifle range and by Geelong Rifle Club Members only;
- Support the relocation of the Geelong Rifle Club and other affiliated shooters from Anglesea Heath to proposed facilities at Lara;
- Ensure adequate clean-up measures are undertaken at the rifle range to minimise long-term contamination of the site.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Investigate develop and implement appropriate management actions that are required to be undertaken within the rifle range and cone area to minimise conflict with, and risk to, other Anglesea Heath users, in consultation with the Surf Coast Shire and the Geelong Rifle Club;
- Support and assist the Geelong Rifle Club in their relocation from the rifle range at Gum Flat Road;
- Monitor and guide removal of infrastructure and expended and unexpended ordnance (particularly any lead shot), when the Geelong Rifle Club relocates from the rifle range.

D.7.10 DOG WALKING

Currently some visitors to Anglesea Heath walk their dogs along vehicle tracks (section D.7.2). The presence of dogs in Anglesea Heath could pose a risk to native fauna, especially the New Holland Mouse (section D.3.2). Dog walking also has the potential to create conflict with other recreational users, especially if dogs are not kept on a lead.

To protect the fauna and other natural values of Anglesea Heath, dogs will be permitted on a lead in the Conservation and Recreation Zone only (section D.2.). Dogs will not be permitted in the Conservation Zone (except if confined to vehicles passing through Anglesea Heath on class 1 or 2 roads and tracks, shown in Appendix 1).

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunities for dog walking on a lead in the Conservation and Recreation Zone only (section D.2);
- Discontinue dog walking within Anglesea Heath outside the Conservation and Recreation Zone (section D.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Change visitor use patterns so that dog walking is undertaken (on lead) in the Conservation and Recreation Zone only (section D.2);
- Increase ranger presence in Anglesea Heath;
- Permit dogs to be carried through the Conservation Zone if confined in a vehicle on class 1 or 2 roads and tracks, refer to Appendix 1.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Undertake an education program (section D.8.1) to inform dog owners of the impacts of dogs on wildlife



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and potential conflicts with other users (sections D.5.4 and D.7.1);

- Provide information to dog owners that currently utilise Anglesea Heath about the prohibition of dogs outside the Conservation and Recreation Zone (section D.2).

D.7.11 COMMERCIAL TOURISM OPPORTUNITIES

Currently five commercial tour operations offer tours within Anglesea Heath. They are: Blazing Saddles Trail Rides, Seamist Trail Rides, Spring Creek Trail Rides, Great Ocean Road Adventure Tours and Ecologic Environmental Services.

The activities offered by these operators include: horse riding, mountain bike riding, nature study and bushwalking (sections D.7.1, D.7.4, D.7.5 and D.7.6). School holiday environmental activities provided by Ecologic Environmental Services are sometimes undertaken within Anglesea Heath.

Parks Victoria administers permits for commercial operators on public land and liaises with operators and local land managers to draft permit conditions that mitigate environmental impacts associated with operators' activities. Where possible, any written authorities for commercial operators' activities will be consistent with current Parks Victoria permits. The Management Group will develop these permits and conditions in the future, with advice from the Consultative Committee (sections C.4.3 and C.4.4).

Commercial operators conducting tours in Anglesea Heath have the ability to educate their clients about the natural values of the area and key management issues. The delivery of conservation themes to visitors by commercial operators can enhance the experience for visitors and improve use ethics within Anglesea Heath (section D.8.1). This level of involvement by commercial tour operators will be encouraged in Anglesea Heath.

It is important that Anglesea Heath can continue to provide a venue of peace and tranquility where visitors can experience nature in a relatively undisturbed state. All commercial tourism activities within Anglesea Heath need to be assessed carefully so that visitor numbers and activities provided by tour operators are not detrimental to the environmental and social values that currently exist there (section C.2).

AIMS

Management Outcomes for this Key Area are to:

- Provide for commercial tourism opportunities that are consistent with the management vision (section C.3);
- Maintain an appropriate balance between commercial and private use of Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Continue to monitor the activities of commercial tour operators in relation to environmental impacts;

- Increase ranger presence in Anglesea Heath;
- Encourage and cooperate with commercial operators to provide information and services, which reflect and interpret the conservation values of Anglesea Heath;
- Encourage operators to become involved in the maintenance of those tracks in Anglesea Heath that they utilise for commercial tours.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Ensure all commercial tour operators operating within Anglesea Heath are appropriately authorised under the regulations;
- Liaise with all commercial tour operators to increase their awareness of the environmental threats and issues within Anglesea Heath;
- Require commercial tour operators to record and present sufficient information about their operations to enable environmental monitoring of their activities;
- Regularly inspect routes of commercial tour operators conducting activities in Anglesea Heath to ensure they are operating in accordance with permit conditions;
- Liaise with commercial tourism operators to reduce conflict with other users;
- Liaise with local tourism bodies to coordinate and ensure tourism initiatives do not cause detrimental environmental impact.

D.7.12 SPECIAL EVENTS

A small number of special events are held annually in Anglesea Heath with event organisers usually seeking permission from Parks Victoria. Occasionally organisers have also contacted the Surf Coast Shire and Alcoa. The events have generally been recreational group activities with a nature-based focus. For example, ANGAIR Inc. hold an annual wildflower show and use Anglesea Heath as a venue for guided tours to view the heath's spectacular wildflowers.

Special events involve relatively large numbers of participants. Groups have the potential to cause safety, environmental, and management concerns. Accordingly, it is important that, any special events held in Anglesea Heath are low impact activities in keeping with the conservation objectives for managing the area. If permission is granted for special events it is important that their activities are well managed and evaluated for future suitability.

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunities for special events that are consistent with the management vision (section C.3);

STRATEGIC PLAN - MANAGEMENT ISSUES AND STRATEGIES

- Minimise impacts on the values of Anglesea Heath resulting from the conduct of special events.

STRATEGIES

Management Strategies for this Key Area are to:

- Develop specific use conditions, if special events are permitted, by the Management Group (section C.4.3) with reference to the guidelines employed in the Angahook-Lorne State Park;
- Ensure special event applications are sufficiently assessed by rangers, and ensure those events occurring are subsequently adequately monitored and evaluated.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Assess all special event applications for numbers, routes and seasonality, to ascertain their potential impact on Anglesea Heath values (section C.2);
- Undertake follow-up monitoring of special events to evaluate their suitability in Anglesea Heath for the future;
- Conduct debriefing sessions as required with event coordinators after special events are held in Anglesea Heath;
- Ensure that all special events conducted in Anglesea Heath are appropriately authorised (with special conditions) compatible with Anglesea Heath regulations.

D.7.13 MILITARY TRAINING

The Australian Defence Forces has have used Anglesea Heath for training; on average four times per year. The training activities have mostly been conducted by the Army, Air School Cadets and Reserve Units. The training has usually been conducted over weekends with base camps commonly restricted to Haggarts Track and Gum Flats Road area. This type of defence force training has the potential to conflict with the conservation objectives and management vision for Anglesea Heath. Due to this potential conflict, some restrictions will be placed on the nature and extent of Defence Force Training conducted within Anglesea Heath. The Defence Force has volunteered to cease using the Anglesea Heath for base camp related training exercises.

Australian Defence Force training is divided into five levels, depending on the nature and objective of training activities, from Level One (small scale adventure and bushcraft training), to level Five (large scale tactical manoeuvres incorporating hundreds of soldiers, heavy machinery and earthworks). In line with management objectives for Anglesea Heath, which are, similar to that of the adjacent Angahook-Lorne State Park, opportunities for Defence

Force training will be restricted to Level 1 activities.

In addition, all applications for Defence Force training will be assessed individually, with consideration to the flora and fauna values at the proposed site. Close liaison between the designated Unit Training Coordinator responsible for training exercises and the Management Group will be undertaken to ensure that Defence Force personnel understand the relevant values and threats to Anglesea Heath posed by their activities.

Permits are currently, and will continue to be, applied to Defence Force training; the conditions of the permits aim to minimise impacts to flora and fauna and the spread of weeds and Cinnamon Fungus (sections D.3.1, D.3.2, D.5.1 and D.5.3). It is envisaged that the Consultative Committee (section C.4.4) will provide advice to the Management Group (section C.4.3) to develop Defence Force training permits in the future.

AIMS

Management Outcomes for this Key Area are to:

- Provide opportunity for some military training within Anglesea Heath;
- Minimise environmental impact of military training within Anglesea Heath.

STRATEGIES

Management Strategies for this Key Area are to:

- Allow for Level One Defence Force training in appropriate areas within Anglesea Heath, involving activities restricted to those compatible with management objectives;
- Ensure all Defence Force training applications are assessed for environmental impact within Anglesea Heath;
- Encourage low impact and sustainable use behaviours to be adhered to by Defence Force personnel.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Ensure that all military training operates under a permit or authority developed by the Management Group (section C.4.4);
- Permit military training on a limited number of specific sites and monitor and evaluate impacts on conservation values (section C.2) and adherence to permit conditions;
- Apply a no fires condition to all Defence Force training permits;
- Liaise with the relevant designated Defence Force Unit Training coordinator in planning and monitoring training in Anglesea Heath.



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D.8 KEY MANAGEMENT AREA: INTERPRETATION AND INFORMATION

D.8.1 INTERPRETATION AND INFORMATION

Anglesea Heath has natural values that could form excellent interpretation themes enabling an improvement in visitors' experience and appreciation of the heath. Interpretation is a valuable management tool that is currently lacking in Anglesea Heath. Also, little basic information is available to the public, apart from road signage and one information panel at the coal mine lookout. Little on-site information is provided.

The number of tracks in Anglesea Heath and the lack of on-site information have ensured that recreational users have little way of knowing which tracks they are allowed to use and why.

Many visitors to Anglesea Heath are uncertain of the land tenure of the area and have little sense of 'arrival'. The recreational activities undertaken by some visitors demonstrate a low level of understanding and appreciation of the values that exist there (section D.7.1). It is likely that availability of on-site interpretation and the continued provision of the Visitor Guide pamphlet will improve the understanding and use of the area by visitors.

An Interpretation Plan is required for Anglesea Heath that will strategically combine orientation information and interpretation of natural and cultural values so that adequate information is available to visitors.

A Visitor Guide has been prepared for Anglesea Heath, it is distributed by rangers on patrol. It is envisaged that the current Visitor Guide will be improved to incorporate an A3 map of Anglesea Heath and higher quality illustrations by local artists.

The Visitor Guide is available at local Parks Victoria and DNRE offices, and is available on-line at www.parkweb.vic.gov.au.

Commercial tour operators provide information to visitors by conducting 'ecotours' in Anglesea Heath (section D.7.1.1). For the benefit of visitors and to help achieve management aims, communication between the Management Group (section C.4.4) and commercial tour operators needs to be clear and frequent. The Management Group will attempt to ensure that visitors participating in 'ecotours' receive the desired information and messages about Anglesea Heath.

Visitors also need to be informed about management strategies so that they are more likely to understand them and comply with desired outcomes. For example, the management role of Alcoa, the community and Parks Victoria needs to be communicated. Additionally, the opportunity for visitors' input and involvement should be made clear. Visitors need to be informed about the

regulations for Anglesea Heath as well as on-ground management actions such as track rationalisation, zoning, fuel reduction and ecological burning (sections D.2, D.5.4 and D.7.2).

The proposed Great Ocean Road Discovery Centre at Anglesea could provide an excellent opportunity to inform a substantial number of visitors to the area about the values of Anglesea Heath from one location. The centre would be an excellent venue for distribution of the Visitor Guide and a static display to interpret Anglesea Heath.

AIMS

Management Outcomes for this Key Area are to:

- Manage recreational use ethics in Anglesea Heath through the provision of information and interpretation;
- Enhance visitors' enjoyment and appreciation of Anglesea Heath's natural and cultural values through the provision of quality interpretative services and facilities.

STRATEGIES

Management Strategies for this Key Area are to:

- Investigate, identify and establish 'Gateway' entrances at strategic points that provide visitors with information to orientate them and that interprets the natural and cultural values of Anglesea Heath;
- Develop an Interpretation Plan that identifies and refines themes for visitors, to enable them to interpret the biodiversity values of, and threats to, Anglesea Heath;
- Liaise with the relevant managing authority to assist in the provision of displays interpreting Anglesea Heath if the proposed development of the Great Ocean Road Discovery Centre at Anglesea proceeds.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Continue to distribute the Anglesea Heath Visitor Guide and promote its acquisition by users via the Internet;
- Write and implement an Interpretation Plan for Anglesea Heath that:
 - provides for a range of interpretative facilities and services that meet the orientation needs of visitors, interprets environmental themes, and that are appealing and attractive to visitors;
 - informs visitors of appropriate codes of conduct and Anglesea Heath Regulations;
 - encourages visitors to follow appropriate codes of conduct and Anglesea Heath Regulations through understanding;
 - is consistent with, and complementary to, the

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Angahook-Lorne State Park Interpretation Plan and to the interpretative facilities and services that are provided there;

- gives information on hazards and safety warnings where applicable;
- Install signs at appropriate vehicle tracks to interpret the major values and threats present within Anglesea Heath;
- Liaise with commercial tour operators to enhance the quality of eco-tourism in Anglesea Heath (section D.7.1.1);
- Install static and interactive displays interpreting Anglesea Heath, if the proposed development of the Great Ocean Road Discovery Centre at Anglesea proceeds.

D.8.2 SCHOOLS AND OTHER EDUCATION

The locality and natural attributes of Anglesea Heath make it an excellent venue for school groups, and other youth groups, to experience and learn in a diverse natural setting.

Anglesea Heath is an excellent learning environment for local schools at Anglesea, Aireys Inlet, Lorne and Geelong. Environmental and ecological programs have the capacity to be partially conducted in Anglesea Heath, enabling students to investigate ecosystems firsthand.

The Anglesea Primary school has, since 1993, been actively involved in a rehabilitation project at Coalmine Road, in Anglesea Heath. This type of participation by schools is beneficial to both students and land managers, and therefore will be encouraged and facilitated by rangers and/or project officers in the future.

For educational experiences within Anglesea Heath to be safe and most meaningful, close communication between teachers and managers is required. Teachers need to contact Parks Victoria and/or Alcoa to plan and arrange school visits to Anglesea Heath. Pre-visit information about Anglesea Heath will be made available to teachers and students to add value to their experience of Anglesea Heath.

AIMS

Management Outcomes for this Key Area are to:

- Increase the use of Anglesea Heath as an educational resource for schools;
- Enhance the quality of school visits to Anglesea Heath;
- Help develop student awareness and understanding of Anglesea Heath and its values (section C.2).

STRATEGIES

Management Strategies for this Key Area are to:

- Promote the use of Anglesea Heath as an environmental educational resource;

- Continue to foster links with local schools and universities.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Prepare educational material that can be provided as a 'kit' for schools upon request;
- Provide work experience and opportunities for local schools, where possible;
- Provide interpretative talks to schools visiting Anglesea Heath, when possible (section D.8.1).

D.9 KEY MANAGEMENT AREA: COMMUNITY PARTICIPATION AND INVOLVEMENT

D.9.1 LOCAL INVOLVEMENT

Anglesea Heath has benefited significantly from the participation of local conservation groups and volunteers. ANGAIR Inc. has active members who have extensive knowledge of the flora and fauna of Anglesea Heath. ANGAIR Inc.'s willingness to share this knowledge and contribute to pest plant control (section D.5.1) and other technical programs in the area has been a significant asset for land managers. ANGAIR Inc. has successfully sought alternative funding for environmental works in Anglesea Heath. The completion of such projects will complement core management actions and assist in protecting significant values (section C.2).

Other groups, including: The Geelong Environmental Council, Geelong Otway Trail Riders, four-wheel drive clubs, Deakin and Ballarat Universities, and local schools, have also participated in voluntary local action to protect the values of Anglesea Heath.

The management planning process (section B.2.1) has highlighted the significant amount of information that is available from individuals and groups such as ANGAIR Inc. in the local community. This information, knowledge, and understanding can contribute to management and conservation of Anglesea Heath. Currently, this information and knowledge circulates within a relatively small scientific, conservation and land management forum. Information about Anglesea Heath's natural values and major issues needs to be relayed to the broader community.

Future management arrangements will encourage a flow of information throughout the wider community (section C.4). Stakeholders will have the opportunity to exchange information with the Management Group and participate in Issue Workgroups (section C.4.5).

In addition, increased information will be available to visitors through ranger presence, the distribution of an Anglesea Heath Visitor Guide, and on-site interpretation (section D.8.1).



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It is expected that schools, recreational users, local media, scientists, clubs and local traders will participate in, and benefit from, the continuing development of information concerning Anglesea Heath. The local community is potentially a 'task force' that will be encouraged to heighten their sense of ownership and understanding of the significance of Anglesea Heath.

AIMS

Management Outcomes for this Key Area are to:

- Maintain the high level of participation and awareness local conservation groups have for Anglesea Heath;
- Increase the level and diversity of community participation in Anglesea Heath;
- Raise community awareness of major issues pertaining to Anglesea Heath (section D.8.1).

STRATEGIES

Management Strategies for this Key Area are to:

- Promote and increase community awareness through a wide range of publications (e.g. newsletters, local papers, and business and community brochures);
- Continue to encourage volunteer and community involvement in Anglesea Heath and promote participation of the wider community.

ACTIONS

Major Actions to be undertaken for this Key Management Area are to:

- Continue to support the participation of ANGAIR Inc. and other organisations in conservation programs and activities in Anglesea Heath;

- Undertake measures to record information held by community groups so that it is readily accessible to managers and the wider community;
- Develop and implement a long-term volunteer strategy that:
 - incorporates the skills and interests of volunteer groups in Anglesea Heath management activities;
 - includes a regularly updated register of suitable volunteer projects;
 - encourages younger volunteers to become involved in conservation programs in Anglesea Heath;
- Encourage volunteer groups to continue to seek alternative funding for approved projects within Anglesea Heath;
- Actively involve local community participants in the Consultative Committee and the Issue Related Working Groups.
- Inform the local community of Management Group activity.
- Actively promote and support the participation of Issue Related Workgroups (section C.4.5) in the planning process for Anglesea Heath (section B.2.1);
- Liaise closely with adjacent landowners and managers regarding management actions and projects within Anglesea Heath.

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E.2 APPENDIX 2 - SIGNIFICANT FLORA

National and State level

Rr	<i>Burnettia cuneata</i>	Lizard Orchid
Rt	<i>Eucalyptus yarraensis</i>	Yarra Gum
Vv	<i>Grevillea infecunda</i>	Anglesea Grevillea
Rr	<i>Caladenia venusta</i>	Large White Spider-orchid
Vv	<i>Prasophyllum spicatum</i>	Congested Leek-orchid
Kk	<i>Thelymitra</i> sp. aff. <i>pauciflora</i>	(Anglesea) Slender Sun Orchid
Ee	* <i>Prasophyllum correctum</i>	Gaping Leek-orchid
Ek	<i>Prasophyllum affine</i>	Heathland Leek-orchid
v	<i>Eucalyptus</i> aff. <i>cypellocarpa</i>	Otway Grey Gum
v	<i>Caladenia aenochila</i>	Red-Lipped Spider-orchid
t	<i>Schoenus turbinatus</i>	Top Bog-sedge
v	<i>Thelymitra benthamiana</i>	Blotched Sun-orchid
v	<i>Thelymitra mucida</i>	Hoary Sun-orchid
r	<i>Caladenia flavovirens</i>	Summer Spider-orchid

Regionally significant - (according to Carr 1995)

<i>Acianthus caudatus</i>	Mayfly Orchid
<i>Allocasuarina misera</i>	Slender Sheoak
<i>Conospermum mitchellii</i>	Victorian Smoke-bush
<i>Amphipogon strictus</i>	Grey-beard Grass
<i>Argemone obtusifolium</i>	Blunt Everlasting
<i>Boronia nana</i>	Dwarf Boronia
<i>Brachyloma ciliatum</i>	Fringed Brachyloma
<i>Brachyscome uliginosa</i>	Heath Daisy
<i>Caladenia caerulea</i>	Blue Caladenia
<i>Caladenia cardiochila</i>	Heart Spider-orchid
<i>Caladenia clavigera</i>	Plain-lip Spider-orchid
<i>Caladenia deformis</i>	Bluebeard Caladenia
<i>Caladenia pusilla</i>	Tiny Caladenia
<i>Caladenia tentaculata</i>	Large Green-comb Spider-orchid
<i>Caleana major</i>	Large Duck-orchid
<i>Chionochloa pallida</i>	Silvertop Wallaby-grass
<i>Comesperma colymega</i>	Blue-spike Milkwort
<i>Comesperma ericinum</i>	Heath Milkwort
<i>Daviesia brevifolia</i>	Leafless Bitter-pea
<i>Dillwynia cinerascens</i>	Grey Parrot-pea
<i>Diuris orientis</i>	Wallflower Orchid

National and State level cont.

r	<i>X Calassodia tutelata</i>	Bluebeard Waxlip Hybrid Orchid
k	<i>Caladenia australis</i>	Southern Spider-orchid
r	<i>Corybas fardhamii</i>	Swamp Helmet-orchid
k	<i>Austrodanthonia</i> sp.	Tall Wallaby-grass
k	<i>Caladenia dilatata</i>	Green-comb Spider-orchid
r	<i>Lepidosperma canescens</i>	Hoary Rapier-sedge
k	<i>Lepidosperma gunnii</i>	Slender Sword-sedge
k	<i>Genoplesium ciliatum</i>	Fringed Midge-orchid
r	<i>Prasophyllum potens</i>	Broad-lip Leek-orchid
v	<i>Thelymitra mucida</i>	Plum Orchid
r	<i>Thamasia petalocalyx</i>	Paper Flower
r	<i>Thelionema umbellatum</i>	Clustered Lily
r	<i>Baockea ramosissima</i> ssp. <i>prostrata</i>	Tiny Baockea
k	<i>Caladenia parva</i>	Small Spider-orchid

Regionally significant - (according to Carr 1995) cont.

<i>Drasera glanduligera</i>	Scarlet Sundew
<i>Drasera macrantha</i>	Climbing Sundew
<i>Eucalyptus baxteri</i>	Brown Stringybark
<i>Genoplesium morrisii</i>	Bearded Midge-orchid
<i>Gompholobium ecostatum</i>	Dwarf Wedge-pea
<i>Goodenia geniculata</i>	Bent Goodenia
<i>Hakea repullulans</i>	Western Furze Hakea
<i>Hibbertia fasciculata</i> var. <i>prostrata</i>	Bundled Guinea-flower
<i>Lepidosperma neesii</i>	Stiff Rapier-sedge
<i>Leporella fimbriata</i>	Fringed Hate-orchid
<i>Leptorhynchus linearis</i>	Shiny Buttons
<i>Labellia rhombifolia</i>	Tufted Labellia
<i>Lomandra micrantha</i>	Small-flower Mat-lily
<i>Lomandra multiflora</i>	Many-flowered Mat-lily
<i>Lomatia ilicifolia</i>	Holly Lomatia
<i>Pyrrhichis nigricans</i>	Red-beaks
<i>Microtis rara</i>	Rare Onion-orchid
<i>Mitrasacme pilosa</i>	Hairy Mitrewort
<i>Olearia teretifolia</i>	Cypress Daisy-bush
<i>Orthoceras strictum</i>	Horned Orchid
<i>Phyllanthus hirtellus</i>	Thyme Spurge



ANGLESEA HEATH - APPENDICES

E.2 APPENDIX 2 - SIGNIFICANT FLORA cont.

Regionally significant - (according to Carr 1995)

<i>Phylloglossum drummondii</i>	Pygmy Clubmoss
<i>Pimelea octophylla</i>	Woolly Rice-flower
<i>Pimelea phylloides</i>	Heath Rice-flower
<i>Platysace heterophylla</i>	Slender Platysace
<i>Poa rodwayi</i>	Velvet Tussack-grass
<i>Prasophyllum elatum</i>	Tall Leek-orchid
<i>Pterostylis plumosa</i>	Bearded Greenhood
<i>Pimelea humilis</i>	Dwarf Bush-pea
<i>Pultenaea scabra</i>	Rough Bush-pea
<i>Rhytidosporum procumbens</i>	White Marianth
<i>Scaevola albida</i>	Pale Fan-flower
<i>Schizaea asperula</i>	Rough Comb-fern
<i>Schizaea bifida</i>	Forked Comb-fern
<i>Schizaea fistulosa</i>	Narrow Comb-fern
<i>Schoenus breviculmis</i>	Matted Bog-sedge

Regionally significant - (according to Carr 1995) cont.

<i>Sphaerolobium vimineum</i>	Leafless Globe-pea
<i>Spyridium vexilliferum</i>	Winged Spyridium
<i>Stipa mollis</i>	Supple Spear-grass
<i>Stipa muelleri</i>	Wiry Spear-grass
<i>Stylidium inundatum</i>	Hundreds and Thousands
<i>Stylidium perpusillum</i>	Slender Trigger-plant
<i>Thelymitra antennifera</i>	Rabbit-ears
<i>Thelymitra aristata</i>	Great Sun-orchid
<i>Thelymitra flexuosa</i>	Twisted Sun-orchid
<i>Thelymitra rubra</i>	Salmon Sun-orchid
<i>Thomasia petalocalyx</i>	Paper-flower
<i>Thysanotus junceifolius</i>	Rush Fringe-lily
<i>Thysanotus tuberosus</i>	Common Fringe-Lily
<i>Tricostularia pauciflora</i>	Needle Bog-sedge
<i>Utricularia tenella</i>	Pink Bladderwort

Key

Description of level of threat to taxa in Australia and Victoria according to Parks Victoria data 2001:

- E species endangered in Australia
- V species vulnerable in Australia
- R species rare in Australia
- e species endangered in Victoria
- v species vulnerable in Victoria, at risk of endangerment
- r species rare in Victoria but not considered otherwise threatened.
- k species poorly known, suspected to fit into a VROT category
- * denotes species listed under the Flora and Fauna Guarantee Act, 1988.

Sources:

- Carr (1995)
- M. Mac Donald (pers. comm.) (1996) Parks Victoria 2001

ANGLESEA HEATH - APPENDICES**E.3 APPENDIX 3 SIGNIFICANT FAUNA****MAMMALS**

Scientific Name	Common Name	Status
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	CEn*
<i>Antechinus minimus</i>	Swamp Antechinus	LR
<i>Potorous tridactylus</i>	Long-nosed Potoroo	LR

BIRDS

Scientific Name	Common Name	Status
<i>Morus serrator</i>	Australasian Gannet	Vul
<i>Rallus pectoralis</i>	Lewin's Rail	End
<i>Accipiter novaehollandiae</i>	Grey Goshawk	LR
<i>Larus pacificus</i>	Pacific Gull	LR
<i>Sterna caspia</i>	Caspian Tern	Vul
<i>Sterna bergii</i>	Crested Tern	LR
<i>Plegadis falcinellus</i>	Glossy Ibis	Vul
<i>Ninox connivens</i>	Barking Owl	End
<i>Ninox strenua</i>	Powerful Owl	End

Key

CEn Critically Endangered

End Endangered

R Rare

Vul Vulnerable

LR Low risk near threatened

* Denotes species listed under the Flora/
Fauna Guarantee Act 1988(Description as per *threatened wildlife of Victoria*)**Sources:**

Ecology Australia, 1995

Wilson, B., pers. comm., 1996

Parks Victoria, 2001

Carr (1995)

M. Mac Donald (pers. comm.) (1996) Parks Victoria 2001

BIRDS cont.

Scientific Name	Common Name	Status
<i>Dasyornis broadbenti</i>	Rufous Bristlebird	LR*
<i>Ardea alba</i>	Great Egret	End*
<i>Nycticorax caledonicus</i>	Nankeen Night Heron	Vul
<i>Phalacrocorax varius</i>	Pied Cormorant	LR
<i>Platalea regia</i>	Royal Spoonbill	Vul

FISH

Scientific Name	Common Name	Status
<i>Galaxias truttaceus</i>	Spotted Galaxias	LR

REPTILES

Scientific Name	Common Name	Status
<i>Egernia coventryi</i>	Swamp Skink	Vul
<i>Litoria raniformis</i>	Warty Bell Frog	Vul



ANGLESEA HEATH - APPENDICES

E.4 APPENDIX 4 - LEGISLATION AND OTHER AGREEMENTS COMMONWEALTH OF AUSTRALIA

Public Land Use and Management

Australian Heritage Commission Act 1975
Endangered Species Protection Act 1992
Aboriginal and Torres Strait Islander Heritage
Protection Act 1984
Native Title Act 1993
Environment Protection and Biodiversity
Conservation Act 1999

VICTORIA

Public Land Use and Management

*Land Conservation (Vehicle Control) Act 1972,
and regulations*
Flora and Fauna Guarantee Act 1988
Domestic (Feral and Nuisance) Animals Act 1994
Wildlife Act 1975
Forest Act 1958, and regulations
Conservation, Forests and Lands Act 1987,
and regulations (including the Conservation, Forests and
Lands (Anglesea Heath) Regulations 2000)
Land Act 1958
Final Recommendations - Melbourne Area, District 1
Review (LCC, 1987)
Strategy for the Conservation of Biodiversity in
Victoria 1997

Environmental Agreements

Convention on Biological Diversity 1992
National Strategy for Ecologically Sustainable Development
1990
Intergovernmental Agreement on the Environment 1992

Fire Management

Country Fire Authority Act 1958
Otway Fire Protection Plan 1995
Code of Practice for Fire Management on
Public Land in Victoria 1995

Mineral and stone extraction

Mines (Aluminium Agreement) Act 1961
Mineral Resources Development Act 1991
Extractive Industries Development Act 1995

Cultural Heritage

Archaeological and Aboriginal Relics Act 1972
Heritage Act 1995

ANGLESEA HEATH - APPENDICES

E.5 APPENDIX 5 ENVIRONMENTAL WEEDS

Scientific Name	Common Name	Risk	Scientific Name	Common Name	Risk
<i>Acacia decurrens</i>	Early Black Wattle	V	<i>Genista monspessulana</i>	Cape Broom	V
<i>Acacia longifolia</i> var. <i>sophorae</i>	Coast Wattle	V	<i>Hakea laurina</i>	Pincushion Hakea	S
<i>Acacia myrtifolia</i> W.A. provenance	Myrtle Wattle	?	<i>Holcus lanatus</i>	Yorkshire Fog	V
<i>Acacia retinodes</i> var. <i>retinodes</i>	Wirilda	?	<i>Hypochaeris glabra</i>	Smooth Cats Ear	S
<i>Acacia saligna</i>	Golden-wreath Wattle	V	<i>Hypochaeris radicata</i>	Cats Ear	S
<i>Agrostis capillaris</i>	Brown-top Bent	V	<i>Leontodon taraxacoides</i>	Hairy Hawkbit	S
<i>Aira caryophylla</i>	Silvery Hair-grass	S	<i>Leptospermum laevigatum</i>	Coast Tea-tree	V
<i>Aira elegantissima</i>	Elegant Hair-grass	S	<i>Lolium perenne</i>	Perennial Rye-grass	S
<i>Anagallis arvensis</i>	Pimpernel	S	<i>Lotus corniculatus</i>	Birds Foot Trefoil	V
<i>Arctotheca calendula</i>	Cape Weed	S	<i>Malus domestica</i>	Domestic Apple	N
<i>Briza maxima</i>	Large Quaking-grass	V	<i>Melaleuca armillaris</i> ssp. <i>armillaris</i>	Giant Honey-myrtle	V
<i>Briza minor</i>	Lesser Quaking-grass	P	<i>Oxalis purpurea</i>	Large-flower Wood-sorrel	S
<i>Bromus diandrus</i>	Great Brome	V	<i>Parasenecio lophanthia</i>	Cape Wattle	V
<i>Callistemon rigidus</i>	Callistemon	S	<i>Paspalum dilatatum</i>	Paspalum	V
<i>Carpobrotus aequilaterus</i>	Angled Pigface	S	<i>Pennisetum clandestinum</i>	Kikuyu	V
<i>Carpobrotus edulis</i>	Hottentot Fig	V	<i>Picris echioides</i>	Bristly Ox-tongue	S
<i>Centaurium erythraea</i>	Common Centaury	S	<i>Pinus pinaster</i>	Maritime Pine	V
<i>Cerastium glomeratum</i>	Common Mouse-ear Chickweed	S	<i>Pittosporum undulatum</i>	Sweet Pittosporum	V
<i>Chrysanthemoides monilifera</i> sp.	Baneseed	V	<i>Plantago coronopus</i>	Bucks-horn Plantain	S
<i>Cicendia filiformis</i>	Slender Cicendia	P	<i>Plantago lanceolata</i>	Ribwort	S
<i>Cirsium vulgare</i>	Spear Thistle	S	<i>Prunus cerasifera</i>	Cherry-plum	V
<i>Conyza albida</i>	Fleabane	S	<i>Psoralea pinnata</i>	Blue Psoralea	V
<i>Coprosma repens</i>	Mirror-bush	V	<i>Senecio jacobaea</i>	Ragwort	P
<i>Crossula tetragona</i>	Crossula	P	<i>Salanum furcatum</i>	Nightshade	P
<i>Cynodon dactylon</i> var. <i>dactylon</i>	Silver-top Wallaby-grass	S	<i>Sollya heterophylla</i>	Blue Bell	V
<i>Dittrichia graveolens</i>	Stinkweed	P	<i>Sonchus asper</i> s.l.	Rough Saw-thistle	S
<i>Euphorbia paralias</i>	Sea Spurge	S	<i>Taraxacum officinale</i>	Dandelion	P
<i>Festuca rubra</i>	Red Fescue	P	<i>Sanctus oleraceus</i>	Saw-thistle	S
<i>Galenia pubescens</i>	Galenia	S	<i>Trifolium dubium</i>	Suckling Clover	S
<i>Genista linifolia</i>	Flax-leaf Broom	V	<i>Vellereophyton dealbatum</i>	White Cudweed	S
			<i>Vulpia myuros</i>	Rat's-tail's Fescue	S
			<i>Watsonia meriana</i> cv. <i>bulbillifera</i>	Wild Watsonia	V

RISK RATING CATEGORIES

(Rating as Carr, et. al., 1992)

- V Very serious threat to one or more vegetation formations in Victoria
- S Serious threat to one or more vegetation formations in Victoria
- P Potential threat to one or more vegetation formations in Victoria
- N Not a threat but may have visual impact
- ? Risk rating unknown

SOURCES:

Ecology Australia, 1995
Carr, pers. comm., 1996
Dale Fuller, pers. comm., 2000
Parks Victoria, 2001



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MANAGEMENT PLAN - NOVEMBER 2002

Compiled by: Parks Victoria and Alcoa in partnership with the local community.

16 APPENDIX E – ALCOA ANGLESEA SITE CLOSURE PLAN



SITE CLOSURE PLAN

ALCOA ANGLESEA

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Alcoa Anglesea Site Closure Plan

1 INTRODUCTION

1.1 Purpose of this Site Closure Plan

This plan has been developed to outline the decommissioning and rehabilitation of the Alcoa Anglesea Power Station and Mine. The aim of the plan is to inform interested parties such as government agencies, the Shire and community groups on how unwanted facilities and infrastructure will be decommissioned and the areas currently open for mining, roads and infrastructure, rehabilitated and returned to an agreed land use. It is also the operating planning tool to be used by Alcoa personnel during the closure of the mine.

1.2 Objectives

This plan has been developed to achieve Alcoa's safety and environmental objectives by ensuring that:

- We maintain our high focus on environmental and safety standards
- All rehabilitation achieves the completion criteria standard
- Planning for future use of the mine or infrastructure will involve the neighbouring community and other interested parties
- The site is left in a condition which is safe, self sustaining and suitable for future land uses
- The amount of waste disposed to landfill is minimised by recycling and reusing waste materials
- The site is liability free when relinquished to the government or utilised by another body

1.3 Background

The Alcoa Anglesea Site is situated on unreserved Crown Land, 41 kilometres southwest of Geelong, and two hundred metres north of the town of Anglesea (Appendix I).

Alcoa mines brown coal in an open cut mine to fuel its 160-MW Anglesea Power Station located within the lease area. Since 1969 Alcoa has mined approximately 1.1 million tonnes of brown coal each year from the main upper seam within the open cut. The electricity produced is transmitted via a 35-km high voltage power line to Alcoa's aluminium smelter and fabricating mills at Point Henry, near Geelong. The Power Station supplies approximately 40% of Point Henry's power requirements.

The site consists of Alcoa freehold and a 7097-ha area of Crown Land leased under provisions of the *Mines (Aluminium Agreement) Act 1961* which grants Alcoa of Australia Limited exclusive right to explore and extract coal found within the area for 50 years, until 2011, with the right of 50 years renewal.

The Alcoa Lease incorporates the Anglesea Heath. The Anglesea Heath consists of two main areas:

- Mining Area: Coal Mine & Power Station: currently 545 ha of lease and freehold where mining, power generation areas and administration offices are located.
- Land for Conservation: currently 6676 ha of lease.

Since 1969 a total of 413 hectares has been cleared for mining operations. Within the current working area, 52 hectares has been cleared for permanent infrastructure and 151 hectares have been rehabilitated. The current open mining area is 210 hectares. Progressive backfilling of the open cut is reshaped to blend with the surrounding terrain, then covered with sub-soil and top-soil and ripped on contour to encourage germination of plant species native to the area. The aim is to rehabilitate the mined areas to a healthy woodland ecosystem, with values and management needs similar to the surrounding lease.

Alcoa Anglesea is within the Anglesea Heath managed with a cooperative agreement with the Department of Natural Resources and Environment (now Dept. Sustainability and Environment). The implementation of the Anglesea Heath Management Plan is administered by Parks Victoria on behalf of DSE. Ninety-five percent of the Land for Conservation portion of the Anglesea Heath is listed on the Register of the National Estate which is the responsibility of the Federal Department of Environment and Heritage.

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Alcoa Anglesea Site Closure Plan

1.4 Overview of Site Closure

As part of the Alcoa closure approval process, adequate consultation is required with community groups and government departments to determine if Alcoa Anglesea could be utilised by another party. This process will look at mine infrastructure and rehabilitation requirements to meet specialised land uses. All proposals must be compatible with the designated land use priorities of the area. The process will not approve new development, but will consider variations to the rehabilitation procedures or determine if infrastructure can remain to be used by another party.

Alcoa will not encourage any community expectations that are clearly incompatible with current land use objectives for the Crown Land as detailed in the Anglesea Health Management Plan.

Notwithstanding the possibility that some areas will be left for use by future parties, this closure plan assumes that the site is to be fully rehabilitated. In the event of the management of specific areas being transferred to a third party, the Alcoa Environmental, Health and Safety Assessment of Prospective Acquisitions and Divestitures procedure will be enacted to address any areas of concern and future liability.

Rehabilitation of areas open, together with areas selected for rework will be rehabilitated to the current rehabilitation plan as specified in the Land Management Plan.

1.5 Government and Regulatory obligations

A search was undertaken of relevant legislation and government department guidelines to ensure that Alcoa developed a closure plan for the Anglesea site that encompassed all legal and best practice requirements. In Victoria there is no specific legislation, regulations or guidelines covering the environmental aspects of decommissioning mine sites but is generally referred to in the *Mineral Resources Development Act (1990)* under sections relating to rehabilitation.

Alcoa's aluminium operations in Victoria are subject to the *Mines (Aluminium Agreement) Act 1961*. The Agreement, ratified by an Act of parliament, outlines the rights and responsibilities of both the company and the State of Victoria. Alcoa's mineral lease at Anglesea was granted under terms of the Agreement. The *Mines (Aluminium Agreement) Act 1961* overrides all other State Acts. This Act does not have any specific requirements regarding decommissioning of mines, however the Minister for the Environment has the power to instruct works to be carried out under Section 14 (2): Company may be ordered to execute works, states, "The Company shall from time to time carry out on the leased area such works for the purpose of rehabilitating any part thereof as may be agreed upon by the Company and the Minister or failing agreement as may be determined as reasonable by arbitration pursuant to clause 27 hereof, but so that the Company shall not be obliged to rehabilitate a part of the lease area until it has fully exercised its rights under this Agreement in respect of that part".

The Australian and New Zealand Minerals and Energy Council, the Minerals Council of Australia and the Chamber of Minerals and Energy in Western Australia have developed guidelines for mine decommissioning and mine closure.

Environment Australia has produced a series of 'Best Practice Environmental Management in Mining' documents, first in booklets now only available electronically. In July 2002 the proposed Mine Decommissioning principals were developed.

The Australian Minerals Industry launched a Code for Environmental Management in 2000 to which Alcoa World Alumina Australia is a signatory. Within this Code, the signatories commit to "Planning for closure in the feasibility and design phases of a project and regularly reviewing plans to consider changes in site conditions, technology, and community expectations" and "Ensuring resources are adequate to implement the environmental plans during operations and closure".

All these guidelines were utilised when developing this plan.

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Alcoa Anglesea Site Closure Plan

1.6 Alcoa Standard and Guidelines

Alcoa's own internal document, Bauxite Mine Rehabilitation Standards and Guidelines, that was developed by the Alcoa Environmental Group in Pittsburgh states "Areas used for mining must be restored to a land use that is socially and ecologically sustainable". Under Section 6 Decommissioning and Divestiture, the following standards are relevant to the Anglesea site mine and will be implemented.

- When mining is completed, facilities and equipment must be removed from the site unless some of the infrastructure is of use to landowners or the public. These may be left upon approval from the landowner and/or regulatory authority.
- Where natural ecosystems have been restored, stability and acceptable regenerative capacity should be demonstrated before responsibility ceases.
- All rehabilitated lands must be monitored for achievement of the established completion criteria.
- Until such time as completion criteria can be met, adequate resources must be allocated for effective maintenance of rehabilitated land.
- Where Alcoa remains in control of the land, planning and provision must be made for the effective management of the land.
- If the land is under a mineral lease or concession and not freehold, divestiture should coincide with attainment of completion criteria and, where applicable, recovery of bonds.
- If the company plans to transfer land to private ownership or to a state authority, agreement should be reached on the future use and management of the land.
- Where restoration of natural habitat is the intended land use, an agreed management plan may need to be developed to ensure continued sympathetic management towards the rehabilitation objective.

1.7 References

- [D9C73707 Land Management Plan](#)
- [D0075935 Anglesea Health Management Plan](#)
- [ANZMEC Strategic Framework for Mine Closure](#)
- [MCA Mine Closure Policy](#)
- [Mine Closure Guideline for Minerals Operations in Western Australia](#)
- [Australian Minerals Industry Code for Environmental Management](#)
- [EPA Best Practice Environmental Management in Mining: Mine Decommissioning](#)
- [Alcoa Environment Standard: Bauxite Mine Rehabilitation](#)

Production Mining/Land Management

Alcoa Anglesea Site Closure Plan



2 STAKEHOLDER INVOLVEMENT

The benefits of a successful stakeholder consultation process include:

- Improved planning decisions,
- Better motivated staff,
- Improved relationships with government,
- Better acceptance of closure decisions,
- Enhanced public image and reputation, and
- Improved community receptiveness to future mining proposals.

2.1 Closure Plan Review

The site closure plan is an evolving process. The document and associated action plans shall be reviewed at least annually and updated. The review should incorporate representatives of all appropriate business functions.

The following attendees shall be considered:

- Location Manager
- Power Station, Mine and Maintenance Managers
- EHS Professional(s)
- HR Professional(s)
- Finance Professional(s)
- Community Relations Professional(s)
- Mine Planner(s)

As the planned closure date approaches, the closure plan shall become more detailed, with more specific actions and plans.

2.2 Community Communication and Consultation

Identification of stakeholders and other interested parties is an important part of the closure process.

At the earliest practicable time, Alcoa shall communicate their intent to close the operation to the local community. The details of these communications may depend on the timeframe until expected closure.

The traditional owners of the land (Wathaurong) shall initially be consulted separately to determine their willingness to participate in a group consultative process. An alternative means by consulting with traditional owners may be considered.

The scope of consultation will need to be defined with the community.

Adequate resourcing shall be provided to ensure the effectiveness of the consultation process.

Action Required	Timeframe	SPA
Determine stakeholders for Community Consultation process.	TBD	Public Relations

**2.3 Employee Communication and Consultation**

Employees potentially facing job loss have an obvious and immediate stake in mine closure.

Employees should be engaged at the earliest possible convenience. More detail is included in Section 6.1.

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3 RISK ASSESSMENT

The closure planning process must involve identification of the full range of risks and potential outcomes associated with the closure of the operation in order to control or minimise any negative environment, health and safety, community, financial or other impacts.

A method for determining, ranking and documenting these risks must be established.

Potential closures risks may include, but are not limited to:

- Environmental or safety issues that impact on Alcoa's reputation,
- Environmental or safety issues that raise legal implications for Alcoa,
- Community reaction to activities,
- Market or other conditions or changes impacting the valuation basis of original decisions,
- Legislative outcomes that differ from expectations,
- Changes in legislation,
- Inappropriate remediation,
- Third party actions,
- Under-provisioning,
- Liability from disposal of assets,
- Increased project cost and delayed completion.

Existing legacies and risks from any future activities must be considered.

Action Required	Timeframe	SPA
Conduct and document risk assessment. Prioritise risks and determine cost of mitigation.	TBD	TBD

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4 CLOSURE CRITERIA

A closure or completion criteria is necessary, so as to ensure that Alcoa and regulatory standards, plus any criteria agreed to during community consultation processes are met before any transfer of land occurs.

Different closure criteria are required for land leased under the *Mines (Aluminium Agreement) Act 1961* and the freehold land owned by Alcoa.

Action Required	Timeframe	SPA
Develop Closure Criteria.	TBD	Mining

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5 CLOSURE COSTS

All liabilities to the business must be understood and adequately provisioned. This includes the current cost of closure and decommissioning (in the event of unexpected closure) and the estimated cost at the expected closure date.

It is essential that the cost of closure be estimated as early as possible. Closure costs will, by necessity, be indicative only, but can be based on broad industry experience.

The closure cost estimate should include costs for final closure activities, as well as for environmental monitoring and longer-term site management.

These costs should be reviewed regularly to adjust for inflation and closure work requirements, and undergo thorough re-assessment on a regular basis to account for changing community standards and expectations. Return on sale of assets or salvage value are difficult to predict and should not be used to offset the cost of closure.

Accepted accounting standards should be the basis for the financial provision.

Action Required	Timeframe	SPA
Determine cost for closure and decommissioning (for unexpected and scheduled closure)	TBD	Finance
Ensure adequate financial provisions are available and document Alcoa's preferred method of accounting for financial provisions for closure.	TBD	Finance

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6 CLOSURE ACTION PLAN

6.1 Human Resources and Responsibilities

The health, safety and well-being of our employees are the most important part of our business, but employees can often be the forgotten aspect as an operation enters the closure phase of its operation. The concept of closure can be a traumatic time for employees at all levels of the business.

"Effective Separation" training for management shall be considered in order to provide some of the skills and background required when dealing with employees during closure.

An employee "Code of Conduct" or "Statement of Commitment" should also be considered. This should compliment Alcoa's existing Values and ensure that all employees maintain the ethical and safe behaviour during closure.

Alcoa will provide the required support to employees prior to the closure of the operation to minimise the trauma that may be experienced. This may include providing information early on redundancy payments, provision of services such as financial planners, career counsellors, superannuation and investment information, chaplaincy or other employee assistance programs. It also needs to be recognised the impact of closure may have on the families of employees.

Where employees are to be relocated to other Alcoa businesses, every attempt will be made to provide employment in comparable positions. For those employees that are unable to be relocated to other Alcoa sites, professional assistance shall be considered help with alternative employment opportunities.

Alcoa shall determine if the employees at the time of closure have the appropriate skills to contribute to the closure process. The appropriate number of Alcoa and contract labour employees to undertake closure activities safely will need to be determined. Employees require clear communication and feedback on their role during closure, as it most likely is a deviation from the work performed during location operation. Appropriate training is required for employees, whose tasks differ from that during normal operation.

Communication with employees and/or union representatives is essential during the closure planning and decommissioning phases.

Action Required	Timeframe	SPA
Develop a people plan to address employee issues during closure.	TBD	Human Resources

6.2 Progressive Rehabilitation

6.2.1 Current Alcoa Mine Rehabilitation

The current rehabilitation objective for the Anglesea site is to establish a diverse, self-sustaining heathy woodland ecosystem that maintains or enhances the surrounding land use such as conservation, recreation and other natural values. The method as outlined in the Land Management Plan provides the principle strategy of mine rehabilitation at Alcoa Anglesea. However, at the anticipated closure of Anglesea, there will be approximately 200-300 ha of area open. This includes the final open-cut void, haul roads, Power Station and other infrastructure areas. An alternative strategy may be required for these particular circumstances where, for example, there is an absence of topsoil for direct return, the slope is too steep to hold topsoil placement or the slope will be inundated with water. Rehabilitation then may employ the placement of subsoil as a growth medium, the application of a seed mix and/or hydro mulch with supplementary planting of tube stock. Irrespective of the method employed, all strategies will strive to utilise indigenous species and provide habitat functionality contiguous with the surrounding heathy woodland.

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6.2.2 Roche's Mine Rehabilitation

Exploration for brown coal began in the late 1950's to supplement dwindling brown coal reserves from mines in the Region.

Results of exploratory drilling by the then Mines Department, Roche Brothers and Western Mining Corporation indicated a large economically-viable coal deposit immediately to the north of Anglesea. Roche Brothers commenced open cut mining operations with two small pits at the western end of this deposit in 1959. Later control of the deposit passed to Western Mining Corporation (an associate of Alcoa of Australia Ltd) and in 1961 Alcoa was granted a long-term lease over the deposit.

As drilling information at the time was largely incomplete, the Roche Brothers open cut was established on the western out-cropping of the lower seam instead of the thicker main seam. That lower seam coal reserve was difficult to mine when Alcoa commenced open cut mining operations in the 1960's and output from the Roche Brothers open cut had dwindled from 169,000 tonnes in 1959 to 14,300 tonnes in 1968.

With mining finishing in the Roche Brothers mine, the rehabilitation of the area began in 1979. Roche Brothers No.1 pit was backfilled with overburden from the western end of Alcoa's open cut from 1979 to 1982 (Plate 1a). The area was progressively covered with topsoil, landscaped and ripped and supplementary planted with a variety of trees and shrubs. Roche Brothers No.2 pit was filled with ash from the Power Station ash ponds in 1979, 1983 and 1987 (Plate 1b). In 1996 a stockpile of topsoil was relocated to the No.2 pit to cap the ash and the area was left to naturally regenerate from seed contained within the topsoil (Plate 1c & d).

Plate 1: Roche Brothers Mine



Plate 1a: In 1981, No.1 pit has been backfilled with overburden, No.2 pit remained open (and full of water).



Plate 1b: In 1993, No.1 pit has been rehabilitated and has good vegetation cover, backfilling with ash is visible in No.2 pit.

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Plate 1: Roche Brothers Mine



Plate 1c: In 1998, the landscaping portion of the rehabilitation is completed on No.2 pit with a layer of topsoil and contour ripping



Plate 1d: 2004, vegetation cover for No.2 pit is satisfactory, however, it remains distinctly different compared with the surrounding vegetation.

6.3 Land Use and Landform Establishment

6.3.1 Future Land Uses

At the time of preparation of this document, future land uses can only be described as conceptual.

It is understood that the land leased to Alcoa under the provisions of the *Mines (Aluminium Agreement) Act 1961* will be handed back to the Victorian State Government to be managed by Land Victoria (or equivalent) within the Department of Sustainability and Environment.

Whilst it is emphasised that no decisions have been made regarding future land use, there is potential for the land at Alcoa Anglesea to be re-used for a variety of commercial, conservation, educational and recreation activities. It is envisaged that Alcoa would not be directly involved in these future land uses beyond facilitating their implementation as an integral part of the decommissioning, rehabilitation and closure process.

Discussions will be conducted by Alcoa representatives with relevant State and local government agencies and other interested parties, prior to finalisation of the decommissioning process, to ensure feasible and sought-after land use opportunities are not lost.

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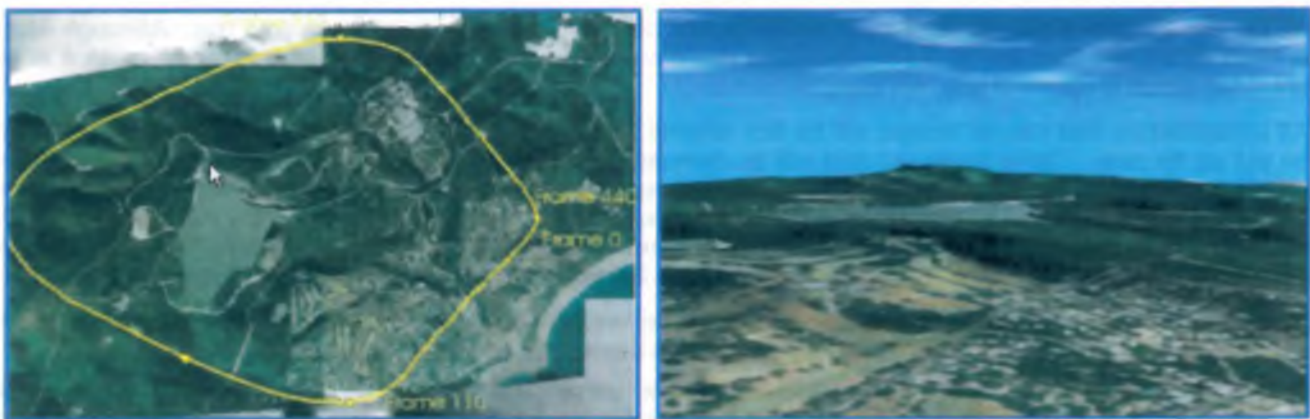
6.3.2 Final Mine Design

Alcoa has developed a series of potential closure designs out until 2014. Work is currently underway to conceptually develop several closure strategies and designs for 2030.

The 2014 closure plan generally depicts all high batters being completely filled and redeveloped into rehabilitated slopes that feed down to a void and valley system that disguises the extraction of 50 million tonnes of coal.

Alcoa has previously engaged BFP Consultants to provide a visual indication of what closure might look like. A potential option for closure is to convert the mining void into a lake, which provides an environmental flow to the Anglesea River. It is expected that the 2030 mine closure plan will incorporate most of the aspects developed in the 2014 plan but with varied lake and slope dimensions.

Some images provided by BFP Consultants are shown below.



BFP Consultants have also developed conceptual 2014 mine closure contours and associated cross sections. This information is provided in the supporting documentation.

6.4 Hydrogeological Assessment

The 2014 plan depicts Salt Creek being diverted back into the lake system and then decanted off through a valley system and back into join Marshy Creek before becoming the Anglesea River.

The 2030 plan will have similar features as above but lake dimensions and location will change.

Other mines are believed to have used a similar scenario for their closure strategies and any similar examples will be researched to extract all relevant learnings for Alcoa Anglesea. Further hydrogeological work is required to better understand slope stability underwater but in particular, lake and river chemistry will need to be fully explored to ensure the integrity of the Anglesea River is not jeopardised. Current knowledge suggests flooding of the final lake system by diverting Salt Creek in time of flood rather than allowing the void the fill though natural groundwater intrusion. The mechanism and legal permitting of this will need to be fully explored.

Alcoa has sponsored a PhD study that will investigate the potential for creating a healthy lake at closure. The study is being undertaken by Tim Tull through Deakin University is being supervised by Associate Professor John Sherwood (Deakin University School of Ecology and Environment) and Barry Knight (Alcoa). The study is entitled "Monitoring and Modelling Hydrogeochemical Interactions with Groundwater: Implications for Mine Dewatering on Groundwater, River and Lake Chemistry". Field trials have begun at the nearby former Wensleydale mine pit and involve the addition of different materials to raise the pH of acid mine water. Bench top trials thus far have been promising. The work is due for completion at the end of 2006.

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6.5 Revegetation

Much of the 2014 and the 2030 closure plan area will be completed using rehabilitation methods as described elsewhere in this plan under Progressive Rehabilitation.

The remaining area requiring special revegetation strategies will be the wetland areas adjacent to the final lake and creek systems.

Additional work is required to develop wetland establishment strategies and an understanding of the natural wetland systems within the Anglesea region. Early research suggests that the wetland species should be well established prior to flooding of the mine and hence strategies will need to be focussed on keeping those species moist whilst establishing prior to being inundated.

6.6 Decommissioning

6.6.1 Dismantling and removal of Infrastructure

All infrastructure at Alcoa Anglesea will remain until a decision is made regarding its final use. Although Alcoa is keen to see the facilities at the mine reused this plan will cover the removal of all infrastructure as it is yet unknown which facilities, if any, will remain.

All infrastructure that can be reused will be first offered to other Alcoa sites, any remaining structures will then be put up for sale. Those items not sold will be demolished by a reputable demolition/salvage firm who will be employed as per Alcoa's Contractor Manual. All salvageable materials that can be reused or recycled will be recovered; the remainder will be bulldozed and transported to an approved landfill facility. Consideration will be given to placing concrete and bitumen, which are inert materials, in the mine for burial. For more specific information on the management of waste materials see Sections 6.7 and 6.8.

An Environmental, Health and Safety Inspection will be undertaken for each item of infrastructure prior to any dismantling or demolition to ensure that all areas of risk are identified and managed.

Where possible, all dismantling and demolition work undertaken on site will be in compliance with the Australian Standard 2601 - 2001 "Demolition of Structures". Under this standard a documented work plan must be developed detailing how the dismantling or demolition work will be undertaken.

For all infrastructure areas dismantled or demolished the following will apply:

- All infrastructure is to be removed down to bare earth to allow for rehabilitation, unless approval has been given for a structure to remain for a specific purpose.
- Underground services and pipes will be removed where possible.
- Power and water to all services will be isolated prior to commencing any dismantling or demolition activities.
- All material that can be reused or recycled will be salvaged where possible.

Given that Alcoa Anglesea was constructed at a time where asbestos was an accepted product, consideration is required into which areas of plant are "asbestos free" and which need to be dismantled by licenced asbestos removal contractors.

Action Required	Timeframe	SPA
Identify infrastructure determined to be asbestos free.	TBD	TBD
Develop management strategy for infrastructure determined to potentially contain asbestos.	TBD	TBD
Develop draft scope for the dismantling of facilities and infrastructure	TBD	TBD

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6.6.2 Office and Amenities Buildings

All buildings on site will be assessed before being dismantled or demolished to ensure salvageable materials are recovered and any hazardous materials are identified. The aim is to try to minimise the amount of building material that is disposed as land fill. Any demountable buildings will probably be offered for sale or alternative use elsewhere.

6.6.3 Workshops

The workshop buildings are steel-framed structures clad in either aluminium or steel sheeting. All salvageable items such as tanks, cranes etc. will be offered to the other sites or put up for auction. Any items or materials not sold will be offered to a scrap metal recycler for removal. Remaining structures (brick walls, concrete foundations, slabs, etc.) will where possible, be offered to a recycling company for reuse. Any unwanted material will be broken up to form rubble and buried as per the guidelines in Sections 6.7 and 6.8.

Due to the use of oils and fuels within the workshops and aprons this area will be investigated for contamination, once the buildings and aprons have been removed, as outlined in Sections 6.7 and 6.8.

6.6.4 Fuel Bays

The fuel bays and aprons will be treated in the same way as the workshop area. There is the potential for some hydrocarbon contamination in these areas. The extent of any contamination and the remedial program to be put in place will be determined using the procedure described in Sections 6.7 and 6.8.

6.6.5 Above ground Storage Tanks

There are a number of bulk tanks on site for the storage of diesel, oils, acids, bases and other chemicals. All unused drums can be returned to the supplier and used drums are sent to a recycling facility. The site has a licence to store dangerous goods from the Worksafe Victoria this will be reviewed two-yearly to ensure it is kept up to date and will only be relinquished when the volume of dangerous goods falls below the license limit.

Where possible, tanks will be re-used by Alcoa or another party. Before removal from site they will be emptied, purged and if necessary reduced in size for transportation. Purging is carried out by specialist tank cleaning companies.

After purging, the tank will be tested to ensure it is totally inert and safe to weld or oxy-cut. All contractors who undertake tank cleaning on site will be trained in Alcoa's confined space policy and procedures.

Once purged, tanks are free to be relocated and re-used or sold as scrap metal if no other use can be found.

6.6.6 Underground Storage Tanks

There are no underground storage tanks remaining on site at Anglesea.

There are currently two underground sumps (employee's car park and near air compressors). Monitoring conducted by IT Environmental has shown some level of hydrocarbon contamination from the sump in the employee car park

A previously removed underground diesel tank also shows some sign of residual hydrocarbon contamination.

These areas will be investigated and remediated as discussed in Sections 6.7 and 6.8.

6.6.7 Haul Roads and tracks

A network of major and minor tracks required for effective land and fire management, exists for the management of the Anglesea Heath and surrounding public land. In some instances existing mining haul roads may form part of this network. Existing roads that do not form part of this network will be rehabilitated.

6.6.8 Stream Crossings

There is one haul road stream crossing and one light vehicle bridge within the current working area. The future of these crossings is dependant on the closure strategy engaged regarding haul roads and tracks. If the crossings are to be removed, the original stream will be rehabilitated with attention paid to stream width, type of flow, streambed structure and vegetation type.

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6.6.9 Salt Creek Diversion Channel.

Once the final void and alternative Salt Creek route is established as part of the closure process, the Salt Creek diversion channel will be filled with the embankment material that was established during the original construction and the area rehabilitated as for the other open land areas.

6.6.10 Electricity

If the site is to be fully rehabilitated, critical equipment such as the water distribution system, waste water and sewage treatment plants will be fully decommissioned prior to the electrical power being disconnected. The entire electrical distribution system (both aerial and subterranean) will be then removed from site.

6.6.11 References

- [Alcoa Environment Standard: Aboveground storage tanks](#)
- [Alcoa Environment Standard: Underground storage tanks](#)
- [D0027851 APS Policy: Safe working in Confined and Restricted Spaces](#)
- [D0073707 Land Management Plan](#)

6.7 Management of Hazardous Materials

To ensure that all hazardous materials are identified before the dismantling or demolition of any infrastructure an Environmental, Health and Safety inspection for each item will be undertaken by EHS professionals. It is Alcoa's responsibility to ensure that all personnel or contractors involved in the dismantling or demolition of any infrastructure containing hazardous materials are aware of these hazards and have been trained in the Alcoa standards and procedures for the removal and disposal of these materials.

Alcoa will abide by all statutory requirements for the handling and disposal of all hazardous materials and will take into account published Government recommendations and guidelines.

6.7.1 Asbestos

During construction of the Power Station in the 1960's, Alcoa utilised asbestos throughout the plant for lagging of pipe work and insulation of the boiler and gas ducting. Over a number of years Alcoa has undertaken removal of asbestos containing materials. As a replacement material, synthetic mineral fibres, principally rock wool, has been used (see later section on Synthetic Mineral Fibres).

This landfill was established in the mid 1980's and asbestos containing waste including pipe lagging, insulating materials and asbestos contaminated waste has been deposited in this facility.

In 1992 Alcoa was granted an EPA licence for disposal of asbestos to land in a small landfill site situated on a portion of crown land and freehold land owned by Alcoa south west of the ash ponds (see Appendix 3). This area has predominantly low permeability mine over burden, which was previously dumped and landscaped at the time the coal mine was opened for production.

The EPA Licence No. EM32162 dated, September 21, 2000 provides conditions for disposal which cover all required management issues including disposal arrangements, licence condition awareness by Power Station personnel, fencing, gates and site security, signage, site maintenance and rehabilitation following cessation of asbestos removal.

Prior to the application of the Licence Alcoa commissioned Mackin Marlin and Associates to conduct a detailed site analysis to determine the local soil profile and permeability, local geology, prevailing groundwater table, groundwater quality and water balance.

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It is expected that Alcoa will continue to use the asbestos disposal site for as long as asbestos removal continues at the Power Station. During this period, the disposal site will be managed in accordance with the applicable EPA licence conditions. The portion of the asbestos pit located on crown land will be excised from the lease and transferred to Alcoa freehold. At completion of asbestos removal from the Power Station, the site will be landscaped and vegetated according to the rehabilitation standard described in later in this plan. The location of the disposal site will be recorded on the title documents so that future landowners of the property will be aware of the presence of asbestos. A record of asbestos containing waste is made whenever the site is used and a drawing of the site is regularly updated to show disposal location.

6.7.2 Ash Ponds

Anglesea coal contains on average about 3 to 6 percent ash. A portion of this ash is collected in the furnace bottom hopper while the greater portion, the flyash, is entrained in the flue gases. The electrostatic precipitator collects the flyash from the gas stream prior to atmospheric dispersal of the gases via the stack. The ash from the furnace is sluiced away by water from the ash tank and the flyash is removed by a pneumatic system. The combined load of furnace ash and flyash is transported by means of water sluicers through piping to the #1 Ashpond. Bottom hopper waste from the clinker grinder is sent to the clinker recovery pit where the clinker is retained. It's removed periodically to be used as road base. Water from this pit flows into the stormwater ponds.

Ash from the ash collection system and iron oxide waste from the water treatment plant settle out in the channels of #1 ashpond. The inorganic constituents of the coal ash are combinations of the following elements: Aluminium, Iron, Calcium, Magnesium, Sodium, Potassium, Silicon and Sulphur. There is at times a small amount of unburnt fuel with the ash.

Since the commencement of operations coal ash has been disposed of in the ash ponds. About every 8-12 weeks a portion of the ash pond cells are dredged and the ash is sent as back-fill to the mine. About 20,000 to 30,000 tonnes of ash is produced each year. The status of leached coal ash has been changed from a prescribed waste to a material suitable for agricultural and horticultural uses.

The area where ash is disposed will be covered with overburden and topsoil and rehabilitated as per the rehabilitation standard described later in this plan.

6.7.3 Sewerage Treatment Plant & Ponds

The wastewater and sewage stream, including cleaning products used in the maintenance of all the amenities at the Power Plant, are pumped to the sewage lagoons via the ejector station. The sewage from the mine area is piped to a septic tank adjacent to the Mine buildings.

The holding ponds for the untreated waste water will be blocked off after all sources of hydrocarbons have been removed from the site. The sludge remaining at the bottom of the pond will be sucked out and disposed at an EPA approved liquid waste facility.

All pipes to the discharge ponds will be blocked before the ponds are decommissioned. Once the ponds have been emptied of the treated water, which is within the current EPA licence limits, the walkways, pipes and pumps will be decommissioned.

Once the infrastructure has been removed a sampling program will be undertaken to test for contamination under the treatment ponds, within the drains to and from the discharge ponds, under the holding and discharge ponds and at the discharge infiltration area.

6.7.4 Land farm

Soil placed in the land farm from contaminated sites is rehabilitated and is then available to be used for clean fill. The land farm is utilised for the remediation of contaminated soil from any spilled hydrocarbons from sources such as burst mobile equipment hoses or fuel oil unloading facilities. It is envisaged that any soils contained within the land farm at closure will continue to be remediated and tested prior to being returned to the mine as clean fill.

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6.7.5 Polychlorinated Biphenyls

Alcoa historically used PCBs in many hydraulic and electrical systems. This widespread use, which included extensive recycling and reuse into other systems, has resulted in contamination of equipment, and dry electrical equipment such as ballasts and dry transformers. Since PCBs are persistent and bioaccumulative, special care is required to evaluate the level of contamination and remediate it appropriately. This standard establishes requirements for monitoring and reporting on PCBs in use, identifying areas of contamination, managing PCB waste materials, appropriate impervious clothing for employees and contractors directly exposed to PCBs above 50 ppm, communicating on potential impacts on reproductive and developmental functions to women of child bearing age who may be potentially exposed, and for utilizing blood tests rather than "wipe tests" when employee exposure assessments are conducted.

PCB contaminated materials will be treated as per the PI Henry and Anglesea PCB Management Plan.

6.7.6 Synthetic Mineral Fibres

Failure to manage Refractory Ceramic Fibres (RCF), as with asbestos, can result in the uncontrolled release of airborne fibres, non-compliance with Alcoa internal standards and future litigation. Alcoa's internal standard for RCF mirrors many of the policy and procedures in place for asbestos. This document describes the Industrial Hygiene, Medical and Environmental controls required when handling RCF so as to limit employee exposure.

6.7.7 Lead Paint

Lead is a solid metal at room temperature and is a basic chemical element. It can combine with various other substances to form numerous lead compounds, such as lead pigments, solders, etc. The greatest occupational and environmental risk at Alcoa Anglesea is removal of lead containing paints during demolition, construction or modernization. Lead pigments become very hazardous when the coating is disturbed by methods such as welding, cutting, grinding, or abrasive blasting.

Alcoa's Lead Hazard Control Standard outlines the health and environmental measures Alcoa employees and outside contractors must follow when removing lead containing materials such as paint coatings. A companion document, Alcoa's Specification for Lead Hazard Control, is intended as a contract specification which outlines requirements imposed on the outside contractors (or Alcoa Employee) performing the work. Alcoa's Lead Hazard Control Checklist assists in tracking the requirements and status of the lead abatement project.

6.7.8 References

- [Alcoa Environmental Standard: Asbestos](#)
- [Alcoa Health Standard: Asbestos](#)
- [Anglesea Power Station Asbestos Management Program](#)
- [Anglesea Power Station Asbestos Landfill Register](#)
- [D0042592 EPA Licence EM32162](#)
- [EPA The Transport and Disposal of Waste Asbestos](#)
- [D0066496 Water Management Manual](#)
- [D0066483 Diagram of Ash pond system](#)
- [D0066090 Effluent Pollutant Survey – Analytical Results](#)
- [D0064369 Management of the Sewerage System](#)
- [D0066489 Diagram of Sewerage Treatment Plant](#)
- [Monthly Sewerage Check Sheet](#)
- [ANZECC PCB Management Plan](#)
- [Alcoa Environmental Standard: PCB](#)
- [Alcoa Health Standard: PCB](#)
- [Alcoa Environmental Standard: Refractory Ceramic Fibres](#)
- [Alcoa Health Standard: Refractory Ceramic Fibres](#)

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- [Alcoa Environmental Standard: Lead](#)
- [Alcoa Health Standard: Lead](#)

6.8 Management of Waste Materials

The current waste management program will be maintained during the closure period. Due to the health and environmental issues associated with the disposal of pulrescible and hazardous waste these waste will be disposed offsite at an approved landfill or liquid waste facility.

A recycling program is in place at Anglesea for steel, timber products, waste oil, drums, batteries, chemical containers, cardboard, paper, aluminium and steel cans, plastics and air and oil filters. Waste segregation commences in the mine, with recyclables and wastes being put in separate bins. A waste recording system has been developed to record the type and volume of waste leaving the mine to be disposed or recycled. These figures are reported. A waste inventory is also maintained detailing the current disposal or recycling practices and volumes.

During the decommissioning of infrastructure extra bins will be bought on site to handle the increased waste volume. Bins will be available for recycled products such as steel and other metals and contractors will be educated to ensure these products are recycled rather than go to landfill. Below is a description of how the major waste items generated from the dismantling or demolition of infrastructure will be handled.

6.8.1 Concrete

If approval is granted from the Victorian EPA and local community, concrete will be buried, as per the following guidelines:

- Only clean concrete will be buried. Hydrocarbon contaminated concrete will be removed from site and disposed of appropriately.
- Concrete will be broken into pieces of a size no greater than 15 cubic metres with a maximum dimension in any one direction no greater than 3 metres. The objective is that 70% of the concrete pieces will be less than 2 cubic metres.
- A number of disposal sites will be selected ensuring that the concrete can be buried with sufficient soil to allow aesthetic blending of the site into the surrounding landscape. No site will receive more than 1000m³ of concrete.
- Buried concrete will have a minimum of 2 metres of fill placed over it.
- A register of concrete burial sites will be maintained on Alcoa's Geographic Information System (GIS) detailing the location, quantity and type of material buried. These records will be made available to DSE and WRC.

6.8.2 Bitumen

Bitumen areas on the mine comprise workers' carparks, workshop aprons, stores compounds, access and interconnecting roads. Bitumen can be reused as bulk fill for road works and the feasibility of this will be investigated. If reuse of the bitumen is not practical the material will be buried on-site, subject to the same approvals applicable to concrete burial.

6.8.3 Scrap Metal

All scrap metal including structural steel, metal framing and roofing, flashing, guard rails, pipes and electrical cabling will be collected and recycled by a metal recycler.

6.8.4 Demolition Waste

The intent of the demolition process will be to source markets for all reusable or recyclable materials. Those materials for which a market does not exist will be removed and disposed of to an approved landfill facility.

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6.9 Investigation of Contaminated Areas

The National Environment Protection Council (NEPC) has developed a National Environment Protection Measure 1999 for the assessment of contaminated sites. The NEPM contains guidelines for contaminated soil and groundwater. The NEPC Measure has been adopted by each State with the NEPC Committee membership comprised of Ministers from each State (not necessarily environment Ministers) chaired by a Federal Minister.

To ensure that all areas of contamination are identified and remediated a site specific plan will be developed taking into account potential health and environmental impacts and future land use strategies. The plan will be based on the NEPM guidelines and will address the following:

- Investigation: – to determine the nature and extent of contamination.
- Assessment – evaluate the risks presented to human health or the environment using the NEPM guidelines.
- Strategies – develop a strategy to remove or remediate the contamination. There will be a number of feasible strategies, however, the preferred option needs to be effective, use resources efficiently, be acceptable to stakeholders and minimises ongoing liability and management requirements.
- Action Plan – detailed plan of how the work will be conducted and the validation procedures to be employed to demonstrate that the remediation is successful. Disposal of waste soils will be undertaken in accordance with the EPA regulations.
- Consultation – discussion with stakeholders such as the EPA and DPI, regarding the appropriateness of the action plan.
- Implementation – overseeing work and ensuring sampling undertaken as per guidelines.
- Validation – sampling is conducted by an independent consultant to demonstrate that contamination has been effectively removed or reduced to acceptable levels.
- Closure – obtaining written confirmation from the regulators that the contamination has been effectively remediated and no further requirements need to be met.

6.9.1 References

- [Schedule A: Assessment of Site Contamination NEPM 1999](#)
- [Schedule B: Guideline on the Investigation Levels for Soil and Groundwater](#)
- [Schedule B: Guideline on Data Collection, Sample Design and Reporting](#)
- [Schedule B: Guideline on Laboratory Analysis of Potentially Contaminated Soils](#)
- [Schedule B: Guideline on Health Risk Assessment Methodology](#)
- [Schedule B: Guideline on Ecological Risk Assessment](#)
- [Schedule B: Guideline on Risk Based Assessment of Groundwater Contamination](#)
- [Schedule B: Guideline on Health-based Investigation Levels](#)
- [Schedule B: Guideline on Exposure Scenarios and Exposure Settings](#)
- [Schedule B: Guideline on Community Consultation and Risk Communication](#)
- [Schedule B: Guideline on Protection of Health and the Environment During the Assessment of Site Contamination](#)
- [Schedule B: Guideline on Competencies and Acceptance of Environmental Auditors and Related Professionals](#)

Production Mining/Land Management



Alcoa Anglesea Site Closure Plan

6.10 Future Land Management

Once the Closure Criteria has been met, it is envisaged that Alcoa will hand over management of the Anglesea Heath to the Department of Sustainability and Environment. Negotiations with DSE are required to determine the level of support that Alcoa may continue to provide. Alcoa will continue to provide resources to ensure rehabilitation has been successful, and meets the criteria defined in the Closure Criteria. Suitable records of the history of the closed site shall be preserved to facilitate any further future land use planning.

6.11 Unplanned Closure

This closure plan is constructed on the assumption that closure will occur in a planned and coordinated fashion. Unplanned closure occurs when operations suddenly cease due to business or financial constraints (or similar economic imperatives) or if the operations are instructed to close due to non-compliance with regulatory requirements. This scenario would involve the immediate preparation and implementation of a decommissioning plan taking into account the non-operational status of the operation. Planning for this outcome would involve determining the cost of decommissioning if the operation were to close at any point.

6.12 Document Management

6.12.1 Location of Hard Copies

Copy No	Anglesea
1	Environmental Project Officer
2	Mine Manager
3	EOH Consultant
4	Station Chemist
5	Power Station Manager

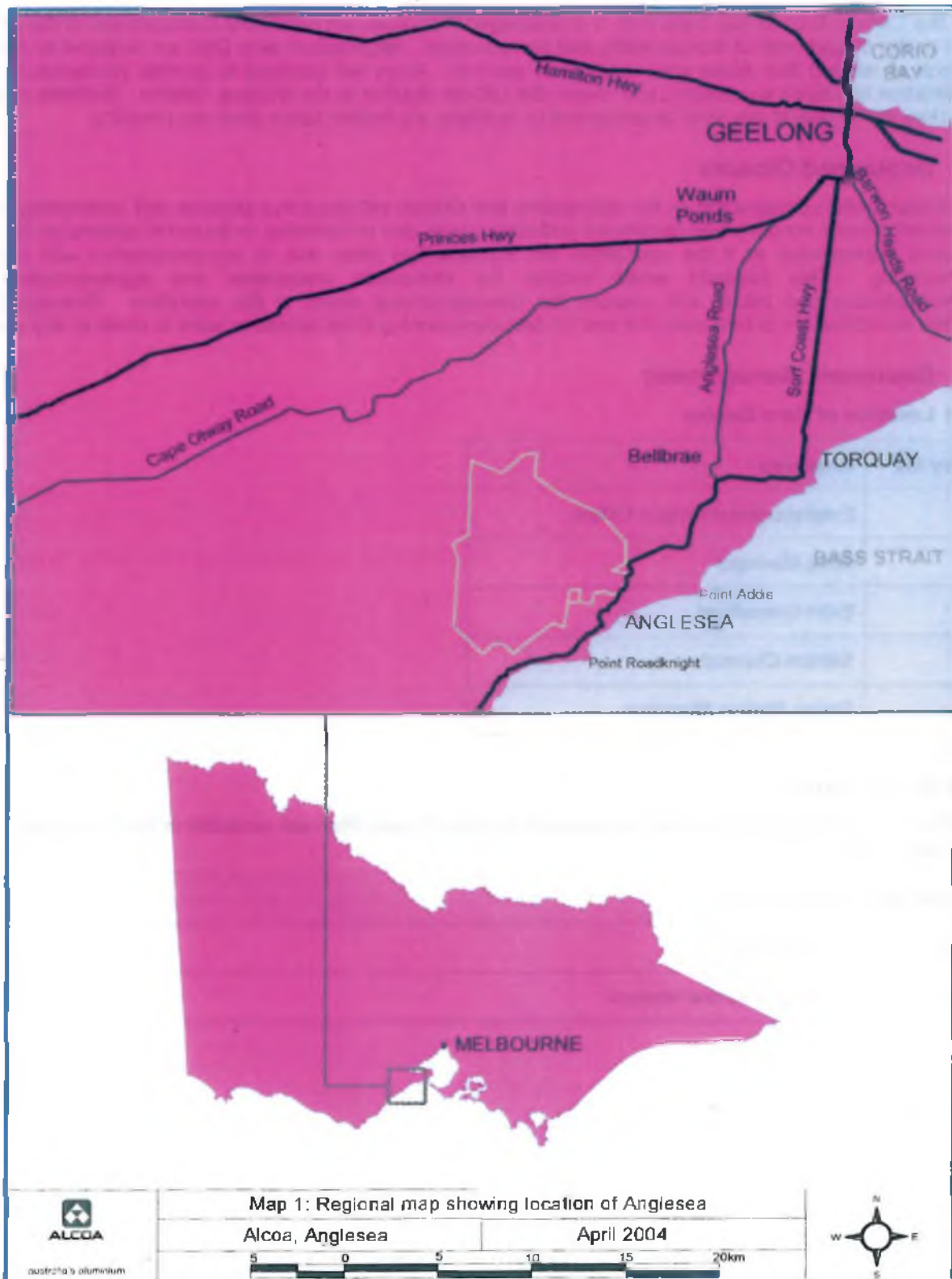
6.12.2 Review History

Note that complete copies of previous versions of the Site Closure Plan are available in the Controlled Document area.

Review Date	Comments
2004	Initial Plan
2005-09	Reviewed and revised



Appendix I: Locality Map

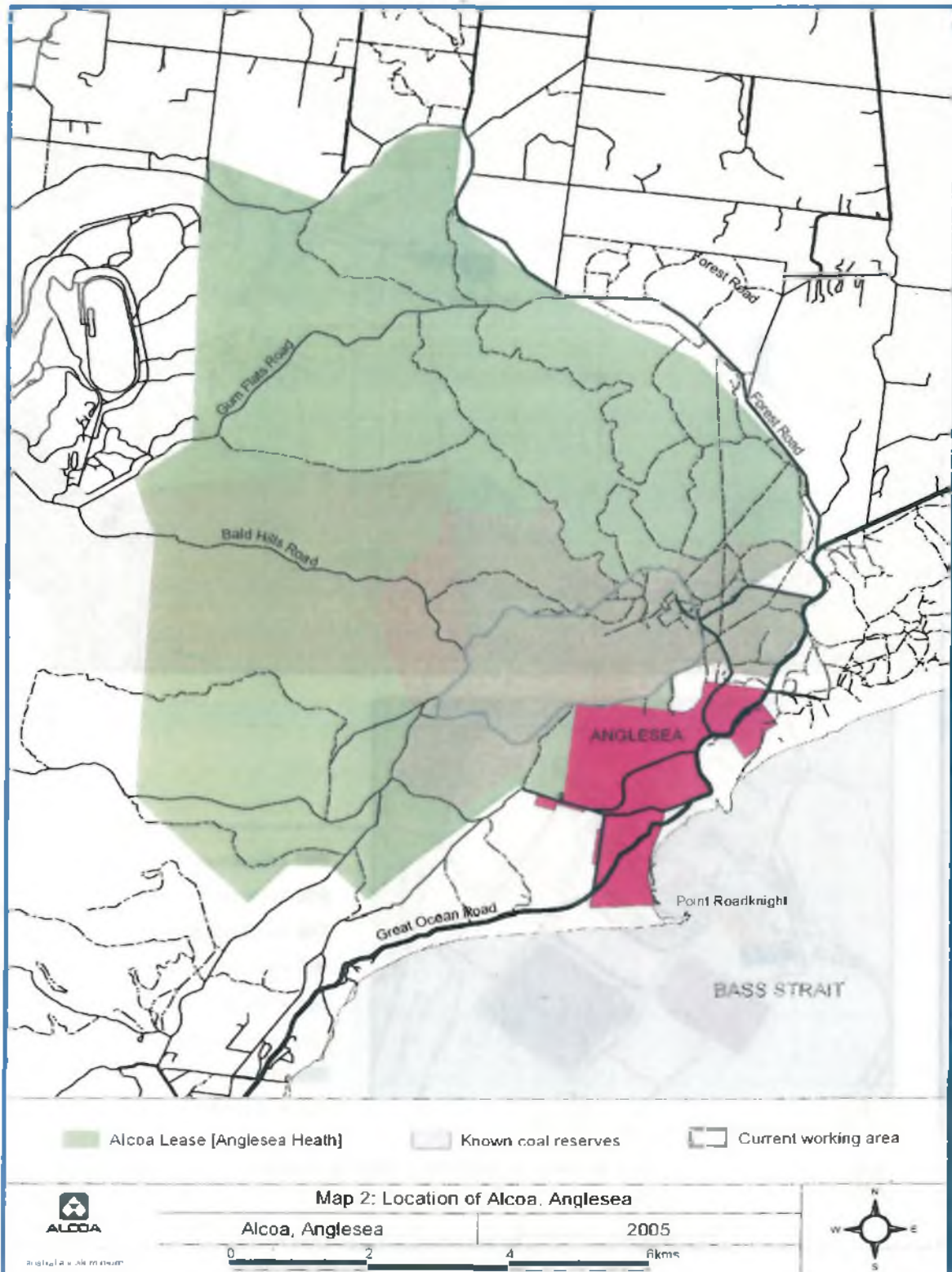


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Appendix II: Lease Area

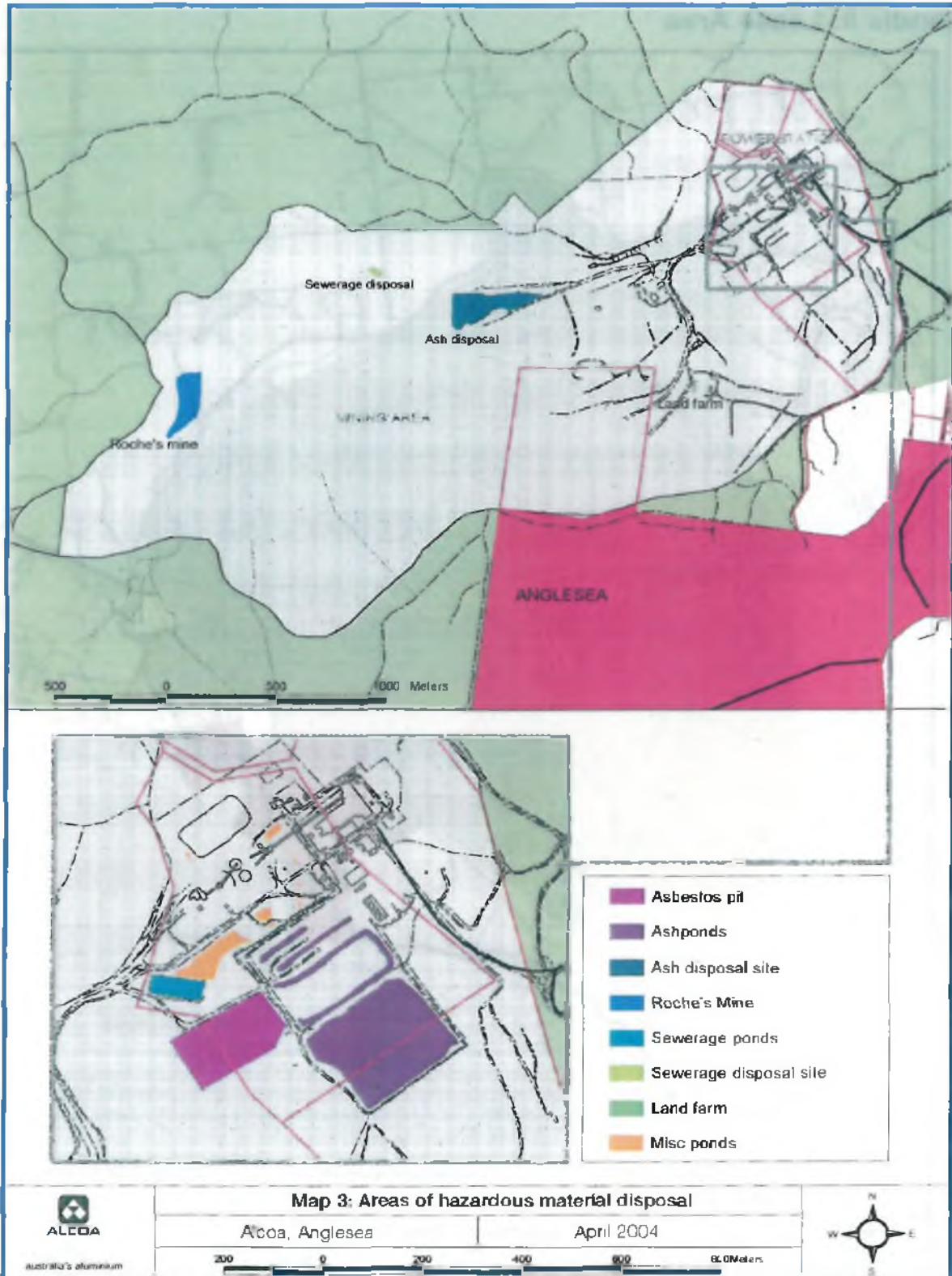


Production Mining/Land Management

Alcoa Anglesea Site Closure Plan





Appendix III: Areas of Hazardous Waste Disposal



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ALCOA – ANGLESEA MINE

GROUND CONTROL MANAGEMENT PLAN

Approvals		
<i>Signed copy to be held in Anglesea Mine Office</i>		
Mine Manager	(signed) 	(date) 25/02/2011
Mine Supervisor	(signed) 	(date) 25/02/2011

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- B. Bureau of Meteorology
- C. Site Geotechnical Log

EXECUTIVE SUMMARY

Alcoa's Anglesea mine is located at Anglesea, on the south western Peninsula, approximately 35 kilometres from Geelong. The Anglesea Mine supplies coal to the Anglesea Power Station since its inception in 1969. The mine has been operating since 1961 and is an open-cut mine approximately 100 metres deep.

This *Ground Control Management Plan (GCMP)* is intended to guide Alcoa's management of geotechnical hazards by providing a framework for which the Mine Manager can implement strategies and delegate tasks related to geotechnical hazard management. In reading this *GCMP* it is important that notice be taken of the requirements (roles and responsibilities) of each individual party.

The *GCMP* is structured as follows:

Design – Geotechnical hazard control at the *Design* stage aims to prevent or minimise geotechnical hazards by considering geotechnical issues at the various stages of mine design.

Implementation – Geotechnical hazard control at the *Implementation* stage ensures that geotechnical considerations of mine designs are put into practice during mining operations.

Verification – Geotechnical hazard control at the *Verification* stage aims to verify that designs have been implemented and are operating within acceptable geotechnical constraints, by applying reviews, monitoring and other checks.

Geotechnical Hazard Management – Geotechnical hazard control at the *Hazard Response* stage aims to maintain safe operating conditions after a geotechnical hazard has been identified.

Reporting & Auditing – Each aspect of the *GCMP* requires that processes are documented and reported. Audits will be carried out as specified in the *GCMP*.

Training - Geotechnical hazard control at the *Training* stage aims to ensure that all personnel who have responsibilities under this *GMS* have the appropriate skills and knowledge to carry them out.

The *GCMP* document must be clearly and regularly communicated to all open pit personnel and be a readily accessible document for all.

1 INTRODUCTION

This Ground Control Management Plan (GCMP) is for use within Alcoa's Anglesea Mine for management of geotechnical hazards within the mine. Geotechnical hazards may be associated with (but are not limited to) the following: pit slopes, stock piles, spoils, waste dumps and any soil/rock material used for retention; i.e. dams or tailings facilities.

The GCMP formalises the management of geotechnical hazards at the Anglesea Mine. This is achieved by identifying, managing, communicating and documenting geotechnical hazards.

1.1 Scope

The document scope is to describe how slope geotechnical management is carried out at the Anglesea Mine in order to prevent geotechnical hazards, identify geotechnical hazards, reconcile actual versus design, and communicate geotechnical hazard issues. This GCMP also defines processes for the management of geotechnical hazards of waste dumps and stockpiles.

1.2 Background

Anglesea Mine has been operating since 1961, and currently supplies coal to the Anglesea Power Station; that opened in 1969. Various consultants have assisted the Anglesea Mine over the years, with BFP Consultants providing geological, mining and geotechnical engineering support for the mine from 1997 to 2005. Numerous reports regarding the slope failures and monitoring assessments were produced. From mid 2005 to mid 2009, Coffey Mining provided the mine planning and geotechnical engineering support, including three to six monthly geotechnical inspections and slope monitoring reporting. Since 2009, Mining One Consultants have been providing support to the Anglesea Mine in mine planning and geotechnical support as required.

1.3 Legislative Framework

Mine Legislation in Victoria is controlled by the State Government of Victoria and administered by the Department of Primary Industries (Victoria). WorkSafe Victoria administers OH&S (Occupation Health and Safety). Relevant Victorian legislation applying to this matter, including subordinate legislation where not specifically mentioned includes, but without being limited to:

- Environmental Protection Act 1997;
- Mineral Resources Act 1990;
- Mineral Resources Sustainable Development Act 1990 (MRSD Act)
- Mineral Resource Development Regulations 2002;
- Mines Act 1958;
- Occupational Health and Safety Act 2004;
- Occupational Health and Safety Regulations 2007; and
- Water Act 1989.

In addition to the above, where practical, relevant Australian and International Standards, Codes and Best Practices should be followed.

1.4 Roles and Responsibilities

The Mine Manager is responsible for:

- Implementation, updating and periodic review of at the GCMP at the Anglesea Mine;
- Day to day application of the GCMP;
- Communication of the GCMP;
- Delegation of tasks under the GCMP to relevant stakeholders; and
- Review of the GCMP; annually or more frequently as required.

The following table (*Table 1.1*) sets out the tasks required to be undertaken and the corresponding roles and responsibilities.

Table 1.1 Roles and Responsibilities

Task	Sub-Task	Role	Responsibility*
Prisms	Surveying	Contract Surveyor	N Brockman
GPS Monitoring Pins	Surveying	Contract Surveyor	N Brockman
Piezometers	Readings	Mine Supervisor/Delegate	N Brockman
Rain Gauges	Readings	Mine Supervisor/Delegate	N Brockman
Inclinometers	Readings	Mine Supervisor/Delegate	N Brockman
Berm and Batter	Inspections	Mine Supervisor	N Brockman
Slope Failures	Site Geotechnical Log	Mine Manager/Mine Supervisor	Chris Rolland/N Brockman
Hazard (Potential) Identification	Visual	All Personnel	All Personnel
Risk Assessment Process	Site Geotechnical Log	Mine Manager	Chris Rolland
Geotechnical Analysis	Prism Data	Geotechnical Consultant	Mining One
	GPS Data		
	Piezometer Data		
	Rainfall Data		
	Inclinometer Data		
	Berm and Batter Inspections Notes		
Slope Change	Design	Geotechnical Consultant	Mining One
Slope Change	Approval	Mine Manager	Chris Rolland
Operational Pit Changes	Approval	Mine Manager	Chris Rolland
Slope Design	Validation of Constructed vs Design	Mine Supervisor	N Brockman
Training	Organisation	Mine Manager	Chris Rolland
Auditing	12 Month Review	Mine Manager	Chris Rolland
GCMP	Review/Changes	Geotechnical Consultant	Mining One

* as at September 2010

1.5 Geological Setting

The Anglesea Mine is located within a coastal environment. An early Tertiary age sedimentary sequence up to 140 metres thick hosts two potentially economic seams of brown coal. The Upper Seam is being mined at present and generally exhibits a close to flat dip in the current

mining area. The Lower Seam is made up of three separate coal seams, separated by layers of inter-seam clay.

The overburden material consists of fine sands, silty sand, silty clay and clayey silts. The overburden is approximately 70 metres thick and exhibits soil like characteristics.

2 DESIGN

Design is a term used to describe the action where a required outcome is realised through the implementation of defined principles to achieve an outcome. The design in this case is the determination of open pit slope geometry; such as batter angle, batter height, berm width, etc.

Incorporating geotechnical hazard control at the *Design* stage aims to prevent or minimise geotechnical hazards by considering geotechnical issues at the various stages of mine design.

The design process is dictated by the geotechnical and geological parameters of the Anglesea Mine site. The design, in terms of slope geometry, is set out in *Appendix A*.

2.1 Slope Design Requirements

Slope stability is typically defined in terms of Factor of Safety (FoS) and Probability of Failure (PoF). Factor of Safety (FoS) is a ratio between stabilising and destabilising net effects acting on an object. Theoretically a FoS less than 1.0 will fail; conversely a FoS greater than 1.0 will be sustained in equilibrium. A Probability of Failure (PoF) represents the likelihood of failure.

When slope stability is undertaken, industry best practice is used to define the required FoS/PoF combination.

2.2 Geotechnical Slope Design Parameters

The current slope design configuration used for the determination of slope geometry is listed in *Appendix A*. These parameters are to be used for designing and checking mine slope angles. These parameters in *Appendix A* should be regularly compared with the current mining practices to ensure compliance.

2.3 Geotechnical Strength Parameters

The following table is a summary from Coffey Mining Report *MINENHIL00024AF* (Ref. 1), which summarises material parameters for materials encountered at Anglesea Mine.

Table 2.1 Laboratory testing Results – Coffey Mining Report MINENHIL00024AF (Ref. 1)

Soil Type	Test type	Cohesion (kPa)	Friction Angle (degrees)	Dry Density (t/m ³)	Sample Location
Lignite	Direct Shear	50	20	NA	BH3, 22m RL
Lignite	Triaxial	10	15	1.3	Hole 762 26m DH (1999)
Lignite	Direct Shear	150	18	1.9	Hole 770 35.5mRL
Sandy Clay	Triaxial	24.5	24	1.5	Hole 763 30mRL
Sandy Clay/Coal Interface	Direct Shear	85	16	NA	Hole 763 5.1mRL
Silty Clay	Triaxial	235	4	1.3	BH3, 19m RL
Silty Clay	Triaxial	19.6	32	1.3	Hole 764 18.8mRL
Silty Clay	Triaxial	15	18	1.2	Hole 762 13mRL
Silty Clay	Triaxial	30	28	1.7	Hole 762 7mRL
Silty Clay	Triaxial	20	21	1.5	Hole 763 16.6mRL
Silty Sand	Triaxial	20	31	1.6	BH3, 37m RL

The following geotechnical design parameters were used by Coffey Mining when completing slope stability analysis for the south-west wall in 2009:

Table 2.2 Material Properties – Coffey Mining (Ref. 1)

[Used by Coffey Mining for Slope Stability Analysis of the south-west wall]

Material	Unit Weight (kN / m ³)	Cohesion (kPa)	Friction Angle (degrees)
Coal	15	30	27
Silty Sand	16	20	31
Silty Clay	14	21	25
Clayey Silt	14	21	25
Fine Sand	16	20	31
Floor Seam – Wet Clay	15	0	10

2.4 Geotechnical Considerations for Design

Geotechnical issues to be considered with regards to the long term stability of the pit are:

- Circular failure of the overburden and waste dumps material; and
- Wall failures through rock mass, or along rock structures, including deep seated block sliding along the base of the upper coal seam.

2.5 Seismic Criteria

Seismic inputs into a design account for the effects of earthquake motion on stability. According to Geosciences Australia – Earthquake Hazard Map of Australia 1991 (Ref. 2); the Anglesea area is in a 0.10 g acceleration zone. Slope design should consider seismic acceleration as part of the design process.

2.6 Hydrology and Hydrogeology

Rainfall in the Anglesea area is approximately 800 to 830 mm annually (*Appendix B*). Higher rainfall periods are between May and October. However it is not unusual to experience higher rainfall outside of these periods. Slope movements at Anglesea have not been linked to high rainfall events.

Further information on the Hydrology and Hydrogeology can be found in the

2.7 External Influences on Ground Control

Any external influence which is thought to adversely affect the stability of the wall should be geotechnically assessed as part of designs. These influences may include, but are not limited to;

- Waste dumps being designed near pit wall limits;
- Structures erected in the proximity of the pit limits;
- Water pooling at the crest of a slope; and
- Excess pore water pressure identified behind a slope.

3 IMPLEMENTATION

The implementation of the *GCMP* is through a systematic approach. Listed below are the required checks that are to be performed at specified/required intervals.

3.1 Change Integration

3.1.1 Slope Design

At times, there may be a requirement for the geometry of the pit to change to accommodate certain aspects of mining and/or the elimination of a geotechnical hazard. If a change from the current design practice is required, the design change must be reviewed for geotechnical compliance. Situations where the slope design may need to be changed are:

- Movement of access ramps;
- Reduction/increase of angles to facilitate change of mining direction;
- To provide bunding/buttrussing in unstable areas;
- Increase catch protection on berms for rilling and/or rock falls; and
- Allowance for further monitoring devices.

Most often, major design changes will be undertaken off site by specialist designers. Input data from on-site is required to provide current information about the site conditions. Slope design changes must be reviewed by the Geotechnical Consultant and signed off and approved by the Mine Manager.

3.1.2 Operation Changes to Pit Designs

An operation change can be described as a change in the method of day to day execution of mining. Operation changes can include a variety of changes, too numerous to list. However the process is similar to pit design changes in that any geometry change must be designed and approved for use by the Mine Manager.

4 VERIFICATION

Verification is the process where an external/independent body reviews work for process and technical correctness. Verification can also include the back analysis of failures for comparison against geotechnical assumptions.

4.1 Site Monitoring Plan

Geotechnical monitoring is required to gather data on slope movement (direct measurement of slope response), and slope stability influences (indirect aspects, such as rainfall and piezometric levels). Each item of collected data listed below must be interpreted in conjunction with each other, along with considerations of mining activity and location, as, quite often each set of monitoring data are interlinked.

The following table (*Table 4.1*) lists the currently required monitoring frequency that should be used for the various available instruments. More frequent monitoring may be required from time to time depending on interpretation of the data, and may be directed at the discretion of the Mine Manager, or recommended by the Geotechnical Consultant.

Table 4.1 Monitoring Frequency

Slope Monitoring Instrument	Monitoring Frequency
Survey Prisms	Fortnightly
GPS Pins	Every two months
Inclinometers	Every third month
Piezometers	Monthly

4.2 Design Validation

4.2.1 Geotechnical Parameters

The validation of the geotechnical parameters used in design models can be realised through the back analysis of failures. A completed back analysis of failures using the 'current' geotechnical design parameters should be compared with the field case. If there is a discrepancy, a review of the parameters should be undertaken to ensure that they are reflective of the in-situ scenario.

4.2.2 Geological Model

A Geological Model is created from drill hole data and localised mapping of the area. As the excavation is undertaken, variances from the Geological Model may become apparent. These changes should be updated in the Geological Model. A constantly updated Geological Model can assist in helping to define limits of boundaries and excavations.

4.2.3 Hydrogeological Model

A major influence on slope stability is the presence of water and the effect thereof. Therefore it is important that constant monitoring of all measuring devices is undertaken to constantly redefine the Hydrogeological Model. The level of a water table will rise and fall with time and it is these changes that must be constantly taken into account within the model.

4.2.4 Survey Prisms

Prisms are a means to detect movement at a point in all three dimensions (Easting, Northing and Reference Level). Readings are taken (in millimetres) using surveying equipment. Prisms can indicate a movement or acceleration of a wall for example.

Prism data is formatted and placed with previous survey data in a database. Review and interpretation of this data is undertaken to highlight any potential issues (irregular movement) and longer term movement trends.

Contract surveyors are responsible for the survey, and sending the data to the Geotechnical Consultant.

Review of prism readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.5 GPS Monitoring Pins

GPS monitoring pins are a means to measure slope movement at locations that are not possible to survey from within the mine. These are typically located around the site, beyond the pit crest and are monitored at regular intervals by the Contract Surveyor.

Review of GPS readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.6 Piezometers

Piezometers are used to measure the location of the groundwater table, or the pressure of confined water. Piezometers should be read at regular intervals as specified in Table 4.1. Rainfall data must be read in conjunction with piezometer data to properly assess the impact of rainfall on slope stability.

Review of piezometer readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.7 Rain Gauges

Rain gauges are an indication of the total rainfall over a selected period of time at a specific location. Rainfall can influence groundwater levels and can cause surface erosion, potentially affecting the slope stability.

Rain gauges must be read daily or more frequently depending on the quantity of rainfall.

Rainfall data must be sent at monthly intervals, or more frequently if required, to the Geotechnical Consultant for interpretation with piezometer and other data.

Review of rain gauge readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.8 Inclinometers

Inclinometers are used to measure lateral displacement within boreholes drilled into a slope. Inclinometers should be periodically read by the Mine Supervisor and sent to the Geotechnical Consultant for interpretation.

Review of inclinometer readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.9 Berm and Batter Inspections

Berm inspections involve the regular walk-over and visual inspection of the catch berms and pit slopes. The inspections are used to record the following:

- Cracking on berms and pit crests;
- Crest damage or crest loss;
- Excessive rilling;
- Rock fall (pieces of rock falling from wall);
- Ponded water;
- Loss of berm access; and
- Failure of catch fences, bunding, safety infrastructure.

Berm inspections will be carried out daily by the Mine Supervisor and will be documented in a Mine Inspection Log. Anomalous conditions will be reported to the Mine Manager, who may at his discretion obtain advice from the Geotechnical Consultant on implications for mine safety.

All personnel working within the mine are required to assess their work areas for safety issues, including the state of berms and batters. Conditions of concern must be reported to the Mine Supervisor, who will then assess, record and report the conditions as specified above for the daily inspection.

The Geotechnical Consultant will visually inspect and assess conditions as part of their six monthly review.

4.3 Data Collection

Data collection involves ongoing collection of technical information that is required for compliance with geotechnical design and verification. Data collection comes in various forms and, includes information from the above *Site Monitoring Plan* and specialist data collection techniques.

4.3.1 Geotechnical and Geological Mapping

Geotechnical Mapping is a term used to describe the collection of geotechnical data from exposures of rock and soil. The fundamental purpose of geotechnical mapping is:

- Increase knowledge of ground conditions within the mine site;
- Collect data for use in analysis; and
- Verify current geotechnical and geological models.

Geotechnical mapping at Anglesea mine is not undertaken often, due to the consistent nature of the materials encountered.

4.3.2 Laboratory Testing

Laboratory testing is a process where samples from the field are taken and tested according to defined standards. The results are used to define the material parameters in a slope design.

Samples will be collected for laboratory testing as deemed necessary by the Geotechnical Consultant for slope design purposes. This would typically be done during any diamond drilling investigations.

The Geotechnical Consultant will select samples, specify test types, and interpret and report results to the Mine Manager. Testing will be carried out to appropriate standards by a NATA registered laboratory.

4.3.2.1 Rock

Laboratory testing of rock should be undertaken when there is insufficient data and/or a new lithology is encountered; where there is insufficient data for a basis of design. Laboratory testing of rock is the best means to determine the relevant properties for design and analysis. Some commonly used tests are:

- Direct shear testing of rock defects;
- Uniaxial compressive strength (UCS);
- Young's Modulus of Elasticity and Poisson's Ratio;
- Brazilian tensile test; and
- Porosity, density and permeability.

Due to the materials encountered at Anglesea Mine these tests are not often performed.

4.3.2.2 Soil

Laboratory testing involves the collection of samples from representative materials throughout the site for compliance with the design parameters being used. The nature of the Anglesea mine dictates that the thick overburden, of fundamentally soil like material, and the basal clay seam at the base of Upper Coal Layer will be two of the determining factors in slope design.

Laboratory testing can include the following tests:

- Moisture content;
- Consolidation tests;
- Triaxials;

- Permeability; and
- Atterbergs.

These tests can be used in establishing base parameters and programmed testing can lead to a full model being produced for highlighting differences with the open pit area.

4.3.3 Recording of Slope Failures

A slope failure database is very important for understanding issues that lead to failures, thereby helping to prevent similar failures in the future. With the recorded data, the event can be back analysed to further understanding and apply this knowledge to future design.

Slope failures must be recorded by the Mine Supervisor as part of the *Site Monitoring Plan (Section 4.1)*. All slope failures should be thoroughly investigated by the Geotechnical Consultant and reported to the Mine Manager. The extent of investigations will be determined by the Geotechnical Consultant according to industry best practice standards as appropriate for the type and scale of failure.

5 GEOTECHNICAL HAZARD MANAGEMENT

A hazard may be defined by a potential/concurrent incident that can cause the loss of operational controls; with respect to both human and inanimate objects.

5.1 Geotechnical Hazard Awareness

Regular communication and training is required to be given to all mine personnel about geotechnical hazards and controls that are in place to manage them. Further, if required a map within the mine office should be utilised to highlight any geotechnical hazards within the mine site and their controls.

5.2 Geotechnical Hazard Detection

The detection of geotechnical hazards before they present as slope failures is important. Integrated with the *Site Monitoring Plan*, hazard detection involves identifying a potential hazard before it becomes an event. Through the monitoring of the installed slope monitoring equipment, with analysis of the data, potential hazards can be detected in some circumstances.

5.3 Risk Matrix

A risk matrix is used to rate risks according to their Likelihood and Consequence. The following table below is the risk matrix to classify identified Geotechnical Hazards in terms of risk and is based on the Australian Standard for risk assessment, (Ref. 3):

Table 5.1 Risk Matrix

Probability	Consequences				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost Certain	Critical	Critical	Critical	High	Medium
Likely	Critical	Critical	High	Medium	Medium
Possible	Critical	High	High	Medium	Low
Unlikely	High	High	Medium	Low	Low
Rare	High	Medium	Low	Low	Low

The above table (*Table 5.1 – Risk Matrix*) must be applied to each identified hazard, by selecting a consequence and likelihood according to the Standard.

This risk matrix is designed to work in conjunction with the *Site Geotechnical Log* (See Section 5.9). The log is designed to identify the risk, classify the risk and describe actions to minimise the risk.

5.4 Risk Assessment Process

Geotechnical risk assessments must be conducted by the Mine Manager, who may obtain advice from, or delegate the process to the Geotechnical Consultant.

Geotechnical risk assessments will be carried out for identified geotechnical hazards as frequently as required to assess the current nature of the risk. For example, if the likelihood or the consequence were to increase, the risk must be re-assessed.

The Mine Manager must implement all controls specified in the risk assessment.

5.5 Hazard Classification

The classification of hazards must be separated between loss of life and/or injury to the loss of operational control at the mine. A classification rating should be given to every hazard identified. The classification is based upon the likelihood and consequence of the hazard; using *AS/NZS ISO 31000:2009* as a basis and replacement for *AS/NZS 4360-2004*.

To simplify the classification system for a real time application, the following can be applied to identify hazards for classification into broad groups:

Table 5.2 Hazard Classification

Hazard Level	Description	Action
LOW	Low likelihood and probability of failure	Continue monitoring and review
MEDIUM	Moderate consequence and possibility of failure	Some action may be required usually within 24 hours, continuing improvement to reduce hazard level
HIGH	High consequence and likely to fail	Cordoning off area, restricting movement, action plan to reduce and negate failure
CRITICAL	Catastrophic consequences with near certain failure	Immediate action required, i.e. evacuation

5.6 Hazard Communication

Hazards must be communicated to all personnel working within the mine by appropriate means such as verbal briefings and notices on safety boards. Further, if required to or directed to by Responsible Authorities communication must be an open dialogue. Responsible Authorities may include:

- Department of Primary Industries;
- Country Fire Authority;
- Department of Sustainability and Environment;
- Environmental Protection Agency;
- Water and Catchment Management Authorities; and
- Vicroads and Department of transport.

5.7 Hazard Prevention

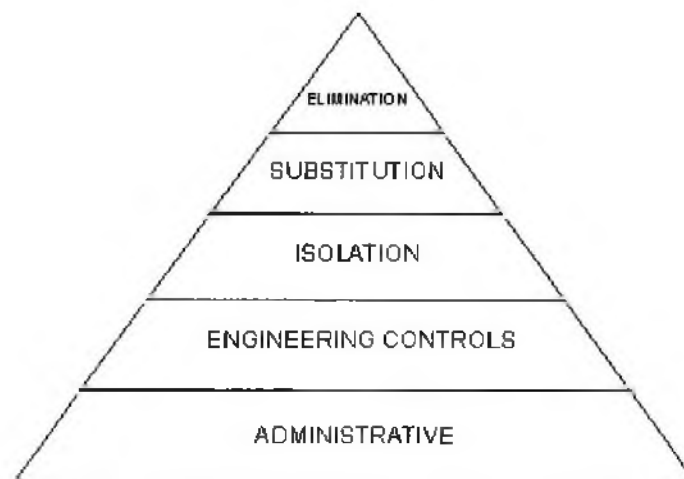
The prevention of hazards is the best engineering control that can be used. Through a systematic approach including geotechnical design, and verification (*Site Monitoring Plan* and *Data Collection* with analysis of data); potential hazards can be realised and prevented. The preventative measures required vary according to the likelihood and consequence of the failure.

5.8 Geotechnical Hazard Mitigation

Hazard mitigation involves reducing the consequences of a potential failure. If a hazard cannot be eliminated, operational and engineering controls must be put into place to reduce or eliminate the consequences of the hazard.

The following hierarchy of control can be applied to the mitigation of hazards:

Figure 5.1 Hierarchy of Control



Elimination – The hazard can be mined out or removed from the mine site

Substitution – Modifications to the pit design and changes of operational procedures

Isolation – The cordoning off of an area to restrict access, using a variety of methods such as windrows, bollards, fencing, etc.

Engineering Controls – Altered slope design to improve stability, such as providing buttressing or catch berm capacity, safety berms, or improving knowledge of slope responses using additional monitoring equipment.

Administrative – Communication of Geotechnical Hazards, geotechnical reporting and Job Safety Analysis (JSA) for one such example.

5.9 Risk Register – Site Geotechnical Log

A Geotechnical Risk Register must be kept on site at all times. This risk register is incorporated into the *Site Geotechnical Log* for simplicity and efficiency. The *Site Geotechnical Log* will be built up over time and have a close out process.

The close out process illustrates that action has been taken to reduce the risk classification level. *Appendix C* contains an example of the system used at Anglesea Mine.

6 REPORTING

Reporting is a required part of the *Ground Control Management Plan*. A fully documented system that records all facets covered within the GCMP must be maintained for future auditing and analysis. Reporting frequency and intensity must be conducted at the discretion of the Mine Manager.

Listed below are examples of types of reports that should be produced and information contained there within. These are described throughout the GCMP in their relevant sections and are summarised here.

6.1 Geotechnical Site Log

A Geotechnical Site Log, as described in *Section 5.9*, is used to list all of the geotechnical hazards found on the site. Hazards will have been identified and given a risk rating accordingly. The site log is required to document all geotechnical hazards at the site. The required information to be included in the report is, as a minimum:

- Date of hazard identified;
- Location;
- Detailed description of the hazard;
- Risk rating;
- Recommended actions and controls (remediation of the hazard);
- Post remediation risk rating; and
- Additional comments.

Appendix C is an example of a Geotechnical Site Log with a Risk Classification System.

6.2 Reporting Responsibilities

The following table (*Table 6.1*) sets out the reporting requirements of this GCMP and the parties responsible.

Table 6.1 Reporting Responsibilities

Report	Role	Responsibility*
Geotechnical Site Log	Mine Manager	Chris Rolland
Mine Inspection Log	Mine Manager/Mine Supervisor	Chris Rolland/ Nick Brockman
Six Monthly Geotechnical Reviews	Geotechnical Consultant	Mining One

*as at September 2010

7 TRAINING

The training and further profession development of all personnel; on-site is imperative. Keeping up to date with changes in Legislation and Codes of Practice(s) is the easiest way to implement any change. With regards to *Ground Control Management Plan* it is recommend that a training seminar be carried out to inform personnel of the possible risks regarding geotechnical hazards.

Having trained personnel on staff will relieve the work load of one person; and result in a greater knowledge of hazards identification and awareness. It is the responsibility of the Mine manager to mandate that all personnel undertake training to fully understand the relevance and importance of this document. The application of ground management is not the responsibility of one person, but a collective team effort.

8 AUDITING

Periodic audits of geotechnical hazards and hazard control processes must be carried out at regular intervals by an external specialist. Items that must be addressed in each audit are:

- Overall site geotechnical conditions and geotechnical hazard management;
- Review of geotechnical ground control management;
- Data review and monitoring review;
- Stability and soundness of geotechnical geometry;
- Implementation of the GCMP;
- Compliance with this GCMP;
- The effectiveness and validity of this GCMP; and
- Responsibilities and accountabilities are being met.

This document, along with all Alcoa documents relevant to Ground Control at the Anglesea Mine, should be reviewed every twelve months or as specified by the Mine Manager.

9 REFERENCES

1. Coffey Mining, January 2009, "Anglesea Coal Mine SW Corner Slope Stability Analysis" Report No. MINENHIL00024AF.
2. McCue, K., (compiler), Gibson, G., Michael-Leiba, M., Love, D., Cuthbertson, R., & Horoschun, G., 1993, "Earthquake hazard map of Australia, 1991" – Geosciences Australia
3. Committee OB-007, 20 November 2009, "Risk Management – Principles and Guidelines" (AS/NZS ISO 31000:2009)

Appendix A

Alcoa – Anglesea Mine

Slope Design Parameters

Summary of Overburden Slope Design Parameters, Recommendations & Measurements		Anglesea Coal Mine (1979-1997)	BFP Consultants (1997)	Anglesea Coal Mine (1997 - 2005)	Anglesea Coal Mine present	2009 Survey	
						Re-entrant No 1	Re-entrant No 2
Batter Angle	Above Haul Road	37°	25°	30°	30°	24.3°	26°
	Below Haul Road	45°	45°	45°	33.7°	42.3°	34.2°
Berm Width	Above Haul Road	5m	5m	Varies	Varies	8.5 & 11.8m	8m
	Below Haul Road	5m	5m	5m	Nil *	3m (silted)	6m
Batter Height	Above Haul Road	12m	12m	Varies	Varies	5, 14 & 18m	12 & 14m
	Below Haul Road	12m	12m	Varies	Varies	13 & 20m	34m
Intermediate Angle	Above Haul Road	29.7°	21.3°	21.3°	21.3°	19.5°	23.2°
	Below Haul Road	35.2°	35.2°	35.2°	33.7°	42.3°	34.2°

- Notes:**
1. 1979 design for upper batters was for 5m berms spaced at 12m vertical intervals, graded to run water at 1 in 125. Batter angle was 1 in 1½ or ~37°. The grade was later steepened to 1 in 100.
 2. At some stage, the grading was reversed to run water to the west. This combined with the varying lengths of the berms resulted in the vertical spacing necessarily departing from the original 12m.
 3. As a practical result of the BFP Consultants recommendations, a uniform batter angle of 30° was adopted, and the berm width was made variable (that is, greater than 5m) to enable an overall batter angle <25° to be achieved as the height varied with the natural surface topography.
 4. In 2005 it was decided to reverse the drainage direction of the haulage berm again. This was achieved by placing fill on the western end of the berm. It was felt that this was safe as there would still be no significant amount of clay below the berm.
 5. It was found impractical to maintain drainage on the berms below the haulage level. The resulting batter erosion could not be effectively repaired as the natural angle of repose of local material is flatter than the 45° batter angle. A slope of 1 in 1.5 or ~33.7° was adopted for planning purposes.

Appendix B

Rainfall Data – Anglesea Area

Bureau of Meteorology

Site Geotechnical Log

Example

DOCUMENT INFORMATION

Status Draft
Version A
Print Date -
Author(s) Christopher Ralph, Ben Roache
Reviewed By David Lucas
Pathname P:\1347_G Alcoa Anglesea Contract\Tech\Geotechnical\GCMP
File Name 2431.doc
Job No 1347_G
Distribution PDF emailed to client for review

DOCUMENT CHANGE CONTROL

Version	Description of changes/amendments	Author (s)	Date
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DOCUMENT REVIEW AND SIGN OFF

Version	Reviewer	Position	Signature	Date
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17 APPENDIX F – GROUND CONTROL MANAGEMENT PLAN

ALCOA – ANGLESEA MINE

GROUND CONTROL MANAGEMENT PLAN

Approvals			
<i>Signed copy to be held in Anglesea Mine Office</i>			
Mine Manager	(signed)		(date) 25/02/2011
Mine Supervisor	(signed)		(date) 25/02/2011

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Figure 5.1 Hierarchy of Control

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- B. Bureau of Meteorology
- C. Site Geotechnical Log

EXECUTIVE SUMMARY

Alcoa's Anglesea mine is located at Anglesea, on the south western Peninsula; approximately 35 kilometres from Geelong. The Anglesea Mine supplies coal to the Anglesea Power Station since its inception in 1969. The mine has been operating since 1961 and is an open-cut mine approximately 100 metres deep.

This *Ground Control Management Plan (GCMP)* is intended to guide Alcoa's management of geotechnical hazards by providing a framework for which the Mine Manager can implement strategies and delegate tasks related to geotechnical hazard management. In reading this *GCMP* it is important that notice be taken of the requirements (roles and responsibilities) of each individual party.

The *GCMP* is structured as follows:

Design – Geotechnical hazard control at the *Design* stage aims to prevent or minimise geotechnical hazards by considering geotechnical issues at the various stages of mine design.

Implementation – Geotechnical hazard control at the *Implementation* stage ensures that geotechnical considerations of mine designs are put into practice during mining operations.

Verification – Geotechnical hazard control at the *Verification* stage aims to verify that designs have been implemented and are operating within acceptable geotechnical constraints, by applying reviews, monitoring and other checks.

Geotechnical Hazard Management – Geotechnical hazard control at the *Hazard Response* stage aims to maintain safe operating conditions after a geotechnical hazard has been identified.

Reporting & Auditing – Each aspect of the *GCMP* requires that processes are documented and reported. Audits will be carried out as specified in the *GCMP*.

Training - Geotechnical hazard control at the *Training* stage aims to ensure that all personnel who have responsibilities under this *GMS* have the appropriate skills and knowledge to carry them out.

The *GCMP* document must be clearly and regularly communicated to all open pit personnel and be a readily accessible document for all.

1 INTRODUCTION

This Ground Control Management Plan (GCMP) is for use within Alcoa's Anglesea Mine for management of geotechnical hazards within the mine. Geotechnical hazards may be associated with (but are not limited to) the following: pit slopes, stock piles, spoils, waste dumps and any soil/rock material used for retention; i.e. dams or tailings facilities.

The GCMP formalises the management of geotechnical hazards at the Anglesea Mine. This is achieved by identifying, managing, communicating and documenting geotechnical hazards.

1.1 Scope

The document scope is to describe how slope geotechnical management is carried out at the Anglesea Mine in order to prevent geotechnical hazards, identify geotechnical hazards, reconcile actual versus design, and communicate geotechnical hazard issues. This GCMP also defines processes for the management of geotechnical hazards of waste dumps and stockpiles.

1.2 Background

Anglesea Mine has been operating since 1961, and currently supplies coal to the Anglesea Power Station; that opened in 1969. Various consultants have assisted the Anglesea Mine over the years, with BFP Consultants providing geological, mining and geotechnical engineering support for the mine from 1997 to 2005. Numerous reports regarding the slope failures and monitoring assessments were produced. From mid 2005 to mid 2009, Coffey Mining provided the mine planning and geotechnical engineering support, including three to six monthly geotechnical inspections and slope monitoring reporting. Since 2009, Mining One Consultants have been providing support to the Anglesea Mine in mine planning and geotechnical support as required.

1.3 Legislative Framework

Mine Legislation in Victoria is controlled by the State Government of Victoria and administered by the Department of Primary Industries (Victoria). WorkSafe Victoria administers OH&S (Occupation Health and Safety). Relevant Victorian legislation applying to this matter, including subordinate legislation where not specifically mentioned includes, but without being limited to:

- Environmental Protection Act 1997;
- Mineral Resources Act 1990;
- Mineral Resources Sustainable Development Act 1990 (MRSD Act)
- Mineral Resource Development Regulations 2002;
- Mines Act 1958;
- Occupational Health and Safety Act 2004;
- Occupational Health and Safety Regulations 2007; and
- Water Act 1989.

In addition to the above, where practical, relevant Australian and International Standards, Codes and Best Practices should be followed.

1.4 Roles and Responsibilities

The Mine Manager is responsible for:

- Implementation, updating and periodic review of at the GCMP at the Anglesea Mine;
- Day to day application of the GCMP;
- Communication of the GCMP;
- Delegation of tasks under the GCMP to relevant stakeholders; and
- Review of the GCMP; annually or more frequently as required.

The following table (*Table 1.1*) sets out the tasks required to be undertaken and the corresponding roles and responsibilities.

Table 1.1 Roles and Responsibilities

Task	Sub-Task	Role	Responsibility*
Prisms	Surveying	Contract Surveyor	N Brockman
GPS Monitoring Pins	Surveying	Contract Surveyor	N Brockman
Piezometers	Readings	Mine Supervisor/Delegate	N Brockman
Rain Gauges	Readings	Mine Supervisor/Delegate	N Brockman
Inclinometers	Readings	Mine Supervisor/Delegate	N Brockman
Berm and Batter	Inspections	Mine Supervisor	N Brockman
Slope Failures	Site Geotechnical Log	Mine Manager/Mine Supervisor	Chris Rolland/N Brockman
Hazard (Potential) Identification	Visual	All Personnel	All Personnel
Risk Assessment Process	Site Geotechnical Log	Mine Manager	Chris Rolland
Geotechnical Analysis	Prism Data	Geotechnical Consultant	Mining One
	GPS Data		
	Piezometer Data		
	Rainfall Data		
	Inclinometer Data		
	Berm and Batter Inspections Notes		
Slope Change	Design	Geotechnical Consultant	Mining One
Slope Change	Approval	Mine Manager	Chris Rolland
Operational Pit Changes	Approval	Mine Manager	Chris Rolland
Slope Design	Validation of Constructed vs Design	Mine Supervisor	N Brockman
Training	Organisation	Mine Manager	Chris Rolland
Auditing	12 Month Review	Mine Manager	Chris Rolland
GCMP	Review/Changes	Geotechnical Consultant	Mining One

* as at September 2010

1.5 Geological Setting

The Anglesea Mine is located within a coastal environment. An early Tertiary age sedimentary sequence up to 140 metres thick hosts two potentially economic seams of brown coal. The Upper Seam is being mined at present and generally exhibits a close to flat dip in the current

mining area. The Lower Seam is made up of three separate coal seams, separated by layers of inter-seam clay.

The overburden material consists of fine sands, silty sand, silty clay and clayey silts. The overburden is approximately 70 metres thick and exhibits soil like characteristics.

2 DESIGN

Design is a term used to describe the action where a required outcome is realised through the implementation of defined principles to achieve an outcome. The design in this case is the determination of open pit slope geometry; such as batter angle, batter height, berm width, etc.

Incorporating geotechnical hazard control at the *Design* stage aims to prevent or minimise geotechnical hazards by considering geotechnical issues at the various stages of mine design.

The design process is dictated by the geotechnical and geological parameters of the Anglesea Mine site. The design, in terms of slope geometry, is set out in *Appendix A*.

2.1 Slope Design Requirements

Slope stability is typically defined in terms of Factor of Safety (FoS) and Probability of Failure (PoF). Factor of Safety (FoS) is a ratio between stabilising and destabilising net effects acting on an object. Theoretically a FoS less than 1.0 will fail; conversely a FoS greater than 1.0 will be sustained in equilibrium. A Probability of Failure (PoF) represents the likelihood of failure.

When slope stability is undertaken, industry best practice is used to define the required FoS/PoF combination.

2.2 Geotechnical Slope Design Parameters

The current slope design configuration used for the determination of slope geometry is listed in *Appendix A*. These parameters are to be used for designing and checking mine slope angles. These parameters in *Appendix A* should be regularly compared with the current mining practices to ensure compliance.

2.3 Geotechnical Strength Parameters

The following table is a summary from Coffey Mining Report *MINENHIL00024AF* (Ref. 1), which summarises material parameters for materials encountered at Anglesea Mine.

Table 2.1 Laboratory testing Results – Coffey Mining Report MINENHIL00024AF (Ref. 1)

Soil Type	Test type	Cohesion (kPa)	Friction Angle (degrees)	Dry Density (t/m ³)	Sample Location
Lignite	Direct Shear	50	20	NA	BH3, 22m RL
Lignite	Triaxial	10	15	1.3	Hole 762 26m DH (1999)
Lignite	Direct Shear	150	18	1.9	Hole 770 35.5mRL
Sandy Clay	Triaxial	24.5	24	1.5	Hole 763 30mRL
Sandy Clay/Coal Interface	Direct Shear	85	16	NA	Hole 763 5.1mRL
Silty Clay	Triaxial	235	4	1.3	BH3, 19m RL
Silty Clay	Triaxial	19.6	32	1.3	Hole 764 18.8mRL
Silty Clay	Triaxial	15	18	1.2	Hole 762 13mRL
Silty Clay	Triaxial	30	28	1.7	Hole 762 7mRL
Silty Clay	Triaxial	20	21	1.5	Hole 763 16.6mRL
Silty Sand	Triaxial	20	31	1.6	BH3, 37m RL

The following geotechnical design parameters were used by Coffey Mining when completing slope stability analysis for the south-west wall in 2009:

Table 2.2 Material Properties – Coffey Mining (Ref. 1)

[Used by Coffey Mining for Slope Stability Analysis of the south-west wall]

Material	Unit Weight (kN / m ³)	Cohesion (kPa)	Friction Angle (degrees)
Coal	15	30	27
Silty Sand	16	20	31
Silty Clay	14	21	25
Clayey Silt	14	21	25
Fine Sand	16	20	31
Floor Seam – Wet Clay	15	0	10

2.4 Geotechnical Considerations for Design

Geotechnical issues to be considered with regards to the long term stability of the pit are:

- Circular failure of the overburden and waste dumps material; and
- Wall failures through rock mass, or along rock structures, including deep seated block sliding along the base of the upper coal seam.

2.5 Seismic Criteria

Seismic inputs into a design account for the effects of earthquake motion on stability. According to Geosciences Australia – Earthquake Hazard Map of Australia 1991 (Ref. 2); the Anglesea area is in a 0.10 g acceleration zone. Slope design should consider seismic acceleration as part of the design process.

2.6 Hydrology and Hydrogeology

Rainfall in the Anglesea area is approximately 800 to 830 mm annually (*Appendix B*). Higher rainfall periods are between May and October. However it is not unusual to experience higher rainfall outside of these periods. Slope movements at Anglesea have not been linked to high rainfall events.

Further information on the Hydrology and Hydrogeology can be found in the

2.7 External Influences on Ground Control

Any external influence which is thought to adversely affect the stability of the wall should be geotechnically assessed as part of designs. These influences may include, but are not limited to;

- Waste dumps being designed near pit wall limits;
- Structures erected in the proximity of the pit limits;
- Water pooling at the crest of a slope; and
- Excess pore water pressure identified behind a slope.

3 IMPLEMENTATION

The implementation of the *GCMP* is through a systematic approach. Listed below are the required checks that are to be performed at specified/required intervals.

3.1 Change Integration

3.1.1 Slope Design

At times, there may be a requirement for the geometry of the pit to change to accommodate certain aspects of mining and/or the elimination of a geotechnical hazard. If a change from the current design practice is required, the design change must be reviewed for geotechnical compliance. Situations where the slope design may need to be changed are:

- Movement of access ramps;
- Reduction/increase of angles to facilitate change of mining direction;
- To provide bunding/buttressing in unstable areas;
- Increase catch protection on berms for rilling and/or rock falls; and
- Allowance for further monitoring devices.

Most often, major design changes will be undertaken off site by specialist designers. Input data from on-site is required to provide current information about the site conditions. Slope design changes must be reviewed by the Geotechnical Consultant and signed off and approved by the Mine Manager.

3.1.2 Operation Changes to Pit Designs

An operation change can be described as a change in the method of day to day execution of mining. Operation changes can include a variety of changes, too numerous to list. However the process is similar to pit design changes in that any geometry change must be designed and approved for use by the Mine Manager.

4 VERIFICATION

Verification is the process where an external/independent body reviews work for process and technical correctness. Verification can also include the back analysis of failures for comparison against geotechnical assumptions.

4.1 Site Monitoring Plan

Geotechnical monitoring is required to gather data on slope movement (direct measurement of slope response), and slope stability influences (indirect aspects, such as rainfall and piezometric levels). Each item of collected data listed below must be interpreted in conjunction with each other, along with considerations of mining activity and location, as, quite often each set of monitoring data are interlinked.

The following table (*Table 4.1*) lists the currently required monitoring frequency that should be used for the various available instruments. More frequent monitoring may be required from time to time depending on interpretation of the data, and may be directed at the discretion of the Mine Manager, or recommended by the Geotechnical Consultant.

Table 4.1 Monitoring Frequency

Slope Monitoring Instrument	Monitoring Frequency
Survey Prisms	Fortnightly
GPS Pins	Every two months
Inclinometers	Every third month
Piezometers	Monthly

4.2 Design Validation

4.2.1 Geotechnical Parameters

The validation of the geotechnical parameters used in design models can be realised through the back analysis of failures. A completed back analysis of failures using the 'current' geotechnical design parameters should be compared with the field case. If there is a discrepancy, a review of the parameters should be undertaken to ensure that they are reflective of the in-situ scenario.

4.2.2 Geological Model

A Geological Model is created from drill hole data and localised mapping of the area. As the excavation is undertaken, variances from the Geological Model may become apparent. These changes should be updated in the Geological Model. A constantly updated Geological Model can assist in helping to define limits of boundaries and excavations.

4.2.3 Hydrogeological Model

A major influence on slope stability is the presence of water and the effect thereof. Therefore it is important that constant monitoring of all measuring devices is undertaken to constantly redefine the Hydrogeological Model. The level of a water table will rise and fall with time and it is these changes that must be constantly taken into account within the model.

4.2.4 Survey Prisms

Prisms are a means to detect movement at a point in all three dimensions (Easting, Northing and Reference Level). Readings are taken (in millimetres) using surveying equipment. Prisms can indicate a movement or acceleration of a wall for example.

Prism data is formatted and placed with previous survey data in a database. Review and interpretation of this data is undertaken to highlight any potential issues (irregular movement) and longer term movement trends.

Contract surveyors are responsible for the survey, and sending the data to the Geotechnical Consultant.

Review of prism readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.5 GPS Monitoring Pins

GPS monitoring pins are a means to measure slope movement at locations that are not possible to survey from within the mine. These are typically located around the site, beyond the pit crest and are monitored at regular intervals by the Contract Surveyor.

Review of GPS readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.6 Piezometers

Piezometers are used to measure the location of the groundwater table, or the pressure of confined water. Piezometers should be read at regular intervals as specified in Table 4.1. Rainfall data must be read in conjunction with piezometer data to properly assess the impact of rainfall on slope stability.

Review of piezometer readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.7 Rain Gauges

Rain gauges are an indication of the total rainfall over a selected period of time at a specific location. Rainfall can influence groundwater levels and can cause surface erosion, potentially affecting the slope stability.

Rain gauges must be read daily or more frequently depending on the quantity of rainfall.

Rainfall data must be sent at monthly intervals, or more frequently if required, to the Geotechnical Consultant for interpretation with piezometer and other data.

Review of rain gauge readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.8 Inclinerometers

Inclinometers are used to measure lateral displacement within boreholes drilled into a slope. Inclinometers should be periodically read by the Mine Supervisor and sent to the Geotechnical Consultant for interpretation.

Review of inclinometer readings and database management is conducted by the Geotechnical Consultant as soon as practicable after receipt of the data, and is reported to the Mine Manager and other interested stakeholders as directed by the Mine Manager.

4.2.9 Berm and Batter Inspections

Berm inspections involve the regular walk-over and visual inspection of the catch berms and pit slopes. The inspections are used to record the following:

- Cracking on berms and pit crests;
- Crest damage or crest loss;
- Excessive rilling;
- Rock fall (pieces of rock falling from wall);
- Pondered water;
- Loss of berm access; and
- Failure of catch fences, bunding, safety infrastructure.

Berm inspections will be carried out daily by the Mine Supervisor and will be documented in a Mine Inspection Log. Anomalous conditions will be reported to the Mine Manager, who may at his discretion obtain advice from the Geotechnical Consultant on implications for mine safety.

All personnel working within the mine are required to assess their work areas for safety issues, including the state of berms and batters. Conditions of concern must be reported to the Mine Supervisor, who will then assess, record and report the conditions as specified above for the daily inspection.

The Geotechnical Consultant will visually inspect and assess conditions as part of their six monthly review.

4.3 Data Collection

Data collection involves ongoing collection of technical information that is required for compliance with geotechnical design and verification. Data collection comes in various forms and, includes information from the above *Site Monitoring Plan* and specialist data collection techniques.

4.3.1 Geotechnical and Geological Mapping

Geotechnical Mapping is a term used to describe the collection of geotechnical data from exposures of rock and soil. The fundamental purpose of geotechnical mapping is:

- Increase knowledge of ground conditions within the mine site;
- Collect data for use in analysis; and
- Verify current geotechnical and geological models.

Geotechnical mapping at Anglesea mine is not undertaken often, due to the consistent nature of the materials encountered.

4.3.2 Laboratory Testing

Laboratory testing is a process where samples from the field are taken and tested according to defined standards. The results are used to define the material parameters in a slope design.

Samples will be collected for laboratory testing as deemed necessary by the Geotechnical Consultant for slope design purposes. This would typically be done during any diamond drilling investigations.

The Geotechnical Consultant will select samples, specify test types, and interpret and report results to the Mine Manager. Testing will be carried out to appropriate standards by a NATA registered laboratory.

4.3.2.1 Rock

Laboratory testing of rock should be undertaken when there is insufficient data and/or a new lithology it is encountered; where there is insufficient data for a basis of design. Laboratory testing of rock is the best means to determine the relevant properties for design and analysis. Some commonly used tests are:

- Direct shear testing of rock defects;
- Uniaxial compressive strength (UCS);
- Young's Modulus of Elasticity and Poisson's Ratio;
- Brazilian tensile test; and
- Porosity, density and permeability.

Due to the materials encountered at Anglesea Mine these tests are not often performed.

4.3.2.2 Soil

Laboratory testing involves the collection of samples from representative materials throughout the site for compliance with the design parameters being used. The nature of the Anglesea mine dictates that the thick overburden, of fundamentally soil like material, and the basal clay seam at the base of Upper Coal Layer will be two of the determining factors in slope design.

Laboratory testing can include the following tests:

- Moisture content;
- Consolidation tests;
- Triaxials;

- Permeability; and
- Atterbergs.

These tests can be used in establishing base parameters and programmed testing can lead to a full model being produced for highlighting differences with the open pit area.

4.3.3 Recording of Slope Failures

A slope failure database is very important for understanding issues that lead to failures, thereby helping to prevent similar failures in the future. With the recorded data, the event can be back analysed to further understanding and apply this knowledge to future design.

Slope failures must be recorded by the Mine Supervisor as part of the *Site Monitoring Plan (Section 4.1)*. All slope failures should be thoroughly investigated by the Geotechnical Consultant and reported to the Mine Manager. The extent of investigations will be determined by the Geotechnical Consultant according to industry best practice standards as appropriate for the type and scale of failure.

5 GEOTECHNICAL HAZARD MANAGEMENT

A hazard may be defined by a potential/concurrent incident that can cause the loss of operational controls; with respect to both human and inanimate objects.

5.1 Geotechnical Hazard Awareness

Regular communication and training is required to be given to all mine personnel about geotechnical hazards and controls that are in place to manage them. Further, if required a map within the mine office should be utilised to highlight any geotechnical hazards within the mine site and their controls.

5.2 Geotechnical Hazard Detection

The detection of geotechnical hazards before they present as slope failures is important. Integrated with the *Site Monitoring Plan*, hazard detection involves identifying a potential hazard before it becomes an event. Through the monitoring of the installed slope monitoring equipment, with analysis of the data, potential hazards can be detected in some circumstances.

5.3 Risk Matrix

A risk matrix is used to rate risks according to their Likelihood and Consequence. The following table below is the risk matrix to classify identified Geotechnical Hazards in terms of risk and is based on the Australian Standard for risk assessment, (Ref. 3):

Table 5.1 Risk Matrix

Probability	Consequences				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost Certain	Critical	Critical	Critical	High	Medium
Likely	Critical	Critical	High	Medium	Medium
Possible	Critical	High	High	Medium	Low
Unlikely	High	High	Medium	Low	Low
Rare	High	Medium	Low	Low	Low

The above table (*Table 5.1 – Risk Matrix*) must be applied to each identified hazard, by selecting a consequence and likelihood according to the Standard.

This risk matrix is designed to work in conjunction with the *Site Geotechnical Log* (See Section 5.9). The log is designed to identify the risk, classify the risk and describe actions to minimise the risk.

5.4 Risk Assessment Process

Geotechnical risk assessments must be conducted by the Mine Manager, who may obtain advice from, or delegate the process to the Geotechnical Consultant.

Geotechnical risk assessments will be carried out for identified geotechnical hazards as frequently as required to assess the current nature of the risk. For example, if the likelihood or the consequence were to increase, the risk must be re-assessed.

The Mine Manager must implement all controls specified in the risk assessment.

5.5 Hazard Classification

The classification of hazards must be separated between loss of life and/or injury to the loss of operational control at the mine. A classification rating should be given to every hazard identified. The classification is based upon the likelihood and consequence of the hazard; using *AS/NZS ISO 31000:2009* as a basis and replacement for *AS/NZS 4360-2004*.

To simplify the classification system for a real time application, the following can be applied to identify hazards for classification into broad groups:

Table 5.2 Hazard Classification

Hazard Level	Description	Action
LOW	Low likelihood and probability of failure	Continue monitoring and review
MEDIUM	Moderate consequence and possibility of failure	Some action may be required usually within 24 hours, continuing improvement to reduce hazard level
HIGH	High consequence and likely to fail	Cordoning off area, restricting movement, action plan to reduce and negate failure
CRITICAL	Catastrophic consequences with near certain failure	Immediate action required, i.e. evacuation

5.6 Hazard Communication

Hazards must be communicated to all personnel working within the mine by appropriate means such as verbal briefings and notices on safety boards. Further, if required to or directed to by Responsible Authorities communication must be an open dialogue. Responsible Authorities may include:

- Department of Primary Industries;
- Country Fire Authority;
- Department of Sustainability and Environment;
- Environmental Protection Agency;
- Water and Catchment Management Authorities; and
- Vicroads and Department of transport.

5.7 Hazard Prevention

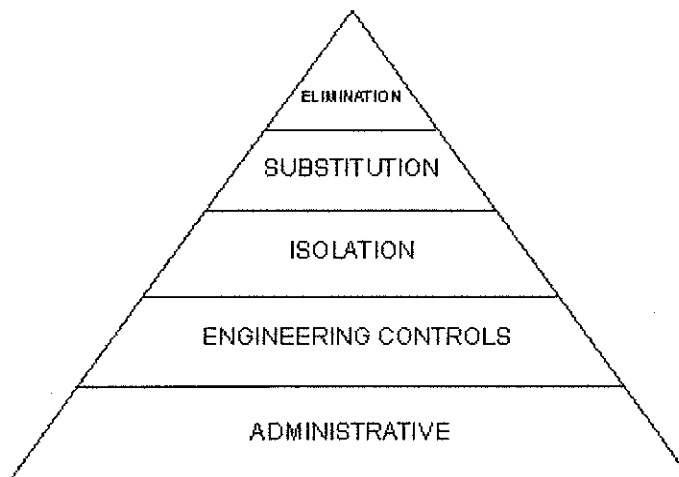
The prevention of hazards is the best engineering control that can be used. Through a systematic approach including geotechnical design, and verification (*Site Monitoring Plan* and *Data Collection* with analysis of data); potential hazards can be realised and prevented. The preventative measures required vary according to the likelihood and consequence of the failure.

5.8 Geotechnical Hazard Mitigation

Hazard mitigation involves reducing the consequences of a potential failure. If a hazard cannot be eliminated, operational and engineering controls must be put into place to reduce or eliminate the consequences of the hazard.

The following hierarchy of control can be applied to the mitigation of hazards:

Figure 5.1 Hierarchy of Control



Elimination – The hazard can be mined out or removed from the mine site

Substitution – Modifications to the pit design and changes of operational procedures

Isolation – The cordoning off of an area to restrict access, using a variety of methods such as windrows, bollards, fencing, etc.

Engineering Controls – Altered slope design to improve stability, such as providing buttressing or catch berm capacity, safety berms, or improving knowledge of slope responses using additional monitoring equipment.

Administrative – Communication of Geotechnical Hazards, geotechnical reporting and Job Safety Analysis (JSA) for one such example.

5.9 Risk Register – Site Geotechnical Log

A Geotechnical Risk Register must be kept on site at all times. This risk register is incorporated into the *Site Geotechnical Log* for simplicity and efficiency. The *Site Geotechnical Log* will be built up over time and have a close out process.

The close out process illustrates that action has been taken to reduce the risk classification level. *Appendix C* contains an example of the system used at Anglesea Mine.

6 REPORTING

Reporting is a required part of the *Ground Control Management Plan*. A fully documented system that records all facets covered within the GCMP must be maintained for future auditing and analysis. Reporting frequency and intensity must be conducted at the discretion of the Mine Manager.

Listed below are examples of types of reports that should be produced and information contained there within. These are described throughout the GCMP in their relevant sections and are summarised here.

6.1 Geotechnical Site Log

A Geotechnical Site Log, as described in *Section 5.9*, is used to list all of the geotechnical hazards found on the site. Hazards will have been identified and given a risk rating accordingly. The site log is required to document all geotechnical hazards at the site. The required information to be included in the report is, as a minimum:

- Date of hazard identified;
- Location;
- Detailed description of the hazard;
- Risk rating;
- Recommended actions and controls (remediation of the hazard);
- Post remediation risk rating; and
- Additional comments.

Appendix C is an example of a Geotechnical Site Log with a Risk Classification System.

6.2 Reporting Responsibilities

The following table (*Table 6.1*) sets out the reporting requirements of this *GCMP* and the parties responsible.

Table 6.1 Reporting Responsibilities

Report	Role	Responsibility*
Geotechnical Site Log	Mine Manager	Chris Rolland
Mine Inspection Log	Mine Manager/Mine Supervisor	Chris Rolland/ Nick Brockman
Six Monthly Geotechnical Reviews	Geotechnical Consultant	Mining One

*as at September 2010

7 TRAINING

The training and further profession development of all personnel; on-site is imperative. Keeping up to date with changes in Legislation and Codes of Practice(s) is the easiest way to implement any change. With regards to *Ground Control Management Plan* it is recommend that a training seminar be carried out to inform personnel of the possible risks regarding geotechnical hazards.

Having trained personnel on staff will relieve the work load of one person; and result in a greater knowledge of hazards identification and awareness. It is the responsibility of the Mine manager to mandate that all personnel undertake training to fully understand the relevance and importance of this document. The application of ground management is not the responsibility of one person, but a collective team effort.

8 AUDITING

Periodic audits of geotechnical hazards and hazard control processes must be carried out at regular intervals by an external specialist. Items that must be addressed in each audit are:

- Overall site geotechnical conditions and geotechnical hazard management;
- Review of geotechnical ground control management;
- Data review and monitoring review;
- Stability and soundness of geotechnical geometry;
- Implementation of the GCMP;
- Compliance with this GCMP;
- The effectiveness and validity of this GCMP; and
- Responsibilities and accountabilities are being met.

This document, along with all Alcoa documents relevant to Ground Control at the Anglesea Mine, should be reviewed every twelve months or as specified by the Mine Manager.

9 REFERENCES

1. Coffey Mining, January 2009, "Anglesea Coal Mine SW Corner Slope Stability Analysis" Report No. MINENHIL00024AF.
2. McCue, K., (compiler), Gibson, G., Michael-Leiba, M., Love, D., Cuthbertson, R., & Horoschun, G., 1993, "Earthquake hazard map of Australia, 1991" – Geosciences Australia
3. Committee OB-007, 20 November 2009, "Risk Management – Principles and Guidelines" (AS/NZS ISO 31000:2009)

Appendix A

Alcoa – Anglesea Mine

Slope Design Parameters

Summary of Overburden Slope Design Parameters, Recommendations & Measurements		Anglesea Coal Mine (1979-1997)	BFP Consultants (1997)	Anglesea Coal Mine (1997 - 2005)	Anglesea Coal Mine present	2009 Survey	
						Re-entrant No 1	Re-entrant No 2
Batter Angle	Above Haul Road	37°	25°	30°	30°	24.3°	26°
	Below Haul Road	45°	45°	45°	33.7°	42.3°	34.2°
Berm Width	Above Haul Road	5m	5m	Varies	Varies	8.5 & 11.8m	8m
	Below Haul Road	5m	5m	5m	Nil *	3m (silted)	6m
Batter Height	Above Haul Road	12m	12m	Varies	Varies	5, 14 & 18m	12 & 14m
	Below Haul Road	12m	12m	Varies	Varies	13 & 20m	34m
Intermediate Angle	Above Haul Road	29.7°	21.3°	21.3°	21.3°	19.5°	23.2°
	Below Haul Road	35.2°	35.2°	35.2°	33.7°	42.3°	34.2°

- Notes:**
1. 1979 design for upper batters was for 5m berms spaced at 12m vertical intervals, graded to run water at 1 in 125. Batter angle was 1 in 1½ or ~37°. The grade was later steepened to 1 in 100.
 2. At some stage, the grading was reversed to run water to the west. This combined with the varying lengths of the berms resulted in the vertical spacing necessarily departing from the original 12m.
 3. As a practical result of the BFP Consultants recommendations, a uniform batter angle of 30° was adopted, and the berm width was made variable (that is, greater than 5m) to enable an overall batter angle <25° to be achieved as the height varied with the natural surface topography.
 4. In 2005 it was decided to reverse the drainage direction of the haulage berm again. This was achieved by placing fill on the western end of the berm. It was felt that this was safe as there would still be no significant amount of clay below the berm.
 5. It was found impractical to maintain drainage on the berms below the haulage level. The resulting batter erosion could not be effectively repaired as the natural angle of repose of local material is flatter than the 45° batter angle. A slope of 1 in 1.5 or ~33.7° was adopted for planning purposes.

Appendix B

Rainfall Data – Anglesea Area

Bureau of Meteorology

Site Geotechnical Log

Example

DOCUMENT INFORMATION

Status Draft
Version A
Print Date -
Author(s) Christopher Ralph, Ben Roache
Reviewed By David Lucas
Pathname P:\1347_G Alcoa Anglesea Contract\Tech\Geotechnical\GCMP
File Name 2431.doc
Job No 1347_G
Distribution PDF emailed to client for review

DOCUMENT CHANGE CONTROL

Version	Description of changes/amendments	Author (s)	Date
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DOCUMENT REVIEW AND SIGN OFF

Version	Reviewer	Position	Signature	Date
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