Mt Piper Power Station
Ash Placement Project

ENVIRONMENTAL ASSESSMENT

CHAPTER 3 – PROJECT DESCRIPTION

August 2010

Contents

3. Project Description

This chapter provides a detailed description of the project. It addresses the Director General's requirements, including:

- *Construction, operation and rehabilitation details including a timeline for construction works and the operating sequence of the project;*
- *The general location of the components relevant to the concept plan and the detailed location and dimensions of all those components relevant to the project application including construction compounds and access roads;*
- *The finished profiles of the sites, including maximum height and treatment details.*

3.1. Project Overview

The proposal comprises Concept and Project Approval for the development as ash storage sites of the previously mined areas referred to as Lamberts North and Lamberts South and Concept Approval for sites known as Neubecks Creek and Ivanhoe No 4 (refer **Figure 1-2).** The proposal for each Project Approval area is as follows:

- **Lamberts North:** Extension of the existing Area 1 into the Lamberts North area, with construction of a capped ash emplacement facility. The ash emplacement would be constructed with typically 1(V):4(H) side slopes, with approximately 10 m wide benches constructed for each 10 metre vertical height. The finished surface of Lamberts North would vary from RL966 to RL980 m AHD, with the exposed ash areas progressively capped as areas reach their design elevations. The available volume for ash placement in Lamberts North has been estimated at approximately 6,850,000 cubic metres (in-situ volume) based on the design footprint of 43 hectares;
- **Lamberts South:** Lamberts South area is located immediately to the south of the Lamberts North Area, and would be constructed to similar geometry as Lamberts North. The finished surface of Lamberts South would be RL1000 m AHD. The available volume for ash placement in Lamberts South is approximately 15,000,000 cubic metres (in-situ volume) based on the design footprint of 61 hectares.

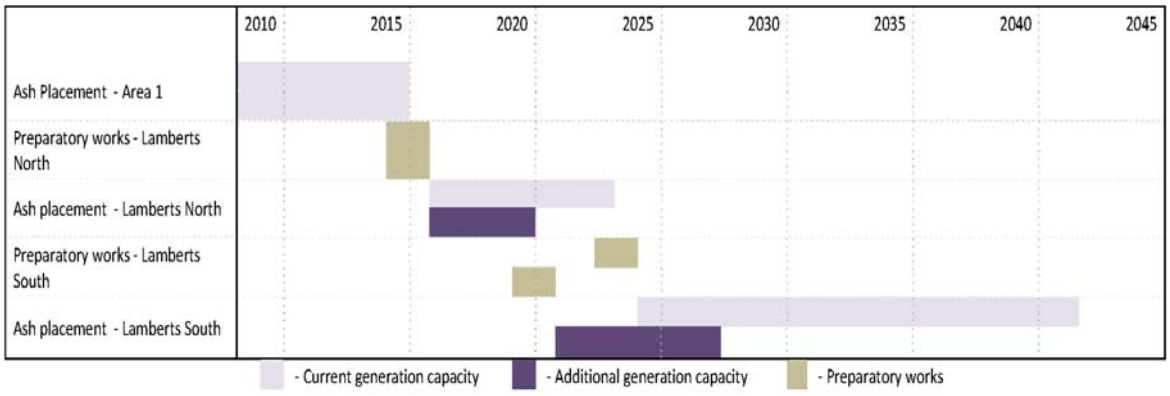
The timeline for the placement of ash in the Lamberts North and South is provided on **Figure 3-1**, and has been estimated based on the following predicted annual ash production rates:

- Current generation capacity of Mt Piper Units 1 and 2 of 1,400 MW = 0.75 Mm^3/annum (based on 1.2 tonnes ash /m^3); and
- Current generation capacity of Mt Piper Units 1 and 2 and the proposed additional capacity of the proposed Mt Piper Extension of 2,000 MW (should it be coal fired), give a total of 3,400 MW which is equivalent to 2.1 Mm^3/annum based on 1.2 tonnes ash /m^3.

The staging for ash placement would include the completion of Area 1 and preparation works for Lamberts North followed by the progressive filling of Lamberts North. Nearing completion of Lamberts North, preparation and then filling of Lamberts South would commence.

Concept approval is also being sought for additional ash disposal sites at Neubecks Creek and Ivanhoe No 4. These areas would only be considered for ash placement when space is no longer available at Lamberts North and South and it is likely they would only be required should the Mt Piper extension project proceed as a coal fired plant. Further discussion on the potential development of these sites can be found in Section 3.3.9 and Section 3.4.8.

Figure 3-1 – Proposed timeline of construction and operational activities



3.2. Site Location and History

3.2.1. Site Location

The project investigation area is located in the Central West region of NSW, approximately 17 km north-west of Lithgow in close proximity to the existing Mt Piper Power Station. The land proposed for the project is predominantly located on the current workings of the Centennial Coal operated Lamberts Gully Mine on land owned by either Delta Electricity or Centennial Coal.

The nearest townships to the proposal are:

- Portland, approximately 1.5 km to the west of Ivanhoe No. 4 site and 4 km from the western boundary of the proposed Lamberts North and Lamberts South sites;
- Blackmans Flat, approximately 1 km from the eastern boundary of the proposed Lamberts North site;
- Lidsdale, approximately 3.5 km to the south-east of the eastern boundary of the proposed Lamberts South site;
- Wallerawang, approximately 4km southeast of the eastern boundary of the proposed Lamberts South site.

The project sites are surrounded predominantly by State forests (Ben Bullen State Forest located north east and south east of Mt Piper Power Station), coal mines and power generation facilities (Wallerawang Power Station is located to the south-east).

The concept approval sites (Neubecks Creek and Ivanhoe No. 4) are previously disturbed (by mining) sites with some woodland / open forest and are surrounded by undulating topography. The project approval sites (Lamberts North and Lamberts South) are highly disturbed as they are currently the site of open-cut mining activities.

Delta is currently undertaking negotiations with Centennial coal regarding the transfer of ownership of parcels of land which will be required for ash placement. This transfer includes outright purchase of lands required for planned initial placement and controlled options for progressive transfer as mining activities are concluded. Ownership of specified areas including the mines washery will remain with the mining company for the foreseeable future.

3.2.2. Site History

The Lamberts Gully area, which broadly covers both Lamberts North and Lamberts South, lies within the former Western Main Colliery holding, which occupies the land immediately east of the power station. This mining lease is now held by Centennial Coal. Since the 1940s the Lithgow Seam here has been worked by shallow underground bord and pillar methods and subsequently by open cut, the latter being generally ‘roof lifting’ exercises to extract pillar remnants. Open cut mining has generally focussed on removing the remnants of the Lithgow seam and extracting from the Lidsdale seam. The most extensive period of open cut mining occurred between 1992 and 1998 (HLA-Envirosciences, 2005). Underground mining ceased in the 1990s and open pit extraction in Lamberts Gulley is due to be completed by 2011/2012.

The bord-and-pillar method of mining formerly employed at Western Main involved driving a network of tunnels (‘roadways’) in the seam to outline coal pillars, which may later be wholly or partly extracted by splitting or skirting. The initial stage is referred to as First Working and does not result in subsidence, but it does leave large open voids (the access tunnels and bords or ‘rooms’). Pillar extraction (Second Working) does cause subsidence and severe surface disturbance

over shallow working areas, at depths less than 30m (as is the case here). The degree of surface subsidence and the sizes of voids left depends, therefore, on the extent of First and Second Workings at the time of underground mine closure.

Superimposed on this are the effects of subsequent open cut mining, where old pillars and unmined ('solid') coal are removed in areas of thin overburden. Although detailed plans of the former Western Main and Lamberts Gully workings have not been provided, their present condition is most likely to be an extremely irregular pattern of:

- Open voids in old access tunnels and in the shadow of pillar remnants. Some weaker pillar remnants ('stooks') have probably been crushed since the mine was abandoned, but further failures could continue for decades;
- Collapsed and poorly consolidated roof strata ('goaf') filling the larger mined-out underground cavities. Similar but slightly more compact spoil has been dumped in former open cuts;
- Varying degrees of subsidence and blast induced fracturing in roof strata, in pillar-supported areas;
- Flooding in lower workings, generally down-dip and towards the eastern side of the mine holding. It should be noted that this water level may rise rapidly after heavy rain, such that the area of flooded workings within the Lithgow Seam may vary.

The existing drainage arrangements at the Lamberts Gulley mine site are shown in **Figure 3-2**. The area known generally as Huon Gully or Creek is a drainage gully between the existing Ash Area 1 and the Lamberts North part of the Lamberts Gully mine. It receives drainage from elevation of RL 1050m AHD to the west and south west of the mine and generally flows over the terrain to the north east. It may have formed from the creek known as Lamberts Creek (as per CMA Topographic Map 8931, 1973) which drained through the former Western Main lease site to Neubecks Creek. The drainage alignment has changed significantly due to coal operations in the area and it is not clear if the Huon drainage gully formed part of the original creek alignment. There is no surface connection between the Huon Creek drainage gully and Neubecks Creek.

The second drainage alignment (known as Lamberts Gully) is located on the eastern side of the Lamberts Gully mine site. It may represent the original Lamberts Creek and joins Neubecks Creek downstream of the proposed ash placement areas.

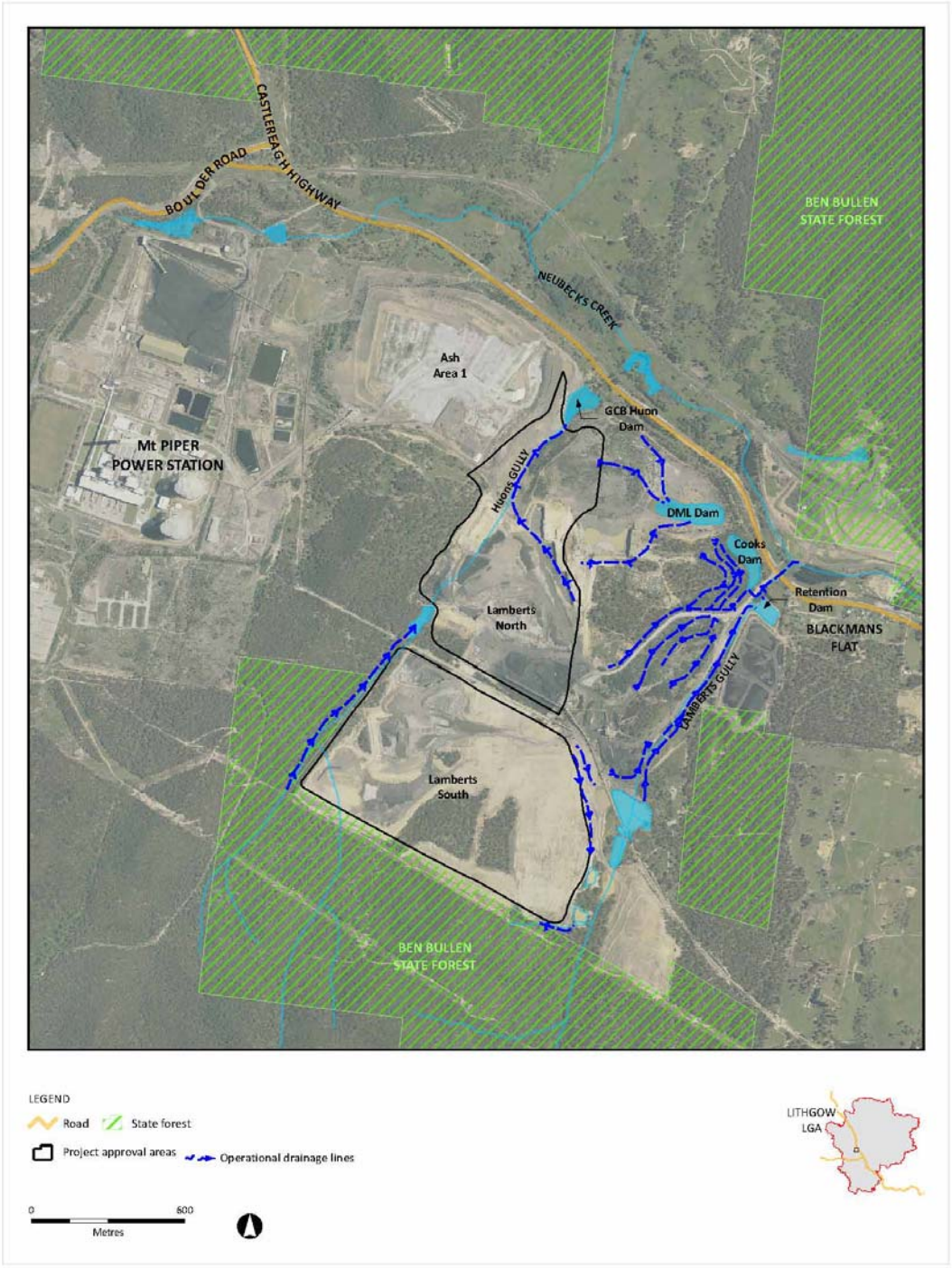


Figure 3-2 Lamberts Gully Sites – Current Layout

3.2.3. Power Generation

The Mt Piper Power Station was constructed on part of the former Western Main Colliery. Approval for the development was sought in 1980 and received in 1981. The existing Mt Piper Power Station was commissioned in stages over 1992 and 1993, comprising two 660 MW steam turbine generators (Units 1 and 2) which were recently upgraded to 700 MW. It was originally intended to construct four 660 MW generators on the site, but the third and fourth units were not built. Some preliminary earthworks were undertaken, however, and space was left for the possible construction of further power generation units.

At the time of the original approval the ash was intended to be "wet storage" in an ash dam in the area of the Neubecks Creek site east of the Castlereagh Highway. In 1990, a subsequent consent was obtained from Lithgow Council for the current dry ash storage and method of placement in part of the former open cut mining site east of the power station site, west of Castlereagh Highway, now known as Area 1.

3.2.4. Other Land Uses

In 2005, Lithgow City Council (LCC) sought approval to develop the Blackmans Flat Waste Management Facility on a parcel of land adjacent to the current Lamberts Gully mine site utilising a mine void located in the area. The development would include the establishment of the Waste Management Facility including the preparation of the mine void for landfilling and construction of a waste transfer and recycling facility and weighbridge. Land parcels in the proposed landfill area were previously unreserved Crown land and are currently owned by Centennial and part of the current negotiations for transfer to Delta upon extinguishment of the mining lease. Transfer of this land to LCC is expected, subject to satisfactory completion of agreements between Centennial and Delta.

3.3. Construction of the Ash Storage Sites

This section provides a detailed description of the works needed to establish the sites to receive ash from the power station.

3.3.1. Overview

As previously outlined in Section 3.2.2, the Lamberts North and Lamberts South areas have been worked by shallow underground methods and more recently by open cut methods to extract pillar remnants across the site. Open cut mining activities in Lamberts North are basically complete with the Lamberts South area expected to be completed by 2011/12 upon which the site will be made available for ash storage.

At the completion of mining activities, remaining overburden materials excavated to extract coal will be placed back into excavations and/or remain in stockpiles, where materials can be later used in construction of earth banks, fill areas and for use as capping materials for the ash storage facility. Re-profiling of the landform will be necessary to re-establish surface water and drainage across the site and to prepare the area for future ash placement. Where areas are not programmed to receive ash for many years, maintenance such as stabilisation of quarry areas/benches may be necessary for safety/operational purposes, with temporary rehabilitation of stockpile and disturbed areas to control soil erosion until these areas are later required for ash placement. These construction and preparatory works would be required at various stages of the project, timed to allow continual placement of ash as outlined above. Construction and preparatory works prior to placement of ash are divided into the following general categories and are discussed in more detail in the following sections:

- Civil works in preparation of ash placement;
- Establishment of haul and access roads;
- Construction of surface drainage and adjustments of surface water and drainage systems as ash placement progresses; and
- Construction of sub-surface drainage.

3.3.2. Preparation of Lamberts North

Prior to completion of ash placement in Area 1 (Mt Piper's current ash placement area), the northern area of Lamberts North, immediately east of Area 1 would be prepared by:

- Clearing and grubbing of the proposed footprint area and re-grading/re-profiling of the Huon Creek to remove/relocate any existing stockpiles remaining from mining operations. Existing stockpiles of spoil and overburden would be made available for current capping activities of Area 1 with suitable materials also stockpiled for future capping of the areas;
- Extension of haul roads from Area 1 by the placement of fill to maintain road grades of less than 10%;
- Earth banks would be constructed around the boundary of the proposed Lithgow City Council landfill site to maintain site levels and to maintain surface drainage lines. Earth banks and bunding would also be incorporated into the surface water management of run-off from ash areas by the construction on containment bunds around the footprint;
- A subsurface rock drainage blanket (as described below in Section 3.3.7**)** would be installed in the invert of the gully.

The approximate extent of preparatory works for Lamberts North is as shown on **Figure 3-3a,b**.

3.3.3. Preparation of Lamberts South

Approximately 12 months in advance of the Lamberts North site reaching its ash placement capacity, site preparation works would commence in the Lambert's South site to make the area suitable for placement of ash. Proposed preparation works would include:

- Clearing and grubbing of the proposed footprint area and re-grading/re-profiling of the surface for placement of ash;
- Existing stockpiles of spoil and overburden would be made available for current capping activities of Lamberts North with suitable materials also stockpiled for future capping of this area;
- Extension of haul roads from Lamberts North by the placement of fill to maintain road grades of less than 10%;
- Earth banks would be constructed around the boundary to maintain site levels and to maintain surface drainage lines. Earth banks and bunding would also be incorporated into the surface water management of run-off from ash areas by the construction on containment bunds around the footprint.

The approximate extent of preparatory works for Lamberts South is as shown on **Figure 3-3c**.

3.3.4. Civil Preparatory works in preparation of ash placement

Civil preparatory works will be required to make the sites suitable for ash placement. These works are divided into the following general categories:

- Clearing and Grubbing: In advance of ash placement, areas designated for ash placement will be cleared of any vegetation and unsuitable founding materials. Clearing and grubbing would be undertaken using dozer and or excavators;
- Re-grading/re-profiling: Earthworks comprising relocation and rehabilitation of stockpiles and excavation areas remaining from previous mining activities and grading of base areas for placement of ash materials. This activity would require the grading of the site with dozers and/or graders and stockpiling and/or hauling of materials across the site to required surface levels;
- Earthworks and Fill Construction**:** As necessary, engineered soil banks would be constructed to assist in the containment and placement of ash to form the proposed profiles around boundary areas (i.e. Council Boundary Area) and also to assist with surface water diversion and containment across the site. Soil banks would be constructed from on-site soils and overburden materials disturbed during previous mining activities (site stockpiles or borrow areas), and placed in compacted layers to required design levels. Construction of these features would be undertaken by the hauling of suitable materials to proposed fill areas,

spreading in 200 to 500 mm loose thick layers with dozer and/or graders and compacting using pad foot and/or rubber tyred compaction equipment or dozer tracked (dependent or required fill density). Subsequent layers of fill would then be spread and compacted (as above) to achieve the required design levels. Indicative locations of starter banks and fill areas for both Lamberts North and South are shown on **Figures 3-3a,b,d**.

- Temporary Rehabilitation and Stockpile Remediation: Areas previously disturbed by mining activities would be maintained and remediated to control surface water flows and soil erosion by implementation of appropriate controls such as sedimentation ponds, surface water diversion and vegetation of disturbed areas. Where areas are not programmed to receive ash for many years, maintenance such as stabilisation of quarry areas/benches may be necessary for safety/operational purposes, with temporary rehabilitation of stockpile and disturbed areas to control soil erosion until these areas are later required for ash placement.

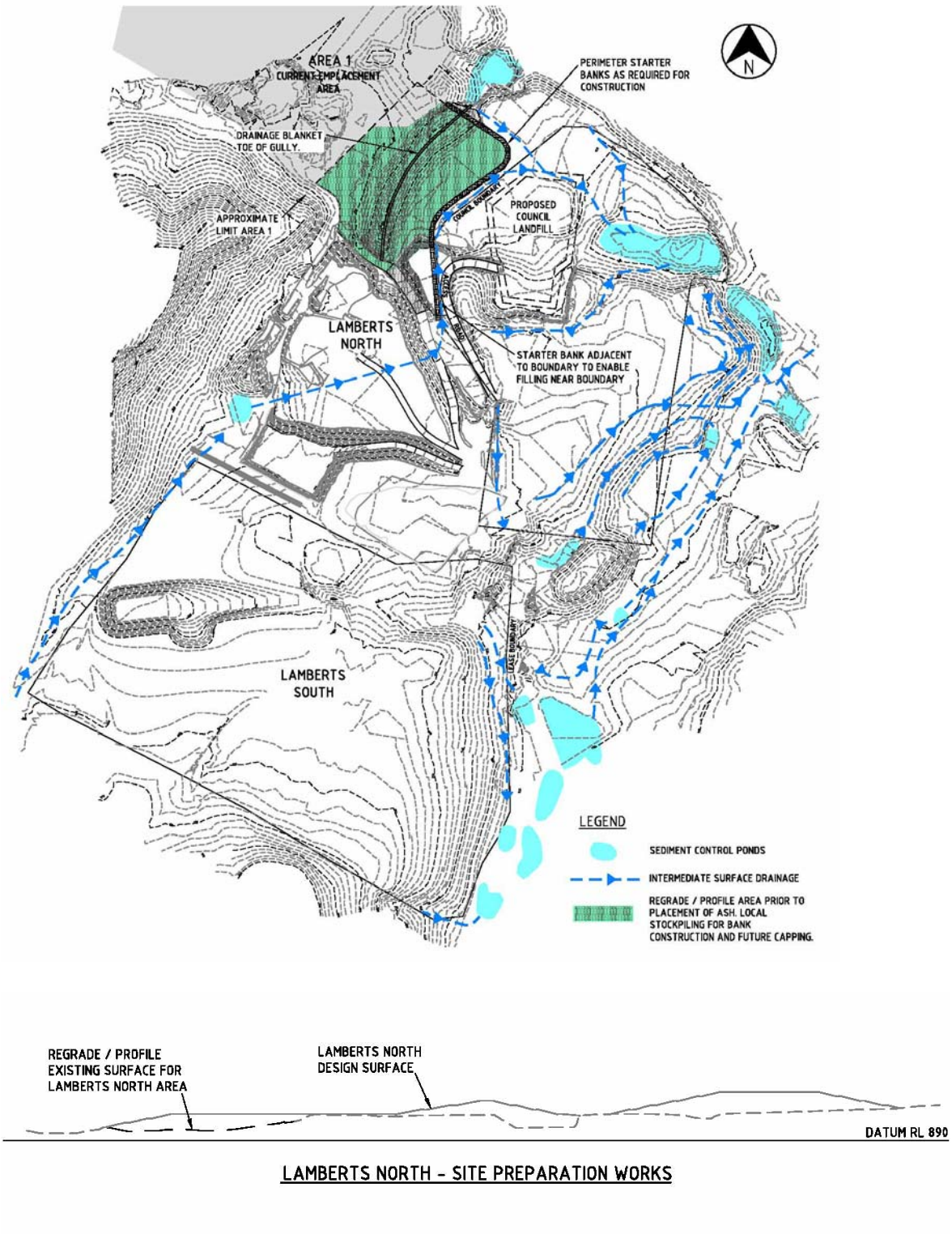
3.3.5. Access and haul roads

Access and haul roads would be created in the same manner as that undertaken for existing ash placement activities. Typically haul roads are in the order of 12 m wide or three times the width of the largest vehicle. Access and haul roads would be established progressively as ash placement continues to the face areas.

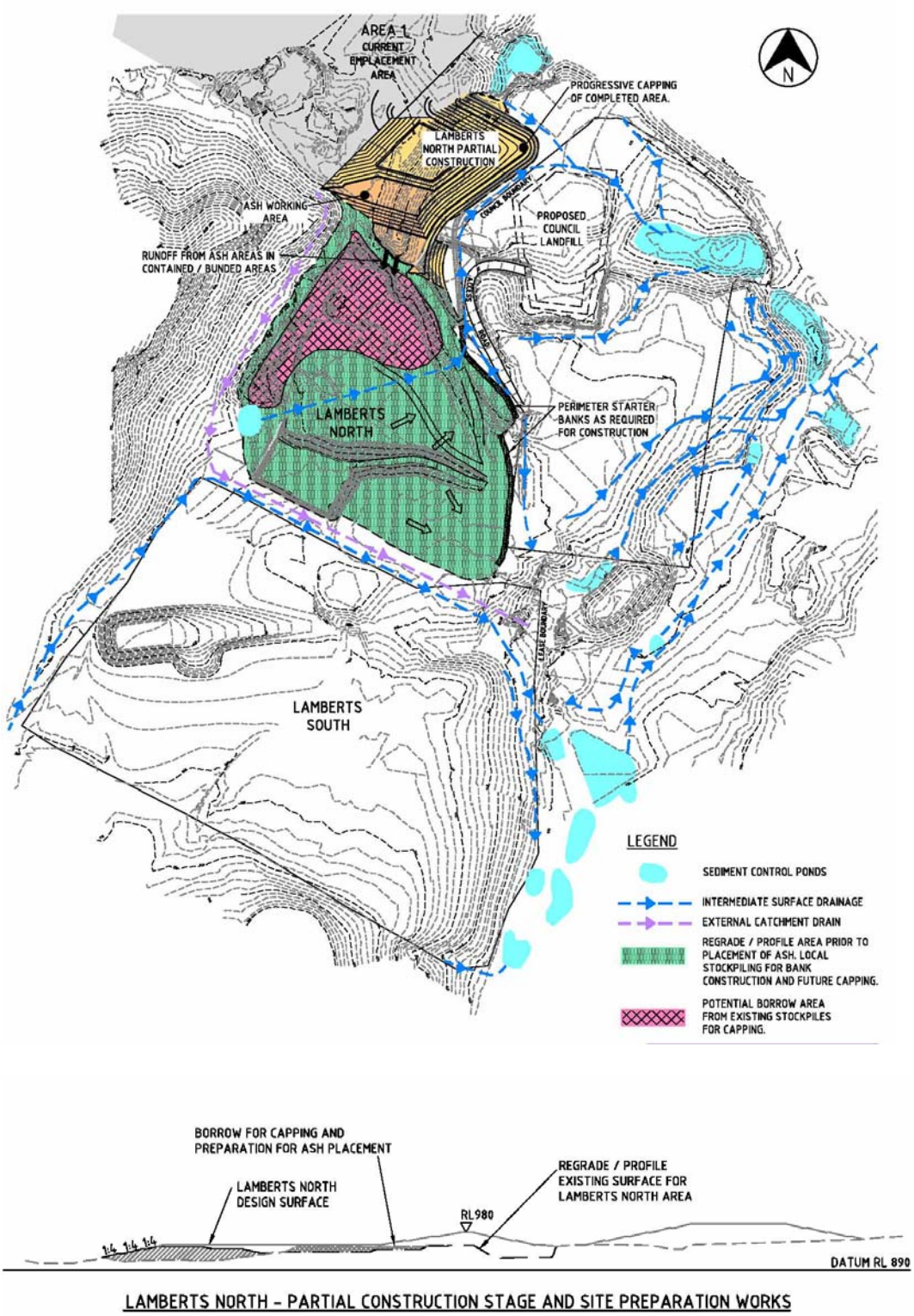
The existing haul road extends across the southern boundary of Ash Area 1. It is proposed to continue the existing haul road access from Area 1 for ash placement to provide access to Lamberts North, generally as shown on **Figure 3-3e**. The haul road would extend to the boundary of and across the Lamberts South site.

Consideration would be given to relocating/extending the existing ash conveyor from its current location near Area 1 to Lamberts North (Option 1) or to a site closer to Lamberts South (Option 2) to minimise the requirement for truck haulage across the site. Conveyor options are shown in **Figure 3-3e**. Conveyor Option 2 would follow the alignment of the existing coal conveyor between Springvale Mine and Mt Piper Power Station.

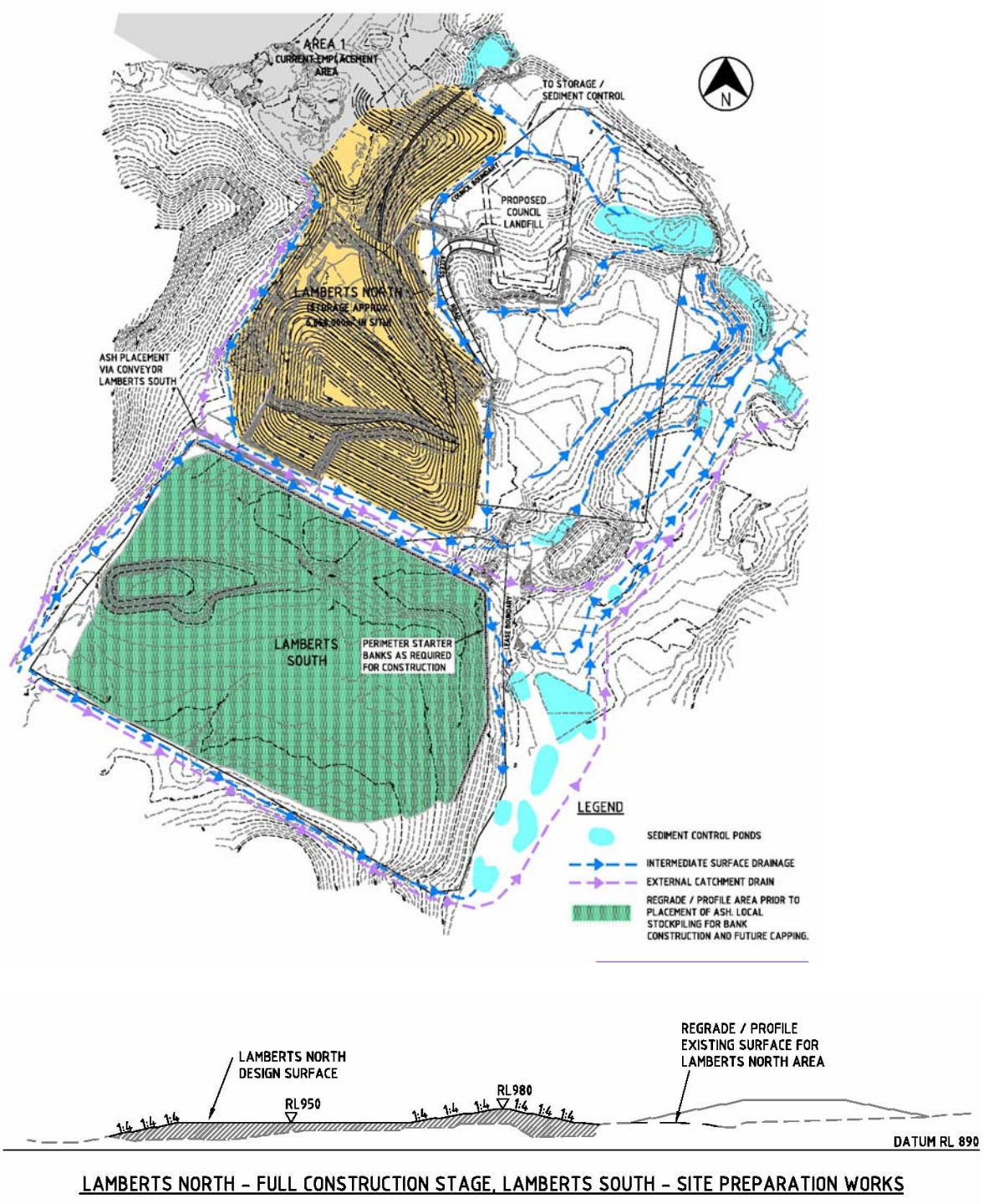
- **Figure 3-3a Lamberts North Site Preparation Works**



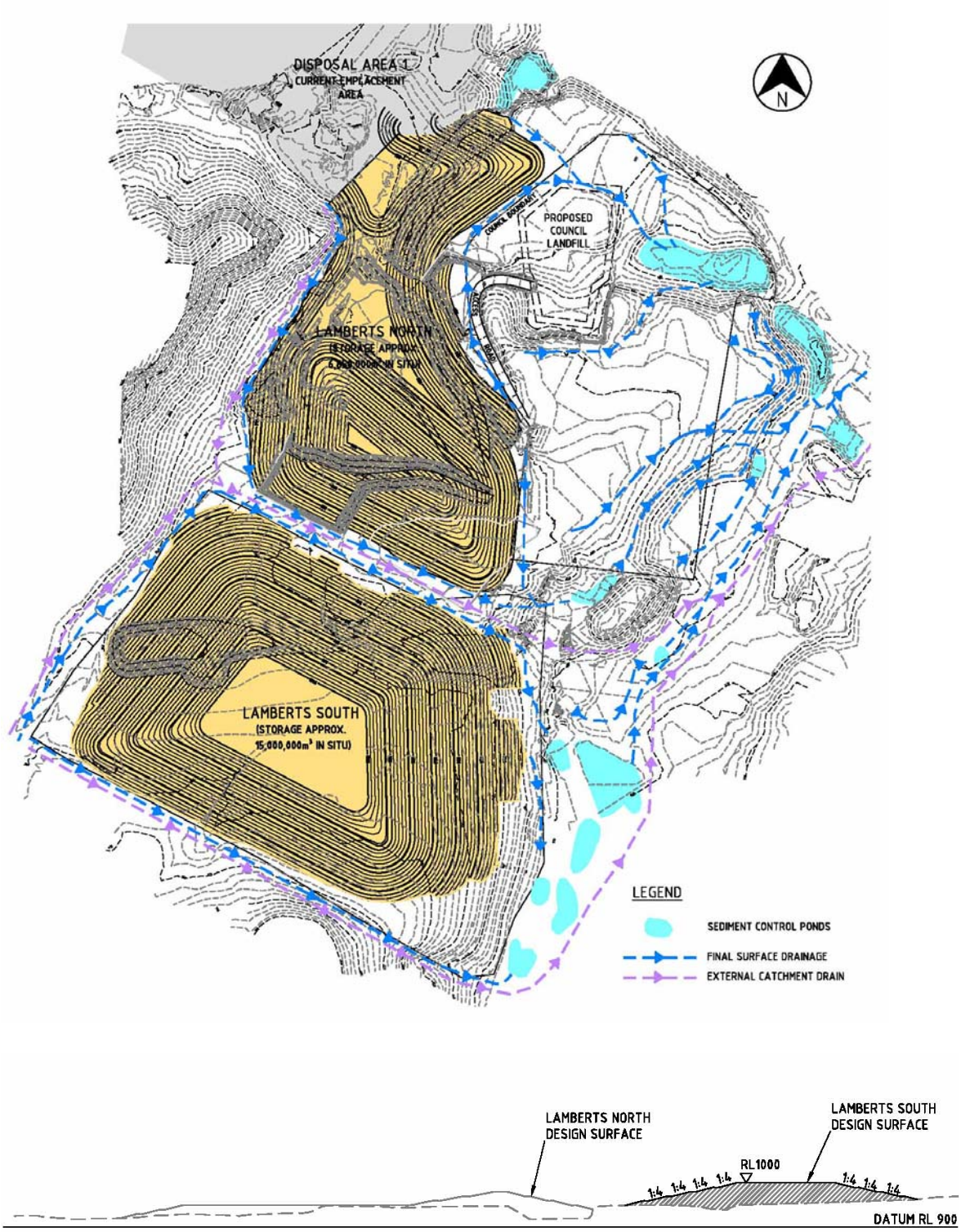
- **Figure 3-3b Lamberts North Partial Construction Stage and Site Preparation Works**



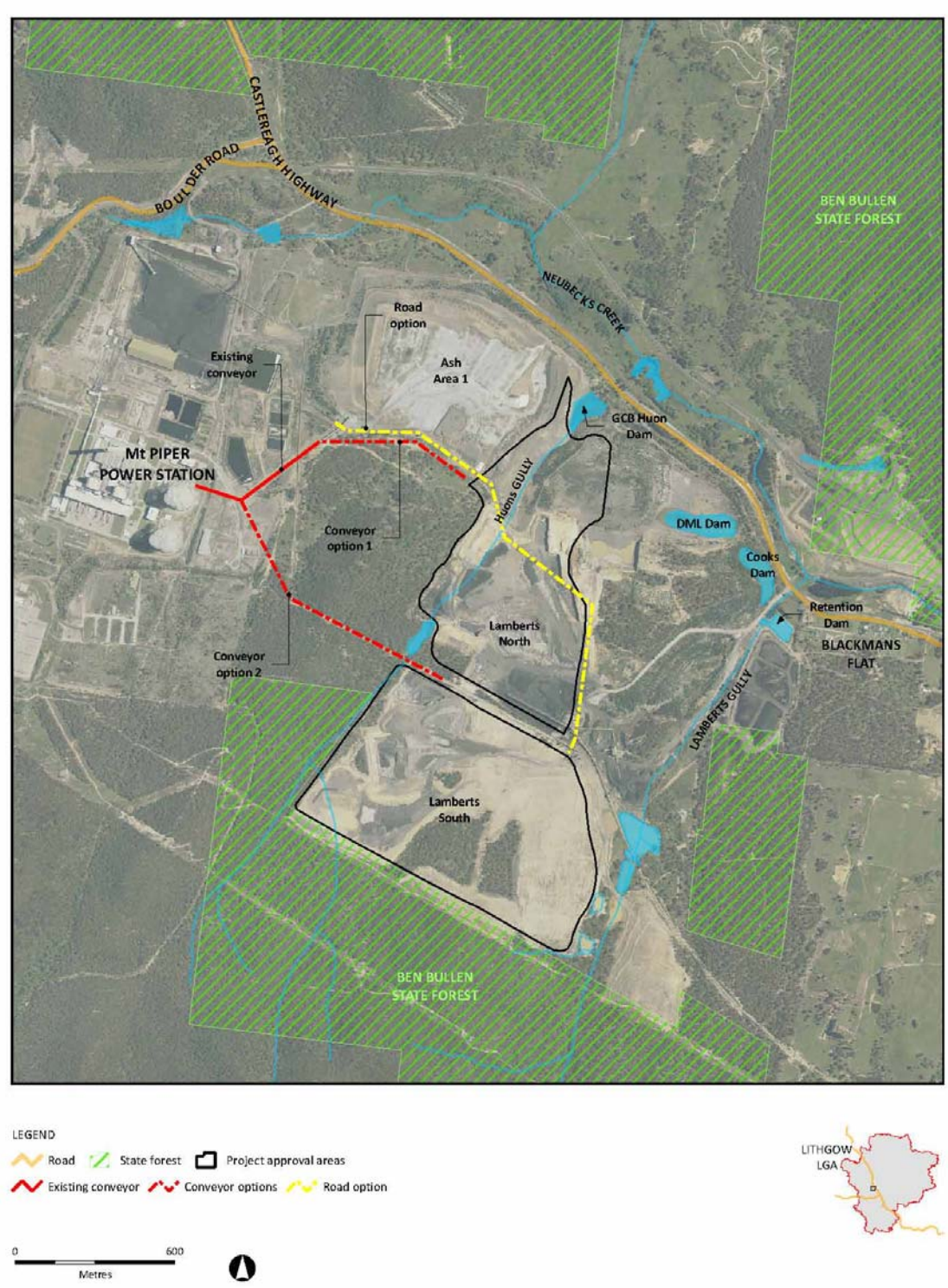
- **Figure 3-3c Lamberts North Layout Plan and Lamberts South Site Preparation Works**



- **Figure 3-3d Lamberts South Layout Plan**



- **Figure 3-3e Options for Conveyors and Road Haulage**



3.3.6. Construction of Surface Drainage Works

Surface water requires management on exposed ash and overburden material on permanent batters. In order to manage surface water run-off and prevent discharge into Neubecks Creek, it would be necessary to manage operational water use and surface water run-off on the site throughout the project. The surface water management would be staged during the construction of Lamberts North and Lamberts South based on the changing landform and drainage requirements as shown schematically on **Figures 3-3a,b,c**. A Water Management System would be developed for the facility with the following key principles:

- stormwater runoff from undisturbed areas surrounding the Project site would be diverted away from disturbed areas and released directly into adjacent waterways;
- design of any drainage systems operating for the life of the Project to ensure erosion minimised;
- staging ash placement to minimise the operational area exposed at any one time to reduce the potential for erosion;
- separation of sediment-containing stormwater from other sources of polluted water on the site such as the ash placement area;
- incorporating the reuse of contaminated stormwater into the overall water management strategy for the Project to meet the demands for rehabilitation and dust suppression; and
- minimisation of extent and duration of disturbed areas by implementing a progressive rehabilitation strategy including prompt stabilisation of landforms.

Rainfall runoff on the proposed ash placement facility will be managed by a series of sediment dams, water storages, a Dirty Water Storage Area and diversion drains. Water collected in the Dirty Water Storage Area will be used for rehabilitation and dust suppression. As the ash placement areas are progressively capped and rehabilitated, the runoff from these areas would be directed to sediment dams.

Sediment Dams

Sediment dams will be required to entrap soil and other particles eroded from rehabilitated areas due to rainfall runoff. There will be a number of sediment dams which accept the runoff from capped and rehabilitated areas of both the Lamberts North and Lamberts South.

The sediment dams will provide additional storage for water captured on site and water from the sedimentation dams will be used for rehabilitation and dust suppression. There will be no planned releases from the sediment dams to natural waterways off site. Overflows from any sedimentation dams will be collected in the Retention Dam.

The sedimentation dams will be designed in accordance with the guidelines from the NSW Department of Environment and Climate Change: *Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries (2008).*

Dirty Water Storage Area

The Dirty Water Storage Area will be used to collect and store rainfall runoff from the active ash placement area. The excess runoff stored in this area will be used for rehabilitation and dust suppression as required. The Dirty Water storage area would move with the progression of the active ash placement area.

Water Storages

There is a number of existing water storages on project site which will be utilised as part of the Site Water Management System. The existing water storages would be used as part of the management system for sediment only contaminated runoff from the capped and rehabilitated areas of the proposed ash placement facility.

Diversion Drains

There is external catchment to the proposed ash placement facility, which is undisturbed land in the Ben Bullen State forest. Diversion drains would be included in the proposed ash placement areas to management clean water runoff from catchment external to the disturbed areas. The diversion drains would be designed to convey the 100 year ARI flood event from the external catchments.

3.3.7. Construction of Sub-Surface Drainage Works

Lamberts North and Lamberts South have previously been affected by underground and open cut mining activities. Until future landforms are re-established at these sites to intercept and divert clean water from rehabilitated areas of the site, a significant proportion of rainfall would be intersected via infiltration (through the loosely replaced overburden materials) and the interconnectivity of infiltration with underground voids at the interface with the base of previous mining activities. To control seepage, it is proposed to undertake site re-grading/re-profiling of the base/footprints of the ash placement facilities to divert and collect surface and subsurface water in the low lying areas to designated temporary storage areas. These works would require the grading of the site with dozers and or graders and stockpiling and/or hauling of materials across the site to designated stockpile areas.

Specific under drainage is also proposed in the Huons Gully drainage area. In this area, it is proposed to construct a rock drainage blanket along the invert of the current gully to collect subsurface flows that are expected to be perched above the Lithgow seam from surface water infiltration through the disturbed overburden and underground mining voids. Construction would comprise re-grading/re-profiling of the existing disturbed surface to maintain uniform drainage and cross-falls across the area to the lower storage dam as discussed above. The subsurface drainage

blanket would then be constructed in the invert of the gully by the placement of rock fill wrapped in geo-textile or graded filter material to reduce erosion of surrounding materials. Construction would be undertaken by the rolling out of the geo-textile across the footprint, with rock fill transported to the area via truck and dumped adjacent to the area. Rockfill would then be placed carefully in layers so as not to damage the geo-textile with an excavator (or similar). Once a cover layer of rock has been placed, rock fill can then be dumped and spread via dozer. Once rockfill has reached proposed design levels, the geo-textile is then wrapped over the completed rock drainage blanket and fill placed and compacted over the geo-textile as a protective layer prior to placement of ash.

Figure 3-4 outlines the proposed concept design of subsurface drainage of Huons Gully in the Lamberts North site.

3.3.8. Construction Hours, Workforce and Amenities

Preparation of the ash placement areas would be undertaken during the hours of 7am-6pm Monday to Friday and 7am – 1pm Saturdays. Construction activities would not occur on Sundays and public holidays.

The required workforce for construction and preparation activities is expected to peak at approximately 20 personnel for each stage of preparatory works.

The current workers' amenities (meal room as a demountable / chemical toilets) are located at the end of the conveyor and it is planned to move these as the ash placement areas are developed. If the conveyor were to be relocated to either of the options it would be the intent of the contractor to move the amenity facilities as well. There may also be a small fuel depot for the haulage vehicles. Any fuel depot would meet the requirements of AS1940-2004: *The Storage and handling of Flammable and Combustible Liquids* and the Dangerous Goods codes.

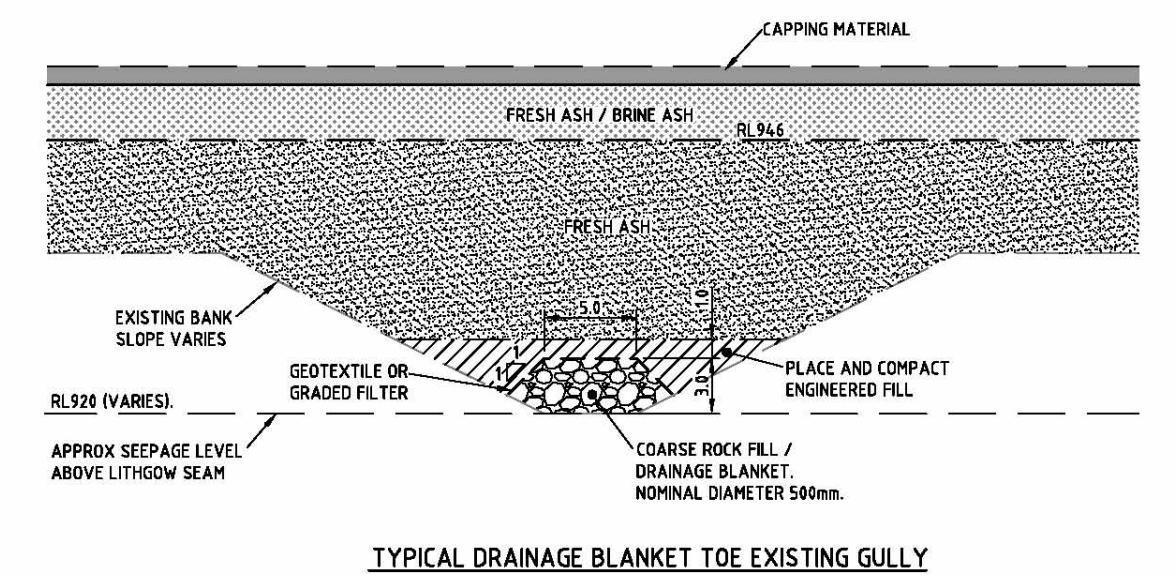
3.3.9. Construction at Neubecks Creek and Ivanhoe No 4 Locations

At this stage the detailed requirements for construction activities and the preparation of sites located in the Concept Approval areas (Neubecks Creek and Ivanhoe No 4) are not available. Ash placement within these sites would only be considered when it is clear that Lamberts North and Lamberts South will be filled. This is only likely to occur if Mt Piper Extension is constructed as a coal fired power station.

It is expected that the basic principles outlined in the sections above would also be applicable to the preparation of future sites. The general principles outlined above for construction preparation works would also apply to the future construction activities associated with the Concept Approval locations of Neubecks Creek and Ivanhoe No 4 sites. Further understanding of the profiles of these

sites post future mining activities and an assessment of potential construction constraints would be required to address in detail the potential construction activities required at these sites.

- **Figure 3-4 Typical Drainage Blanket for Gully**



3.4. Operational Activities

3.4.1. Overview

Ash placement activities in the proposed sites would be similar to that which is currently undertaken in Area 1 and are described in the sections below. In general, operations would be occurring in parallel to construction activities as described above.

Ash is generated at Mt Piper Power Station as a by-product of the combustion process. When the coal is burnt a residue of ash is produced, which is separated as either 'bottom or furnace ash' or 'fly ash'. Bottom ash consists of larger particles which fall to the bottom of the boiler and are collected, while the finer particles (fly ash) are carried up through a fly ash collection plant by the hot exhaust gases. Bottom ash is collected in a 'wet' hopper where it is dragged into a temporary loading hopper prior to being transported to Mt Piper's current ash placement area, where it is stockpiled and drained.

Fly ash is collected and generally conditioned with water although fly ash may alternatively be conditioned with brine (a boiler water treatment by-product). The brine alters the ash's chemical composition and requires that the brine ash must be placed separately within the ash placement area. Operational activities associated with ash placement include:

- Ash conveyance;
- Ash placement;
- Ash management;
- Capping; and
- Rehabilitation.

The proposed ash placement areas would be located to the east (Lamberts North and South), south-west (Ivanhoe No. 4) and north-east of the existing power station (Neubecks Creek). The ash placement areas would be developed progressively. Lamberts North would be developed first in continuation from Area 1. Lamberts South would then be developed and, if required, followed by Neubecks Creek and Ivanhoe No. 4, the timing and order of the latter two being subject to the timing of future approvals.

On completion of the existing surface mining activities and preparatory works the estimated capacity and lifespan of each placement area is outlined in **Table 3-1**.

Table 3-1 Capacity and lifespan of ash placement sites

Ash Placement Site	Capacity (volume m^3)	Estimated Lifespan (cumulative years)	
		Mt Piper 1 & 2 (1,400 MW)	Mt Piper 1&2 and Mt Piper Extension (3,400MW)
Lamberts North	6,850,000 m^3	8 years (2015 - 2023)	5 years (2015 - 2020)
Lamberts South	15,000,000 m^3	20 years (2023 - 2043)	7 years (2020 - 2027)
Combined Lamberts North and South	21,850,000 m^3	28 years (2015 – 2043)	12 years (2015 – 2027)
Neubecks Creek Ivanhoe No 4	19,000,000 m^3 (estimate only)	n/a	9 years (2027 – 2036)

The proposed staging of works associated with the ash placement project is outlined below, based on the current generation capacity at Mt Piper of 1,400 MW.

- **Placement of Ash Lamberts North:** Placement of ash in Lamberts North is anticipated to commence in 2015. There is approximately 6,850,000 cubic metres capacity (in-situ volume) in Lamberts North, with filling estimated to be completed by 2023. The ash emplacement would be constructed generally with 1(V):4(H) side slopes, with 10 m wide benches constructed for each 10 metre vertical height. The finished surface of Lamberts North would vary from RL966 to RL980 m AHD, with the exposed ash areas progressively capped as areas reach their design elevations. **Figures 3-3b,c** show the indicative partial construction of Lamberts North at approximately 50% capacity and at completion (capacity).

- **Placement of Ash, Lamberts South:** Placement of ash in Lamberts South is anticipated to commence upon completion of placement at Lamberts North in approximately 2023. There is approximately 15,000,000 cubic metres capacity (in-situ volume) in Lamberts South, with filling estimated to be completed by between 2042 and 2045. Lamberts South will be constructed to similar geometry as Lamberts North. The finished surface of Lamberts South is RL1000 m AHD. **Figure 3-3c** shows the plan of the Lamberts South Area on completion of filling activities.

The following sections provide a summary of each of the main operation activities associated with ash placement across the sites.

3.4.2. Ash Conveyance

Under existing operations, fly ash is conveyed in the fly ash collection plant by means of a dense phase system to a silo for transfer to conveyor. Furnace or bottom ash is transferred from the boilers by submerged scraper conveyor. The furnace ash then passes to a hopper for transfer to the repository by heavy haulage vehicles.

Transportation to the ash area of conditioned fly ash is by enclosed belt conveyor. The conveyor discharges into separate surge bins located in the ash storage area, from which the ash is discharged into an off-road articulated trailer-truck for ash emplacement. When the conveyor is out of service, ash is taken by truck to the ash placement area.

The current system of transport will be maintained for the proposed ash placement sites.

At some time in the future, the economic benefit of the conveyor system in its current location may be reassessed and the conveyor realigned to service ash placement as it progresses further from the current location. In particular as placement continues into the Lamberts South area, it may become more viable to relocate or extend the ash transport conveyor toward the Lamberts South area.

3.4.3. Ash Placement

Detailed methodologies have been developed for the placement of ash materials to optimise compaction and stability of the emplacement areas during and after construction. Existing ash placement methods including target moisture content, compaction density and progressive capping and revegetation, would be adopted for these sites, with ongoing monitoring and assessment of specifications to optimise placement and moisture conditioning requirements.

The current practice is that ash is placed to the desired height in ‘pads’, with materials moisture conditioned with water placed in the lower layers to an elevation of up to 946 m AHD. Above this level, ash moisture conditioned with brine is permitted. Typically ash is placed by:

- Delivering ash to the working face via truck and dumping into position;
- The ash is then spread and shaped via dozer operation;
- Ash is then compacted using a controlled number of passes with a dozer and/or truck to achieve required compaction as discussed below.

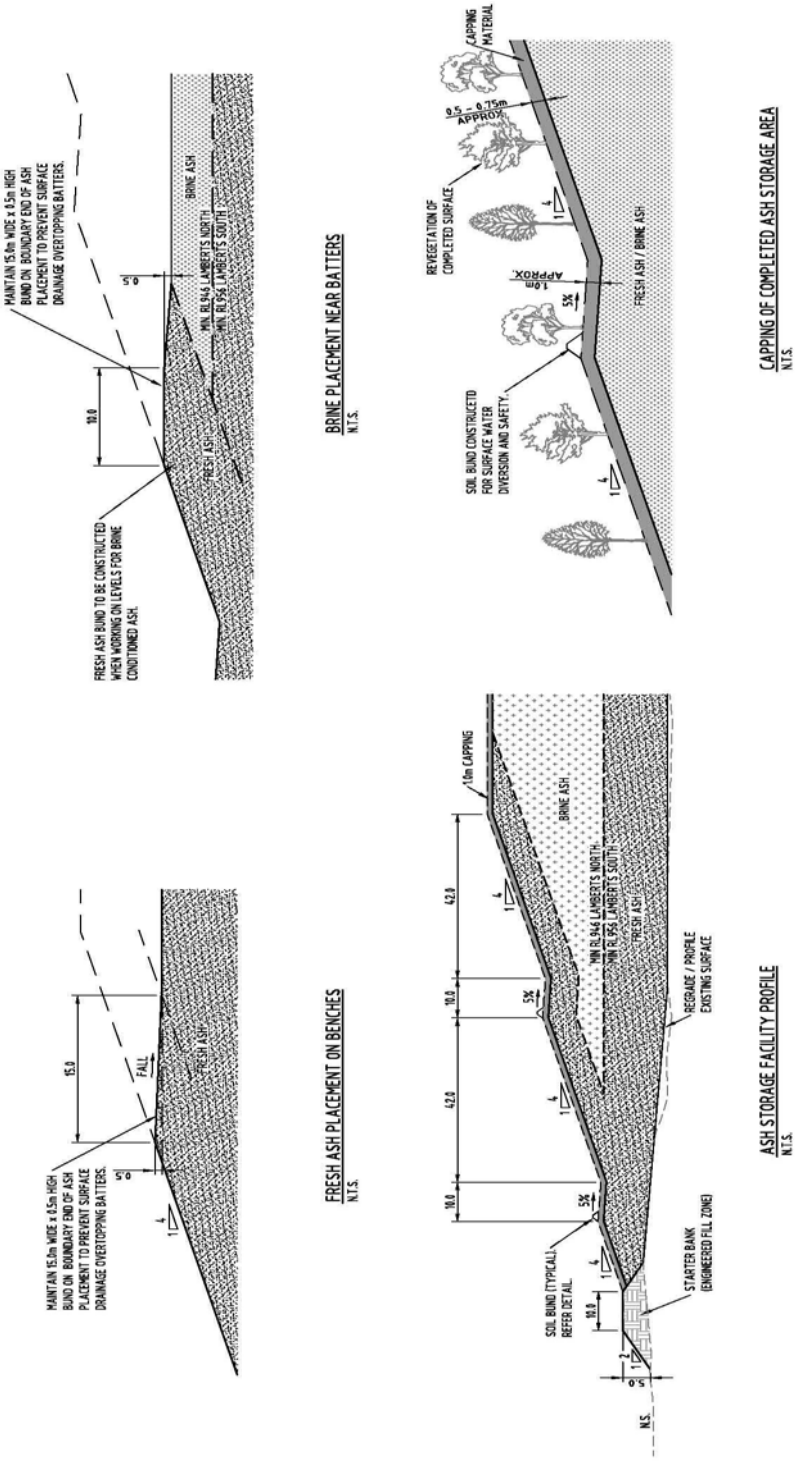
Typically, ash is placed in 500 mm lifts. The ash is treated to achieve a compaction of 95%, relative to its maximum standard compaction, through a combination of controlled addition of water (through conditioning) and a process of machine compacting with the use of rollers and rubber-tyred vehicles which are also used for the transport of the material. Ash is placed in layers and stepped to produce an overall batter slope of approximately 1(V):4(H), with benches added every 10 m in vertical height change. Typical ash placement profiles and the required separation of brine and fresh water conditioned ash near benches would be as shown on **Figures 3-5a,b**. As shown on these diagrams, bunds are constructed (minimum 500 mm) at batter extents to prevent discharge of surface water over the benches and down batter slopes to minimise scour and erosion and also to ensure separation of surface water run-off from brine conditioned areas.

For pads on their final lifts that would be left for long durations, the final surface is graded to 1 % to drain surface water away from completed batters. For working pads the surface is graded to 2 % along the pad length. Typical ash placement and completed profiles are shown on **Figure 3-5c**.

In all cases surface water runoff is drained away from permanent batters and directed to flow along benches and/or formalised channels (away from batters to maintain stability and minimise erosion). Runoff is typically directed into the centre of the ash placement area, where runoff water can be directed into the dirty water storage areas via drainage channels.

Where such diversion is not possible, away from finished batters, collected water is discharged down batters in lined channels or pipework to minimise scour.

- **Table 3-5 a,b,c,d Brine Ash Placement and Capping at Ash Placement Areas**



Design of the ash placement pads incorporates ash dry density values for fly ash and furnace ash. **Table 3-2** outlines the geotechnical properties for ash to be placed in Lamberts North and South.

Table 3-2 Geotechnical properties of Mt Piper ash

Property	Units	Fly ash	Brine Ash	Furnace Ash
Dry density	t m3	1.2	1.36	0.965
Optimum moisture content	%	22	18	48
Permeability	cm s-1	-	1.1 x 10-5	-
Texture	-	silt	Silt	gravelly sand
Saturation Percentage	%	33 – 362	-	-

Source: Bilfinger Berger, 2007

3.4.4. Ash Management

Ash is managed by carefully controlling the moisture condition during placement and also by the use of artificial dust suppressors, sprinklers and water carts to minimise the generation of dust of prepared and working areas, haul roads, stockpiles and working surfaces. Monitoring and testing of ash placement is also proposed to be undertaken on a routine basis including:

- Ash moisture content;
- Groundwater levels by piezometers in the ash pads;
- Dust within the ash placed areas;
- Compaction of ash;
- Water quality and volume;
- Ash placement levels (survey); and
- Engineering and geotechnical considerations (compaction and stability).

3.4.5. Capping

At the completion of each pad, the pad is covered with mine spoil and the area is then progressively re-vegetated as part of the power station's ongoing landscaping and re-vegetation program. Capping will occur progressively as each area reaches its design height. Capping will also be routinely applied to external and permanent batters. The standard method for capping requires the capping material to be pushed out to an approximate depth of 750 mm on 1(vertical) in 4 (horizontal) batters, with 1 m thickness on benches. Capping on benches is placed as a 1 m layer and graded with a cross fall into the bench and along its length.

Capping is typically placed by hauling suitable materials into position via truck and dumping and spreading across the completed ash areas with a dozer to the required thickness and levels. The removal of overburden will be a continuous requirement and it is a critical aspect for long-term placement for both brine conditioned ash and fresh water conditioned ash.

A typical profile for a capped area is shown in **Figure 3-5d.**

3.4.6. Rehabilitation

Revegetation of permanent batters of the ash placement area marks a final stage in the operation stage of ash placement once the ash placement areas are filled and decommissioned. Revegetation would occur progressively throughout the life of the placement areas once capping is completed.

Rehabilitation of the sites will be developed to consider both landscape and soil conservation aspects. Revegetation is to provide a landscape feature for the area and act as a functional catchment for the Coxs River. The final profile of all sites will be developed to promote surface water runoff to reduce infiltration of water into the ash pads

A rehabilitation plan would be prepared for the sites addressing revegetation, landform, surface water management and monitoring and will be periodically updated during the progressive rehabilitation of the sites.

3.4.7. Operations Hours and Workforce

Ash placement activities are expected to be between 6am-8pm Monday to Friday and 6am – 5pm Saturdays and Sundays, in line with current hours of operation at Area 1. This is required to manage the ash produced over the 24 hours a day operation of the power station and reflects current licence conditions for Area 1.

The required workforce for operation of the repository is normally two people operating the necessary plant on each shift as well as two people managing the environmental aspects of placement activities on day shift (6am until 5 pm) and one person on afternoon shift (5 pm until 8 pm) carrying out the environmental activities.

On weekends the area is operated on dayshift alone.

The staff numbers may be increased by any additional units from Mt Piper Extension and resultant placement requirements.

3.4.8. Operations at Neubecks Creek and Ivanhoe No 4 Locations

Operational activities for the Concept Approval sites (Neubecks Creek and Ivanhoe No. 4) would be similar to that outlined in the sections above. As with that proposed for the Project Approval

sites, activities involved with operating new sites would involve the conveyance of ash to the site, placement into ash pads, management of the ash pads and progressive capping and rehabilitation of the sites.

The placement of ash at either site would not be undertaken until Project Approval is sought and obtained. Based on current ash rates and the predicted life of Lamberts North and Lamberts South, development of either Neubecks Creek or Ivanhoe No. 4 would not be required (ie beyond the life of the existing Mt Piper Units 1&2) for approximately 30 years (around 2045). Should the Mt Piper Extension proceed as a coal fired plant then the need for Neubecks Creek or Ivanhoe No. 4 would eventuate and may be required as early as 2026 to store ash for both plants.

Conveyance of ash to either site would require further detailed assessment of environmental, social and heritage issues as well as a detailed assessment of cost implication associated with ash transport options. A number of ash transport options could exist for Neubecks Creek including the use of existing public roads (Boulder Road and Castlereagh Highway), the private haul road that services the Angus Place Mine and the provision of an ash transport conveyor spanning the Castlereagh Highway. Transport of ash to Ivanhoe No. 4 would occur directly from the power station to the ash placement area most likely via a dedicated haul road across Delta owned land. The transport options for both sites would be analysed as part of the project approval process in accordance with the requirements of the consent conditions of the concept approval.

Capping, rehabilitation and revegetation of these sites would be undertaken in line with the basic principles outlined for Lamberts North and Lamberts South, accepted practices of the day and in accordance with a Site Rehabilitation Plan.