Mount Piper Power Station

Brine Conditioned Flyash Co-placement: Statement of Environmental Effects

Prepared by Environmental Services, Pacific Power International for Delta Electricity

August 1999

Delta electricity

PACIFIC POWER

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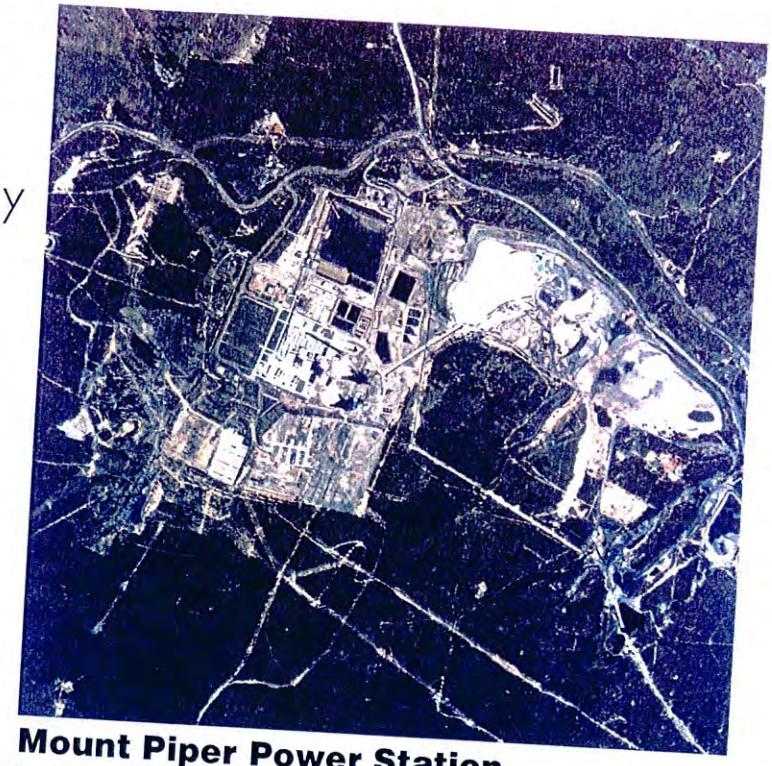

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Executive Summary

This document relates to the proposed modification of the existing ash disposal development consent for co-placement of 'dry' flyash conditioned with brine in the Mount Piper Power Station ash disposal area. The various options examined included ocean disposal, reuse of the brine and means of reducing brine production in the power station as well as brine conditioned flyash co-placement in the existing ash disposal area.

From this work it was found that reuse of the brine was not economic and, in any case, left a residual that had to be disposed of, while ocean disposal was not cost-effective. The most environmentally acceptable and cost-effective long-term method of brine disposal is co-placement of the brine with a limited amount of flyash. This involves conditioning of about 7% of the annual flyash production with brine to give 15% moisture to prevent dusting.

The brine conditioned flyash would be placed and capped in a specific location on top of the existing ash disposal area. The remaining, unsold, flyash and furnace ash would be conditioned with water and placed so that the disposal area contours remain as already approved, except for a minor modification near the Eastern Drain.

The environmental impact assessment of the brine conditioned flyash co-placement modification was undertaken by:

- Field trial testing of a brine conditioned ash pad, which was monitored for the effects of salts and trace elements leached from the surface by rainfall runoff and infiltration of rain water into the pad over a two year period;
- leaching tests on flyash and brine conditioned flyash;
- chemical characteristics of the flyash and brine;
- spoil characteristics and trace element adsorption;
- modelling of the proposed co-placement area to assess the impact on the local groundwater and surface waters.

The results of this work indicated that the brine conditioned flyash proposal would be environmentally acceptable because the brine is effectively immobilised by retention in the flyash pores. The proposal meets the aims of the Waste Minimisation Act, 1995 in respect of the effective treatment and disposal of wastes which are not technically or economically feasible to recycle. By conditioning the minimum amount of flyash with brine, the potential for recycling of flyash at Mt Piper Power Station will be maintained. The proposal also meets the aims of the Sydney Water Catchment Management Act, 1998 by protecting the water quality in a part of the catchment of Sydney's drinking water supply.

This Statement of Environmental Effects has been prepared under Part 4 of the Environmental Planning and Assessment Act 1979 to seek approval for this modification.

Measures proposed to mitigate identified environmental effects are:

- immobilisation of brine in flyash by use of the minimum amount to condition the flyash to prevent dusting;
- the use of the minimum amount of flyash for brine co-placement to optimise reuse of flyash production;
- placement of the brine conditioned ash above the final water table expected to be reached when the site is fully rehabilitated;
- location of the brine conditioned flyash in the ash disposal area away from local surface waters;

- water cycle management by collection of surface runoff in perimeter drains and a plastic-lined pond, its reuse for dust control and capping to minimise brine conditioned flyash exposure to rainfall;
- location of the brine conditioning plant, pump and pipeline in drainage areas where potential spills can be intercepted and the water/brine recycled;
- safe storage of the brine in the double-lined holding ponds, leakage early warning by an effective monitoring program and contingency plans in the event of detection of a leak;
- a surface and groundwater quality monitoring program to ensure detection of leachates, if any, which provides feedback for management of the brine conditioned flyash deposit during the twenty years of operation;
- spoil capping and revegetation of the whole ash deposit, including the capped brine conditioned flyash.

The proposed modification optimises the use of ash production, while providing an environmentally acceptable long-term solution for brine disposal at the power station.

The proposed modification of brine conditioned flyash co-placement in the existing ash disposal area at Mount Piper Power Station has been shown to be a cost effective way of providing a sustainable, long-term, environmentally acceptable, on site, disposal of brine. The modelling and studies undertaken indicate that the modification will not have any significant impact on surface and groundwater quality of the Neubecks Creek catchment, in the short or long-term. Its is concluded that the overall environmental impact of the modification will be acceptable.

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Mount Piper Power Station Brine Conditioned Flyash Co-Placement: Statement of Environmental Effects

1. Introduction

1.1 Purpose of this document

This document relates to the proposed modification of the existing ash disposal development consent for co-placement of flyash conditioned with brine in the Mount Piper Power Station ash disposal area. Its purpose is to record the Environmental Impact Assessment (EIA) carried out in respect of the modification and to serve as a Statement of Environmental Effects (SEE) supporting the modification applications to the Department of Urban Affairs and Planning (DUAP) and Lithgow City Council. The Sydney Water Catchment Authority will also need to concur with the proposed modifications. It describes the proposed modification, the existing environment and identifies and assesses the environmental issues and water cycle management relating to the proposal. Measures proposed to mitigate identified environmental effects are also described.

The document outlines previous development consents and approvals for brine storage at the power station by DUAP and flyash disposal in the ash disposal area by Lithgow City Council. As the brine approval was for temporary storage of brine until a final long-term method of disposal was developed, an overview of the studies undertaken to assess the various options for brine disposal is presented in this document. Approval for permanent storage of some brine in the holding ponds will be sought from DUAP as part of the modification application.

1.2 Background

1.2.1 Mount Piper Power Station and Ash Disposal Area

Mount Piper Power Station is a coal-fired power station comprising 2x660MW coal-fired generating units. It is located near Lithgow in New South Wales and has been fully operational since 1994. Its location is shown in Figure 1, and an aerial photograph of the power station and Stage I ash disposal area is shown in Plate 1. Ash production since 1994 has been deposited to RL 946m at the western end of the old Western Main open-cut mine void, called the Stage I area (Plate 2). Rainfall runoff from the ash is collected in ponds for reuse in dust suppression (Plate 3).

The station supplies about 15% of the electricity requirements of New South Wales. It has a sophisticated water recycling plant to conserve water withdrawn from the Coxs River Water Supply Scheme for use as cooling water and other uses.

The water used in the cooling towers is recycled, and when it reaches a salt concentration that may cause scaling of the cooling water system, it is diverted to a treatment plant where it is concentrated to a brine concentration of about 110,000 mg/L. In this way discharge of the cooling water to the local streams is prevented. The pure water produced in the process of concentrating the brine is recycled for use in the power station. However, an environmentally acceptable method of disposal of the brine has to be found.

Total ash production at Mount Piper Power Station is currently about 750,000 tonnes per year, of which 660,000 tonnes is flyash. Ash sales in 1998/99 were about 160,000 tonnes per year, or 21%. At the current filling rate, the Stage I ash disposal site will be filled by 2016. The stage I and II ash disposal areas are shown in Figure 3.

In the four years of operation of the power station, 'dry' ash (flyash and furnace ash) has been stock piled at the western of the ash disposal area near the power station up to a level of RL 946 (Figure 6). At that level the ash extends out from the end of the western retaining wall by a distance of about 260-290 metres. Brine production over the same period has been 8 ML/year or 32 ML in the four years of power station operation to end 1998.

1.2.2 Background to the Proposal

An EIS for Mount Piper Power Station was exhibited in 1980 (ECNSW, 1980) and development consent was granted by the Minister of Planning in 1982. The initial consent provided for the disposal of brine by mixing with the water used to slurry flyash. The ash would be deposited in a dam to be established on Neubecks Creek and the slurry water, containing brine not incorporated in the deposited ash, would be reused at the power station for ash slurry purposes. However, prior to the establishment of the ash dam, the then Electricity Commission of New South Wales (ECNSW) developed a preference, primarily based on environmental grounds, for 'dry' ash disposal at the power station. "Dry" ash disposal involved conditioning of the ash with water to give 15% moisture to prevent dusting. An alternative proposal for the placement of ash in the disused Western Main void was subsequently developed but the question of brine disposal was not resolved.

Accordingly, the ECNSW (1990a) proposed temporary storage of the brine to allow time for a thorough environmental examination of the alternatives for long-term disposal of the brine. In March 1991, the Minister of Planning and Environment amended the original developed consent to provide for temporary storage of brine on site in two 20ML lined ponds until 30th June, 1996.

A comprehensive EIS for the current 'dry' ash storage facility was prepared in November 1989 by the ECNSW (1989). An EIS was required for the facility because it was a designated development and was outside the area identified for the development of the power station under the Mount Piper development consent . Lithgow City Council granted development consent for the 'dry' ash disposal in March, 1990.

The ECNSW (and subsequently Pacific Power) conducted extensive studies over a number of years to find a long-term method of brine storage that was cost-effective, technically feasible and environmentally acceptable. Due to the complexities of the studies, Pacific Power International (PPI, 1996), on behalf of First State Power (now Delta Electricity) requested that the Department of Urban Affairs and Planning (DUAP) modify the original consent for temporary brine storage. The consent was amended in June, 1996 to extend the time of storage by four years to 30th June, 2000. The Consent conditions required that the brine reduction initiatives mentioned in the request be implemented to prevent the storage capacity being exceeded and that the results of the long-term brine management investigations be reported to Sydney Water Corporation. Accordingly, the brine reduction initiatives and reporting were undertaken.

It is proposed that brine be used to condition flyash in batches once every three years. During the intervening years it is proposed that it continue to be stored in the ponds. Accordingly, as

part of the brine co-placement proposal, it will be necessary to obtain the approval of DUAP and NSW EPA to continue to store brine in the lined ponds after 30th June, 2000. It is expected that storage of the brine will require modification of the EPA licence for Mount Piper Power Station.

Heavy rainfall in August, 1998 resulted in a major increase in the volume to be stored in the brine storage ponds. As a further year of brine storage was needed to allow time for development consent for the brine conditioned flyash co-placement proposal, a further modification of the consent to provide for a temporary addition of another lined pond of 8 ML capacity was requested by Delta Electricity (see PPI,1998b). This was approved by DUAP in January, 1999 (Attachment 1).

In 1997-98, negotiations were held between Delta Electricity and Sydney Water for a temporary disposal of brine at sewage treatment plants on the coast near Sydney or Wollongong. This option was required as a contingency if the brine conditioned flyash proposal was not approved for some unforeseeable reason. A Review of Environmental Factors was prepared for a one year trial of brine disposal at Wollongong sewage treatment plant (PPI, 1998a). The Pollution Control Approval to install the discharge facility was recently approved by the NSW EPA (Attachment 1).

However, the EPA indicated that ocean disposal was only a temporary solution and on-site disposal of the brine was the favoured long-term solution. The proposed co-placement of brine with flyash in the approved ash placement site is outlined in Section 1.5 below.

1.3 Consultation with Government Departments and the Coxs River Catchment Management Committee

A presentation describing the current brine co-placement proposal was given on 15/10/98 to the various government departments which will be involved in approvals, or would have interest in the project, as well as representatives from the Coxs River Catchment Management Committee. The government departments involved were DUAP, Lithgow City Council, Sydney Water, EPA, DLWC. Mr D. Mullins, Assistant Director of Infrastructure Assessments, DUAP was given the presentation in Sydney. The agenda and attendees to the presentation are given in Attachment 6.

The presentation was by Delta Electricity, Pacific Power International and the National Centre for Groundwater Management (UTS). The proposal was outlined as well as the various means of assessment, such as field trials on brine conditioned ash and laboratory testing. Groundwater modelling results were also presented.

It was indicated at the meeting that an SEE would be prepared to support the request for modifications of the existing approvals from DUAP and Lithgow City Council.

1.4 Legislative Requirements

In order to implement the brine conditioned 'dry' flyash co-placement plan, Delta Electricity proposed to seek modification of the development consent for the power station from the Department of Urban Affairs and Planning (DUAP), which covers the generation of flyash and generation and storage of brine. Modification of the Ministers consent for the power station will be sought under Section 96, of the Environmental Planning and Assessment Amendment Act, 1979. The modifications required are the construction of a brine conditioning plant and the continued storage of brine in the lined ponds.

As the brine will be stored on site, the concentration of compounds in the brine have been compared with the guidelines for classification and management of liquid wastes (EPA, 1999a). All the concentrations, except nickel, are below the guidelines. This means that brine would be classified as a "Group A liquid waste" and so a licence may be required under the Waste Minimisation and Management Act 1995 for the production and storage of the brine at the power station. It is expected that this would be added to the EPA licence for Mt Piper Power Station.

Ash generated at Mt Piper power station is licensed under the Pollution Control Act 1970 and is disposed of on-site. Under Cl 5(3)(a)(ii) of the Waste Management and Minimisation Act, 1995 regulation, the ash disposal area is not classified as a "controlled waste facility" and therefore does not need to be licensed under the WMM legislation.

The brine conditioned flyash is still a solid because the brine is immobilised in the pores of the 'dry' ash. According to the definition of "Inert" waste, given in Schedule 1 of the Regulation and in the "Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes" (EPA, 1999a), the composition and leaching tests show that the brine conditioned flyash is classified as "Inert" waste. Hence, co-placement in the ash disposal area at Mt Piper Power Station would not need to be licensed under the WMM legislation.

Under the Contaminated Land Management Act, 1997, the NSW EPA (1999b) have proposed that the ANZECC (1992) guidelines for the protection of marine and freshwaters be used as an interim means of assessing if the groundwater in a property is contaminated. The brine conditioned flyash co-placement proposal has been designed so that the increase above background, due to movement of brine to the groundwater, will meet the ANZECC guidelines where the seepage could interact with freshwater aquatic life in the nearby Neubecks Creek.

Construction approval of the brine conditioning plant will be requested from the EPA. The use of the ash disposal area for co-placement of brine conditioned flyash would be covered by the current EPA licence for the power station under the Protection of the Environment Operations Act (POEO),1999.

At the same time, Delta Electricity will seek modification of the ash disposal development consent from Lithgow City Council to allow for the co-placement of the brine conditioned 'dry' flyash. Modification of the ash contours near the eastern drain, will also be sought from Lithgow City Council.

Ash disposal is a designated development under the Environmental Planning and Assessment Regulation, 1994. As Lithgow is in the Sydney hydrological catchment, concurrent approval for the modification to co-place brine with flyash will also be sought from the Sydney Water Catchment Authority by DUAP. This is required under the Sydney Water Catchment Management Act, 1998.

A copy of all of the development consents for the power station, temporary brine storage and the ash disposal area are given in Attachment 1.

1.5 Outline of the Modification Proposal

The proposed co-placement of brine with flyash in the approved ash placement site has been subject to extensive environmental testing and modelling. It is now proposed to use the brine to condition about 7% of the annual flyash production, instead of water, to prevent dusting. The

'dry' brine conditioned flyash would be co-placed in a specific area of the 'dry' ash storage area at Mount Piper Power Station. The area selected is on top of the western end of the existing ash placement. It is located away from local surface waters and elevated so that the groundwater table will not reach the brine conditioned flyash.

It is proposed that the flyash be conditioned with brine by modifications to the existing ash conditioning plant at the power station. The conditioned flyash would be transported to the 'dry' ash disposal area on the existing ash conveyor and placed by trucks and compacted by heavy machinery.

Due to a better understanding of rainfall infiltration into flyash and improved modelling capabilities, it is expected that the effects of seepage water from the ash deposit itself will be less than that mentioned in the Mount Piper Ash Storage EIS. However, the modelling also indicated that the approved contours of the ash deposit are too close to the Eastern Drain (see Figure 2.6 of the EIS, which is reproduced in Attachment 4). Hence, it is proposed that the contours be modified so that the deposit does not come within 50metres of the drain to maintain water quality near background levels (Figure 2).

The assessment of the environmental effects of co-placement are summarised in this document and the detailed water quality assessments and groundwater modelling are given as attachments. The studies show that the brine is effectively immobilised in the brine conditioned flyash. The design of the co-placement has been shown by modelling to ensure no significant contamination of salts or trace elements in groundwater by leachates as a result of the use of brine to condition a limited amount of the flyash production. Surface waters will be protected by the water cycle management plan of collection and reuse of surface runoff and capping of the brine conditioned flyash with normal (water conditioned) flyash between the three year co-placement campaigns.

It is proposed that brine would be used to condition some of the flyash production to give a final concentration of 17% and stored on top of the existing ash pad. The program for conditioning of flyash with brine and its placement in the ash disposal area is given in Section 1.6.

As the brine conditioned flyash is placed, it would be covered with 1m of water conditioned flyash so that the envelope of the ash disposal area pesented to the environment will be as approved by Lithgow City Council in 1990. The area to the east of the brine conditioned flyash will be filled with normal ash to the contours set out in the original EIS. This is proposed to be slightly modified at the far eastern end of the deposit to stop 50m short of the Eastern Drain. As the ash surface reaches the design contours it will be covered with spoil and revegetated, as set out in the Mt Piper Power Station Ash Emvironmental Management Plan (MPA, 1999).

The brine conditioned flyash will require about 7% of the total annual ash production, of 750,000 tonnes, for retention of the brine in the flyash pores. The water conditioned flyash capping will require an additional 3%.

1.6 Project Program

The proposed brine conditioned flyash co-placement program involves the steps set out in Table 1.

Modifications to the mixing plant would be constructed in the power station area to condition the flyash with the brine. Transportation of the brine conditioned flyash would be through the existing system as described in section 3.

The brine conditioned flyash will be placed in seven stages covering 3 years of brine production over a 20 to 21 year time frame. As mentioned above, the first stage will place all the existing brine contained in the lined ponds to provide ample storage capacity of the brine to be placed in three year batches in subsequent stages. The EPA will be requested to modify the EPA licence for the production and storage of the brine at the power station.

It is expected that it will take about 9 months to place the first stage and about 5 months to place each subsequent stage. Placement is planned for the period March to August, which are, on average, the driest months in the Lithgow area. However, due to timing considerations, placement of stage I will not commence until October, 1999. As stage I will be placed along the western end of the ash disposal area, the western slope will be capped with spoil as it is placed, thus reducing exposure to rainfall.

Table 1. Brine Conditioned Flyash Project Program

Stage	Proposed Timing
Flatten and compact the existing ash pad at RL 946 in preparation for brine conditioned flyash co-placement	March,1999
Development consents	Oct-Nov 1999
EPA approval to modify the ash brine mixing plant and modify the EPA licence for brine storage	Nov-Dec 1999
Modify the ash brine mixing plant for brine conditioning of flyash	Jan – Mar, 2000
Commence stage I of brine conditioned flyash placement-40 ML brine to give 17% in flyash. Cap with normal flyash and then cap western slope with spoil.	Apr., 2000-Dec, 2000
Stage II – 24ML of brine in 140,000 tonnes flyash + 60,000 tonnes normal flyash for capping	March-August, 2002
Repeat every 3 years until the stage 1 ash disposal area is filled in 2016/17	2005, 2008, 2011, 2014, 2017

The stage I ash disposal area is expected to be full by 2017, so options for ash and brine disposal, including co-placement in the Stage II area, will be reviewed at that time.

2. Alternatives Considered

As required by the Development Consent for the power station (as amended), the then Electricity Commission, and subsequently Delta Electricity, has been investigating the alternatives for a long-term solution of the disposal of brine. A Brine Disposal Task Force was established (ECNSW, 1991)and the initial approach was to investigate means of reducing the volume of brine produced at the power station. This was necessary because the brine storage volume was limited to 2x20 megalitre ponds.

Several options for brine management were investigated at Mt Piper Power Station and the three most feasible long-term solutions were recommended for further investigation (Pacific Power, 1995):

- brine utilisation
- ocean disposal
- co-placement of brine with flyash.

2.1 Brine utilisation

Utilisation of the salts in the brine was investigated at length but found to be very energy intensive in terms of separation of the salts into useful products. The products such as sodium sulfate had a low market value and there were still residual salts that had to be disposed of. The utilisation studies are presented in Pacific Power (1992 and 1993a) but utilisation was ultimately discounted as a feasible option for disposal of the brine.

2.2 Ocean Disposal

Ocean disposal through coastal sewage treatment plants was investigated because the majority of the salts were concentrated from the Coxs River water which would otherwise have entered the sea via the Hawkesbury River. The feasibility of ocean disposal at the Malabar STP was initially investigated (AWT, 1996) but was subsequently abandoned in favour of Wollongong STP due to truck movement noise at the site (AWT, 1998).

Arrangements are currently in hand for a 12 month trial at Wollongong sewage treatment plant. This would involve the movement of two road tankers of brine per day from the power station to Wollongong. The brine would be mixed with the sewage to give a dilution of about 300 to 1, which gives a total dilution of 20,000 times once the sewage and brine are diluted in the 'mixing zone' of the ocean outfall. A Review of Environmental Factors found that this discharge would have insignificant effects upon the aquatic life or the environment near the ocean outfall (PPI, 1998a).

As mentioned above, the EPA has indicated that they consider ocean disposal to be only a short-term method of brine disposal and the preferred long-term solution is for disposal on site at the power station. The ocean disposal option is only proposed as a contingency measure, with brine co-placement with flyash as the preferred option.

2.3 Brine in Ash Co-placement

2.3.1 Initial Investigations

Initial investigations into co-placement of brine with ash in the existing mine void near Mount Piper power station commenced in 1989 (ECNSW, 1990b). The rate of rainfall infiltration into flyash was calculated from literature values of soil permeability at about 470 mm/year, or about 54% of the long-term annual rainfall of 873 mm/year. Even with capping and extensive revegetation the infiltration was calculated to be 45 mm/year or about 5% (Unisearch, 1989). However, the permeability used in the calculations was considered speculative and could have been incorrect by an order of magnitude (CSIRO, Div. Water Resources, 1989). Infiltration tests were done on Vales Point Power Station ash, which could have also lead to incorrect estimates (Forster, 1999 - see Attachment 2). Due to the uncertainty of the available information, the decision to co-place brine with ash was deferred until more definitive infiltration studies could be undertaken and other options could be more fully investigated.

Further work on flyash rainfall infiltration was undertaken for the Bayswater Power Station ash disposal in the Ravensworth open-cut mine void (Pacific Power, 1993b). This indicated that the rainfall infiltration rate was about 2% of the annual rainfall of 635mm/year.

2.3.2 Brine in Ash Trial at Mt Piper Power Station

To confirm that the Ravensworth results were applicable to the situation at Mount Piper Power Station, a two year field trial of rainfall infiltration into a brine/ash trial pad began in 1996 (Pacific Power, 1995a). The pad consisted of 11% brine used to condition the flyash/furnace ash produced by the power station at the time of testing.

The amount of brine required to give 15% moisture determines the amount of brine to be added to the ash to prevent dusting. Brine contains about 10% salts, ie about 90% water. Up to 1997, the furnace and flyash at Mount Piper Power Station were placed together. The mixed ash contained 10% furnace ash and 90% flyash and furnace ash contains about 50% moisture but flyash has none.

At the time of the field trial, both ashes were disposed together so the first alternative considered was 11% brine in the mix ash. The brine would provide about 10% of the moisture, with the remaining 5% provided by the furnace ash.

2.3.3 Brine in Ash Co-placement Alternatives

Two alternative brine concentrations and ash types have been assessed and two disposal sites were considered as follows:

- mixed flyash and furnace ash conditioned with 11% brine and either:

1. placed separately in the Stage II ash disposal area;
2. co-placed with water conditioned flyash in the Stage I area.

- flyash only conditioned with 17% (v/v) brine and co-placed with water conditioned flyash in the Stage I area..

Since 1997, furnace ash has been handled separately from the flyash but the two ashes have been placed together in the ash disposal area. To achieve 15% moisture in flyash conditioned

with brine, the amount of brine required would have to be 17%. This alternative was investigated by modelling salts and trace element movements to groundwater for 17% brine conditioned flyash and was found to be acceptable (see Section 4.6) and is the preferred option. As the total amount of brine to be placed in the deposit was not changed, the percentage used to condition the ash would not significantly change the expected effects on local groundwater.

Within the ash disposal area, two alternative sites were investigated for brine conditioned ash placement. The ash disposal area is divided into two areas in the Ash Disposal EIS: Stage I for the initial 20 years of ash production and a contingency area called Stage II for the storage of ash production after 20 years of production (Figure 3).

Separate placement of brine conditioned ash at the southern end of the Stage II area has disadvantages, such as its close proximity to the drainage system between the Stage I and Stage II areas (called the Eastern Drain). It was considered that any ground water seeping out of the deposit may go directly into the drain and impact on local water quality. The drain goes into the old Western Main open-cut mine void and it is likely that there is some flow from the void to Neubecks Creek. Also, part of the area had been subject to underground coal mine workings.

The alternative was to co-place the brine conditioned flyash in the Stage I area, on top of the existing ash deposit. This site has benefits in that it is close to the power station and well away from any water courses, such as the Eastern Drain. It is also placed well above the water table so that groundwater is unlikely to interact with the brine conditioned flyash deposit. Preliminary modelling of this proposal indicated that groundwater contamination would be insignificant provided that the main ash deposit was moved about 50m back from the Eastern Drain (see Table 8 and Attachment 4).

Co-placement of 'dry' brine conditioned flyash, at 17%, in the Stage I area, on top of the existing ash deposit has become the preferred option for the long-term management of brine production at the power station. This statement of environmental effects is directed at addressing the environmental effects of using this option.

3. Project Description

The project involves co-placement of flyash, conditioned with 17% brine, on top of the existing ash deposit in the Stage I ash disposal area (Figure 5). Brine conditioned flyash will be capped with 1 m of water conditioned ash and will occupy a specific section of the western end of the ash disposal area. The percentage of brine in the whole brine/ash deposit will be about 12.2% when the capping is taken into account.

The remaining water conditioned ash will be placed under the brine conditioned flyash and the mound contours will be continued to the east with normal ash, as previously approved. Hence, the contours and ash envelope presented to the environment remain unchanged, with the exception that the main ash deposit will be moved 50m back from the Eastern Drain.

This section provides further details of the brine conditioned flyash co-placement modification. It describes the characteristics of the flyash and brine and the brine conditioned flyash, the water cycle management and the placement plan for a twenty to twenty one year period. The associated engineering works for mixing the brine with the flyash and ash capping are also described.

Water quality monitoring of surface and groundwaters are an integral part of the project because it provides feedback on management of the co-placement area. A description of the monitoring is given under water cycle management.

The proposal is based upon the premise that the brine is retained in the pores of the flyash, which can hold up to 30% moisture. As only 17% brine is proposed to be added to the flyash, and the rainfall infiltration rate is small (see Section 4.4), the brine is expected to be effectively immobilised in the flyash. This is described in more detail in Section 4.1.

Water cycle management of surface runoff in the ash disposal area will be undertaken to ensure the brine does not enter the groundwater in this way. The two year trial found that due to adsorption onto the ash surface and evaporation, only 5% of rainfall appeared as runoff.

The low surface rainfall runoff from the brine conditioned ash surface means that it is possible to collect the runoff. Also, to minimise exposure of the surface to rainfall, the ash will be covered with water conditioned flyash at the end of the 5 months of placement. This surface water cycle management will become part of the Mt Piper Power Station Ash Placement Environmental Management Plan (MPA, 1999) when it is modified to allow for co-placement of brine conditioned flyash.

3.1 The Characteristics of Brine

A schematic for the production of brine from the cooling tower blowdown, through the water treatment plant to the storage in plastic lined ponds is shown in Figure 5. About 90% of the salts in the brine are naturally occurring salts derived from the Coxs River Water Supply Scheme. The remaining 10% is from sodium sulphate (the result of sulphuric acid and sodium hydroxide) added for water treatment purposes. There is some increased concentration, relative to other elements, of copper and nickel which originate from the leaching and corrosion of the condenser tubes in the cooling towers. The salinity of the brine produced is about 3 times the salinity of sea water and its analysis is shown in Table 2. As expected the content of organic matter is insignificant (see PPI, 1998a).

Table 2. Chemical Composition of Brine, Mt Piper Power Station

	Average *	Maximum	Minimum	Guidelines for 'Non-controlled' Liquid Wastes **
	(mg/l)			(mg/kg)
General				
pH	7.9	8.2	7.6	
Cond (uS/cm)	63,664	85,600	46,500	
TDS	116,650	129500	94,340	
Alk ($CaCO_3$)	1,360	1810	980	
Cl	19,864	23,000	18,000	
SO4	49,670	59,000	41,600	
Na	25,678	29,330	22,318	
K	4,258	4980	3448	
Ca	645	844	663	
Mg	5480	6530	3360	
Trace Elements		(ug/l)		
As	409 ^^^	450	386	1.0
Ag	1.4 ^^	<1	2	5.0
Ba	272	427	210	-
Be	17 ^	-	-	1.0
B	73,560	95,000	49,100	-
Cd	19 +	20	16	1.0
Cr	49 +	60	30	5.0
Cu	7,858	9,900	5,300	-
F	21,178	26,000	12,800	20
Fe	833	6,030	100	-
Hg	1.35 ^^	1.6	1.1	0.03
Mn	17,530	22.5	12,500	-
Mo	2,600 ^^	2,840	2,450	200
Ni	4,187	5.37	3,100	3.0
Pb	6 ^^	9	3.7	5.0
Se	245	530	30	5.0
Zn	2,020	5,400	270	-

* mostly 10 – 15 analyses (sources Hodgson, 1999 – Attachment 3 to this report; AWT, 1996)
** EPA (1999a)
^ one analysis ^^ 3 analyses ^^^ 5 analyses + 6 analyses, Cr VI <25ug/l

3.2 Ash Characteristics

The chemical characteristics of flyash and the brine conditioned flyash are shown in Table 3, together with the threshold values for "Inert" waste, when used in conjunction with TCLP leaching tests (see 4.2.2.1 below), as set out in the EPA guidelines (EPA, 1999a).

It can be seen from Table 3 that the solids concentrations in are considerably lower than the EPA (1999a, Table A4) Inert Waste guidelines. The same applies to the modified TCLP (20:1) leaching tests given in Table 5, below, and hence the brine conditioned flyash would be classified as "Inert" under the Waste Minimisation and Management Act, 1995.

Table 3. Chemical Characteristics of Mt Piper Power Station Flyash and Brine Conditioned Flyash

Element	Flyash	Brine Conditioned Flyash (17%)	Guidelines for Inert Waste Classification *
		(mg/Kg dry wt)	
General			
Cl	<0.1	4800	
SO4	720	8220	
Na	1080	5000	
K	20500	19,900	
Ca	2610	2510	
Mg	1450	2160	
Trace Elements			
As	7.7	5.4	500
Ag	0.14	0.2	180
Ba	330	300	-
Be	15	15	100
B	22	32	-
Cd	0.29	0.05	100
Cr	52	50	1900 +
Cu	50	45	-
F	75	80	10000
Fe	6300	6000	-
Hg	0.01	0.01	50
Mn	92	87	-
Mo	5.6	5.5	1000
Ni	40	30	1050
Pb	43	35	1500
Se	6.8	3.05	50
Zn	56	50	-

* used with leachable concentrations for brine conditioned flyash (TCLP), in Table 5 below, to classify as inert (EPA, 1999a). Note: the concentration of some elements was slightly less in brine conditioned flyash than normal flyash due to the natural variability of the ash. + Cr(VI)

3.3 Brine Conditioned Flyash Co-placement Plan

Initially, the existing 32 ML of brine production in the two storage ponds and the 8ML expected to be produced in 1998/1999, giving a total of 40 ML, would be used to condition about 235,000 tonnes of flyash, giving a moisture content of 15%, and placed on the brine conditioned flyash placement area, as shown in Figure 6. The ash would be placed and compacted by heavy machinery in the same way as normal ash. The first placement is planned to occur in late 1999 as the brine storage at the power station is approaching full capacity.

Brine production at the power station is about 8 ML per year. It is proposed to condition flyash with brine in three year batches of 24 ML and placement of it in the Stage I area would involve the use of about 141,000 tonnes of flyash for each campaign. The brine conditioned flyash placement management plan is shown in Figure 6. The brine would be stored in the existing brine storage ponds for the three years between placement campaigns.

The brine conditioned flyash placement will be finished with 1m of normal flyash on top. The finished surface will follow the contours of the existing flyash placement plan up to RL 980m, the height previously approved by Lithgow City Council. The brine conditioned flyash will be placed above RL 946m, giving a total height of 33 metres of brine conditioned flyash and extending out from the western wall of the dam by about 260-290 metres. After the initial 40 ML of brine placement, the seven subsequent three year stages over the next 21 years of placement are shown in Figure 6.

It is expected that the initial placement of brine conditioned flyash will take about 9 months to complete and that each subsequent three-yearly placement will take 5 months. Each placement would be covered with one metre of normal flyash to prevent leaching of brine by surface

rainfall runoff between the three-year placement campaigns. If a stage is to be built up to the contours shown in Figure 1, the brine conditioned flyash would be covered with flyash and that covered with a minimum of 200 mm of compacted spoil. Revegetation of the spoil covered ash will take place as set out in the Mt Piper Power Station Ash Placement and Environmental Management Plan (MPA, 1999). In this way the envelope of the ash disposal area presented to the environment would be as originally approved for the ash placement proposal.

Diversion drains will be constructed around each placement stage to collect the surface run-off and direct the water to a plastic-lined holding pond (Figure 6). If sufficient water is collected in the holding pond, it will be reused for dust suppression on the brine conditioned flyash disposal site. Accumulated ash in the holding pond and perimeter drains will be collected and returned to the brine conditioned flyash disposal site as required.

3.4 Flyash Conditioning Plant Modifications.

The plant modifications required to allow brine conditioning of fly ash consist primarily of a pump and transport pipeline from the existing storage ponds to one of the existing mills where the flyash is currently conditioned with water to allow placement (Attachment 5).

Under the existing plant layout, 'dry' fly ash is conditioned with water in one of two mixing mills before being conveyed to the ash disposal area for placement. At present the brine is stored in two lined holding ponds.

Co-placement will require brine to be used to condition about 7% of the dry fly ash, instead of fresh water. The process will produce flyash conditioned with brine and will proceed continuously for about 5 months, every three years, until most of the stored brine has been removed from the ponds. Recycled washdown water will then be used as conditioner for the ensuing three years until the brine ponds are again becoming full.

To conserve freshwater, the power station has implemented a program of recycling water where possible and other than containing some silt, the washdown water is similar in quality to fresh water and suitable for flyash conditioning.

One of the two existing conditioning mills will be modified to take pipework and nozzles to inject brine for conditioning flyash. The installation of the brine pipeline, transfer pump and the modifications to the conditioning plant will take about four months to complete.

The existing fly ash conditioning plant area drainage is collected and pumped to settling basins from which the water is recycled. This layout ensures that any spill of brine is intercepted at the earliest point. The drainage system is backed up by the Mt Piper Final Holding Pond, so that in the unlikely event of leaked brine escaping from the settling basins, it can be collected and pumped back to the water treatment plant.

The new pump will be located adjacent to the brine holding ponds, and any drainage from the pump area will be directed back to the brine ponds. The pipeline will be fully welded HDPE and ABS pipe, located above ground to ensure that the possibility of an undetected leak is minimised.

During the period of storage of the brine, and estimated 25 M^3 of solids have settled out into the brine holding ponds. As the settled material cannot be slurried with the brine for mixing with the fly ash, it will be excavated and transported to the ash storage area in sealed trucks. The material will be placed in stage I of the brine conditioned ash placement area, spread in thin layers and covered by a layer of brine conditioned ash in the manner described in Section 3.4. As there will always be some salt deposits generated in the holding ponds, the solids will

be spread in a thin layer in the designated brine conditioned flyash disposal area during each three year campaign.

3.5 Water Cycle Management and Monitoring

3.5.1 Water Cycle management

Due to the nature of the ash disposal area, there is no surface runoff from the site to local water bodies. Surface runoff from the existing ash disposal area is collected in ponds and reused for dust suppression (see Plate 3). With modification to allow inclusion of some brine conditioned flyash placement, as indicated above, diversion drains will be constructed around each placement stage to collect the surface run-off in a lined plastic detention pond for reuse in dust suppression (Figure 6). The detention pond has been sized at 300ML to collect 90% of rainfall runoff events from the brine conditioned flyash placement area. This water cycle management will be incorporated into the Ash Placement and Environmental Management Plan (MPA, 1999).

Groundwater management is an essential part of the water cycle management of the ash disposal area. A schematic of how 'dry' ash disposal is performed and groundwater managed in the old western main cut mine void is shown in Figure 4. The bottom of the mine void is being covered with mine spoil to a minimum level of RL 908m and the ash placed on top of the spoil. In this way, groundwater flow from the Lithgow coal seam passes through the spoil, under the ash deposit, and either does not come in contact with the ash or has minimal contact with it. This will be continued as the void becomes filled with ash.

Some of the groundwater in the mine void is currently exposed in small voids, as can be seen in the aerial photograph in Plate 1 and in Plate 3. These voids, except the north-eastern one known as the "Western Main Void", will be filled with spoil to RL908m and covered with ash. The water in these voids will be used for dust suppression on the existing ash deposit until they are filled. The "Western Main Void" will be kept as a groundwater and surface water collection basin after the ash deposit is capped and revegetated, as indicated in the original EIS.

3.5.2 Water Quality Monitoring

Extensive groundwater monitoring has been ongoing on at least a quarterly basis around the ash disposal site since 1985 to characterise the water quality and hydraulic characteristics before commencement of operation of the power station. Additional sites inside the ash disposal area were installed in 1994 and are monitored on a six monthly basis. The location of the bores were selected according to the ANZECC (1995) principles of up-gradient and down-gradient bores. The bores were placed inside and adjacent to the ash disposal area for early warning of leachates as well as bores further away to allow detection of groundwater movements toward Neubecks Creek and to indicate background conditions.

The locations of the groundwater bores used for modelling the hydraulic characteristics and salt and trace element movement from the brine conditioned flyash co-placement area are shown in Figure 7. This monitoring was supplemented by water quality monitoring of the water in the Western Main open cut mine void (at the northern end of the eastern drain) because some of the groundwater flow was expected to enter Neubecks Creek via the void.

The groundwater parameters monitored in the bores and the mine void are water depth, conductivity, pH, sulfate, chloride and trace elements listed in Schedule 2 of the previous Clean Waters Act, 1970 and relevant ANZECC (1992) guideline trace elements. The details of

the groundwater monitoring program are give in Hodgson (1999) - Attachment 3 as part of the water quality assessment for the brine conditioned ash trial.

Surface water quality monitoring involves the water quality at the Mt Piper Power Station licenced discharge point (DP006), in Neubecks Creek at the stream gauging station, site WX22 and the open cut mine void, mentioned above. The sampling sites are shown in Figure 7. Surface water quality monitoring is proposed to be undertaken on a quarterly basis at these sites to be consistent with the frequency at the licenced discharge point. (Note: water level in the holding pond and pH are measured monthly at DP006 under the current EPA licence). The same characteristics as measured in groundwater are proposed to be monitored at the surface water qualaity sites. The details of the surface water monitoring are also shown in Attachment 3.

It is proposed to install lysimeters to detect seepage, if any, from the brine conditioned flyash deposit. The first lysimeter would be installed in the Stage I co-placement area after it is completed. The existing groundwater monitoring programme will be continued with sampling on an annual basis for borehoes outside the ash disposal area and six monthly for the bores inside the area. If the lysimeters begin to show signs of seepage, the frequency of the outside bores will be increased, as required, to provide feedback for management of the brine conditioned co-placement area.

In addition to the groundwater monitoring associated with the brine conditioned flyash proposal, the following monitoring at the brine ponds is proposed for early warning of leaks to prevent contamination of local groundwater:

- Brine ponds - monitored monthly for pH and conductivity and trace elements listed in Table 8 measured at six monthly intervals;
- Water in the interliner of the ponds containing brine will be tested monthly for pH, conductivity, sulphate and chloride to detect leaks;
- Ground water adjacent to the ponds will be sampled annually, at bores 5/D5 and 5/D6 (Figure 7), for all the elements listed in Table 8 in order to detect any leaks from the outer liner or spills from the ponds.

4. Environmental Impact Assessment

This section describes the environmental issues that are relevant to the proposal, the assessment of effects of co-placement of brine conditioned flyash in the stage I area and the proposed management of each issue. The aim is to ensure that the modification is environmentally acceptable both during the next twenty years of ash and brine conditioned flyash placement and in the long-term, well after the power station has ceased to place ash and brine in the stage I area and it has been rehabilitated.

4.1 Immobilization of Brine in Fly Ash

The theory supporting the brine conditioned flyash co-placement proposal is that the brine will be retained in the pores of the ash provided that the ash does not become saturated. This happens at about 30% moisture. Even if the ash does become saturated, the movement of salts to groundwater would only occur very slowly because the rainfall infiltration into the ash would be limited by the low permeability of the ash.

As the ash pores have a capacity to hold about 30% moisture (Attachment 2), and it is only necessary to have 15% moisture to prevent dusting of the ash, the remaining 15% is available for rainfall infiltration. As the flyash becomes partially cemented when conditioned with water or brine, it was found that rainfall infiltration was only about 1% (but could be up to 4.5% for a 'wet' year and negative in a 'dry' year, see Section 8.5, Attachment 2). Therefore, it would take the order of 20 years for infiltration to fill up the remaining 15% of voids in just one metre of flyash. For this reason rainfall leaching of brine from the ash into the groundwater is not expected to be significant and the brine is effectively immobilised in the flyash.

4.2 Water Quality

Quality. The potential impacts of the proposal on surface and groundwater water quality near the ash disposal area, has been the subject of a significant amount of testing, studies and modelling. A water cycle management plan has been developed to ensure that long-term effects are acceptable. This section describes the water quality issues in the following sequence:

- the existing surface and groundwater;
- leaching tests on flyash and the brine conditioned flyash;
- spoil adsorption of trace elements leached from flyash and brine conditioned flyash;
- measurements of rainfall infiltration and surface runoff from a trial brine conditioned ash pad;
- modelling of the brine conditioned ash co-placement proposal.

Note that the water quality information is be presented in a summary form only. Details are presented in the attachments to this document.

4.2.1 Existing Surface and Groundwater Quality

Surface water in the nearby Neubecks Creek is characterised by moderately elevated concentrations of sulphates and manganese, reflecting the nature of the local geology including the coal out-cropping and mining in the area. The groundwater likewise reflects the local

geology and is also elevated in sulphate and manganese as well as iron and some trace elements.

Trace elements such as zinc and lead are relatively high in groundwater near an old copper, lead, zinc open-cut mine to the north-west of the ash disposal site. The groundwater has low pH due to the presence of iron pyrites, and its oxidation by groundwater passing through the area, gives very high concentrations of iron and sulphate. At background bores away from the old mine area the concentrations of the metals are much lower.

Due to the localised nature of the various ore bodies and coal mines in the area, the groundwater water quality is highly variable between sampling bores. Accordingly, it is not possible to define the background conditions as one set of typical concentrations. For this reason the groundwater was modelled to understand and characterise the water quality distribution and direction of groundwater flows. This is discussed further in section 4.2.5 below.

The existing surface and groundwater water quality for the area is summarised in Table 4 and details are given in Attachment 3.

Table 4. Existing Surface and Groundwater Quality in and Near the Ash Disposal Area

Element	Ash Disposal Area Current *	Ash Disposal Area Open-cut Void	Background **		Neubecks Creek ***	ANZECC/CWA #	
			(mg/l)				
General	B&MP901		/D4	/D3	WX22		
pH	6.2	7.4	2.5	6.4	7.6	6.5-9.0	
Cond (uS/cm)	1233	1080	2722	725	370	-	
TDS	888 ^	858	2442	435	217	1000	
Alk ($CaCO_3$)	-	68	0	182	77	-	
Cl	-	15	21	42	13		250
SO4	-	462	1605	136	85		250
Na	-	23	10	52	14	300 +	
K	-	10	8	63		-	
Ca	-	93	43	50	27	-	
Mg	-	65	18	32	16	-	
Trace Elements							
As	0.009	-	0.0665	0.0016	<0.001	0.050	
Ag	0.005	-	0.001	<0.001 +	-	0.0001	
Ba	0.024	0.036	0.021	0.035	-		1.0
Be	-	-	0.003	<0.001	-	0.004	
B	0.170	0.035	0.01	0.01	0.071	0.5-6.0	
Cd	0.001	-	0.005	<0.001	-	0.002 ^^	
Cr	0.028	-	0.051	0.0017	-	0.010	
Cu	0.008	0.005	0.182	<0.01 +	0.002	0.005 ^^	
F	0.425	0.24	0.30	0.33	0.20	1.0 +	
Fe	15.95	0.30	370	6.85	0.053	1.0	
Hg	0.0001	-	<0.0001	<0.0001	-	0.0001	
Mn	4.20	2.55	1.725	0.563	0.071	2.0 +	
Mo	-	-	<0.001	<0.001	-	0.01 +	
Ni	0.478	0.290	0.086	0.0025	-	0.150 ^^	
Pb	0.001	<0.005	0.185	0.002	0.001	0.005 ^^	
Se	0.005	0.001	<0.001	<0.001	<0.001	0.005	
Zn	0.327	0.119	0.830	0.010	0.012	0.050 ^^	

* average of bores B901and MP901in currently used area (MPA, 1995)
** bore MPGM4/D4 near old Cu, PB, Zn open-cut mine and bore MPGM4/D3 between ash disposal area and Neubecks Creek (Hodgson, 1999)
*** sampling site WX22
^ conductivity x 0.72 ^^ local water hardness allows upper limit
# ANZECC (1992) guidelines for protection of freshwaters (#) and Irrigation water(+)/Schedule 2 of CWA, 1970 in lieu of POEO Act Regulations which has no concentration schedule
+ detection limit of routine analytical method greater than the ANZECC guideline

4.2.2 Leaching tests

In order to understand how rainfall infiltration can leach salts and trace elements from the brine conditioned flyash deposit and the main ash deposit, leaching tests were undertaken. ASTM shake tests were done at high ratios of demineralised water to ash or brine conditioned flyash (2:1) to simulate the expected conditions of leachate entering groundwater under the deposits (Hodgson and Tam, 1998). The results are summarised in Table 5 and the details are given in Attachment 3.

These leachate concentrations, adjusted for the effects of mine spoil adsorption or releases (see Section 4.3), were used to model the effects of leachates from the main ash deposit and the brine conditioned flyash deposit on local groundwater. As mine spoil was shown to release some metals (see Section 4.2.3) in the presence of brine, leaching tests were also done on the spoil itself. This showed that the mine spoil contains minerals, such as manganese, nickel and zinc that can be leached by the brine. These elevated concentrations in the spoil occur because of the local geological conditions, and explains why the Mount Piper area has some elevated background trace element concentrations. The results are given in Table 5.

4.2.2.1 TCLP Leaching Tests

The Waste Minimisation and Management Act, 1995 guidelines for classification of wastes recommends leaching tests at a ratio of 20:1 and provides concentration limits for classification of wastes (EPA, 1999a). These tests are called Toxicity Characteristics Leaching Procedure (TCLP) and were done on brine conditioned flyash for comparison with the guidelines.

Table 5. Leaching Tests on Water and Brine Conditioned Ash and Mine Spoil

Element	Normal Flyash	Brine Conditioned Ash		Inert **	Mine Spoil	
% Brine	0	17		Waste	0	
Ratio	2:1	2:1	20:1	Guidelines	2:1	20:1
		(mg/l)				
General			TCLP	TCLP		
pH	4.92	7.6	7.6	^	7.6	7.2
Cond (uS/cm)	745				1212	90
TDS *	627	8400	960		800	48
Alk ($CaCO_3$)	14	155	40		18	
Cl	<1	1410	160		103	10
SO4	351	3750	414		349	9
Na	<1	1610	178		157	<5
K	29	244	27		31	<5
Ca	101	100	12		19	<5
Mg	<1	310	35		26	<5
Trace Elements						
As	0.009	0.050	0.012	0.5	0.001	<0.001
Ag	0.0002	<0.0002	<0.0002	0.5	<0.0001	
Ba	0.107	0.072	0.041	-	0.245	0.173
Be	<0.0002	0.003	0.002	0.1	0.0001	
B	4.02	6.1	0.74	-	1.475	0.146
Cd	0.024	0.003	<0.002	0.1	0.002	<0.005
Cr	0.003	0.037	0.006	0.5 +	0.001	<0.005
Cu	0.179	0.078	0.012	-	0.002	<0.005
F	8.2	6.0	0.91	15	0.49	0.68
Fe	<0.1	0.007	0.015	-	0.097	<0.03
Hg	$<1x10^{-5}$	0.00002	<0.00001	0.02	<0.0001	
Mn	0.154	0.44	0.069	-	1.640	0.035
Mo	2.2	0.84	0.100	0.5	0.003	
Ni	0.020	0.20	0.020	0.2	0.050	
Pb	0.003	<0.0002	<0.0002	0.5	0.0002	<0.005
Se	0.179	0.180	0.020	0.1	0.0115	<0.001
Zn	0.120	0.039	0.012	-	0.366	<0.050

* Total Dissolved Solids or filterable residue

** used with solids concentrations for brine conditioned flyash, in Table 5, above to classify as inert.

^ natural pH of test solution when leached with demineralised water + Cr (VI)

As the main ash deposit and the brine conditioned flyash are not penetrated by the local groundwater, the tests were undertaken at the pH that naturally developed at the 20:1 ratio. The brine conditioned flyash was slurried with demineralised water to simulate rainfall infiltration. The TCLP leaching tests and the Inert Waste leaching test guidelines, are given in Table 5 and the details are given in Attachment 3.

More salts, but not necessarily more trace elements, were leached from the brine conditioned flyash than from normal flyash. The results indicate that the presence of brine may inhibit leaching of some trace elements (eg copper and zinc) from the brine conditioned ash, probably because of the high concentrations of calcium and magnesium carbonate in the brine (see Table 2). Although the brine contains relatively high concentrations of copper, nickel and zinc these do not add to the amounts leached and are effectively immobilised in the brine conditioned flyash.

It can be seen from Table 5 that the leachate concentrations in are considerably lower than the TCLP (20:1) leaching tests given in EPA (1999a, Table A4) Inert Waste guidelines. Hence the brine conditioned flyash would be classified as "Inert" under the Waste Minimisation and Management Act, 1995.

The mine spoil leached significant concentrations of manganese at the 2:1 water: spoil ratio and chemical composition of the mine spoil itself (Attachment 3) reflected the local geological conditions.

4.2.3 Mine Spoil Adsorption Tests

Trace elements leached from water conditioned flyash or brine conditioned flyash by rainfall infiltration may move down into the groundwater where they could interact with the mine spoil placed under the ash deposit. It is known that the fine soil particles adsorb the trace elements because of ion exchange and adsorption sites that the spoil presents. For example, about 87% of trace elements leached from the flyash deposit in the Ravensworth voids were removed by seepage through the surrounding spoil (Hodgson and Tam, 1998). Therefore, spoil adsorption tests were undertaken according to the US EPA protocol (1991) to allow more realistic modelling of the movements of trace elements leached from the ashes and brine conditioned flyash to local groundwater at Mt Piper Power Station.

The adsorption tests were undertaken at ratio of 2:1 (distilled water : normal flyash or brine conditioned flyash), to allow an accurate estimate of adsorption and interactions with the mine spoil under the main ash deposit. Adsportion tests were done using 11% brine conditioned ash, which is similar to the 12.2% of the final proposal.

The tests showed mine spoil adsorbs some metals while some can be leached from the mine spoil. Trace elements such as selenium were up to 90% removed from leachate solutions and these percentages were used to model the trace element concentrations in seepage entering the Eastern Drain.

Due to the local geology, the mine spoil is rich in minerals containing zinc, nickel, and manganese. A small amount of these metals were leached from the mine spoil and added to the leachate concentrations. However, because of the remoteness of the mine spoil from the brine conditioned flyash, the increase in leachate concentrations would be minor. The increases were estimated to be about 0.5% for zinc, 1.4% for iron, 6.2% for manganese and 11% for nickel. These increases, as well as the decreases due to adsorption, were taken into account in

modelling the groundwater concentrations. The adsorption test results, and a leaching test on the mine spoil itself, are summarised in Table 6 and details are given in Attachment 3.

Table 6. Trace Element Adsorption by Mine Spoil

	Leached Brine Conditioned Ash	After Adsorption on Mine Spoil *	Adsorption (%)
% Brine	11	0	
Ratio	2:1	2:1	2:1
Leachant	Demin. Water	Brine/ash Leachate	
	(mg/l)		
General			
pH	6.2	7.3	
Cond (uS/cm)	5007	6004	
TDS	5090	5920	
Alk ($CaCO_3$)	60	62	
Cl	554	730	
SO4	1850	2560	
Na	670	791	
K	135	115	
Ca	173	192	
Mg	149	232	
Trace Elements			
As	0.027	0.009	67
Ag	<0.0001	<0.0001	-
Ba	0.134	0.063	39
Be	0.0006	0.0002	-
B	4.025	2.100	48
Cd	0.0053	0.0006	88
Cr	0.015	0.003	80
Cu	0.008	0.002	75
F	4.2	0.31	93
Fe	<0.001	0.175	**
Hg	<0.0001	<0.0001	-
Mn	0.343	13.035	**
Mo	1.91	0.038	98
Ni	0.0275	0.810	**
Pb	0.0004	0.0003	-
Se	0.290	0.058	80
Zn	0.0485	0.244	**

* corrected for desorption (see attachment 3) and leaching of mine spoil (see Table 5)
** indicates element leached from mine spoil, rather than adsorbed.

4.2.4 Brine in Ash Field Trial

The aims of the brine in ash field trial were to measure the rainfall infiltration and compare the results with those previously estimated for the ash disposal EIS in 1989. The aim was also to measure the volume and water quality of the surface runoff to assist in the design of water cycle management around the brine/ash disposal site. A smaller test pad, next to the main pad, was capped with spoil and allowed to revegetate naturally to determine the effectiveness of capping material on reducing infiltration.

The two year trial between March, 1996 to 1998 was approved by Lithgow City Council and the NSW EPA in 1996 (see Attachment 1).Brine was added to the 10%, 90% mixed furnace and flyash production from the power station, at 11% (v/v) brine, and used to construct a 30 metre by 10 metre test pad of 1.5m thickness. The pad construction can be seen in Plate 4 and the surface and infiltration collection devices are shown in Plate 5. Construction of the pad is described in Attachment 2.

Brine was added to the mixed (10%:90%) furnace and flyash production from the power station, at 11% brine, to construct a 30 metre by 10 metre test pad of 1.5m thickness. Details of the construction of the pad are described in Attachment 2.

The trial test pad was monitored for rainfall infiltration and runoff as well as water quality in the surface runoff. The moisture content of the pad was monitored over time to estimate the rainfall infiltration.

The trial found that the infiltration was about 5 mm per year (compared with the previous calculation of 470 mm/year. This small amount of rainfall infiltration is equivalent to less than 1% of the annual average rainfall.

Rainfall infiltration into the trial pad over the two year period was so small that no leachate appeared in the drainage at the base of the pad. That is, no mobilisation of water in the ash pores occurred. Monitoring of the main ash deposit over the four years of operation since 1994 has also shown no mobilisation of water in the ash (Attachment 3). The low rainfall infiltration, together with the design of the brine/flyash deposit, make co-placement of brine a viable proposition.

The rainfall runoff from the test pad, when it occurred, contained significant concentrations of salt and trace elements but, because of the small volume, the amount of brine leached out of the ash was <1% (Attachment 3). The salts were leached from the surface as the rainfall penetrated into the surface layers of the ash and dissolved a small amount of the brine, causing efflorescence of the ash surface (see Plate 6).

The rainfall runoff water quality results from the brine conditioned ash test pad are summarised in Table 7 and compared with that in runoff collected from normal ash in a small pond near the existing ash disposal area. Runoff from the existing pad had a near neutral pH but was lower than that collected in the pond.

The brine conditioned ash runoff was more saline during dry weather but was similar to that in the local groundwater during wetter periods. However, the concentration of some of the trace elements, such as zinc and selenium, were elevated in the pad runoff and would have to be managed to prevent local surface and groundwater contamination.

A detailed report on the surface runoff and measured infiltration rates is given in Attachment 2. Water quality in the test pad runoff is detailed in Attachment 3.

Table 7. Brine Conditioned Ash Test Pad Water Quality in Rainfall Runoff Compared with the Main Ash Disposal Area Runoff

Element	Ash Disposal Area *	Test Pad		ANZECC/CWA #	
		Wet Weather ** (Aug.,96-Feb.,97)	Dry Weather *** (Mar-Aug.,97)		
		(mg/l)			
General					
pH	7.8	6.8	6.2	6.5-9.0	
Cond (uS/cm)	1096	476	1346		
TDS	789 ^	436	1055	1000	
Alk ($CaCO_3$)	192	7.4	8.1		
Cl	26	7	13		250
SO4	581	233	696		250
Na	36	7	79	300 +	
K	13	<5	9		
Ca	125	101	216		
Mg	86	<5	7.7		
Trace Elements					
As	0.001	0.020	0.017	0.050	
Ag	<0.005	-	-	0.0001	
Ba	-	0.227	0.128		1.0
Be	-	-	-	0.0004	
B	0.16	0.310	0.396	0.5-6.0	
Cd	0.00056	<0.001	0.002	0.002 ^^	
Cr	0.0011	0.015	0.010	0.010	
Cu	0.010	0.015	0.015	0.005 ^^	
F	0.75	0.56	0.92	1.0 +	
Fe	0.03	0.341	0.165	1.0	
Hg	0.00013	-	-	0.0001	
Mn	0.48	0.025	0.129	2.0 +	
Mo	-	-	-	0.010 +	
Ni	0.048	-	-	0.150 ^^	
Pb	0.0009	0.007	0.006	0.005 ^^	
Se	0.008	0.071	0.135	0.005	
Zn	0.038	0.173	0.424	0.050	

* surface runoff collection Pond No6, MPA (1995)
** 0.036 l/m^2/month *** 0.018 l/m^2/month (excluding 4th March, 1997)
^ Conductivity x 0.72
^^ local water hardness allows upper limit
# ANZECC (1992) guidelines for protection of freshwaters and Irrigation water (+)/Schedule 2 of CWA, 1970 in lieu of POEO Act Regulations which has no concentration schedule

Although the concentration of dissolved salts in runoff from the test pad was high at times, and averaged 1140 mg/l over the two year period, little of the brine was leached out of the ash deposit by rainfall runoff. This was because most of the rainfall landing on the surface of the ash was evaporated and less than 5% of the rainfall actually ran-off the ash surface. It appears that the rainfall was adsorbed into the surface layer of the ash but that it evaporated between rainfall events. As a result, less than 1% of the 3,975 kg of brine in the test pad was leached out by runoff over the two year period.

Given the relatively small amount of runoff, it is feasible to manage and collect all of this water in perimeter drains and direct it to a plastic lined retention basin, as shown in Figure 6. It is proposed to do this and in this way, none of the salts and trace elements in surface runoff will enter the local groundwater. The water would be reused for dust suppression in the brine/ash area. As explained in Section 2.3.3, at the time of the field trial, furnace ash was deposited together with flyash at Mt Piper Power Station. The field trial results of rainfall infiltration and runoff are considered to be representative of the subsequent change in the design conditions to 17% brine conditioned flyash and were used in the groundwater modelling presented in the next Section.4.2.5

4.2.5 Groundwater Modelling

Groundwater flows and pathways were modelled using the water height data from the bores and the mine void and rainfall data for the Lithgow gauge. Groundwater flows were shown to be from west of the ash disposal area to the Eastern Drain, which enters the mine void, but with limited connection between the mine void and Neubecks Creek (Merrick and Tammetta, 1999 – see Attachment 4).

Stream flows have been measured by the Department of Land and Water Conservation (DLWC) at the stream gauging station on Neubecks Creek since 1992. The flow data has been used to assist groundwater modelling and to assess the effects of brine movement to Neubecks Creek. The stream flow data is shown in Attachment 3 and summarised in the modelling report in Attachment 4. Rainfall data was obtained for the Lithgow gauge from the Bureau of Meteorology for comparison with stream flows.

Modelling of the effects of the proposed brine conditioned flyash disposal site on groundwater water quality was undertaken using the rainfall infiltration, leachate test data, spoil adsorption and the existing groundwater water table height. The model assumed that seepage from the brine conditioned flyash deposit, which enters the underlying spoil, would enter the Eastern Drain, which flows to the Western Main Open-cut void. As a small amount of water from the void may seep into Neubecks Creek, the potential effects of this on water quality in the creek was also modelled. The effects of both the proposed brine conditioned flyash co-placement, as well as the overall ash placement, on local groundwater was modelled. The results are discussed in this section and the detailed modelling report is given in Attachment 4.The current distribution of dissolved solids in groundwater around the ash disposal site is shown in Figure 8. As indicated above, the highest salt and trace element concentrations and lowest pH occurs in bores outside the ash disposal area (Table 4). The bores at the southern end of the ash disposal area are also elevated in salt content, where underground mining appears to have effected the water quality. Groundwater under the ash disposal area, in mine spoil, is in the middle of the range of salt concentrations, the pH slightly acidic and trace elements moderately elevated. Due to this variability caused by the local geological conditions, it was only possible to model the increase in concentrations of salts and trace elements likely to result from the proposal.

The existing and modelled groundwater table is shown in Figure 9 and indicates that the flow is from the west of the ash disposal site, through the spoil, and directed towards the Western Main Open-cut Mine Void, at the eastern end of the ash disposal area. The predicted levels were based upon the distribution and characteristics of ash, spoil and sandstone in the area and were in acceptable agreement with the measured water table levels.

The model was calibrated for rainfall infiltration and hydraulic conductivity of ash, spoil and sandstone. The ash infiltration estimate was comparable with that measured by the field trial at 0.6 % of the annual average rainfall (Attachment 4). The model required a high hydraulic conductivity for spoil, which means that most of the groundwater will flow rapidly through the spoil under the ash deposit. That is, the spoil will act as a drain under the ash disposal area and minimise contact with the ash. This was the original proposal in the ash storage EIS (ECNSW, 1989).

Using these characteristics, with the 20 years of normal flyash and the brine conditioned flyash in place, the water table would only rise a maximum of about 2 metres above the existing levels (Attachment 4). This means that the groundwater table will not come in contact with the brine

conditioned flyash, which is located some 37 metres above the maximum predicted groundwater table.

The model was run for 17% brine conditioned flyash and the conditions of median rainfall and rainfall recharge of 0.62% on the ash deposit. The previous model run for 11% brine (Merrick and Tammetta, 1999) showed that a 10 year time frame was sufficient to indicate long-term equilibrium conditions after final ash placement. The predicted increase in salts and trace elements in the groundwater seeping into the Eastern Drain and the Western Main Void and from there to Neubecks Creek are shown in Table 8. The concentrations for the Eastern Drain are shown for the water conditioned ash and the brine conditioned ash deposits. The highest predicted concentrations in Neubecks Creek, resulting from these sources, are also shown.

Table 8. Predicted Increase in Groundwater Concentrations of Salts and Trace Elements Seeping into the Eastern Drain/Western Main Void and Neubecks Creek

Element	Water Conditioned Ash - 50m from Eastern Drain	Brine Conditioned Ash 17% Brine	Neubecks Creek	Guidelines ANZECC/CWA #
		(mg/l)		
General				
pH				6.5-9.0
Cond (uS/cm)	90 *	90 *	$7.1x10^{-4}$ *	
TDS	65	65	$5.1x10^{-4}$	1000
Cl	<0.1	11	$8.5x10^{-5}$	250
SO4	36	29	$2.3x10^{-4}$	250
Na	<0.1	12	$9.7x10^{-5}$	300 +
K	3.0	1.9	$1.5x10^{-5}$	
Ca	10	0.78	$6.0x10^{-6}$	
Mg	<0.1	2.4		
Trace Elements				
As	$1.9x10^{-4}$ ^	$2.3x10^{-4}$	$7.3x10^{-9}$	0.050
Ag	$1.2x10^{-5}$	$<9.3x10^{-7}$	$<1.6x10^{-10}$	0.0001
Ba	0.0041 ^	$3.3x10^{-4}$	$8.6x10^{-8}$	1.0
Be	$<1.2x10^{-5}$	$1.4x10^{-5}$	$1.8x10^{-10}$	0.004
B	0.130 ^	0.0147 ^	$3.3x10^{-6}$	0.5-6.0
Cd	0.00016 ^	$1.4x10^{-5}$	$1.9x10^{-8}$	0.002 ^^
Cr	$1.9x10^{-4}$	$1.7x10^{-4}$	$2.4x10^{-9}$	0.010
Cu	0.0028 ^	$3.6x10^{-4}$	$1.5x10^{-7}$	0.005 ^^
F	0.051 ^	0.028	$6.6x10^{-6}$	1.0 +
Fe	<0.006	$3.3x10^{-5}$ **	$8.0x10^{-8}$	1.0
Hg	$<6.0x10^{-7}$	$0.93x10^{-7}$	$8.0x10^{-12}$	0.0001
Mn	0.0096	0.0022 **	$1.3x10^{-7}$	2.0 +
Mo	0.0027 ^	$0.8x10^{-4}$ ^	$1.8x10^{-6}$	0.010
Ni	0.0012	0.00103 **	$3.1x10^{-8}$	0.150 ^^
Pb	$1.9x10^{-4}$	$<0.9x10^{-6}$	$2.4x10^{-9}$	0.005 ^^
Se	0.0022 ^	$1.7x10^{-4}$ ^	$1.5x10^{-7}$	0.005
Zn	0.0074	$1.8x10^{-4}$ **	$1.6x10^{-7}$	0.050 ^^

^ application of soil adsorption given in Table 6
* TDS / 0.72 ** included effects of desorption from mine spoil
^^ local water hardness allows upper limit
# ANZECC (1992) guidelines for protection of freshwaters and Irrigation water (+)/Schedule 2 of CWA, 1970 in lieu of POEO Act Regulations which has no concentration schedule

Modelling of the fly ash disposal mound approved in the 1989 EIS showed that where the deposit came within one metre of the eastern drain, some trace elements were predicted to have significant concentrations in groundwater seeping into the Eastern Drain (Attachment 4). Modelling showed that the increase above background of trace element concentrations entering the Eastern Drain would be at acceptable levels with the main ash deposit moved back about 50 metres from the drain. It was therefore decided that part of the modification of the development consent would involve approval to modify that the ash placement plan to move the contours by 50 metres from the Eastern Drain. This was included in the modelling results shown in Table 8.

With 17% brine conditioned ash, all the trace elements entering Eastern Drain were predicted to be below the water quality guidelines for freshwaters or irrigation waters. The increase in groundwater salinity and trace elements was predicted to have an insignificant effect on Neubecks Creek. These results were obtained because flyash and brine conditioned flyash has a low infiltration rate, so seepage from the existing ash deposit to the local groundwater is very slow. Hence the effects of the proposal on water quality in Neubecks Creek is likewise expected to be insignificant.

4.3 Traffic

The proposal involves no change in the method by which ash will be deposited. Accordingly, the proposed ash and brine disposal will not lead to an increase approved traffic in the site or traffic from the power station to the ash disposal site.

4.4 Air Quality

The brine conditioned flyash placement will be kept moist, either by watering trucks or by sprays, to prevent dusting. Accordingly, the proposal will not lead to any changes in air quality compared with that from the existing ash disposal area.

4.5 Noise

The installation of the brine pipeline and the modifications to the conditioning plant will be undertaken over about four weeks during daylight hours on week days and will only be associated with minor noise impacts. The noise level is not expected to exceed the background level by more than 20 dB(A). However, as Mt Piper is remote from any residences or public places, no noise nuisance is expected.

4.6 Soils

As the brine conditioned flyash is to be placed in the existing ash disposal area there is no risk of soil contamination from the project. Any spillage of brine conditioned flyash in the truck loading area will be cleaned up to prevent rainfall runoff introducing leached brine into the general ash disposal area. The only risk of soil contamination is from the potential for spillage of brine at the holding ponds, the conditioning plant or from the pipeline. This will be controlled by the collection and recycling of all drainage at the fly ash conditioning plant.

At the end of each brine conditioned flyash placement campaign, the ash conveyor will be washed down to make it ready for the normal water conditioned flyash. This washdown water is not expected to affect the local soils and will be collected in the station drains and recycled in the ash conditioning plant. All the station drains are backed up by the Mt Piper Final Holding Pond to prevent discharges to Neubecks Creek.

4.7 Waste Management

This section is about the management of the various wastes associated with the project: brine conditioned flyash and brine storage.

An important way to manage brine is to minimise its production at the power station. Several strategies for minimising brine production at Mt Piper Power Station have been investigated. The most effective has been to use a greater proportion of the Fish River water supply allocation and to reduce the use of the saltier Coxs River supply. This has limited brine production to about 8ML/year, even when the power station was operated at near full capacity.

Brine will continue to be stored in the two 20ML lined ponds, subject to DUAP consent and EPA approval. The ponds will be monitored for leaks, as set out in Section 3.5.2, and managed to prevent local groundwater contamination.

The brine in the temporary 8 ML storage pond will be used to condition flyash placed in the first stage of brine co-placement. After that, any residual brine will be cleaned out and put into one of the 20ML holding ponds. The pond will than be returned to its normal use as a settling basin.

The conditioning plant construction wastes, eg HDPE and ABS pipe, will be taken off site by contractors for disposal in the local garbage facility.

The placement of the ash in the ash disposal area will continue as approved, with modification for the brine conditioned flyash placement. There should be no operational wastes associated with this modification.

4.8 Visual

The contours of the ash disposal area will be similar to those in the original EIS, apart from some minor modification near the Eastern Drain. The uncapped ash deposit will not be visible from the main roads in the vicinity of the site. At the height when it would become visible, it will have been capped and revegetated. Hence, there will be no change to the visual impact of the power station

4.9 Land Use

The brine conditioned ash will be stored in the ash disposal area, the existing transportation infrastructure will be used and the conditioning plant will be built adjacent to the existing water conditioning plant. On this basis, the proposal will not alter the existing land use. The grounds of Mt Piper power station are an industrial facility for electrical power generation.

4.10 Flora Fauna and Heritage

The power station site was previously an open cut coal mine. The area in which the brine pipeline is to be constructed and the brine conditioning plant located is generally concreted.

No species of flora and fauna and no historical or archaeological items of importance have been identified within the power station area and as the site is now completely disturbed no further investigation is considered necessary.

4.11 Social and Economic Issues

A small workforce will be involved in the construction of the pipeline and the conditioning plant over a period of approximately four weeks. Owing to its relatively minor scale, the modification is unlikely to have any social or economic impacts.

The brine conditioned ash proposal is a cost effective and environmentally acceptable long term solution for disposal of the brine, a waste product that is not economically feasible to recycle.

4.12 Safety and Risk Management

The brine storage ponds are double lined to minimise the risk of leaks and local groundwater contamination. Monitoring of any water collecting in between the liners and the local groundwater is expected to minimise the risk of brine leaks by providing feedback for management of the ponds.

If the inner liner fails, the pond would be emptied into either the other pond or one of the water treatment plant holding ponds for temporary storage until the leak was repaired. Regular inter-liner monitoring is expected to make undetected leakage from the outer liner highly unlikely. If it were to occur, groundwater monitoring bores located adjacent to the brine storage ponds (Figure 7) will enable early detection and enable prompt remedial action to be taken.

The brine conditioned flyash modification does not involve any significant environmental or safety risks. Although the brine contains dissolved salts and metals, manual handling of the liquid or brine conditioned flyash is not planned. The usual precautions will be taken to protect the safety of workers involved in the use of brine for conditioning of flyash and a Materials Safety Data Sheet has been prepared. WorkCover NSW have confirmed that the brine is not classified as Dangerous Goods, so the proposal will not impact on the occupational health and safety at the power station.

4.13 Construction Impacts

All work associated with the brine conditioning plant will take place within the boundary of the Mt Piper power station site. The area is a cleared industrial site and was previously an open cut coal mine.

The work associated with construction of the runoff detention pond for the brine conditioned flyash area will be within the ash disposal area, so no impacts are expected.

Measures will be taken during construction to avoid any air (sprays and watering to prevent dusting), water (retention basins as described above) or noise (activities will be within the times and limits approved) pollution. Containment will prevent any spills to the environment. Approval for construction of the brine conditioning plant will be sought from the EPA under S17K of the Pollution Control Act 1970.

4.14 Cumulative Impacts

To ensure cumulative impacts of the brine conditioned flyash proposal are acceptable, the effects of leachates on groundwater from the main ash disposal area as well as the brine co-placement area was assessed. The groundwater modelling has shown that the impact of the proposed brine conditioned flyash co-placement is minor and cumulative effects of both the brine conditioned flyash and the greater ash disposal deposit are acceptable with minimal effects on long-term groundwater quality in the area. The slow rate of movement of groundwater to Neubecks Creek from the combined site is also expected to have insignificant effects on water quality.

The existing power station and ash disposal area have been designed to ensure that there will be no long-term effects on the environment. The brine conditioned flyash modification has been designed to ensure this remains the case. Monitoring of groundwater is undertaken around the brine ponds and ash disposal area, as well as in Neubecks Creek, to provide management feedback to ensure that ground and surface waters in the vicinity of the power station are protected. The additional monitoring proposed in the brine conditioned flyash area will support this management function.

5. Summary of Mitigation Measures and Safeguards

The measures to be implemented to ensure that the proposed co-placement of brine conditioned flyash in the Mt Piper Power Station ash disposal area has acceptable long-term environmental effects on local water quality, in surface and groundwaters, are summarised below:

- immobilisation of brine in flyash by use of the minimum amount to condition the flyash to prevent dusting;
- the use of the minimum amount of flyash for brine co-placement to maximise the amount available for possible future utilisation;
- placement of the brine conditioned ash above the final water table expected to be reached when the site is fully rehabilitated;
- location of the brine conditioned flyash in the ash disposal area away from local surface waters;
- water cycle management by collection of surface runoff in perimeter drains and a plastic-lined pond, its reuse for dust control and capping to exposure of the brine conditioned flyash to rainfall;
- location of the brine conditioning plant, pump and pipeline in drained areas where potential spills can be intercepted and the water/brine recycled;
- safe storage of the brine in double-lined holding ponds, surveillance by an effective monitoring program and contingency plans in the event of detection of a leak;
- a surface and groundwater quality monitoring program to ensure detection of leachates, if any, for feedback to management of the brine conditioned flyash deposit during the twenty years of operation;
- spoil capping and revegetation of the whole ash deposit, including the capped brine conditioned flyash.

The proposed modification optimises the use of ash production, while providing an environmentally acceptable long-term solution for brine disposal at the power station.

6. Conclusion

With the inclusion of brine in only about 7% of the total ash deposit, the basic operation of the deposit will not change. The brine conditioned flyash will be situated on the upper western edge where it will not come in contact with the local groundwater. Due to the way that it is to be placed, covered with normal ash and surface runoff collected, the brine is expected to be effectively immobilised in the ash deposit and not significantly affect the long-term local groundwater and surface water quality.

The proposed modification of brine conditioned flyash co-placement in the existing ash disposal area at Mount Piper Power Station has been shown to be a cost effective way of providing for the sustainable, long-term, environmentally acceptable, on site, disposal of brine. The modelling and studies undertaken indicate that the modification will not have any significant impact on surface and groundwater quality of the Neubecks Creek catchment, in the short or long-term. Its is concluded that the overall environmental impact of the modification will be acceptable.

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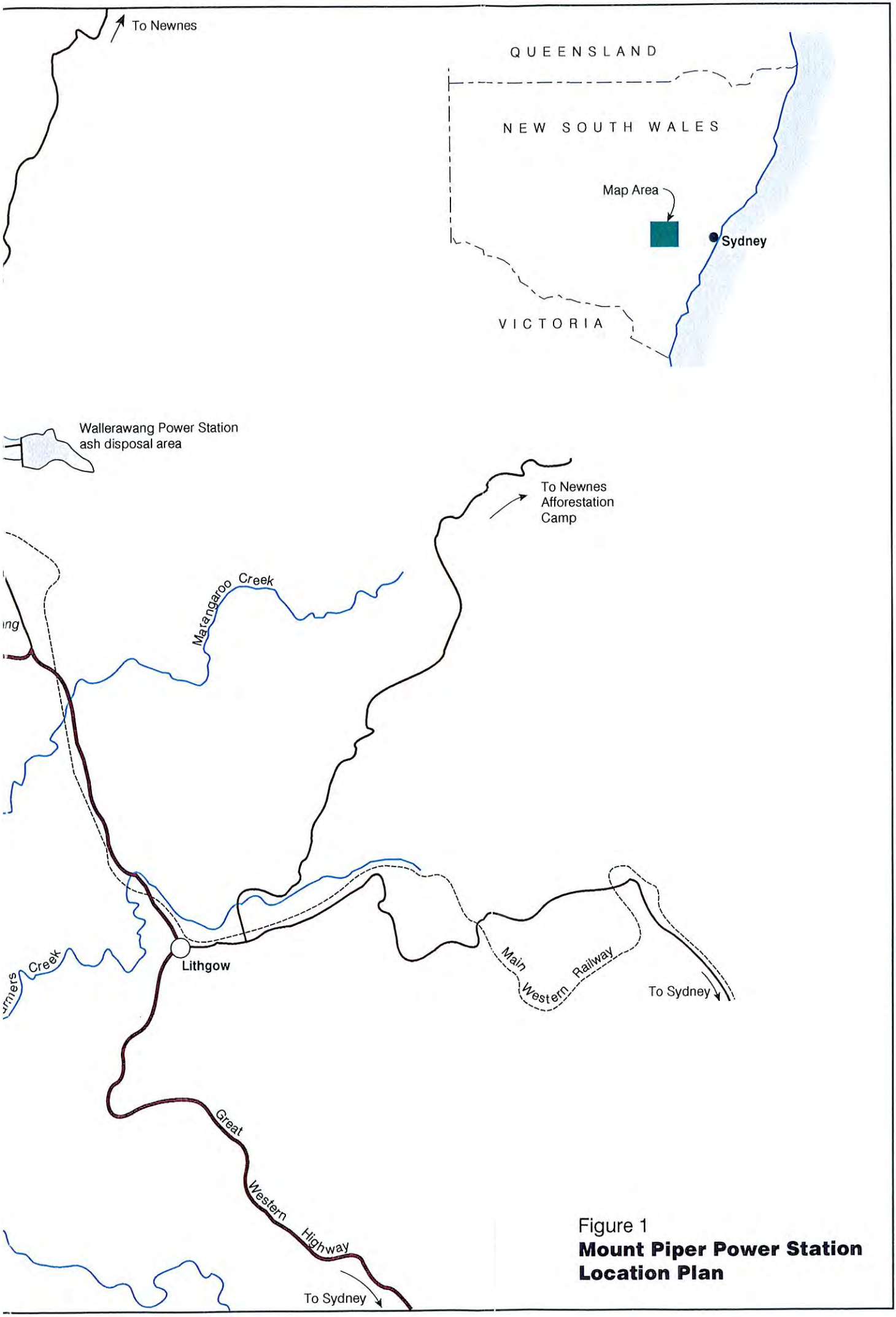
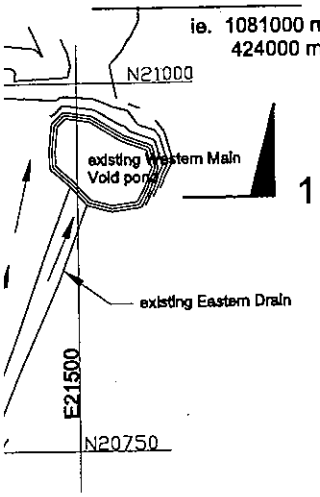


Figure 1
Mount Piper Power Station
Location Plan

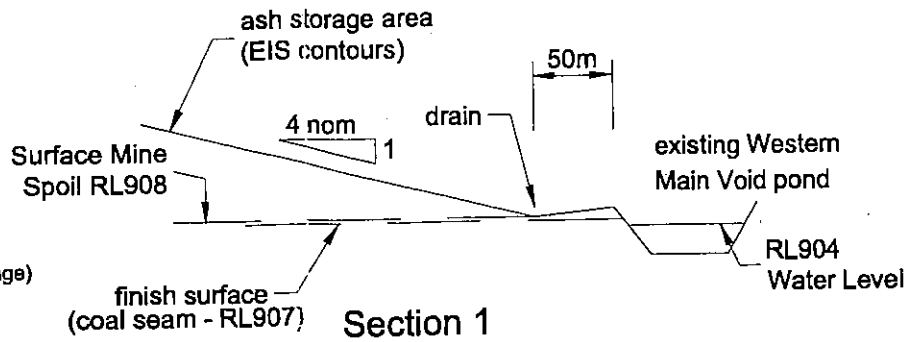
SH/BRINE DUMPS

Oct 99 - Jul 00	235000 m^3	(ash/brine dump)
	84000 m	(capping layer)
Oct 02 - Mar 03	141000 m^3	(ash/brine dump)
	60000 m^3	(capping layer)
Oct 05 - Mar 06	141000 m^3	(ash/brine dump)
	60000 m^3	(capping layer)
Oct 08 - Mar 09	141000 m^3	(ash/brine dump)
	60000 m	(capping layer)
Oct 11 - Mar 12	141000 m^3	(ash/brine dump)
	60000 m	(capping layer)
Oct 14 - Mar 15	141000 m^3	(ash/brine dump)
	48000 m^3	(capping layer)
Oct 17 - Mar 18	141000 m^3	(ash/brine dump)
	52000 m^3	(capping layer)
Total	1505000 m^3	

ie. 1081000 m^3 (ash/brine storage)
424000 m^3 (capping layer)

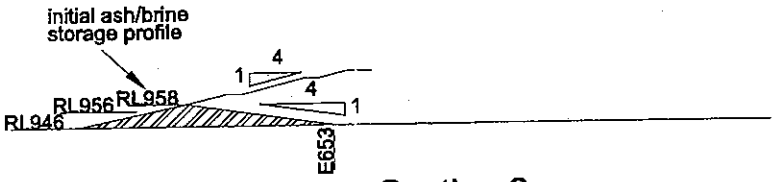


EIS Contours



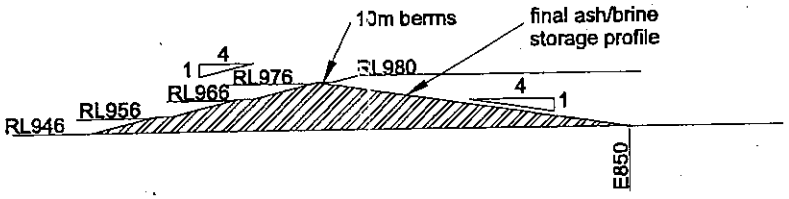
Section 1

typical section thru east edge of storage



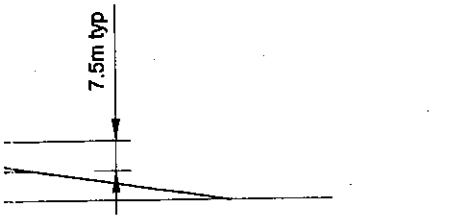
Section 2

TYPICAL SECTION THRU INITIAL STORAGE (0.235 x 10^6 m^3 ash/brine storage)



Section 2

TYPICAL SECTION THRU FINAL STORAGE (1.08 x 10^6 m^3 ash/brine storage)



NOTE

Batters to external batters between berms is shown at 1:4, final batters to be 1:5 (without berms)

Details shown are diagramatical only, final edge of batters to be determined on site and as directed by the Superintendent

CLASSIFICATION	DRAWING NUMBER	REV
	PM747316	

E DRAWING

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SCALE AS SHOWN

PACIFIC POWER INTERNATIONAL
MOUNT PIPER POWER STATION
ASH DISPOSAL AREA
BRINE ASH STORAGE AREA
TOTAL 20 YEAR STORAGE
CIVIL AREA PLAN

Figure 6

A3	PM747316	00
	PREFIX NUMBER SHEET	AMDT

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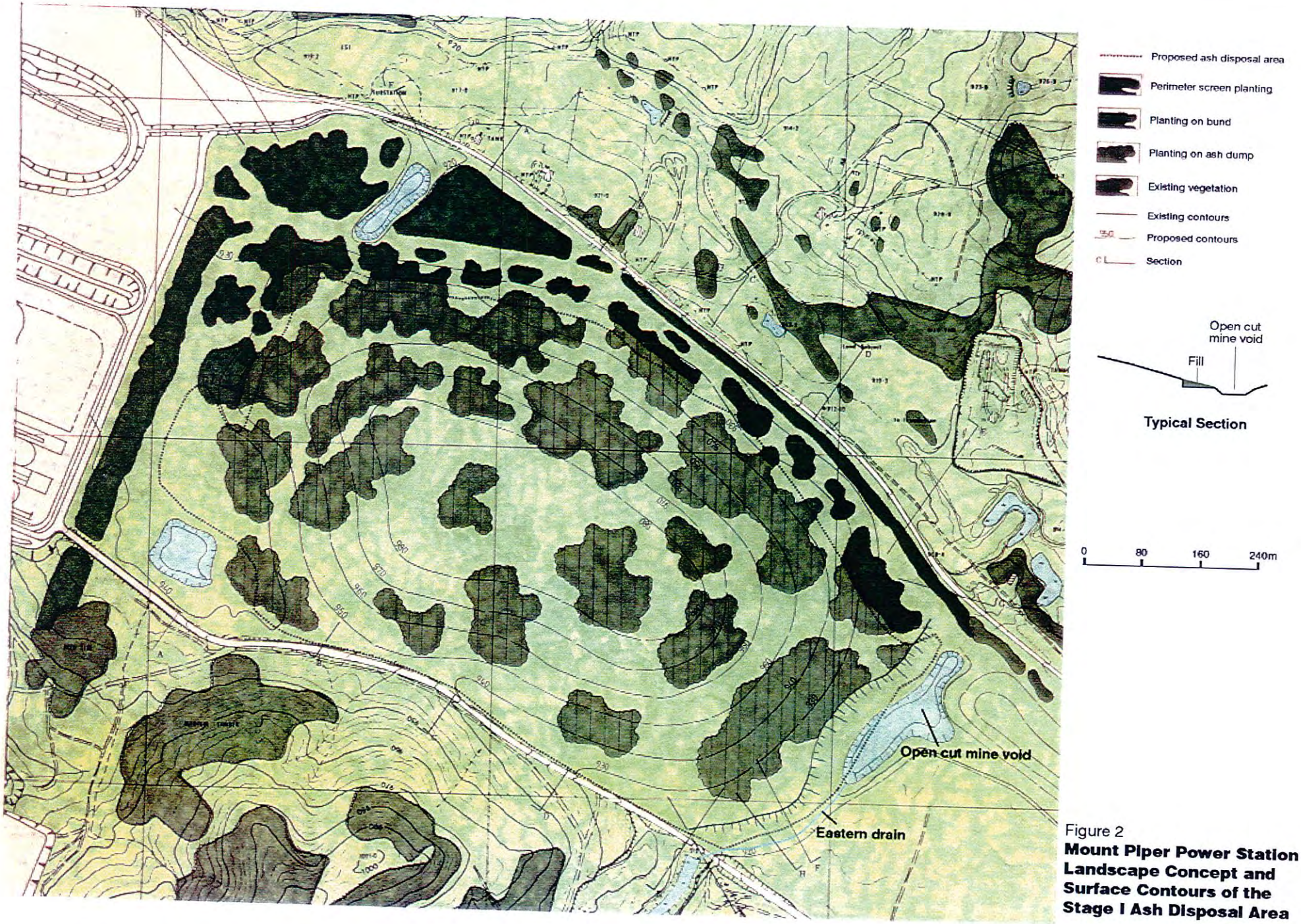


Figure 2
Mount Piper Power Station Landscape Concept and Surface Contours of the Stage I Ash Disposal Area

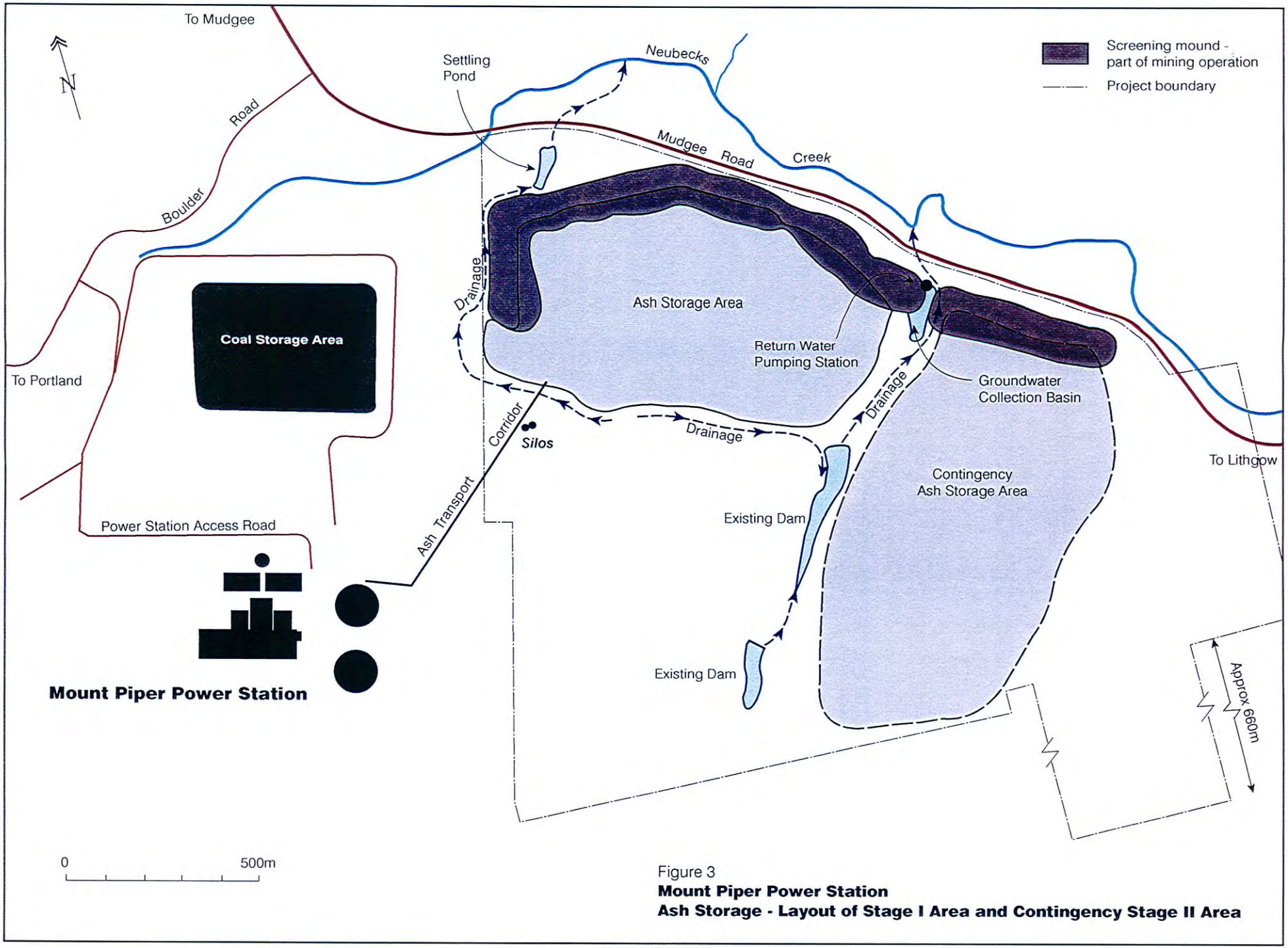
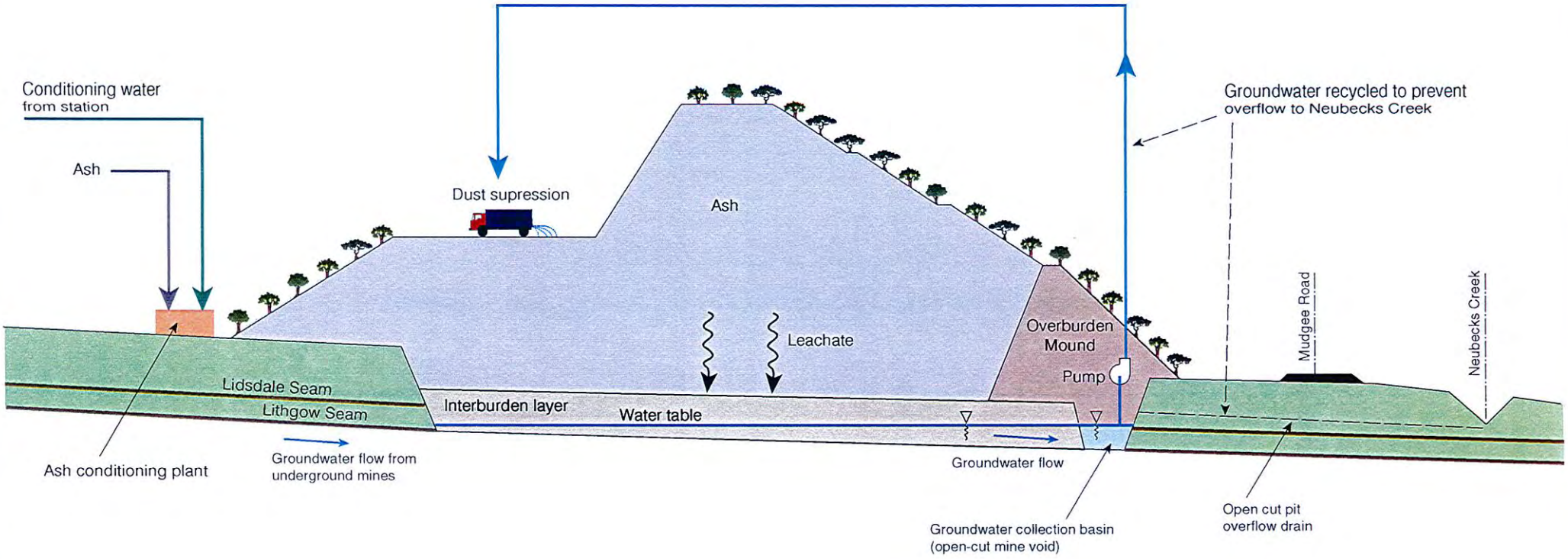


Figure 3
Mount Piper Power Station
Ash Storage - Layout of Stage I Area and Contingency Stage II Area



Note: Drawing is not to scale

Figure 4
Mount Piper Power Station
Schematic Diagram of Groundwater Management

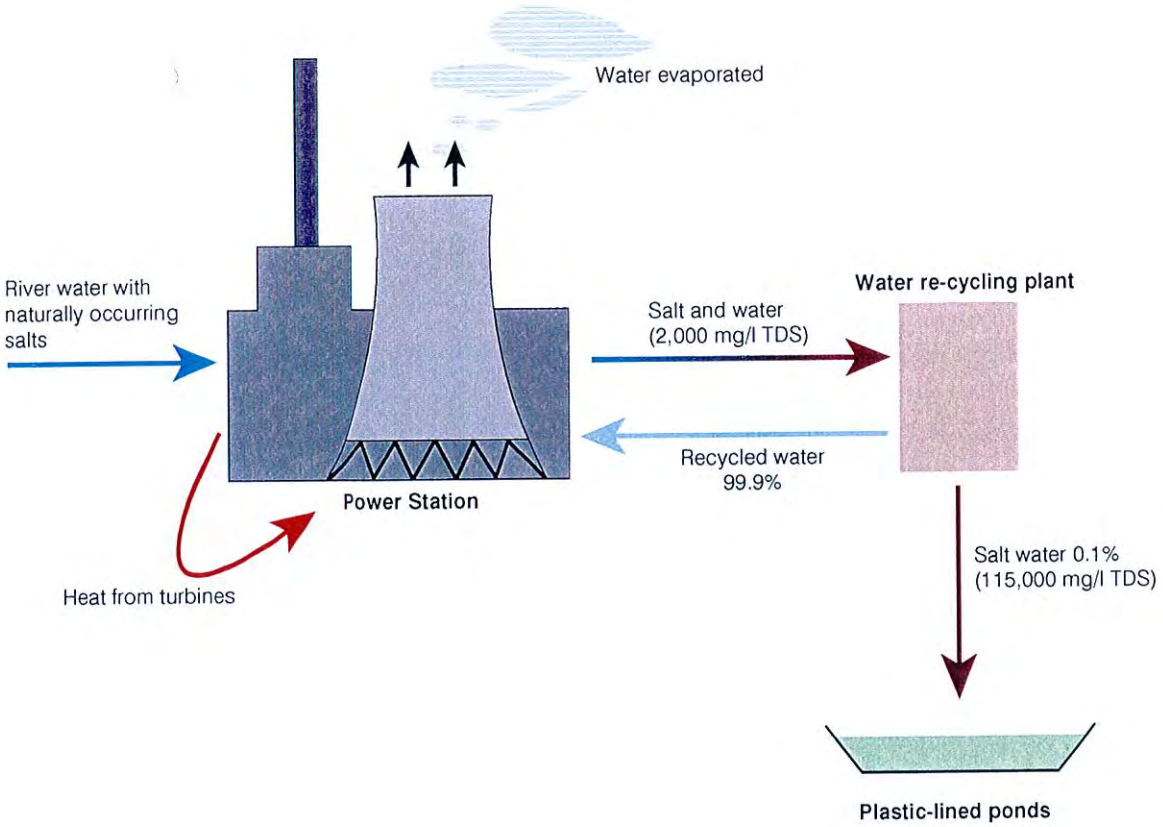


Figure 5
Mount Piper Power Station
Schematic Diagram of Cooling Tower Blowdown Reduction to Brine

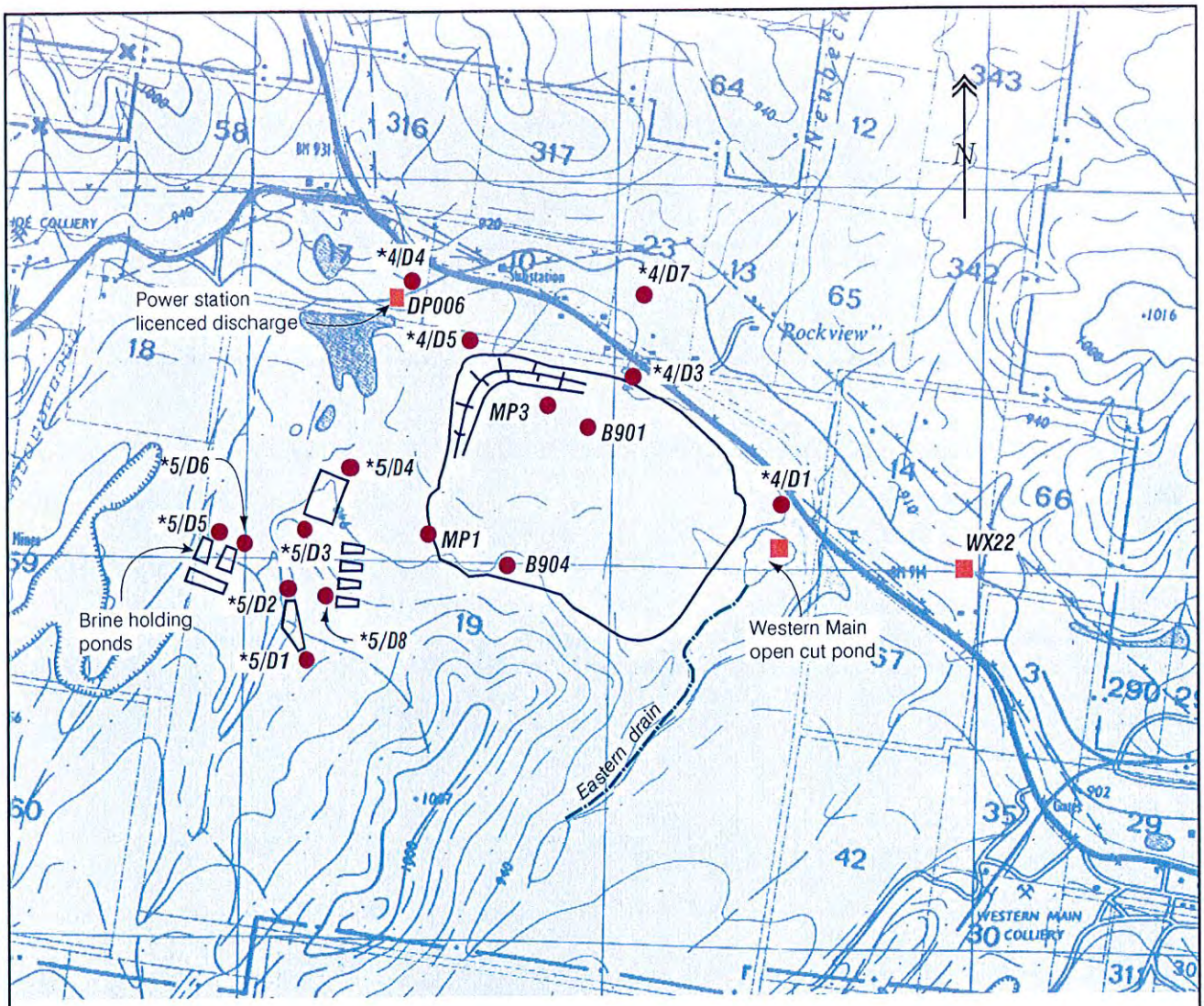
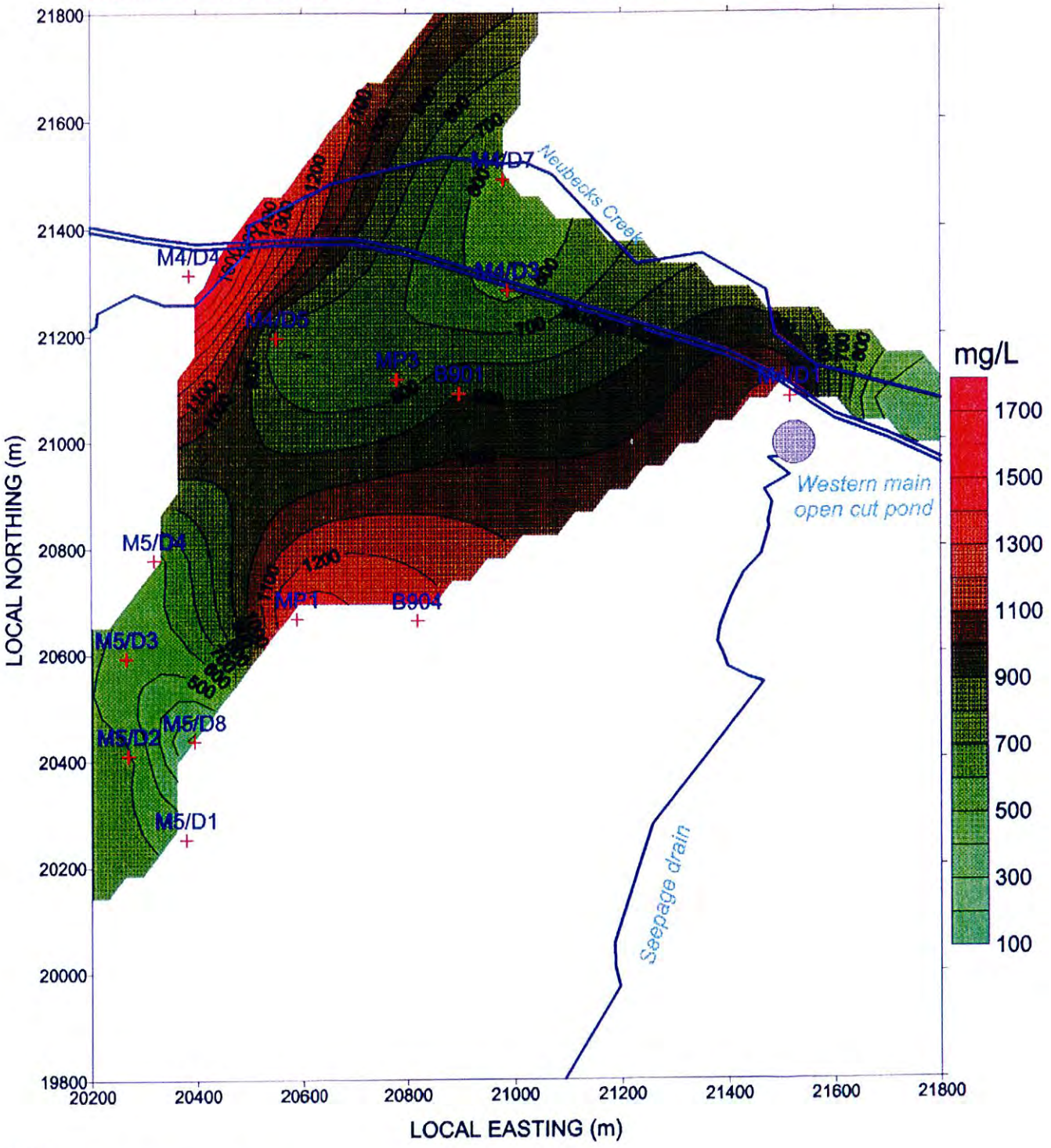


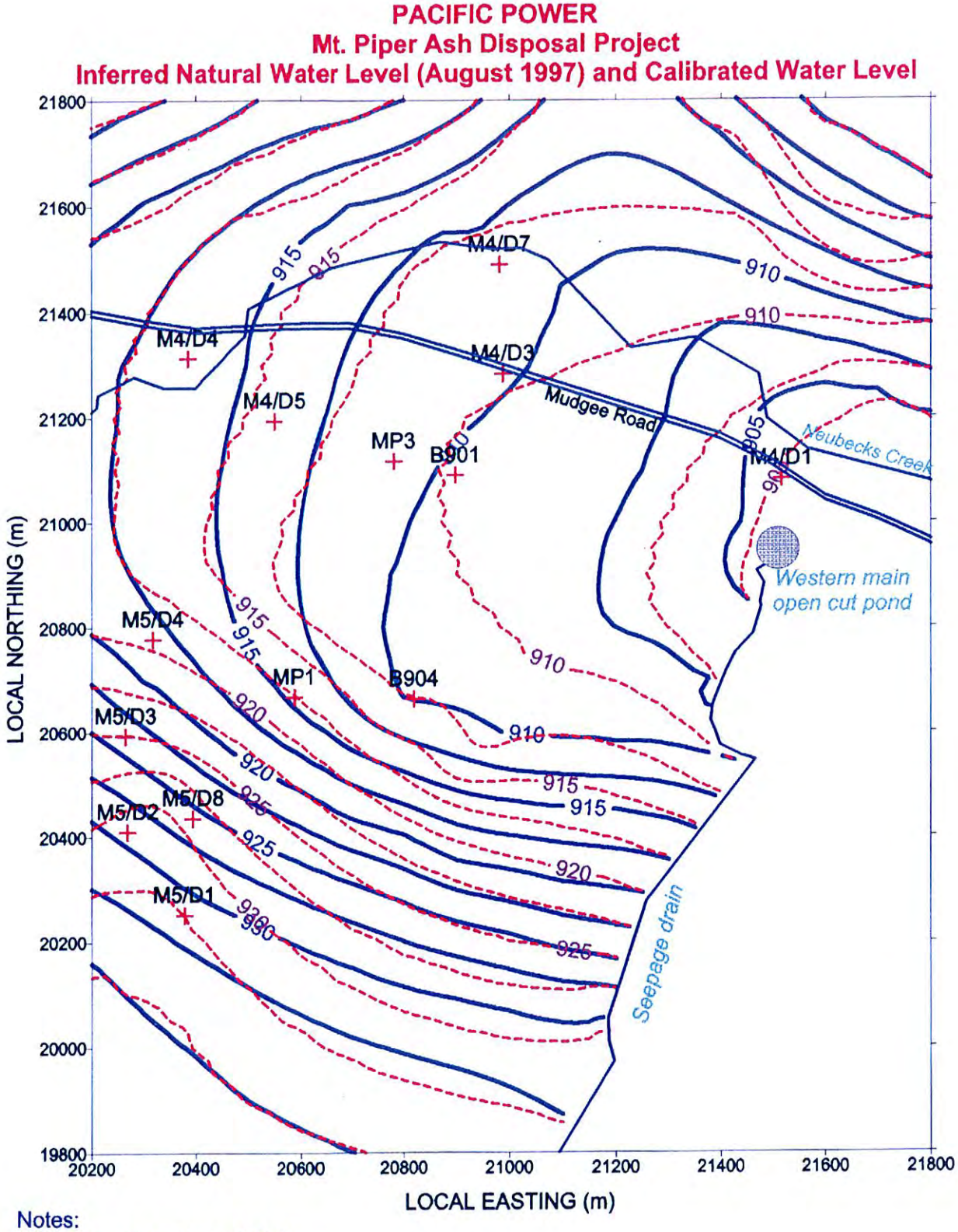
Figure 7
Mount Piper Power Station
Groundwater Bores used for Modelling the Stage I Area and Surface Water Quality Sampling

PACIFIC POWER
Mt. Piper Ash Disposal Project
Current Distribution of Total Dissolved Solids in Groundwater



Notes:
(i) All contours in milligrams per litre.
(ii) Data used for interpretation are arithmetic means of temporal data covering approximately November 1995 to August 1997.
(iii) Data were derived from readings of electrical conductivity, multiplied by a factor calculated from the mean of the ratios between EC and TDS for a number of readings in undisturbed Permian coal measures and spoil from Permian coal measures from the area (Woodward Clyde report No. 3258, 1993).

Figure 8
Existing Distribution of Groundwater Dissolved Solids around the Stage 1 Ash Disposal Area



Notes:
(i) Contours in metres A.H.D.
(ii) Contour interval 2.5m.
(iii) Natural water level contours are solid, calibrated water level contours are dashed.

Figure 9
Mount Piper Power Station
Ash Disposal Area Existing and
Modelled Natural Groundwater Levels

Plate 1
Mount Piper Power Station
Aerial Photograph of Station and Stage I Ash Disposal Area

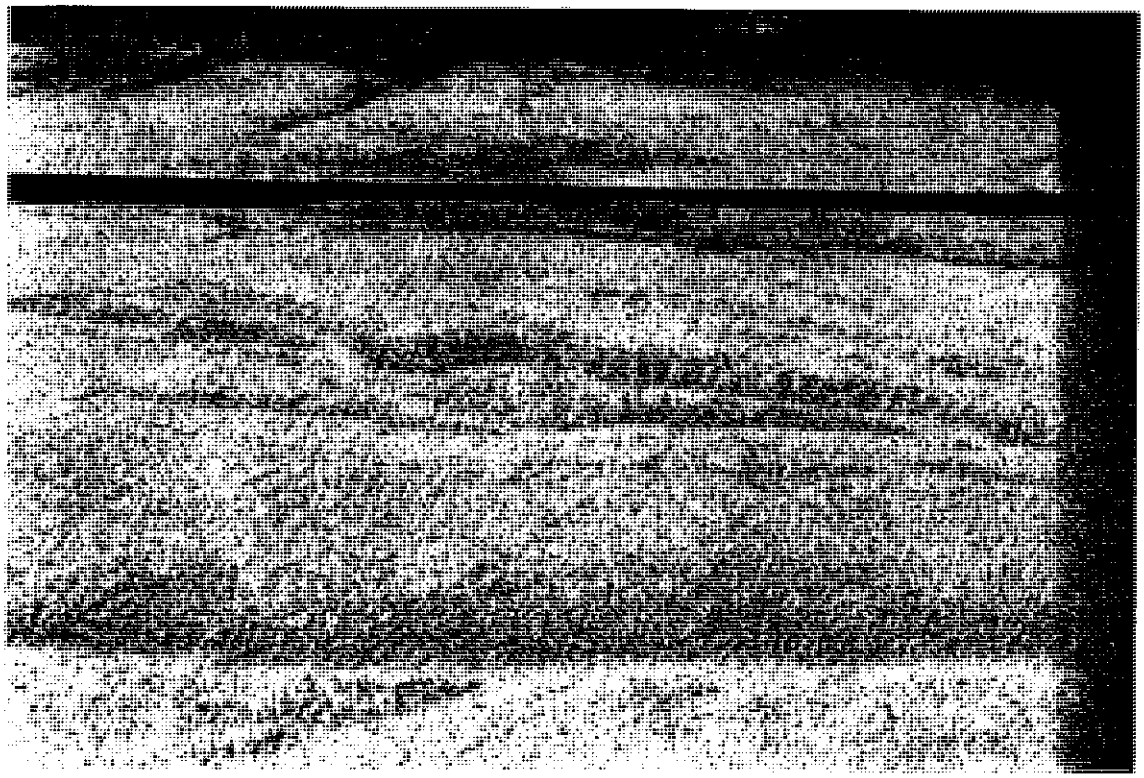
Plate 2. Existing Ash Disposal at Western End of the Stage I Ash Disposal Area

Plate 3. Mt Piper Power Station Stage I Ash Disposal Area (Old Western Main Open-Cut Mine Void).

Plate 4. Brine Conditioned Ash (11% Brine/Flyash and Furnace Ash) Co-Placement Trial Pad

Plate 5. Brine Conditioned Ash Co-Placement Trial Pad Surface Rainfall Runoff and Seepage Collection System

Plate 6. Brine Conditioned Ash Efflorescence of the Ash Surface



Attachments

Attachment 1

Mount Piper Power Station
Development Approvals Relevant to the Brine in Ash Co-placement Proposal

1. Mount Piper Power Station, 4th May, 1982, Department of Environment and Planning
2. Ash Storage – Mount Piper Power Station, 21st March, 1990, Lithgow City Council
3. Temporary Storage of Brine Waste at Mount Piper Power station, 18th March, 1991, Department of Environment and Planning
4. Temporary Storage of Brine Waste at Mount Piper Power station, extension to 30th June, 2000, approved 21st June, 1996, DUAP
5. Co-Disposal of Brine with Ash Pilot Field Test at Mt Piper Power Station, Lithgow City Council, 8th January, 1996; EPA 4th January, 1996.
6. Pollution Control Approval for a Brine Discharge Facility at Wollongon Sewage Treatment Plant (STP) by NSW EPA, 11th December, 1998
7. 8ML Temporary Storage ???????

1. Mount Piper Power Station, 4th May, 1982, Department of Environment and Planning

APPENDIX 2

ADVICE RECEIVED FROM GREATER LITHGOW CITY COUNCIL
DATED 9TH FEBRUARY, 1981.

84/1/1016 JWR:PS

9TH FEBRUARY, 1981.

The Secretary,
Electricity Commission of N.S.W.,
G.P.O. Box 5257,
SYDNEY N.S.W. 2001.

ATTENTION: Mr. G. Coulter

Dear Sir,

Mount Piper Power Station

At the meeting held on 6th February, 1981 between Mr. G. Coulter (Electricity Commission), Mr. R. Mortleman (Premiers' Department), M/s. J. Thompson (Department of Environment and Planning) and the undersigned it was felt that a Development Application should be submitted to Council for The Mount Piper Power Station. It was agreed that the Department of Environment and Planning would advise the Commission of this requirement and that Council would in turn advise the Commission of the conditions that should apply to the development.

In order that early consideration may be given to Council's requirements, I have included a list of conditions which Council believes should be incorporated in the Minister's consent.

The Council is of the opinion that its requirements are reasonable and that the Commission should make a contribution towards infrastructure costs associated with the development. In addition it is felt, because of the population growth associated with the project, that the Commission should contribute to the social and recreational amenities of the community.

Having regard to the size and the impact of the Mount Piper Power Station the requirements are no greater than would be applied to any private development.

CONDITIONS OF APPROVAL:

1. Social & Economic Infrastructure:

The Environment Impact Statement lacks evaluation of the social and economic impact of the proposal on the City of Greater Lithgow, and in particular Wallerawang and Portland. It is essential that an urgent assessment of the social and economic impact of the development is undertaken.

It is considered the discussions between

- Premiers' Department
- The Electricity Commission
- Mining Companies
- Department of Environmental Planning
- Department of Youth and Community Services
- Greater Lithgow City Council

should take place regarding the social impact study. The financing of such a study shall not be the responsibility of Council. It should be noted that the Department of Youth and Community Services has offered Council a grant of $25,000 for a social impact study.

2. Recreation & Leisure

The Portland and Wallerawang townships are lacking in communcity facilities i.e. Senior Citizens Centres, Halls, Child Core Centres, Recreation Centres, parks and the like.

The Mount Piper Power Station will increase the population of the area and thus additional demands will be placed on Council to provide adequate Recreation and Leisure facilities.

Council is matching a government grant of $75,000 to assist in the provision of a community recreation centre in Portland. The cost of this centre is estimated at $450,000.

It is considered that the Electricity Commission should contribute the balance of funds, $300,000, for the recreation centre. The contribution of funds by the Electricity Commission will ensure the constructian of the centre.

The Council also seeks a contribution towards the development of the foreshores of the Wallerawang Dam and Lilyvale Dam.

Wallerawang Dam - Council has adopted a plan for the development of the foreshores at an estimated cost of $186,000. Council seeks a contribution from the Commission on a dollar for dollar basis.

Lilyvale Dam - Officers of the Commission have indicated that consent will be granted to Council to enable the Dam to be used for recreational purposes.

Council seeks a contribution from the Commission on a dollar for dollar basis once the parties have agreed on a development plan for the area.

3. Transport & Roads:

Council believes that certain roads leading to the power station site should be upgraded to cater for the additional traffic that will be generated by the development.

Mudgee Road T.R.55: - The Commission with the concurrence of the Department of Main Roads will be required to:-

- Relocate and upgrade the intersection of the Boulder Road and Mudgee Road (T.R.55).

- Widen Mudgee Road (T.R.55) between Springvale Lane (1.5 kilometres) and its intersection with Main Road 53i to Cullen Bullen.

Boulder Road: - Council will require that the Boulder Road and certain Portland streets be upgraded, at no cost to Council, to the intersection of Wallerawang Road and Cullen Street.

Council will require that plans and specifications of the required upgrading be submitted to the City Engineer for approval.

4. Accommodation for Construction Employees:

Sites for temporary camps have been selected by Council, and it is required that all camps be constructed on the pre-selected sites.

Council's concurrence with sites selected should be determined prior to Development Application being submitted.

If an alteration of site is required by the Electricity Commission, Council consent is required prior to the relocation of the camp site.

Council's development approval will be needed prior to the construction of any camp site. Temporary camps will be constructed to a standard determined by Council. This standard will include the need for water and sewerage and the camps will be of a much higher standard then those existing in the area.

5. Londscaping & Planting:

To achieve unity in design and coherence in layout it is necessory to supplement the bare form of buildings with a more natural and visually pleasing environment.

Council will require the Electricity Commission to submit a landscaping plan for approval. This plan must include:-

- An appraisal of the site.
- The purpose of the landscaping.
- Tree planting programme.
- Time phasing of the landscaping.
- Types of flora to be planted.
- Alternative landscaping uses.

6. Aesthetics:

It is understood that with a project of this nature and immensity it is difficult to construct the station so as to make it unobtrusive to the surrounding environment.

However, Council will require that office blocks, outbuildings, service sheds, and the like be constructed of a material that has a non-reflective nature in an effort to produce a structure that has a planned and positive approach towards landscape and environmental quality.

7. Public Transport:

The Council will require the Commission to negotiate with existing public transport authorities in an effort to establish a suitable transport network to the power station from surrouding areas.

The transportation network would be planned to cover the transportation of workers as well as goods.

8. Off-Street Car Parking:

Council will require that off-street car parking be supplied at the rate of 0.75 spaces per worker. (i.e. 750 spaces for 1,000 workers). The Commission should give consideration to planning the location of parking area(s), and the benefits of having strategically placed smaller parking lots in preference to one massive parking area.

The car parking area(s) will be required to be treated with landscaping and as such should be included with landscaping plan.

Parking area(s) will be required to be sealed, adequately drained and have marked spaces 2.5 x 5.5.

9. Other Authorities:

Council will require that all the requirements of other Government Bodies be adhered to.

10. Internal Accessways:

Council will require all internal accessways being sealed with heavy delivery and service traffic being separated from employees private cars. A plan of the internal road layout should be submitted to Council.

11. Fencing:

Council will require the site as a whole being fenced with a suitable form of man-proof fencing.

12. Pollution Control:

Pollution control will be dealt with under condition (9) and when the requirements of the State Pollution Control Commission, Department of Environment and Planning, Water Resources Commission and Soil Conservotion Service are known these will be imposed as conditions. Further, stations will be required to be licensed in accordance with necessary acts in respect to pollution control.

13. Local Services & Utilities:

The proposed power station will ploce a heavy burden on local services and utilities. High capacity water, and waste disposal equipment will be required to enable the station to function properly.

Council will require the Commission to negotiate with the Department of Public Works and Lithgow Council to ensure these services and utilities are installed in the optimum manner.

14. Housing:

At this time Greater Lithgow is faced with a very severe shortage of housing. Because the City has been in a no growth situation for many years there is only a very minor house construction industry in the City. It will be necessary to establish both land development and housing at a rate not previously known in this area.

It is noted that the Commission will require approximately 390 houses for permanent staff employed at the Power Station and supporting coal mines.

The Commission and Council have been negotiating on the subject of housing, including finance and land availability and it appears that a satisfactory agreement will be reached.

15. Water:

The Commission has indicated that Council will be able to use Lilyvale Dam as a short term solution to Council's water needs.

16. Transmission Lines and Routes:

Council understands the need for transmission lines radiating from Power Stations.

As there will be twa (2) stations in close proximity to each other, it is considered that the Commission should give consideration to the planning of Transmission Line Corridors.

These corridors would be of sufficient width and area to occommodate future lines, and have the effect of containing Transmission Lines to a single corridor instead of radiating in all directions and rendering certain lands useless for future development.

17. Apprenticeship & Staff Training Facilities:

Council will require the continued provision of staff training facilities by the Commission, such as the apprenticeship training facility situated in Hartley Valley Road, Lithgow.

Compliance with the conditions listed will benefit the local community, the Electricity Commission and its employees.

A copy of this letter will be submitted to the Department of Environment and Planning.

Yours faithfully,

(J.W. RAYNER),
TOWN CLERK

DEPARTMENT OF ENVIRONMENT AND PLANNING
OF NEW SOUTH WALES

PROPOSED MT. PIPER POWER STATION

CONSENT TO A DEVELOPMENT APPLICATION REFERRED FOR DETERMINATION PURSUANT TO SECTION 101 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979.

APPLICANT'S NAME AND ADDRESS:

The Electricity Commission of New South Wales (hereinafter called the "Applicant"), T. & G. Tower, Park and Elizabeth Streets, SYDNEY. N.S.W. 2000

WHEREAS:

(a) The Minister for Planning and Environment (hereinafter called the "Minister") gave a Direction in writing (hereinafter called the "Direction") in accordance with Section 101(1) of the Environmental Planning and Assessment Act, 1979, (hereinafter called the "Act") dated the 19th February, 1981, to the Council of the City of Greater Lithgow (hereinafter called the "Council") to refer to the Secretary of the Department of Environment and Planning (hereinafter called the "Department") for determination by the Minister any development application specified in the Direction;

(b) A development application (hereinafter called the "application") for the development of a power station to be known as Mt. Piper Power Station (hereinafter called the "proposed development") on land delineated by red edging on the plan annexed hereto and marked with the letter "A" (hereinafter called the "land") and being an application to which the Direction applies was received by the Council from the applicant and referred to the Secretary of the Department in accordance with Section 101(2) of the Act; and

(c) The persons referred to in Section 101(3) of the Act have not required to be afforded the opportunity of a hearing as provided in Section 101(4) of the Act, before the Minister determines the application;

Now, I, the Minister for Planning and Environment, in accordance with Section 101(6) of the Act, do hereby determine the application for the proposed development by granting consent to that application for the proposed development as described in the Environmental Impact Statement (hereinafter called the "Statement") entitled "Mt. Piper Power Station Environmental Impact Statement", dated August, 1980, and "Mt. Piper Power Station Environmental Impact Statement Supplementary Information", dated August, 1980, subject to the following conditions:-

(1) That the applicant shall, prior to the commencement of construction of the proposed development, obtain from the State Pollution Control Commission (hereinafter called the "Commission") all necessary approvals under the Clean Air Act, 1961, the Clean Waters Act, 1970 and the Noise Control Act, 1975;

New South Wales Government

Department of Environment and Planning

47223

Remington Centre
175 Liverpool Street, Sydney 2000
Box 3927 G.P.O. Sydney 2001
DX. 15 Sydney

Telephone (02) 237 9111 ext. 7578

Contact Mr. R. Power

Our reference 80/10060 Pt.2

Your reference 47223 PD/AH

4th May, 1982.

The Secretary,
The Electricity Commission of
New South Wales,
T. & G. Tower,
Park & Elizabeth Streets,
SYDNEY, N.S.W. 2001.

ATTENTION MR. ROLLINSON

Dear Sir,

Development Application by the Electricity Commission of New South Wales to erect a Power Station at Mt. Piper - Determination of Development Application.

I refer to the above matter and to my telephone conversation of even date with Mr. Rollinson of your Commission.

2. It is confirmed that the Minister has determined the Development Application, by giving consent to that application subject to certain conditions.

3. Enclosed please find a copy of the Instrument of Consent for the Commission's records.

Yours faithfully,

(R.L. Pincini)
Secretary

(2) That the applicant shall meet the reasonable requirements of all public authorities having statutory responsibilities in respect of the construction and operation of the power station;

(3) That the applicant shall prepare and submit to the Council, development applications supported by environmental impact statements (prepared in accordance with the Environmental Planning and Assessment Act and Regulations) in respect of any new coal mines required to provide fuel for the proposed development, and any other designated development associated with the project, prior to the letting of appropriate contracts for these developments;

(4) That the applicant shall prepare and submit for the approval of the Commission plans of the proposed desalination plant, including the nature of the salt residues anticipated therefrom, together with evidence of the environmental acceptability of the proposals for the disposal of same;

(5) That the applicant shall submit to the Department of Mineral Resources a report setting out the reasons for the suitability of the Neubecks Creek site for the construction of the proposed ash disposal dam with particular reference to the stability of the structure, the alienation of mineable coal and the possibility of mining such coal prior to construction of the dam;

(6) That the applicant shall inform the Department should it be decided not to construct the Neubecks Creek ash disposal dam and seeks its prior approval to the development of an alternative site which will include consideration of the question of possible sterilization of coal reserves;

(7) That the applicant shall submit to the Commission results of site investigations and studies of existing ground water quality and ground water flows in the catchment of the proposed Neubecks Creek ash disposal dam, together with an assessment of the potential for any increase in acid drainage to the Cox's River from changes to ground water flow that may result from the construction and operation of the dam;

(8) That the applicant shallprepare and implement a monitoring programme to the satisfaction of the Commission relative to the quantity and quality of the Neubecks Creek ash disposal dam discharge water and of waters in Neubecks Creek downstream of the power station and make any arrangements required by the Commission to alleviate any significant adverse effects should they arise;

(9) That the applicant shall submit to the Commission the results of studies into the pyritic content of its initial coal resources , and of the acid generating potential of run-off from its proposed coal stockpiles for the proposed development;

(10) That the applicant shall, prior to commencement of construction of the proposed development, prepare and submit to the Commission comprehensive plans of work necessary, and proposed policies for the controlling of those works for the management of water flowing from the site to watercourses during the period of construction of the proposed development;

(11) That the applicant shall prepare and submit to the Commission proposals environmentally acceptable to the Commission for the disposal of any carbonaceous material encountered during the preparation of the power station site;

(12) That the applicant shall submit to the Department and to the Commission a report on the current status of the construction and operation of the existing developments known as the Wallerawang Reservoir and the Lilyvale Reservoir, and on action taken and proposed, having regard to the Commission's conditions of approval to the applicant's water supply scheme for its existing development known as Wallerawang Unit 8 and other power station needs;

(13) That the applicant shall implement a monitoring programme to the satisfaction of the Commission, of the meteorology in respect of the land the subject of the proposed development;

(14) That the applicant shall implement a monitoring programme, to the satisfaction of the Commission, relative to the ground-level concentrations of sulphur dioxide, nitrogen oxide and suspended dust resulting from the operations of the proposed development and the applicant's existing development known as Wallerawang Power Station. Such monitoring programme shall be commenced at least one year before the commissioning of the proposed development;

(15) That the applicant shall prepare and implement to the satisfaction of the Commission, a monitoring programme relative to the sulphur dioxide content of the flue gas and opacity of the stack emissions;

(16) That the applicant shall, to the satisfaction of the Commission, carry out an appropriate study programme into the meteorology of the area the subject of the proposed development to assist in the final determination of the stack height;

(17) That the applicant shall carry out, to the satisfaction of the Commission, wind tunnel tests modelling buildings; cooling towers and terrain to assist in final determination of the stack height;

(18) That the applicant shall prepare and implement, to the satisfaction of the Commission, relative to air particulate concentrations consequent to the coal stockpile and make suitable arrangements to alleviate any significant adverse effects should they arise;

(19) That the applicant shall, prior to any site works being carried out, submit to the Department of Mineral Resources, its proposals for the restoration and rehabilitation of any coal mining operations on the lands the subject of the proposed development which mines are the responsibility of the applicant;

(20) That the applicant shall undertake to preserve vegetation on the escarpment to the south of the lands the subject of the proposed development and on the rocky outcrops and canyons in the north of the proposed Neubecks Creek ash disposal area;

(21) That the applicant shall, prior to any site works being carried out, submit to the National Parks and Wildlife Service, the archaeological, flora and fauna reports referred to in the Statement. Further, the applicant shall consider, in conjunction with the Blue Circle Southern Cement Company, implementing any reasonable advice that that Service may provide;

(22) That the applicant shall obtain the appraval of the Deportment of Main Roads to proposals for:

(a) intersections of the power station access road and Boulder Road;

(b) crossings for water supply;

(c) furnace and fly ash disposal pipelines; and

(d) coal conveyor crossing with Trunk Road No.55;

(23) That the applicant shall negotiate with the Council and any other public authority having an interest in the proposed development with a view to meeting any reasonable requirements relative to the proposed development, and shall refer any disputed matters to the Department before determining them. In particular, the applicant shall meet the requirements of the Council as set out in Appendix 2 of the Department's Environmental Impact Assessment Report dated March, 1981, except for those matters involving the provision of an appropriate monetary contribution fram the applicant which shall be the subject of negotiations between the Council and the applicant and which shall take into account the value of relevant preinvestment by the applicant;

(24) That the applicant shall co-operate with the Inter-Departmental Committee formed to aversight the social impact studies relevant to Local Enviranmental Studies and to Local Environmental Plans for Greater Lithgow and which will include a review af the social impacts of development proposals in the Lithgow area;

(25) That the applicant shall report to the Department, as soon as it is able, to confirm the accommodatian, infrastructure and transport requirements of personnel engaged in the canstruction and operation of the power station in order that appropriate action can be taken to plan and provide far all necessary facilities required;

(26) That the applicant shall provide evidence to the Department that the location af the buildings of the proposed development and associated facilities will not without good reason alienate part of the coal reserves of Clutho Development Pty. Ltd. and that it has satisfied all reasonable claims of the Campany in that regard;

(27) That the granting of this consent to the praposed development shall nat relieve the applicant from any future condition or contribution which may be required by the Council in respect of any of the following:-

(a) the development of coal mines by the applicant for the purposes of or in assaciation with the generation of electricity at the proposed develapment;

(b) an expansion of the proposed development; or

(c) any other development

(28) That the applicant shall:-

(a) forthwith, take all necessary steps to effect the expeditious transfer to the Council of:-

(i) all those pieces or parcels of land situate at Wallerawang in the City of Greater Lithgow, Parish of Lidsdale and County of Cook, being part of Lot 2, in Deposited Plan 618280, as delineated by red edging on the plan onnexed hereto and marked with the letter "B", being part of the estate known as the "Barton Estate", and having an area of 67.38 hectores or thereabouts, and being known as the "Wallerawang East Site"; and

(ii) all those pieces or parcels of land situate at Wallerawang in the City of greater Lithgow, Parish of Lidsdale and County of Cook, being part of Lot 2, in Deposited Plan 618280, as delineated by red and yellow edging an the plan referred to in (i) obove and hoving an area of 124.4 hectares or thereabouts, and being known as the Wallerawang South site; and

(b) upon the transfer to it by the Council of all those pieces or parcels of land situate at Wallerawang in the City of Greater Lithgow, Parish of Lidsdale, and County of Cook, being the land shown in Deposited Plan 443235 (but excluding thereout right of easements for electricity transmission line resumed by Government Gazette of 6th March, 1959, Folio 665), as delineoted by orange edging on the plan referred to in (i) above and having an area of 4.279 hectores, or thereabouts, and described as the "Heel Street Site", make that site available to the Council

Provided that the transactions referred to in (a)(i), (ii), and (b) above shall be in occordance with the terms and conditions agreed to between the applicant and the Council as set forth in letters dated 20th October, 1981, and 5th November, 1981, respectively, copies of which are annexed hereto and marked with the letters "C" and "D" respectively;

(29) That the applicant shall, to the Council's satisfaction, provide access roads, parking areas, landscaping, and boat ramps at the Wallerawang Dam generally in accordance with the Council's Development Plan, a copy of which is annexed hereto and marked with the letter "E"

Provided that the applicant shall use its best eneavours to complete such works and facilities in order that they may be available for use not later than 1st December, 1982, or such further time as the Council may agree.

(30) That the applicant shall, upon the preparation and adoption by the Council of a Development Plan for the Lilyvale Dam Foreshores, negotiate with the Council the carrying out of works in accordance with the Development Plan, as required by the Council;

(31) That the applicant shall carry out to the satisfaction of the Council all necessary works to effect the upgrading of the Boulder Road from its intersection with the Mudgee Road to the point of deviation of preferred route for the crossing of the Wallerawang-Gwabegar Railway line

(32) That the applicant shall contribute the sum of $350,000.00 towards the upgrading of the Wallerawang-Gwabegar Railway line crossing and the extension of such upgrading from that crossing to the intersection of Wallerawang Road and Cullen STreet, Portland. Such money to be advanced to match the Council's design and construction programme in respect of all works west of the north-eastern extremity of Portland;

(33) This approval does not relieve the opplicant of the obligation to obtain any other approval required under the Local Government Act, 1919, as amended, or the Ordinances (including approval of building plans) or any other Act.

(80-10060 Part 2)

Signed at Sydney this first day of April, 1982

ERIC BEDFORD
Minister for Planning
and Environment

2. Ash Storage – Mount Piper Power Station, 21st March, 1990, Lithgow City Council

:B:AJC/1468B:375/512/ASB
:nvironmental Services

21st March, 1990

Electricity Commission of N.S.W.,
G.P.O. Box 5257,
SYDNEY. N.S.W. 2001.

Dear Sir,

Ash Storage - Mount Piper Power Station

Please find enclosed a copy of Development Consent No. 230/89, issued in respect of the abovementioned development proposal.

You are advised that the application was approved subject to the attached conditions. The conditions were agreed to by the Electricity Commission as required by Section 91A(l)(b) of the Environmental Planning and Assessment Act, 1980, in their letter of the 16th March, 1990.

Should you require any further information, please do not hesitate to contact Miss. K. Bulkeley in Council's Environmental Services Division.

Yours faithfully,

S.W. McPHERSON,
TOWN CLERK.

PER _____
ENVIRONMENTAL SERVICES,
MANAGER.

Address Correspondence to: Town Clerk. P.0. BOX 19. Lithgow.2790
Fax Nom (063) 51 4259

KB:AJC/1470H:40/01/16
Environmental Services

Assessment No:

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979
NOTICE TO APPLICANT OF DETERMINATION OF A
DEVELOPMENT APPLICATION

To Electricity Commission of N.S.W. of G.P.O. Box 5257, Sydney, N.S.W., 2001., being the applicant in respect of Development Application No. 230/89.

Pursuant to Section 92 of the act, notice is hereby given of the determination by the consent authority of the Development Application No. 230/89 relating to the land described as follows: Portions 19, 67, 42, 35, 30 & Part Portion 3, Parish Cox & Portions 13 & 357, Parish Lidsdale. Transportation and emplacement of ash and restoration of affected areas.

The Development Application has been determined by GRANTING OF CONSENT SUBJECT TO THE CONDITIONS SPECIFIED IN THIS NOTICE.
The Conditions of the consent are set out as follows: SEE ATTACHED SCHEDULE

The reasons for the imposition of the conditions are set out overleaf.

Endorsement Date of consent 19th March, 1990.

NOTES:

1. Subject to the provisions of Section 93 of the Act, consent shall become effective from the date of endorsement of the consent.

2. Subject to the provisions of Section 99 of the Act, any consent granted shall lapse if such development is not commenced within two (2) years from the date of endorsement.

3. Extensions of consent will be determined having regard to the nature of the application, the current policies and standards of Council and other matters under Section 90 of the Act.

4. Subject to the provisions of Section 97 of the Act, any applicant who is dissatisfied with the determination by the consent authority may appeal to the Land and Environment Court. The right of appeal may be exercised within twelve (12) months from the date of receipt of the consent notice.

DATED THIS TWENTY-FIRST DAY OF MARCH, 1990.

S.W. MCPHERSON,
TOWN CLERK.

PER:_____
ENVIRONMENTAL SERVICES, MANAGER.

IMPORTANT:

(1) It is to be clearly understood that the above consent is NOT an approval to carry out any structural work. A formal Building Application must be submitted to Council and be approved before any structural work is carried out to implement the above consent. Also the applicant is not relieved of any obligation to obtain any other approval required under any other Act.

attach

CONDITIONS

1. Subject to the applicant preparing and submitting to Council ,prior to any ash being emplaced , an Overall Site Management Plan for the proposed development; such plan being to the satisfaction of Council and referring to all aspects pertaining to the date and should include:

The full site management plan submitted to the Council to fulfil the conditions above.

Summary details of each of the following section of the plan are also annotated below:

1.1 A description of the stages of development of the site including the site preparation, ash emplacement and revegetation.

As well as the plan submitted to the Lithgow Council see also the submission made to the Environmental Protection Agency.

1.2 Details of the proposed method of fly and furnace ash transportation between the power station and the ash storage area; such details to include all methods employed to minimise air pollution.

Transportation from the power station to their storage area is by fully enclosed conveyor belt in addition to the ash having been conditioned with water.

1.3 The preparation of a detailed site plan indicating all necessary engineering works, drainage systems, construction offices, workers' amenities, car parking provisions and any other matters which may be pertinent to the proposed use.

Site plans indicating the various work listed above were included with the plan submitted to the Lithgow City Council.

1.4 Details being provided of the proposed methods of monitoring surface and ground water in order to ensure that contaminated water is not permitted to enter Neubecks Creek and the Upper Coxs River systems. Any such water discharged into these systems should meet the standards of the State Pollution Control Commission and the Water Board.

See of Part 1 Monitoring and Reporting on environmental matters of this Overall Site Management Plan.

1.5 The water monitoring system, in addition to measuring pH levels,should also measure sulphate, chloride, iron, manganese, selenium, boron and arsenic.

See 1.4 above.

1.6 Details being provided of the short-term and long-term management of leachate, both during occupation of the site and after site abandonment, in order to ensure an acceptable discharge into Neubecks Creek.

See Section 3.6 of the Ash Storage Environmental Impact Statement File No. 06ASHSUB.

1.7 Details being provided of the proposed monitoring system to measure air quality and any pollution that may result from the transportation and emplacement of ash; together with measures that may be undertaken to reduce contaminants if the quality becomes unacceptable in terms of the standards set by the State Pollution Control Commission.

See Part 1 of this Overall Site Plan.

1.8 An engineering assessment of the stability of the proposed or the contingency site (whichever is to be used) being provided to Council; such examination to include an assessment of the likely effects of the proposed ash emplacement.

1.9 Details being provided of the proposed means of ash management including how erosion may be minimised, drainage provided, and other materials supplemented during the process.

1.10 Landscape plan forming part of the Overall Site Management Plan should provide details of the proposed staging of site revegetation and include details of topsoil, grasses, vegetation, reticulation and maintenance with such plans being prepared in conjunction with the NSW Soil Conservation Service.

A copy of the landscaping plan is included in the plan.

2. Subject to in the event of the contingency site being utilised, a hydrogeological study to assess ground water and the effects of underground mining being undertaken before emplacement commences.

Prior to use of the contingency site for disposal of ash a hydrogeological study will be carried out.

3. Subject to all oils, fuels and greases being contained in a concrete bunded storage, with a bund capacity equal to the total sum of the product stores plus 10%. The storage should be roofed and stormwater collected and conveyed to ground level by downpipes.

4. Subject to any machinery servicing, repairs or refuelling areas having a concrete floor with bund walls to contain petroleum contaminants. An oil and grit separation unit must be installed and maintained in a functional manner at all times. Maintenance and servicing areas should be roofed to divert rainwater from the area of contamination.

The requirements of Clauses 3 and 4 above were conveyed to the Contractor and design has been based on these requirements.

5. Subject to high temperature/high pressure wash-down methods only, being used for cleaning machinery. No detergents are to be used for this purpose.

The requirements and limitations on cleaning of machinery was included in the operations and maintenance specification.

6. Subject to all waste water from bath-houses, offices and amenity blocks being collected and treated to the standards set by the State Pollution Control Commission and the Water Board.

Well waste waters on site are drained through the sewerage plant for the site.

7. Subject to the discharging of ground water and surface water meeting the standards set by the State-Pollution Control Commission and the Water Board.

The requirements of monitoring the ground water and surface waters are based on the standards set by the Environmental Protection Agency for their discharge.

8. Subject to air control and monitoring measures being installed to ensure standards satisfactory to the State Pollution Control Commission are maintained at all times.

The air control monitoring measures are based on the Environment Protection Agency's site operation licence.

9. Subject to noise monitoring being undertaken from time to time in order to ensure that target levels identified in the E.I.S. are maintained.

A regime of noise monitoring of the stations boundaries from time to time has been set in place.

10. Subject to the development being carried out generally in accordance with the E.I.S.

The station, its equipment and its operations have been designed in accordance with EIS and the conditions of approval.

11. Subject to an Annual Performance Report being submitted to Council by the Electricity Commission, this report shall contain air and water quality data taken during the monitoring programme, progress in relation to the development, and other aspects related to this consent.

An Annual Performance Report on the conditions of asset will be submitted to Council.

12. Subject to the applicant complying with the Council's requirements to prevent and fight bushfires.

    Bushfire prevention and fighting in relation to the station are included in the station emergency response planning.

13. Subject to an undertaking being given by the Electricity Commission of New South Wales that the rehabilitation works are carried out in accordance with the approved Site Management Plan. Each stage of rehabilitation identified in the plan will be completed to the satisfaction of Council and further, no subsequent stage shall be commenced without Council approval

14. Subject to Council Officers or Officers from Public Authorities being permitted access to the site at any reasonable time for the purpose of inspection, monitoring air and water readings or other matters pertaining to their respective duties.

    All Council and Public Authorities will be given reasonable access to the site in accordance to the authorities laid down in the Act under which they are entitle to access.

15. Subject to approval being obtained from the State Pollution Control Commission under Section 17 of the State Pollution Control Commission Act prior to any work commencing on the site.

    SPCC construction approvals have been received and are included in this documentation.

Having regard to Section 909 of the Environmental Planning and Assessment Act, 1979

CONDITION	SECTION 90(1) REASONS
1/1.10, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14 & 15	Having regard to the impact of that development on the environment (whether or not the subject of an environmental impact statement) and, where harm to the environment is likely to be caused, any means that may be employed to protect the environment or to mitigate that harm. (Section 90(1)(b))
CONDITION 12	Having regard to the likelihood of bushfire occurring due to the establishment of the proposed development and ensuring adequate measures exist to control such outbreaks. (Section 90(1)(g))
CONDITION 13	To ensure the site is adequately restored and rehabilitated in accordance with the staged management plan. (Section 90(1)(m)).

3. Temporary Storage of Brine Waste at Mount Piper Power station, 18th March, 1991, Department of Environment and Planning

The Manager
Electricity Commission of NSW
Electricity House
Park and Elizabeth Streets
SYDNEY NSW 2000

M. Beveridge
Ext. 2083

S90/01696

57657 DM/SP

28 MAR 1991

Dear Sir,

Re: Proposed Temporary Storage of Brine Waste at Mount Piper Power Station: Modification of Development Consent pursuant to Section 102 of the Environmental Planning and Assessment Act (1979)

I refer to the above matter and wish to advise that the Minister has approved of modifications pursuant to Section 102 of the Environmental Planning and Assessment Act (1979) to the development approval granted on 1 April, 1982 to the Electricity Commission of NSW in respect of the Mount Piper Power Station.

Attached is a copy of the Notice of Amended Development Consent as signed by the Minister.

Yours sincerely,

Peter Hamilton
Manager
Assessments

80/10060(Z)4

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

NOTICE OF AMENDMENT OF A DEVELOPMENT CONSENT GRANTED UNDER SECTION 101 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 PURSUANT TO SECTION 102 OF THE ACT

I, the Minister for Planning, pursuant to Section 102 of the Environmental Planning and Assessment Act, 1979, being satisfied that the development to which the modified development consent will relate is substantially the same development, and there being no objectors to the original development application, modify the consent referred to in Schedule 1 as set out in Schedule 2.

DAVID HAY
Minister for Local Government and
Minister for Planning

Sydney, 18th March, 1991.

(File 80/10060(Z)4)

SCHEDULE 1

Consent granted by the Minister for Planning and Environment on 1 April 1982 in respect of a development application made by the Applicant, the Electricity Commission of New South Wales, to the Greater Lithgow City Council for construction and operation of a power station known as the Mount Piper Power Station.

SCHEDULE 2

The Applicant may construct and operate a temporary storage facility for brine waste in accordance with the application dated 8 October 1990 and "Mount Piper Power Station Temporary Storage of Brine Waste: Supporting Environmental Information Document" dated August, 1990, where modified by the following:

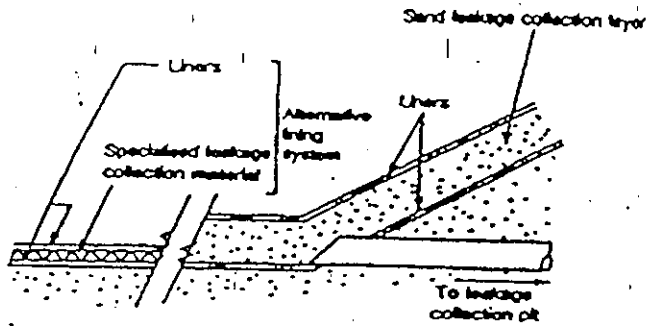
(a) Citation of the development. On page one of the Instrument of Consent, after "The proposed development described in the Environmental Impact Statement ..... dated August, 1980", insert the matter:

"as modified by the works set out in figures 1 and 2 attached to this Notice of Amendment".

(b) Renumber Condition 33 to 34.

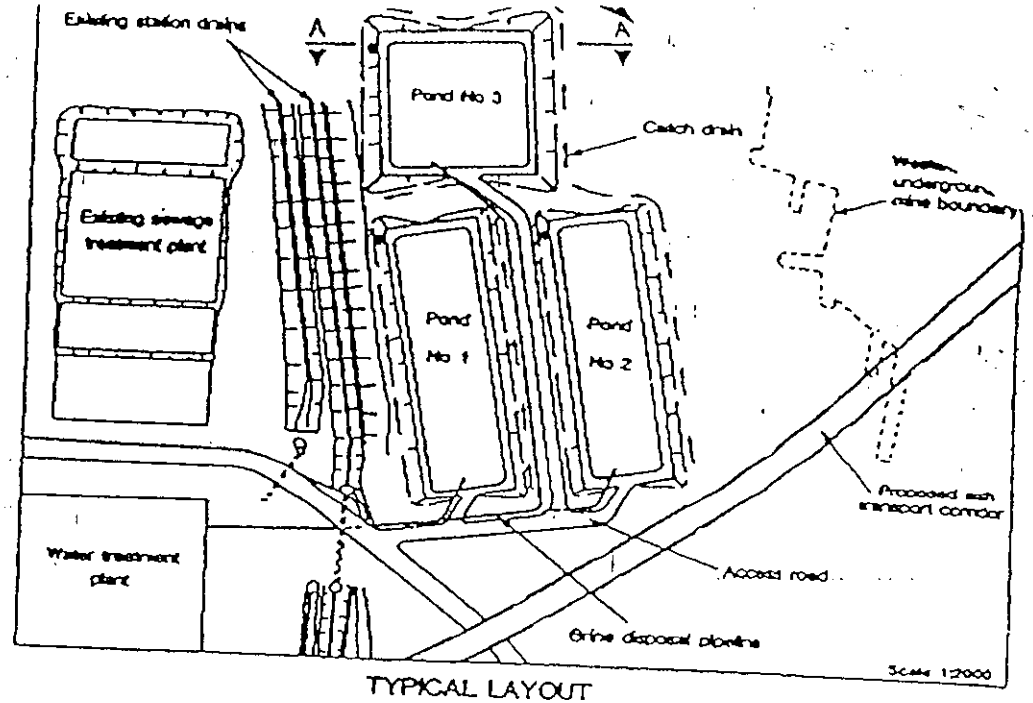
(c) Insert new Condition 33, "Temporary Brine Waste Disposal - The applicant shall construct the temporary brine waste disposal facilities in conformity with the environmental protection measures and general specifications set out in Section 2 of the "Supporting Environmental Information Document" accompanying the application.

(d) Insert new Condition 35, "This consent expires on 30 June 1996.

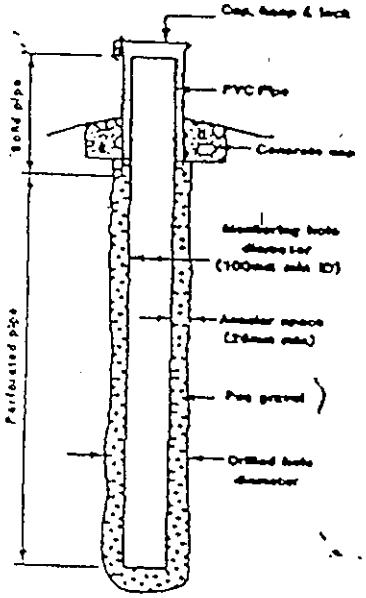


DETAIL X

Not to Scale

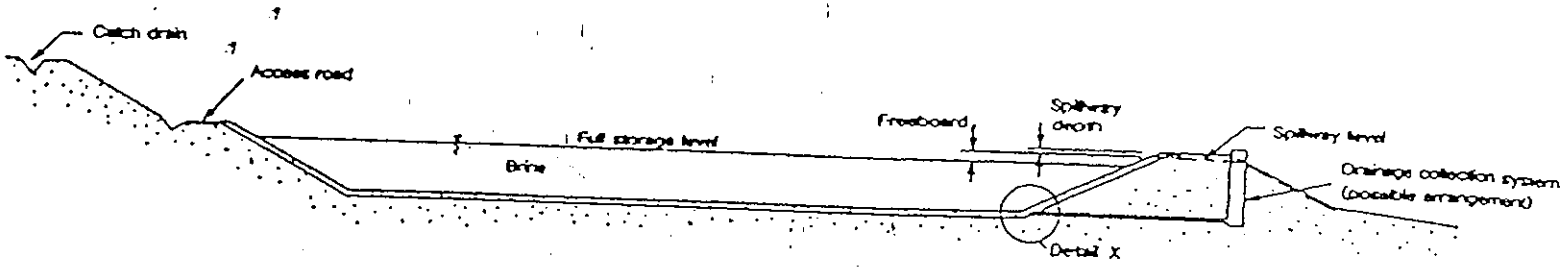


TYPICAL LAYOUT



MONITORING HOLE

Cross Section



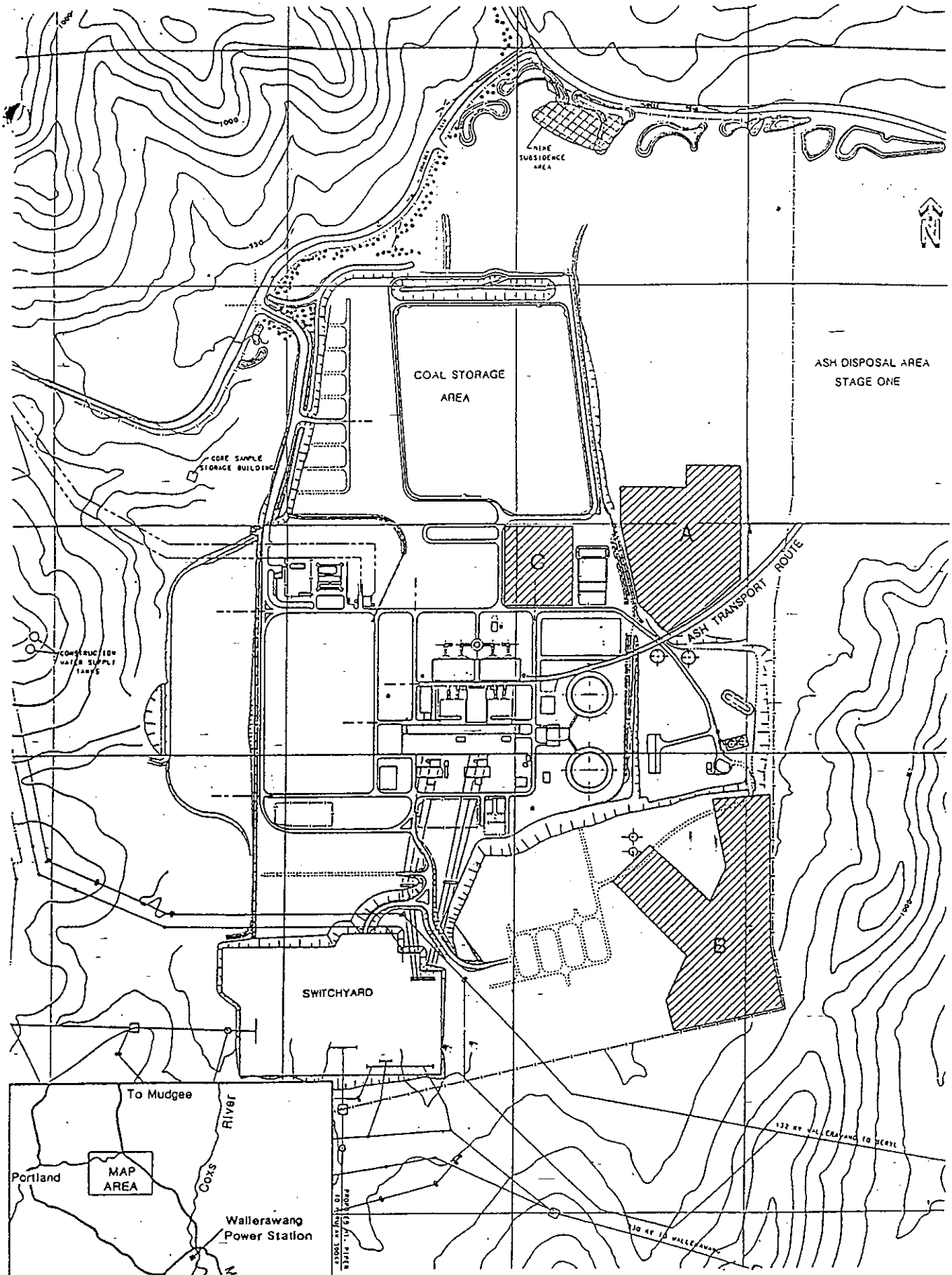
SECTION A-A

Scale 1:400

MOUNT PIPER POWER STATION
TEMPORARY STORAGE OF BRINE WASTE

POSSIBLE LAYOUT & DESIGN OF PONDS

Figure 2



MOUNT PIPER POWER STATION
TEMPORARY STORAGE OF BRINE WASTE

LOCATION PLAN

Figure 1

4. Temporary Storage of Brine Waste at Mount Piper Power station, extension to 30th June, 2000, approved 21st June, 1996, DUAP

New South Wales Government
Department of Urban Affairs and Planning

4 JUL 1996

Original Mgr/MP.
cc Mgr/Eqpt
& Paul Flanagan/PP.
Mr Tam

Mr. J. Henness
A/Chief Executive Officer
First State Power
PO Box A2614
Sydney South NSW 2000

(Attn: Mr. Andrew Tam)

Contact: Victor Yeung

Our Reference: S90/01696/004

Your Reference: ES/AT/GK:[ES]14096

Dear Mr. Henness,

MODIFICATION OF DEVELOPMENT CONSENT - TEMPORARY STORAGE OF BRINE AT MOUNT PIPER POWER STATION

I refer to the above matter and wish to advise that the Minister for Urban Affairs and Planning has approved of modifications pursuant to Section 102 of the Environmental Planning and Assessment Act, 1979 to the development consent granted on 1 April 1982 and modified on 18 March 1991 to the Electricity Commission of New South Wales in respect of the Mount Piper Power Station.

Attached is a copy of the Notice of Amendment for the Development Consent as signed by the Minister.

Yours sincerely,

Stephen Brown
Manager
Major Assessments and Hazards Branch

1 JUL 1996

Governor Macquarie Tower
1 Farrer Place, Sydney 2000
Box 3927 GPO, Sydney 2001

Telephone: (02) 391 2000
Facsimile: (02) 391 2111

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

NOTICE OF AMENDMENT OF DEVELOPMENT CONSENT GRANTED UNDER SECTION 101 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 PURSUANT TO SECTION 102 OF THE ACT

I, the Minister for Urban Affairs and Planning, pursuant to Section 102 of the Environmental Planning and Assessment Act, 1979, being satisfied that the development to which the development consent as modified will relate is substantially the same development, and there being no prejudice to objectors to the original development application, modify the consent referred to in Schedule 1 as set out in Schedule 2.

Craig Knowles
Minister for Urban Affairs and Planning

Sydney, 21/6/ June 1996

File No. S90/01696/004

SCHEDULE 1

Consent granted by the Minister for Planning and Environment on 1 April, 1982, in respect of a development application made by the Applicant, Electricity Commission of New South Wales, to the Greater Lithgow City Council for construction and operation of a power station known as the Mount Piper Power Station, as modified by the Minister for Planning on 18 March, 1991.

SCHEDULE 2

1. Renumber Condition 34 as Condition 37.

2. Delete Condition 35 of the development consent.

3. Insert new Conditions 34, 35 and 36 to the development consent as follows:

   34. Temporary storage of brine at the power station shall cease by 30 June 2000.

   35. The storage capacity of the brine storage ponds shall not be exceeded at any time. Brine reduction initiatives and monitoring of the brine production rate and remaining storage capacity must be undertaken as appropriate to ensure this condition is met.

   36. The applicant shall forward a summary progress report and field test results of the long term brine management investigation to the Catchment Services Unit of Sydney Water Corporation annually prior to finalisation of the long term brine management solution.

First State Power

PT

Ms Gabrielle Kibble
Director General
Department of Urban Affairs and Planning
Governor Macquarie Tower
1 Farrer Place
SYDNEY NSW 2000

ATTENTION: MANAGER, MAJOR ASSESSMENT AND HAZARD BRANCH

Dear Madam

MODIFICATION OF DEVELOPMENT CONSENT - TEMPORARY STORAGE OF BRINE AT MOUNT PIPER POWER STATION

On 1st April, 1982, Consent was granted by the Minister for Planning and Environment in respect of a development application to the Greater Lithgow City Council for construction and operation of the Mount Piper Power Station.

On 18th March, 1991, modification to the Consent was granted by the Minister for Planning and Environment to construct and operate a temporary storage facility for brine waste pursuant to Section 102 of the EP&A Act and this consent expires on 30th June, 1996.

First State Power, by submitting the completed Form 6 together with the attached "Extension of Approval for Using Existing Brine Storage Facilities - Supporting Document" now apply, in accordance with Section 102 of the Environmental Planning and Assessment Act, for further amendment of the Consent.

(Following the disaggregation of Pacific Power on 1 March, 1996, Mount Piper Power Station is now one of the Business Units of First State Power. The Supporting Document is prepared by Pacific Power on behalf of First State Power - Mount Piper Power Station. References to 'Pacific Power' in the document should be interpreted accordingly.)

Requested amendment to Development Consent Condition 35:

"This consent expires on 30 June, 1996".

New Circumstances

In view of the need to handle the disposal of brine in a safe and environmentally effective manner, detailed investigations have and continue to be carried out by First State Power in order to find the most environmentally and technically acceptable long-term solution(s).

Park and Elizabeth Streets, PO Box A2614 Sydney South New South Wales 2000 Australia
Telephone 02) 285 2700 Facsimile 02) 285 2777

MODIFICATION OF DEVELOPMENT CONSENT
TEMPORARY STORAGE OF BRINE AT MOUNT PIPER POWER STATION

The three most favourable options currently being investigated are utilisation, ocean disposal and co-disposal of brine with ash. First State Power is making significant progress in these investigations however more time is required before a final decision can be made in selecting a preferred long term solution.

The temporary brine storage ponds at Mount Piper have been in service since the commencement of the power station operation. One of the ponds is nearly full and storage in the second pond will commence shortly. It is estimated that both temporary brine storage ponds could be full within 2 years under normal power station operation and average weather conditions. However with the implementation of various brine reduction initiatives and the incorporation of an accelerated evaporation or concentration system, the remaining storage capacity could be extended to 4 or more years.

Based on extensive studies and investigations already carried out, 4 years is considered a reasonable time to enable a final decision to be made regarding the long term solution and its implementation if the ocean disposal and co-disposal of brine with ash were selected. Should the utilisation option be adopted, the time taken for its implementation may extend beyond the 4 year period. However, with the incorporation of an accelerated evaporation or concentration system, the remaining storage capacity can be extended to 4 or more years.

Proposed Change

In recognition of the need for extra time to find the most environmentally and technically acceptable long term solution or solutions to handle the disposal of brine at Mount Piper Power Station, the approval to use the temporary brine storage facilities should be extended for four (4) year to 30 June, 2000. Consent Condition 35 should be amended accordingly.

The Application Fee has not been included but it will be forwarded when the amount applicable is confirmed.

Yours faithfully

J Henness

J HENNESS
A/CHIEF EXECUTIVE OFFICER
3 / 4 / 96

Form 6

Application to modify a consent
granted under the Environmental Planning and Assessment Act 1979 Section 102

owner of land
name
address

First State Power
PO Box A 2614
SYDNEY SOUTH NSW 2000

land
address

lot no, DP/MPS, vol/fol etc

Portion 59 Parish of Cox and
Lot 191 DP 629212

or
[] map(s) attached

consent
give details

Consent for construction & operation of Mt Piper Power Station granted on 1/4/82 modification of consent to construct & operate temporary brine storage facilities granted on 18/3/91.

modification
give details of
manner and extent
(provide evidence that the modification does not substantially alter the development)

Apply to extend approval to use of existing brine storage facilities for another 4 years. For details see attached supporting document attached.

agreement of all owner(s)

Being the owner of the land described above,
I apply to modify the consent as described above.

signature(s)
name(s)
date

Peter McIlveen (Company Secretary)
3/4/96

5. Co-Disposal of Brine with Ash Pilot Field Test at Mt Piper Power Station, Lithgow City Council, 8th January, 1996; EPA 4th January, 1996.

Council of the City of Greater Lithgow

180 Mort Street, Lithgow, NSW, 2790. Telephone: (063) 52 1077

Your Reference:
Our Reference: 12300;56070;GJP
Contact: Environmental Services

8 January 1996

The Manager, Environmental Services
Pacific Power,
GPO Box 5257
SYDNEY NSW 2790

Dear Sir / Madam,

PROPOSED CO- DISPOSAL OF BRINE WITH ASH PILOT FIELD TEST MT PIPER YOUR REFERENCE ES/AT/GK;(ES) 13527

In reference to your recent letter regarding the above please be advised that Council has noted your proposal for complying with the Section 102 amendment to the Development Consent and requests the field test be carried out subject to the following provisions :-

1 That the pilot field test be carried out incorporating all necessary controls to ensure that no pollution or nuisance arises outside the test area.

2 That the test procedure is carried out prior to 1 July 1996 or as extended by the Department of Planning and Urban Affairs.

3 That the permanent disposal method of the brine water is implemented as soon as practically possible.

4 That Council is kept informed of the progress and developments concerning the proposal. on site for further information.

5 That the approval of the Environment Protection Authority is granted.

Please do not hesitate to contact Mr G Prince of Council's Environmental Planning and Services Division should you require any additional information in relation to this matter.

Yours Faithfully,

Mr Andrew Muir
PLANNING PROGRAM MANAGER
for

Mr Stuart McPherson
GENERAL MANAGER

ENVIRONMENTAL SERVICES
Telephone: (02) 268 8306
Our Reference: ES/AT/GK:[ES]13527

The General Manager,
Council of the City of Greater Lithgow,
P.O. Box 19,
Lithgow,
NSW 2790

Attention : Mr Greg Prince

Dear Mr Prince,

RE: MOUNT PIPER POWER STATION
PROPOSED CO-DISPOSAL OF BRINE WITH ASH
PILOT FIELD TEST

Referring to the telephone conversations between our Mr Andrew Tam and yourself advising you of the proposed pilot field test for the co-disposal of brine with ash at the existing Western Main ash disposal area, please find attached a description of the proposal and associated drawings for your information as requested.

Mount Piper Power Station has approval to temporarily store brine in ponds on site which will expire on 30th June, 1996. A preliminary discussion has been held with the Department of Urban Affairs & Planning and Pacific Power is planning to apply for an extension of the approval period while investigating into a number of permanent brine disposal options.

The option of co-disposal of brine by mixing it with fly ash in the designated ash disposal area is one of the alternatives referred to in the 1990 Supporting Document to the Modification of Development Consent to the Mount Piper Power Station development. The pilot field test will examine the proposal and provide data for input into more detailed environmental evaluation.

Approval for the ultimate brine disposal method will be sought in accordance with the Environmental Planning & Assessment Acts and Regulations.

Should you require more information regarding the proposal or further discussion, please contact Mr Andrew Tam on (02) 268 8306 or Mr Peter Coombes at (063) 548111.

Yours Sincerely,

M Gamble
ACTING MANAGER/MOUNT PIPER POWER STATION

5 / 12 / 95

Attach

MOUNT PIPER ASH/BRINE CO-DISPOSAL

PROPOSED PILOT FIELD TEST AND MONITORING PROGRAM

1. INTRODUCTION

Mount Piper Power Station has approval to temporarily store brine in ponds on site which will expire on 30th June, 1996. Pacific Power is planning to apply for an extension of the approval period while investigating into a number of permanent brine disposal options. It has been estimated that the existing brine storage ponds will have sufficient storage capacity to allow power station operation to continue for 2-3 years under a worst case scenario of two consecutive wet years and solar evaporation.

The different brine disposal options being investigated by Pacific Power include:

- brine utilisation
- disposal via ocean outfall sewers
- co-disposal of brine with ash .

The option of disposal of brine by mixing it with fly ash in the designated ash disposal area is one of the alternatives referred to in the 1990 Supporting Document to the Modification of Development Consent for the Mount Piper Power Station development. In order to further examine the feasibility of this proposal and determine the likely environmental impact, a pilot field test on the existing ash disposal site at Western Main is proposed.

The pilot field test will examine the proposal and provide data for input into more detailed environmental evaluation. This brief outlines the design of the test and the proposed construction method. Details of the proposed monitoring program during the test are also provided.

2. PURPOSE

A pilot field test of the co-disposal of an ash/brine mix is proposed to:

- determine the physical and chemical properties of the ash and brine mix;
- determine the volume and quality of runoff water from the surface of the ash/brine deposit over time;
- determine the volume and quality of any leachate which may be produced from the ash/brine deposit;
- determine the rate of infiltration into the ash brine deposit; and
- determine the effectiveness of a layer of capping material in preventing infiltration into the deposit.

The design of the test also needed to ensure that the trial placement of the ash/brine mix produced a deposit which had similar properties to the existing ash deposit. In order to achieve this, the trial deposit was to be constructed as near as possible with methods currently utilised by the ash disposal contractor, Mt Piper Ash P/L (MPA).

The design of the pilot field test is shown in drawing PM637641, and comprises a bare ash pad and a capped section. The proposed construction method is presented below and the location of the field test is shown in Figure 1.

3. PROPOSED CONSTRUCTION METHOD

(a) Place a base pad of compacted ash (min. 0.5 metre thick) using placement techniques normally used by Mt Piper Ash (current contractor).

Size of pad required	20 m x 50 m (minimum)
Slope on top of pad	2% approx.

(b) Survey the surface of the base pad. Excavate leachate collection drains and diversion drains as per drawing PM 637641. Place impervious membranes, then install drainage pipes and sand backfill. Install leachate collection pipes.

(c) Place ash conditioned with 11% by weight of brine in five 0.3 m thick compacted layers on base pad to form bare ash trial pad 1.5 m thick x 20 m x 30 m approx. The bottom three layers of compacted ash are to be extended over the entire base pad (20 m x 50 m) to form the capped section which is 0.9 m thick. The brine conditioned ash is to be placed to a similar density to the existing deposit. Conditioning is to be carried out either by thorough mixing prior to placement and compaction or by spraying the brine onto the loose ash in place prior to compaction.

The total moisture content of the ash (including water + brine) should not exceed 15%. The percentage of brine to be added may be altered, depending on the results of experimental work currently in progress.

(d) After placement of each layer:

(i) Install soil moisture probes (as per drawing PM 637641), and recompact ash by hand over the cables and probes.

(ii) Survey the level of all moisture probes when installed.

(iii) Determine the insitu density of the compacted ash layer, and take an ash sample for laboratory determination of insitu moisture content, OMC/MDD, grainsize analysis, pH, conductivity.

(e) After placement of layers two and five:

(i) Install suction lysimeters in the uncapped area (as per drawing PM 637641).

(ii) Survey the level of lysimeters when installed .

(f) Place a 0.3 m x 10 m x 10 m capping of mine spoil on top of the base pad and compact using a vibrating roller. Add a 0.2 m thick capping of uncompacted mine spoil on top of the compacted layer. Rake the spoil surface and re-seed with grass/trees.

(g) Install one moisture probe in the capping material.

(h) Survey the final ash surface on the trial pad and surface of the capping on the base pad. Insert surface erosion markers on the bare ash pad.

(i) Install the run off control border on the bare ash surface. Install the runoff collection pipe and sump with tipping bucket flow meter, conductivity probe and water meter.

(j) Install the leachate collection sump with tipping bucket flow meter and conductivity probe for the uncapped area. Install the leachate collection sump for the capped area.

(k) Connect moisture probes, conductivity probes and flowmeters to the data loggers. Install the pluviometer and connect it to the data logger. Install the data loggers in a secure enclosure. Test all instrumentation.

(l) Add cement to the ash slopes and rake over to provide stabilisation against erosion.

(m) Erect the perimeter fencing.

4. MONITORING PROGRAM

The pilot field test will include a detailed monitoring program to provide all the data required for use in the environmental assessment. The proposed monitoring program generally will include the following:

4.1 Rainfall Monitoring

Tipping bucket pluviometers installed at field test site and at power station. Rain gauge at Mount Piper Ash Site.

4.2 Evaporation Monitoring

Pan evaporation monitored at Mt Piper Power Station. Data to be obtained at one monthly intervals.

4.3 Runoff Monitoring

Runoff from surface of trial pad to be collected in runoff sump. Small flows into runoff sump are to be logged for volume at 30 minute intervals. Large flows into sump to be measured by water meter which is to be read daily when rain occurs. Conductivity of runoff in runoff sump is to be logged.

4.4 Infiltration Monitoring

Soil moisture probes installed in ash/brine trial pad - 10 probes at five different depths. Soil moisture probes installed in and just below capping on base pad - 2 probes.

Moisture content measured by probes in trial ash pad to be logged at 24 hourly intervals. Moisture content measured by probes beneath capping to be logged. Datalogger to be downloaded at one monthly intervals. Trial ash deposit to be sampled at five different depths at 6 monthly intervals. Moisture content to be determined on ash samples as a check on logged moisture data.

4.5 Leachate Monitoring

Leachate from base of trial pad to be collected in leachate sump.

Leachate flows in volume and conductivity of leachate in sump will be logged.

4.6 Chemical Analyses

4.6.1 Runoff Water Chemistry

(a) Water from runoff sump will be sampled at one monthly intervals or more regularly during high rainfall periods.

(b) Runoff water samples to be analysed for pH, alkalinity, conductivity, Cl, SO_4, Na, K, Mg, Fe, Cu, B, Ba, Cr, Cd, Mn, Pb, Zn, As, Se.

(c) Runoff sump to be emptied after sampling; volume disposed of to be measured (including sample volume) and replaced with distilled water.

4.6.2 **Leachate Chemistry**

(a) Water (if any) from leachate sump to be sampled monthly when it appears.

(b) Leachate samples to be tested as in 4.6.1 (b) above.

(c) Leachate sump to be emptied after sampling; volume disposed of to be measured (including sample volume) and replaced with distilled water.

4.6.3 **Ash Water Chemistry**

Ash water in trial deposit to be sampled at 6 monthly intervals from lysimeters. Water will be tested in 4.6.1 (b) above if sufficient volume extracted.

4.6.4 **Ash Chemistry**

Samples of ash to be taken at time of ash placement. Chemical characteristics of ash will be determined.

4.6.5 **Brine Chemistry**

Samples of brine to be collected at time of placement. Brine chemistry will be determined.

4.7 **Ash Characteristics**

Bulk samples of ash to be taken at time of placement. Ash samples to be tested for grain size, Atterberg limits, insitu moisture content, insitu density, compaction properties.

5. POLLUTION CONTROL MEASURES

5.1 Site Selection

The pilot test site is selected in the part of the existing ash disposal area which will create the minimum environmental concern in terms of surface and groundwater pollution, dust, noise and fauna.

Perimeter fencing will be provided to the test site to prevent unauthorised access and access by animals.

5.2 Water Quality

As described in (3) above, a surface runoff and collection system will be incorporated to divert or collect surface water from the test field. This will eliminate any risk of surface water contamination.

Impervious membranes will be installed at the bottom of each test pads and any leachate produced will be collected and removed to prevent groundwater contamination.

5.3 Dust

Mixture of brine and ash will contain moisture content similar the emplaced ash in the existing operation. During the trial, one of the test pads will be capped and revegetated therefore dust generation will be minimised. For the uncapped test pad, provision will be made for wetting the area with water spraying under adverse dry windy conditions should there be a dust problem. There is no obvious problem at Western Mains based on current experience.

5.4 Noise

Construction of the test pads will be carried out during normal operation hours over a two week period. With the proposed construction method and considering the specific location of the test pads, noise concern is not envisaged.

5.4 Clean-up

As the test pad areas are small compared with the overall disposal area special cleaning up of the site after the trial is not considered necessary. However if the trial results demonstrated that there are major concerns with water quality pollution the brine ash mixture could be removed and disposed in an acceptable location.

6. COST

The estimated cost for this pilot field test is approximately $ 120,000 over the trial period.

7. PROGRAM

Subject to approval given, it is planned that the field trial at Western Main will commence in late January, 1996. It is envisaged that the trial and monitoring will continue for about 24 months depending on climatic conditions and adequacy of monitoring data collected.

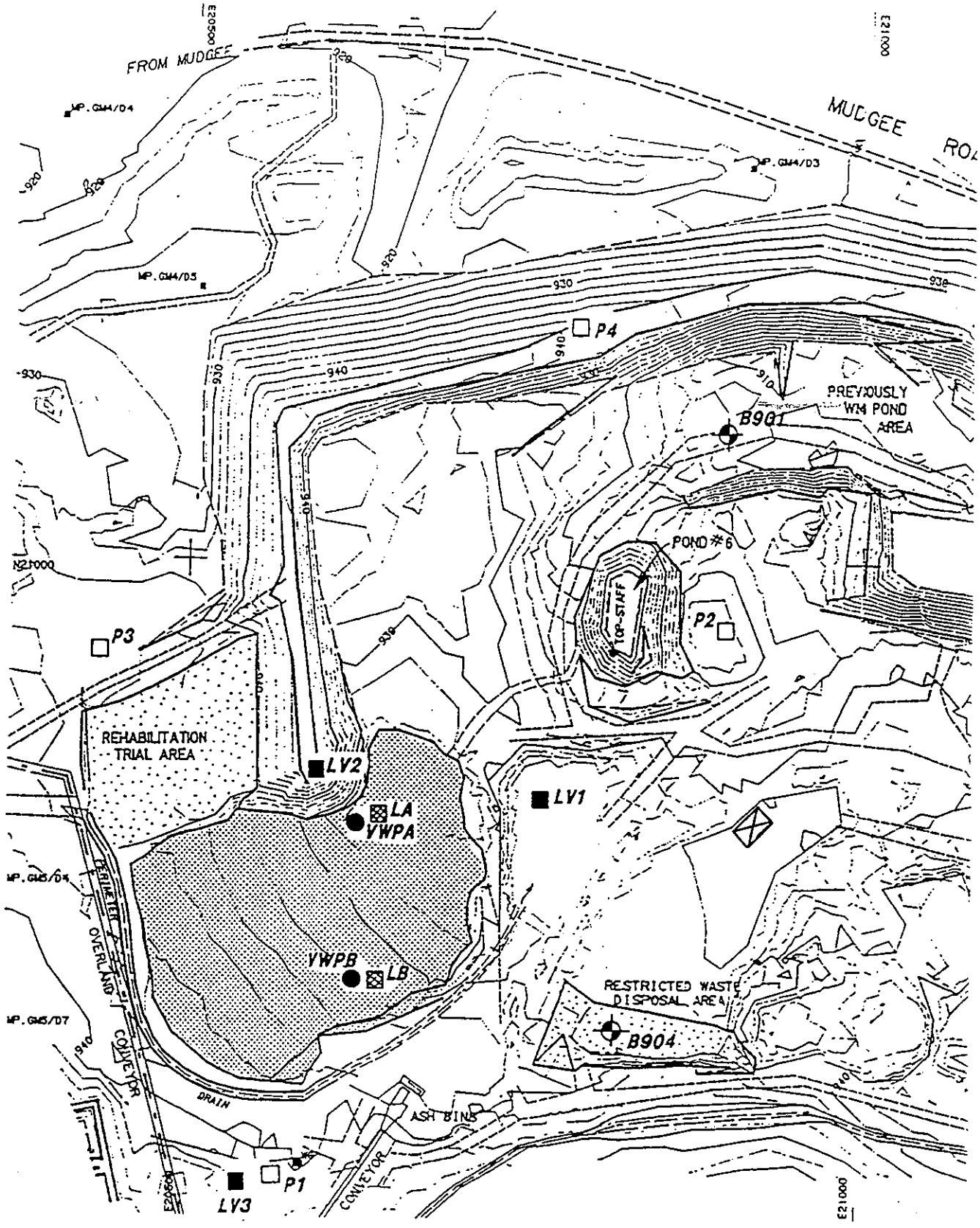
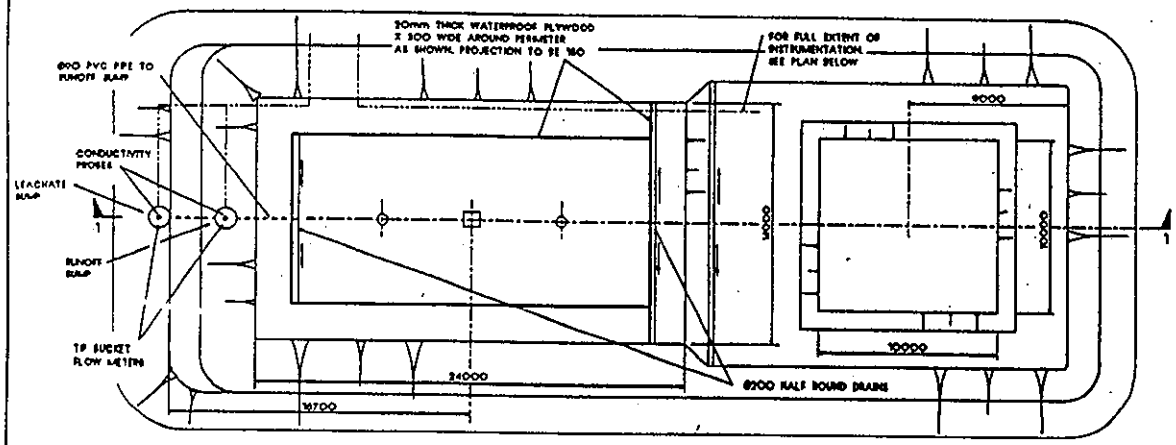


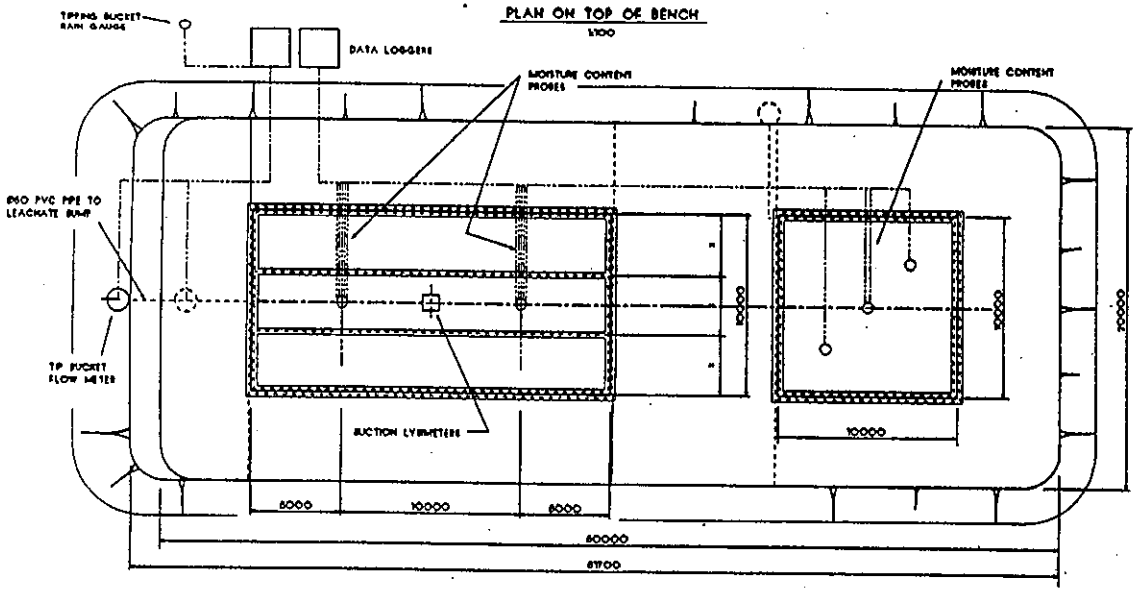
Figure 1
Location of Pilot Field Test

LEGEND :

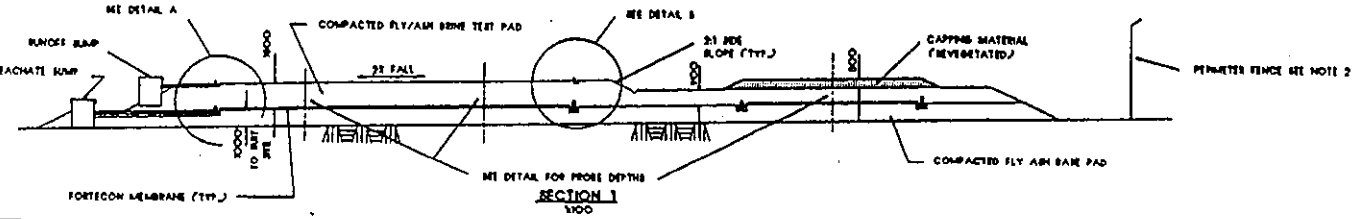
- MAIN ASH DISPOSAL AREA
- OTHER ASH DISPOSAL AREAS
- B901 – MONITORING BORE
- Pilot Field Test
- VWPB – VIBRATING WIRE PIEZOMETER
- P2 – DUST MONITOR - PASSIVE
- LA – LYSIMETER INSTALLATION
- LV2 – DUST MONITOR - LOW VOLUME



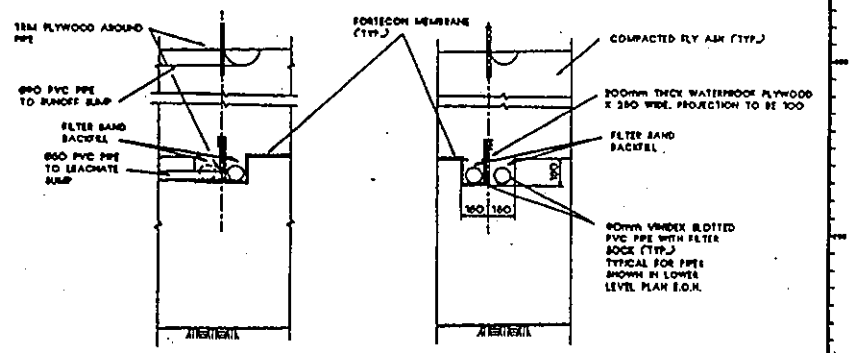
PLAN ON TOP OF BENCH
1:100



PLAN ON LOWER LEVEL
1:100

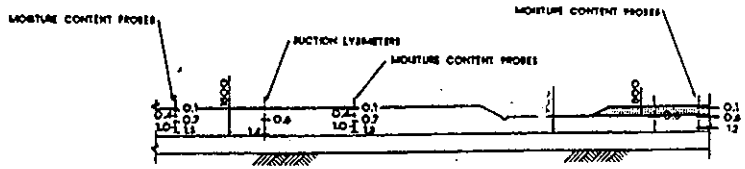


SECTION 1
1:100



DETAIL A
1:10

DETAIL B
1:10



DEPTHS FOR MOISTURE CONTENT PROBES
1:100

NOTES

1. EXPOSED ASH SLOPES TO BE PROTECTED FROM EROSION USING CEMENT STABILISATION.
2. TRIAL PAD TO BE FENCED WITH STANDARD RURAL FENCING AND GATE IN ACCORDANCE WITH DRG 84/1251.

Contract No.			PACIFIC POWER	
			POINT PETER POWER STATION ASH DISPOSAL AREA INVESTIGATION FLOW FIELD TEST DETAILS	
		TENTATIVE	A0	PH6337621

EPA

Environment
Protection
Authority
New South Wales

Facsimile Transmission

To Andrew Tham.

Date 9-1-96

Facsimile No. 02 268 7186

From Name TERRY KNOWLES

Branch SENIOR REGIONAL OPERATIONS OFFICER
CENTRAL WEST - BATHURST

Phone (063) 321 838

Number of Pages (including this page) 4

Subject

Copy of our letter to Mal Gamble.

Jenny

Original Documents will
~~will not follow~~

219 Howick Street
PO Box 1388
Bathurst
NSW 2795

Telephone .063. 32 1838
Facsimile .063. 32 2387

File: MTPIPERP.WPD
location: N:\TERRY\
contact: Knowles

Mr M Gamble
Acting Manager
Mt Piper Power Station

PORTLAND NSW

260932 A1 TK:TK

ES/AT/GK:[ES]13528

Contact: Terry Knowles

Dear Mr Gamble

I refer to our visit to the Power Station on Thursday 14 December 1994 and the subsequent discussions and site inspection.

The following briefly outlines matters discussed and conclusions, if any, reached:

* fan silencers and PRP

  The installation of these units are nearing completion. The effectiveness of the units is expected to be evaluated following installation.

* brine disposal pollution reduction program

  The proposal was explained in detail and we have no objections to it.

  We will be preparing the terms of the associated pollution reduction program and forwarding to you for your comments and eventual agreement through negotiation.

* PWD proposal to reticulate sewage onsite

  The system existing system was designed to cater for the construction phase of the power station that occurred in the early 1980's with absorption trenches in the "proposed" ash dam area. I understand that you intend to review sizing requirements of the sewage treatment system and concentrate collection, treatment and disposal onto the power station site. In addition you intend to reuse effluent to irrigate regeneration areas. We would commend this effluent reuse proposal.

ENVIRONMENTAL SERVICES
Telephone: (02)268 8306
Our Reference: ES/AT/GK:[ES]13528

The Environment Protection Authority
Bathurst Office,
P.O. Box 1388
Bathurst,
NSW 2795

Attention : Mr Terry Knowles

Dear Mr Knowles

RE: MOUNT PIPER POWER STATION
PROPOSED CO-DISPOSAL OF BRINE WITH ASH
PILOT FIELD TEST

Referring to the telephone conversation between our Dr George Hawke and yourself regarding seeking approval to proceed with the proposed pilot field test for the co-disposal of brine with ash at the existing Western Main ash disposal area, please find attached a description of the proposal containing the information as required.

We have noted your verbal advice that the quickest and most appropriate approval will be granted via a notice under the Pollution Control Act to attach a new condition to the existing Pacific Power licence No. 766.

The proposed date to commence construction of the pilot field test is late January and your early approval of the proposal is requested.

Should you require more information regarding the proposal or further discussion, please contact Mr Andrew Tam on (02) 268 8306 or Mr Peter Coombes at (063) 548111.

Yours Sincerely,

M Gamble
ACTING MANAGER/MOUNT PIPER POWER STATION

5/12/95

Attach

6. Pollution Control Approval for a Brine Discharge Facility at Wollongong Sewage Treatment Plant (STP) by NSW EPA, 11th December, 1998

EPA

Environment Protection Authority
New South Wales

NSW Government Offices
84 Crown Street
Wollongong NSW 2500
PO Box 513
Wollongong East NSW 2520

Telephone: 042 26 8100
Facsimile: 042 27 2348

Mr Jeff Brown
Manager Ocean Wastewater
Sydney Water Corporation Limited
PO Box A53
SYDNEY SOUTH NSW 1232

Our Reference: 280177C9 ATC:MV

Your Reference:

Contact: Andrew Couldridge (02) 4226 8100

Dear Mr Brown

POLLUTION CONTROL APPROVAL
FOR A BRINE DISCHARGE FACILITY
AT WOLLONGONG SEWAGE TREATMENT PLANT (STP)

I refer to your Pollution Control Approval application dated 31 July 1998 for installation of a brine discharge facility at Sydney Water's Wollongong STP.

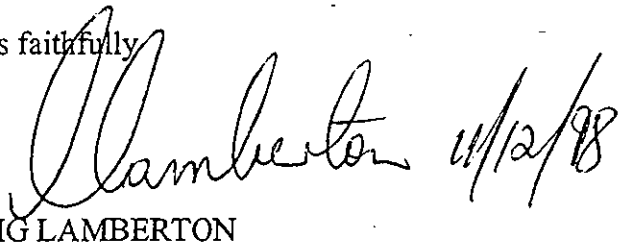
The Environment Protection Authority has approved the application and the formal approval document is enclosed.

I have also attached a set of draft licence conditions which it is intended to attach to the Wollongong STP licence (number 000218) once the brine discharge facility commences operation.

I would appreciate any comments you may have on the draft conditions and remind you that it is a condition of the Approval that you are required to complete and return the enclosed Certificate of Compliance (for Category 1 conditions) within fourteen days of commissioning the above works.

If you have any further questions, please do not hesitate to contact Andrew Couldridge (02) 4226 8100.

Yours faithfully



CRAIG LAMBERTON
Regional Manager South Coast
for Director-General

(n:\atc\0177c9b)

Att

cc: Mr George Hawke, Environmental Services
Pacific Power International
GPO Box 5257
SYDNEY NSW 2001

ATTACHMENT 1

Sydney Water currently holds a Pollution Control Licence number 218 for discharge of waste under the Clean Waters Act 1970. It is recommended that following commissioning of the brine discharge facility, a Section 17D(3) Notice under the Pollution Conrol Act, 1970 be issued adding the following conditions to the Wollongong STP licence.

Volume Limits

Brine Discharge

L2.2

The brine discharged from the brine discharge facility to the authorised discharge point ADP001 must not exceed a volumetric ratio of one part of brine to 300 parts of effluent.

Time Limit for Brine Discharge

L4.1

The discharge of brine to the authorised discharge point must cease on (date to be provided 12 months from commencement).

Appropriate Treatment Processes

O5.6

This condition does not apply to the discharge of brine to the authorised discharge point ADP001.

Location of Monitoring Points

M3.1

The Licensee must maintain the following monitoring points at the location specified for each monitoring point:

Monitoring Point	Purpose	Location
Brine Discharge Volume	To record the volume of liquid brine discharged to ADP001	Downstream of the brine dosing pumps
Brine Quality	To obtain a representative sample of the quality of liquid waste discharged to ADP001	Brine storage tank

Volume Monitoring of Liquid Waste

M4.1

The licensee must measure the volume of liquid waste passing through the following points at the frequency, and using the method, specified for each monitoring point:

Monitoring Point	Frequency	Method
Brine discharge volume	Continuous flow measurement integrated over one day	Electro-magnetic flow meter

Quality Monitoring of Liquid Wastes

1. Brine Quality in Brine Storage Tank

M5.2

The Licensee must analyse the liquid waste at the following monitoring point for the parameters specified for the monitoring point at the frequency, and using the method specified for each parameter:

Parameter	Frequency	Method
TBD	Once every 2 months	Representative grab sample(s). Two litres from each sample must be securely stored by the licensee for 12 months from the sample date.

Annual/Interim Reports

Quality Assurance Program for Brine Discharge

R5.6/R6.7

The annual/interim report must contain a section comparing the results of the analysis of brine quality (in the brine storage tank) as required by this licence with:

- the results of the analysis of brine quality from samples taken on the same day from the brine storage lagoons at the Mt Piper Power Station;
- the results of the analysis of brine quality contained in Appendix 1 of the report entitled "Brine transfer to the ocean, Review of Environmental Factors, Pacific Power International, June 1998".

The report must also contain a description of remedial, investigative and preventative actions taken where it is found there is a statistically significant increase in the results of analysis of brine quality in the brine storage tanks.

Brine Dilution Ratio

R5.7/R6.8

In addition to reporting of monitoring results required by this Part, the annual/interim report must contain the daily brine dilution ratios calculated by division of the daily effluent discharge volume by the daily brine discharge volume.

ENVIRONMENT PROTECTION AUTHORITY (EPA)

POLLUTION CONTROL ACT, 1970

Pollution Control Approval

Approval Number : 003915

File Number : 280177/C02

Date of application : 31 July, 1998

Date of issue : 4 December, 1998

Approval is hereby given to : SYDNEY WATER CORPORATION ACN 063 279 649

of : 73 GARDENERS RD
DACEYVILLE
NSW 2032

under the provisions of Section 17K of the Pollution Control Act, 1970 to carry out the following work : Construction of brine handling facilities described in the attached REF

For stage number : 001

single

at : WOLLONGONG SEWAGE TREATMENT PLANT
PORT KEMBLA ROAD
WOLLONGONG
NSW 2500

subject to the following conditions:

CATEGORY I

1 The work must be carried out in accordance with this approval and in accordance with the information supplied in the application dated 31 July, 1998 and with any supplementary documentation which has been supplied to support the application.

CATEGORY II

2 The applicant must certify, by means of the form titled Certificate of Compliance with Pollution Control Approval -

2.1 the extent to which the conditions under Category I and any requirements as specified in subsequent correspondence

between applicant and the EPA have been complied with; and

2.2 identify any conditions not complied with; and

2.3 the reasons for any non compliance referred to in paragraph 2.2.

The applicant must forward the completed form to the EPA within fourteen days of the completion of the work and/or before the plant, equipment or construction is put into regular operation.

NEIL SHEPHERD
Director-General

Per 4/12/97
Andrew Nethery
Head, Regional Operations Unit
SOUTH COAST ML
(by Authorisation)

7. 8ML Temporary Storage, DUAP Modification Approval January, 1999

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

NOTICE OF AMENDMENT OF A DEVELOPMENT CONSENT GRANTED UNDER SECTION 101 OF THE UNAMENDED ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 PURSUANT TO SECTION 96(2) OF THE AMENDED ACT.

I, the Minister for Urban Affairs and Planning, in pursuance of section 96(2) of the Environmental Planning and Assessment Act, 1979, being satisfied that the development to which the development consent as modified will relate, is substantially the same development, and there being no prejudice to objectors to the original development application, modify the consent referred to in Schedule 1 as set out in Schedule 2.

Craig Knowles MP
Minister for Urban Affairs and Planning

Sydney, 18.1. 1999.

File No. S90/01696/005

SCHEDULE 1

Consent granted by the then Minister for Planning and Environment on 1 April 1982, in respect of a development application made by the Applicant, Electricity Commission of New South Wales, to the Greater Lithgow City Council for construction and operation of a power station known as the Mount Piper Power Station, as modified on 18 March 1991 and 21 June 1996.

SCHEDULE 2

1. Renumber Condition 37 as Condition 38.

2. Replace the existing Condition 1 with the following:

   1 That the Applicant, prior to commencement of construction of the proposed development or any subsequent modification, obtain from the Environment Protection Authority (EPA) all necessary statutory pollution control approvals and licences under the Pollution Control Act 1970, Clean Air Act 1961, Clean Waters Act 1970, Waste Minimisation and Management Act 1995 and/or any other Act as advised by the EPA.

New South Wales Government
Department of Urban Affairs and Planning

29/1/99 → IC

Mr Frank Mieszala
General Manager/Western Operations
Delta Electricity
Private Bag No. 1
Post Office Portland NSW 2847

Contact: Dana Barto

Our Reference: S90/01696Pt5

Your Reference:

Dear Sir/Madam,

MODIFICATION OF APPROVAL FOR DELTA ELECTRICITY – MOUNT PIPER POWER STATION, BOULDER ROAD, PORTLAND.

I refer to your application, under Section 96(A) of the Environmental Planning and Assessment Act, 1979, for a modification to the development consent granted to the Electricity Commission of NSW on 1 April 1982, and modified on 18 March 1991 and 21 June 1996 in respect of the Mount Piper Power Station.

The Minister for Urban Affairs and Planning has approved the application after being satisfied that the proposal is substantially the same development and that no person objected to the original application will be prejudiced. A copy of the signed determination by the Minister is enclosed.

If you require any additional information, please contact Dana Barto on (02) 9391 2074.

Yours sincerely

for Geoff Noonan 20/1/99
Director
Development and Infrastructure Assessment

Governor Macquarie Tower
1 Farrer Place, Sydney 2000
Box 3927 GPO, Sydney 2001

Telephone: (02) 9391 2000
Facsimile: (02) 9391 2111

Attachment 2

Mt Piper Ash/Brine Co-Disposal Pilot Field Test
Pacific Power, Report GO 129, 1999 to Delta Electricity

SEE SEPARATELY BOUND REPORT
By
I Forster

Attachment 3

Mt Piper Power Station
Brine Conditioned Flyash Co-placement Water Quality Assessment
Pacific Power Report by Environmental Services to Delta Electricity, 1999

SEE SEPARATELY BOUND REPORT
By
B R Hodgson

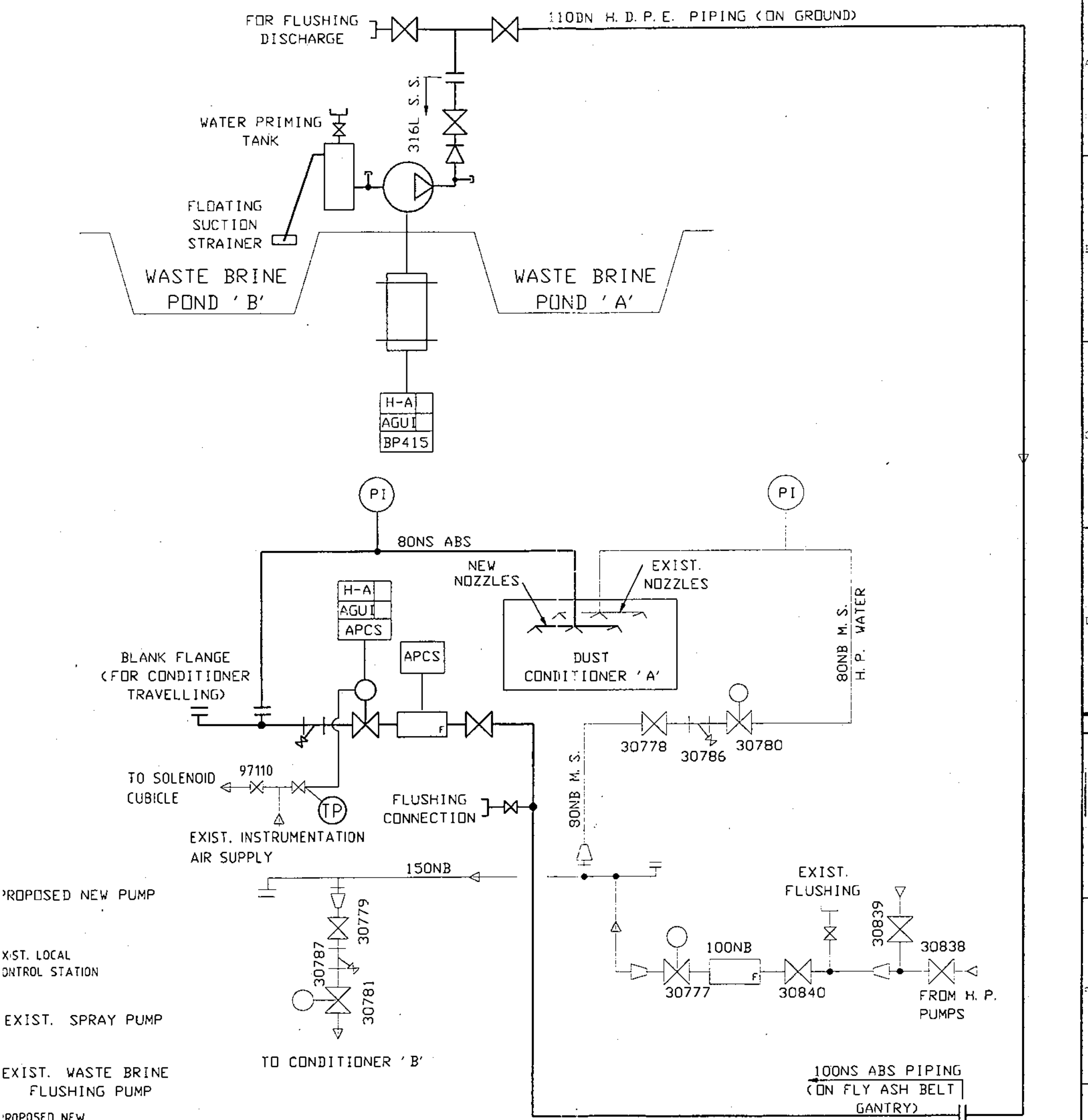
Attachment 4

Mt Piper Brine Conditioned Ash Disposal Project
Groundwater Contaminant Transport Study
Insearch Limited Report to Pacific Power, 1999

SEE SEPARATELY BOUND REPORT
By
N P Merrick and P Tammetta

Attachment 5

Brine and Flyash Mixing Plant Design Details



NOTES

1. ALL PIPING INSTALLATION SHALL BE IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS & MANUFACTURERS RECOMMENDATIONS.

2. THE CONTRACTOR SHALL CHECK THE PIPING ROUTE ON SITE TO ENSURE A CLEAR RUN OF THE PIPE AWAY FROM ANY OBSTRUCTIONS.

REFERENCE DRAWINGS

PM748397	ASH PLANT PROPOSED BRINE MIX WITH FLY ASH PIPING LOCAL TO ASH PLANT PLAN & SECTIONS
PM637558	STORMWATER, WASTEWATER, CONTAMINATED WATER & HAZARDOUS MATERIAL STORAGE LAYOUT

REFERENCE DRAWING

ONLY
TRUCTION

PACIFIC POWER
INTERNATIONAL

CONTRACT No.	DRAWN	MI	MPS	CV
W0011/99	DESIGN		B & TS	---
	CHECKED 00	RMcR	CE	---
	ENG	GF	E & CS	---
	PASSED	CV		

cad

KKS CODING GTG
ORIGINAL DRAWING APPROVED BY
D MORPHETT per CV 3-5-99
PPI/PROJECTS MANAGER
APPROVED
DRAWING STATUS
SCALE AS SHOWN

PACIFIC POWER INTERNATIONAL
MT PIPER POWER STATION UNITS 1&2
WASTE WATER RECOVERY - BRINE CONCENTRATOR
PROPOSED BRINE MIX WITH FLY ASH
DIAGRAM & SITE PLAN

A2 PM747119 00
PREFIX NUMBER SHEET AMDT

Attachment 6

Mt Piper Power Station Brine Long-Term Management
Co-placement Strategy Seminar
15th October, 1998

Delta electricity

WESTERN OPERATIONS
ENVIRONMENT

MT PIPER POWER STATION BRINE LONG TERM MANAGEMENT

CO PLACEMENT STRATEGY SEMINAR

Terry Knowles	EPA Bathurst
Greg Prince	Lithgow City Council
Gordon Hamilton	Coxs River Catchment Committee
David Joy	Sydney Water
Amir Deen	
Robert Emanual	
Helen Spreadbrough	DUAP
Dan McKibbin	DLWC Parramatta
Charles Demetriou	
Matt Gray	DLWC Lithgow
Bruce Hodgson	Pacific Power Environment Services
Ian Forster	Pacific Power
George Hawke	Pacific Power
Noel Merrick	UTS
Paul Tammetta	
Frank Mieszala	General Manager / Western Operations
Peter Coombes	Delta Sydney
John Rensen	Delta Mt Piper
Andrew Davies	Delta Mt Piper
Ian Roufeil	Delta Mt Piper
Nino di Falco	Delta Mt Piper
Peter Griffiths	Delta Mt Piper
Ian Cruickshank	Delta Mt Piper

AGENDA

1. Background to the Brine in Ash Disposal Project (PC)
   - current ash disposal development consent
   - need for a long-term brine disposal method
     - -ocean disposal
     - -brine in ash

2. Trial Brine Coplacement (IF/BH)
   - background to need for trial
   - design
   - results
     - -surface runoff
     - -rainfall infiltration
     - -leaching tests

3. Groundwater Modeling (NM/PT - UTS)
   - background (BH)
   - Modeling Approach
   - Results

4. Brine Coplacement REF (GM)
   - clarify if need modification of ash disposal DA or a new DA

5. Ash Disposal Area Inspection