Section 2

Project Description

This section of the Environmental Assessment describes the proposed development and operation of the proposed New Berrima Clay/Shale Quarry, including:

- *the Proponent's objectives;*
- *the approvals required;*
- *the geological setting and resource;*
- *the design of the extraction area and proposed on-site operations; the transportation of the clay/shale materials to the Bowral Brick Plant; and*
- *the proposed rehabilitation and final landform.*

The proposed quarry design, operation and rehabilitation procedures described within this section reflect all environmental constraints identified and recommendations made throughout the environmental impact assessment process.

The information presented in this section is presented at a level of detail sufficient for the Minister to determine the Major Project Application.

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2.1 OUTLINE OF THE PROJECT

2.1.1 Objectives

The Proponent's principal objectives for the Project are to:

i) secure access to clay/shale resources that would ensure the continued provision of a range of dry pressed bricks to the Sydney, Southern Highlands and NSW markets for a further 30 years;

ii) maintain the level of production from the defined extraction area at an average of approximately 120 000 tonnes per annum (tpa) to meet the supply demands of these markets particularly after clay/shale extraction ceases adjacent to the Bowral Brick Plant (in about 2015);

iii) progressively rehabilitate disturbed areas to limit visual impacts and to provide for a range of productive land uses at the completion of operations;

iv) maintain local employment levels, particularly at the Bowral Brick Plant; and

v) maximise the recovery of the natural resource.

The dry pressed bricks produced as a result of the extraction of the clay/shale from the Project Site would contribute significantly towards meeting the ongoing market demand for dry pressed bricks throughout the Sydney Metropolitan Area, Southern Highlands and NSW. These broad objectives would be achieved by:

a) planning and removing the clay/shale resource in a manner that maximises the quality and quantity of materials removed;

b) undertaking all activities in an environmentally responsible manner that enables compliance with all relevant legislative requirements;

c) planning and operating all activities in consultation with surrounding residents and the wider community; and

d) monitoring and reviewing the environmental performance of all activities.

2.1.2 The Project Site

The area which is the subject of the application for project approval ("the Project Site") is approximately 51ha in area and located within the "Mandurama" property, namely Lot 1 DP 414246, 1 Berrima Road, New Berrima which is 100.2ha in area. The "Mandurama" property is owned by The Austral Brick Company Pty Ltd. The Project Site effectively incorporates the optimum clay/shale resource area on the "Mandurama" property and the site access road between the property entrance and the extraction area.

The entrance to the "Mandurama" property is located on Berrima Road approximately 300m north of the intersection of Taylor Avenue and Berrima Road, New Berrima. **Figure 2.1** provides a topographic map presenting the location of the "Mandurama" property, the boundary of the Project Site and the proposed limit of extraction of clay/shale.

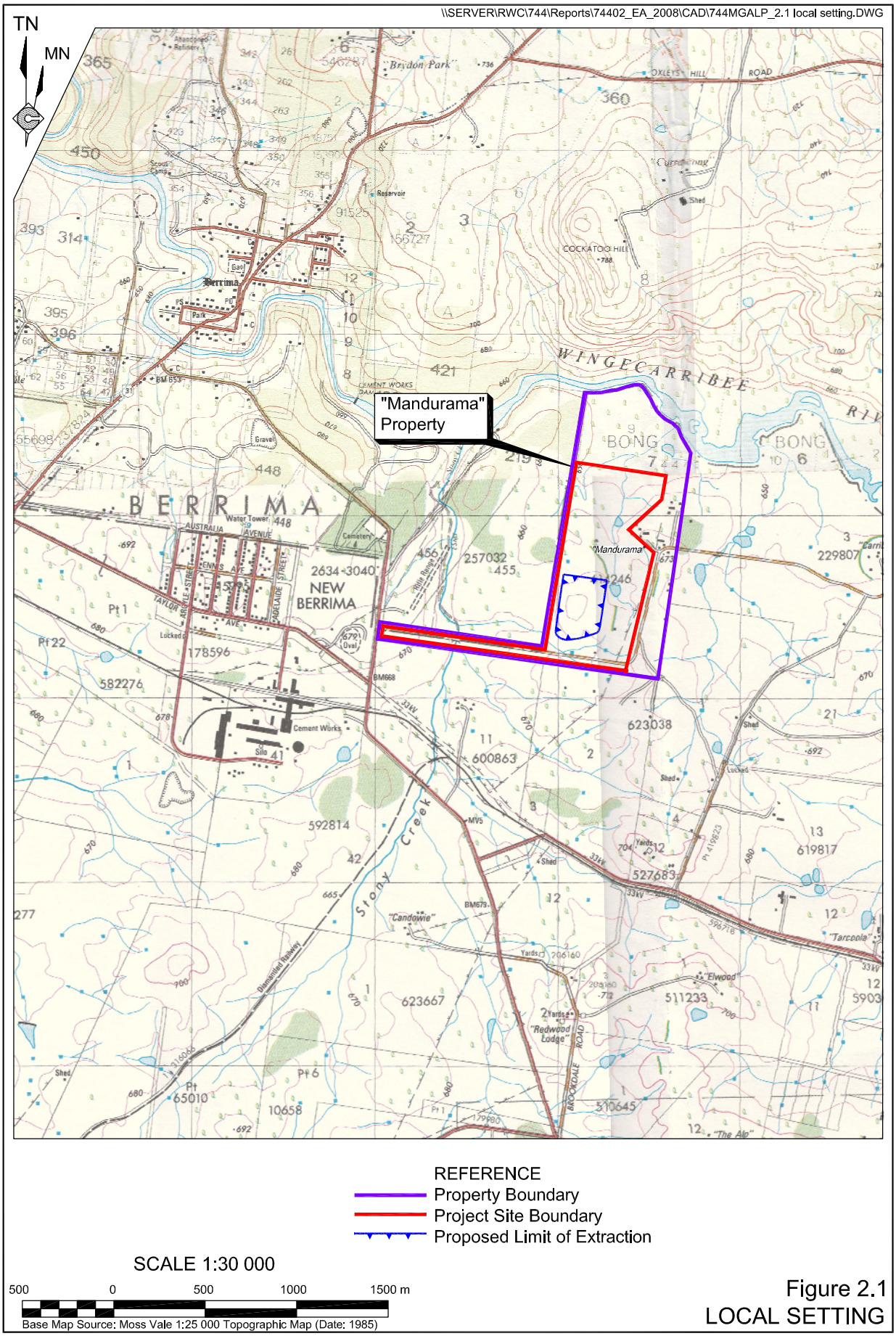

Figure 2.1
LOCAL SETTING

The entire Project Site has been previously disturbed, used for grazing, and is covered with pasture, comprising predominantly introduced pasture species and weeds. Five small farm dams are situated within the Project Site.

2.1.3 Overview of the Project

The Proponent proposes to extract and transport an average of approximately 120 000tpa shale, weathered shale, brick clay and some friable sandstone, with an upper limit of 150 000tpa, for a period of 30 years. The upper limit of 150 000tpa is being sought to allow for fluctuations in the demand for the various raw materials as determined by the production levels at the Bowral Brick Plant. The operation would employ approximately five part-time persons for the duration of the Project. The Project would involve a capital investment of approximately $1 million.

The extraction of the resource would be undertaken in six stages principally to reduce the area of disturbance at any one time and to facilitate progressive rehabilitation of disturbed areas. The Proponent's principal raw material requirement at its Bowral Brick Plant is for the shale material within the defined extraction area. Whilst the overlying clay, weathered shale and sandstone has uses in the manufacture of bricks, the Proponent anticipates at this time, that only small quantities of the these materials would be extracted and transported to the Bowral Brick Plant and potentially other Proponent's brick plants in the Sydney area and other sites requiring fill materials. For the purposes of the Project, the materials transported from the extraction area are referred to throughout this document as "product clay/shale".

The main features of the extraction operations would be:

- campaign stripping of topsoil and subsoil for use in the construction of amenity bunds and progressive site rehabilitation;
- progressive construction of amenity bunds;
- two or three extraction campaigns per year, each involving the excavation and stockpiling of the product clay/shale on the floor of the extraction area;
- a water management system to manage water collected within the sump and runoff from disturbed areas; and
- full-time transportation of the product clay/shale to the Bowral Brick Plant.

The Project has been designed cognizant of the SEPP (*Mining, Petroleum Production and Extractive Industries) 2007* and its intent to ensure that extractive material resources are properly developed and managed for the purpose of promoting the social and economic welfare of the State. The staging has been designed to avoid sterilisation of the total resource and to maximise its potential extraction beyond the proposed limit of extraction at a later date. The staging would also allow early and progressive rehabilitation, thereby reducing the impacts on visual amenity.

2.1.4 Approvals Required

The Project requires project approval under Part 3A of the *Environmental Planning and Assessment Act 1979*. As such, the Minister for Planning is the approval authority. Under Part 3A, the application for project approval must be made prior to the receipt of Director-General's Requirements for the project. The application for project approval was made in November 2008 (application number MP 08_0212).

The following licences and approvals, additional to those encompassed by the project approval process, would be required following the issue of the project approval to allow commencement of the project.

Environment Protection Licence – Department of Environment, Climate Change and Water
An Environment Protection Licence is required under Section 47 of the *Protection of the Environment Operations Act 1997* to develop and operate the quarry.

Section 138 Road Permit – Wingecarribee Shire Council
Under the *Roads Act 1993*, a permit would be required for the proposed works at the intersection of the site access road and Berrima Road.

Water Licence – Department of Environment, Climate Change and Water – NSW Office of Water
A licence may be required under Section 10 of the *Water Act 1912* to enable the Proponent to construct dams for the collection of surface water for dust suppression purposes i.e. within the Harvestable Right Dam Capacity for the property.

It is noted that a mining lease is not required for the Project as the ownership of the clay/shale to be extracted is vested in the landowner. Notwithstanding this, the Proponent will lodge a Section 8 Notice of Intent to satisfy the provisions of Section 8 of the *Mining Act 1992*.

Given the comparatively low-key nature of the proposed activity, it is proposed that no permanent buildings or sewerage systems would be constructed within the Project Site.

2.2 GEOLOGY AND RESOURCES

The Project Site is located close to the southwestern margin of the Sydney Basin where one of the main geological units is the Wiannamatta Group with the Ashfield Shale overlying the widespread Hawkesbury Sandstone. The drilling investigations undertaken by the Proponent on the "Mandurama" property have established there is in the order of 8 million tonnes of recoverable shale on the property, which is ideally suited to the manufacture of dry pressed bricks at the Bowral Brick Plant. **Figure 2.2** shows the extent of the optimum resource area within the Project Site and two representative cross-sections through the resource.

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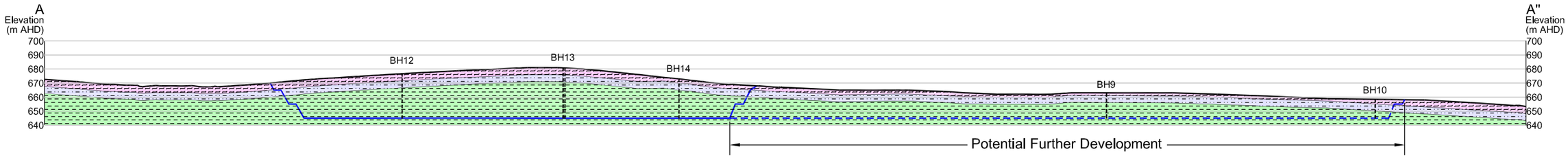

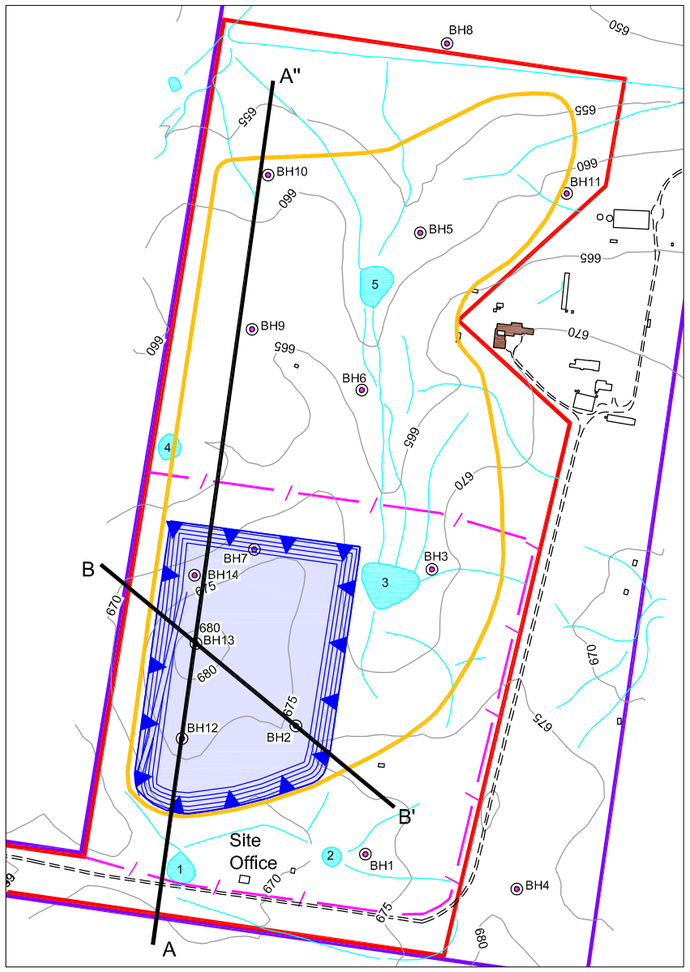

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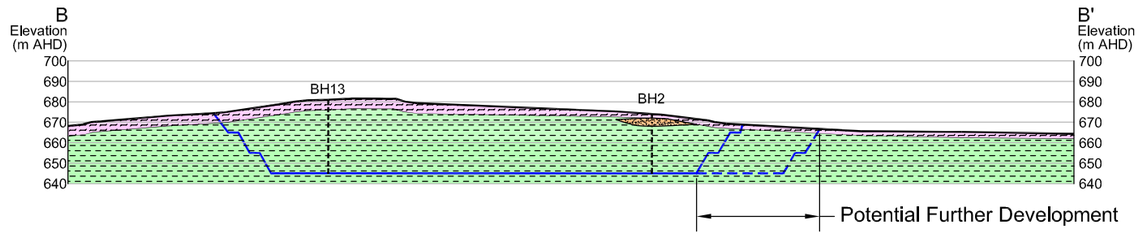
Base Map Source: Geo-Spectrum (Australia) Pty Ltd - Date of Photography: 26 August 2008



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REFERENCE
- Property Boundary
- Project Site Boundary
- Clay/Shale Resource Boundary
- Limit of Extraction
- Contour (m AHD)(Interval = 5m)
- Creek / Drainage Line
- Dam / Water Storage (and Reference No.)
- Unsealed Road / Track
- Proposed Fence
- Residence / Building
- Bore Hole (and Reference No.)

RESOURCES
- Clay
- Weathered Shale
- Shale
- Sandstone

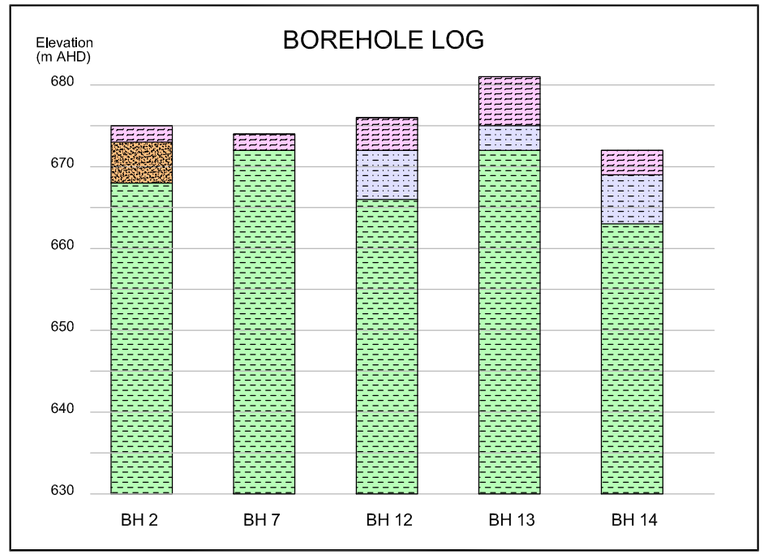

Figure 2.2
RESOURCES

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The Proponent's experience in extracting Ashfield Shale over many years has assisted the Company to define the optimum extraction area within the "Mandurama" property. A total of 14 diamond holes drilled on the "Mandurama" property has assisted the Proponent to define the optimum area of extraction of the long term resource to underpin the manufacture of bricks at the Company's Bowral Brick Plant. The drilling established a common topsoil/subsoil thickness of at least 1m underlain by variable thicknesses of clay/weathered shale (1m to 8m) and shale (7m to 23m). Variable thicknesses of sandstone are present either in the more elevated areas on the southern side of the "Mandurama" property or in the lower northern parts of the property.

For the purposes of the current project application, approximately 3.6 million tonnes of shale has been defined within the southern section of the total identified resource. This quantity of shale would be sufficient to satisfy the raw material demands of the Bowral Brick Plant for approximately 30 years. However, in order to maximise the utility of the overall resource, the Proponent proposes to seek a further approval to extract the remainder of the 8 million tonne resource towards the completion of extraction within the defined extraction area. The Proponent recognises the importance of ensuring that the total resource of 8 million tonnes is not sterilised by subsequent and adjacent land uses and that it is available for future generations requiring bricks and pavers manufactured from Ashfield Shale.

2.3 SITE LAYOUT

The Project Site incorporates all areas of disturbance associated with the proposed Project-related activities and includes the following components (**Figure 2.3**).

- A site access road from Berrima Road to the extraction area, a distance of approximately 800m.
- An extraction area covering approximately 7.7ha.
- A water storage facility in the active extraction area to store surface water runoff and any incidental groundwater inflows to the extraction area.
- Re-development of two existing dams to serve as sedimentation dams which would capture runoff from disturbed areas outside the extraction area.
- A transportable lunchroom/amenities building.
- A storage and workshop area located within a shipping container.
- Three perimeter amenity bunds which would minimise visual, noise and dust impacts, namely the combined Northern and Western Amenity Bunds and Southern Amenity Bund.
- A surplus overburden stockpile area which would initially be the storage area for surplus overburden and product clay/shale and topsoil in the longer term.

2.4 SITE ESTABLISHMENT

2.4.1 Introduction

Due to the simplicity of the proposed extraction operations and despatch of product clay/shale, the Project Site would require minimal infrastructure development. There would be an initial program to establish the extraction operation with subsequent programs as the extraction area is developed.

2.4.2 Land Preparation

Land preparation activities would be undertaken, where practicable, on an ongoing annual campaign basis, with the area to be prepared limited to the area required for extraction-related activities during the subsequent 12 month period, whenever appropriate.

The following procedures would be implemented during the initial period of site establishment.

- The boundary of the approved extraction area would be surveyed and clearly marked at each main corner at intervals of approximately 100m together with the location of the three amenity bunds, surplus overburden stockpile area, haul road and site access road.
- Surface water and/or sediment and erosion controls would be installed or constructed prior to or during vegetation removal and soil stripping activities in accordance with a Sediment and Erosion Control Plan based on undertakings described in Section 5.2.
- Drains would be constructed adjacent to the haul road and surplus overburden stockpile area and other disturbed areas to direct runoff from disturbed areas into the sedimentation dams.
- Screening trees would be planted east of the proposed surplus overburden stockpile area, following appropriate soil preparation to receive the tube stock. Planted areas would be mulched and protected with temporary fencing.
- A plot of farm forest, approximately 4ha in size, would be planted on the northern side of the extraction area, over the proposed Stage 4 area. The purpose of these trees would be to provide screening from the north of the extraction area during Stage 4. A tall and fast growing native species which provides marketable timber, such as *Corymbia maculata*, would be planted. It is expected that these trees would be up to 18 years old and of sufficient height to provide good visual screening when Stage 4 commences. They would be subsequently strip cleared as Stage 4 proceeds down the hill in a northerly direction (see Section 5.6.4).

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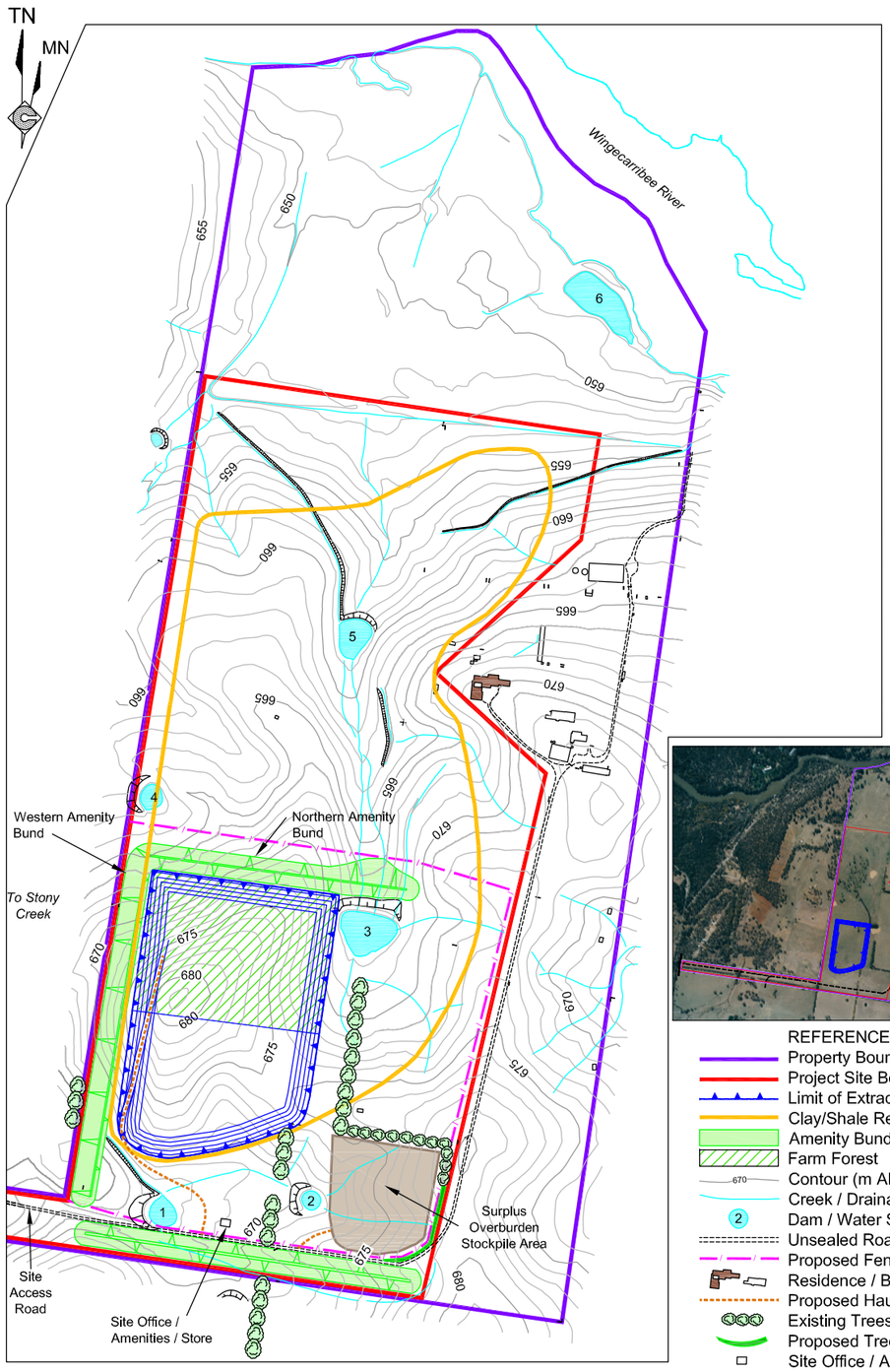

REFERENCE
- Property Boundary
- Project Site Boundary
- Limit of Extraction
- Clay/Shale Resource Boundary
- Amenity Bund
- Farm Forest
- Contour (m AHD)(Interval = 1m)
- Creek / Drainage Line
- Dam / Water Storage (and Reference No.)
- Unsealed Road / Track
- Proposed Fence
- Residence / Building
- Proposed Haul Road
- Existing Trees
- Proposed Tree Screen
- Site Office / Amenities / Storage

SCALE 1:7 500

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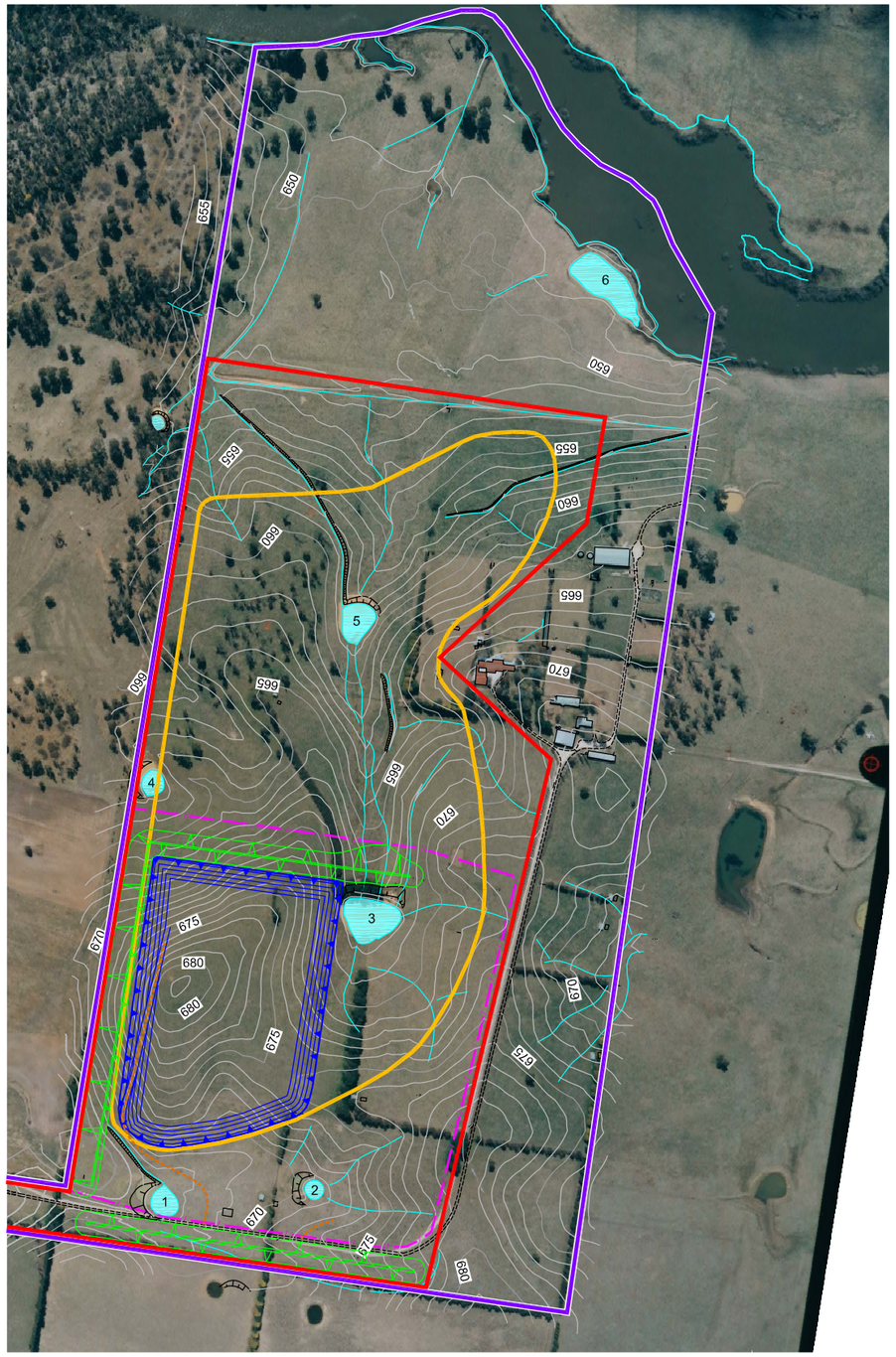
Base Map Source: Geo-Spectrum (Australia) Pty Ltd - Date of Photography: 26 August 2008



Base Photograph Source: Geo-Spectrum (Australia) Pty Ltd - Date of Photography: 26 August 2008

Figure 2.3
PROPOSED SITE LAYOUT

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2.4.3 Infrastructure and Services

Two Telstra telephone lines traverse the "Mandurama" property, one of which traverses the proposed extraction area. This would be relocated before any earthworks commence. The existing telecommunications line would be connected to the site office. Potable water would be transported to site in portable tanks/bottles. The supply of any electrical power required would be through the use of a diesel generator.

A transportable lunchroom/amenities would be placed on the southern side of the active extraction area. A small shipping container would be brought to the site to serve as a storage area for small quantities of earthmoving equipment consumables and general tools and small equipment. Diesel would not be stored on site but be delivered as required by mobile tankers. A small skip bin would be kept on site for general rubbish and collected, as required.

The extraction area would be fenced with lockable gates for security and safety purposes. The remainder of the Project Site and the "Mandurama" property would continue to be used for grazing and cropping. The bridge on the site access road currently supports large cattle trucks but would undergo an engineering inspection and rectification or improvement as required, prior to use by heavy haulage vehicles. As recommended in the Traffic Assessment Report (Traffic Solutions, 2010), the intersection of Berrima Road and the site access road would be upgraded to an RTA type BAR treatment to provide safe traffic movements. The existing gate/driveway would be reconstructed to allow two heavy vehicles to pass at the entrance, if required. Approximately 400m of the western end of the site access road would be sealed to minimise the tracking of mud from the Project Site onto public roads.

2.4.4 Vegetation Removal

The existing vegetation on the Project Site comprises mainly introduced pasture species. This would be removed during topsoil stripping and remain incorporated in the topsoil. Should it be necessary, a herbicide may be sprayed across the area to be stripped prior to soil stripping to limit the presence of weeds in the stripped topsoil.

A few trees would require removal, principally near the centre of the extraction area and at the southern boundary of the property at the proposed location of the southern amenity bund. These trees are cotoneaster shrubs, pine trees which have been planted to form windbreaks and two *Eucalyptus botryoides* (Bangalay). The flora assessment has determined that the two *E. botryoides* are not potential habitat trees or threatened species. All trees would be felled and mulched and the mulch used on site.

2.4.5 Soil Stripping and Handling

Stripping of topsoil and subsoil would be undertaken in accordance with the recommendations of GCNRC (2009b). Topsoil would be stripped to a depth of approximately 15cm from all areas to be extracted and those areas to be disturbed, such as beneath the proposed amenity bunds. Handling of the topsoil and subsoil would be kept to a minimum and avoided during wet conditions to protect against damage to the soil's structure.

Stripping would not be conducted under the temporary structures such as the site lunchroom/amenities. The topsoil would be temporarily stockpiled for later dressing of the constructed amenity bunds. As the extraction area is further developed and where practicable, emphasis would be placed upon directly transferring a proportion of the soils removed from the proposed extraction area to a completed section of a final perimeter bund. It is anticipated that there would be a surplus supply of topsoil during the stripping of Stage 4 because amenity bunds would be fully established. Topsoil not used immediately for rehabilitation would be stockpiled and vegetated for stability in the surplus overburden stockpile area for later rehabilitation work.

The clayey subsoil would be stripped to a depth of approximately 100cm and either directly placed in the area of amenity bunds, stockpiled for use in rehabilitation activities, or used for brick manufacture.

2.5 EXTRACTION OPERATIONS

2.5.1 Design of Extraction Area

Extraction operations would involve two or three campaigns each year, with approximately 40 000 to 60 000 tonnes of product clay/shale extracted throughout each campaign.

The principal design parameters of the extraction area are as follows.

Face Heights:	10m
Bench Widths (operational):	30m to 50m
Final Bench Widths:	5m
Face Angle:	Approximately 70 degrees from the horizontal
Haul Road Grade:	Variable but typically >1:10 (V: H)

2.5.2 Methodology

The approach to the extraction of the product clay/shale would generally be consistent with that adopted in the extraction area adjacent to the Bowral Brick Plant. Following removal of all topsoil and unwanted clayey subsoil, the weathered shale would be pushed up with a bulldozer and used in bund construction, stockpiled in the surplus overburden stockpile area or stockpiled for despatch, as required. Topsoil would be stockpiled separately if not immediately required for bund construction or rehabilitation. Weathered shale would be stockpiled separately from other inferior clays. Similarly, sandstone would be used in bund construction or stockpiled for despatch or rehabilitation.

Based on an area of 40 000m^2, an average topsoil depth of 15cm and an average overburden depth of 7m, approximately 6 000m^3 of topsoil and 280 000m^3 of overburden would have to be removed during Stage 1 to access the shale. Of the overburden, approximately 50 000m^3 would be sandstone and the remaining 230 000m^3 would be clay and weathered shale. Depending on its quality and suitability for brick manufacture, a proportion of the weathered shale, clay and sandstone may be removed from site by truck. An additional 6 000m^3 of topsoil would be stripped from areas under the amenity bunds and used immediately if possible or stockpiled for

later use in rehabilitation. The surplus overburden stockpile area would be approximately 2ha in size, with a capacity to store approximately 100 000m^3 of materials. It is anticipated that the construction of the amenity bunds would require approximately 140 000m^3 of material and 7 000m^3 of topsoil. Therefore, approximately 45 000m^3 of material would have to be stored in the excavation area or transported off site during Stages 1 to 3. It is noted that a proportion of this material would be used for rehabilitation which would commence following Stage 1. A temporary "wet weather" stockpile of product clay/shale would be established in the surplus overburden stockpile area. This would allow some transportation of product clay/shale during wet weather events which prevent trucks entering and departing from the extraction area.

Once exposed, the shale would be ripped and then cross ripped preferably across a vertical interval of at least 5m to achieve the required level of blending. The ripped shale would then be pushed up into one or more stockpiles on the floor of the extraction area, typically to a height of approximately 4.5m.

In the event any lenses or bands of sandstone are encountered during the extraction campaigns, the upper surface of the sandstone would be cleaned of shale and the sandstone ripped and either used in bund construction, pushed with a bulldozer to a completed section of the extraction area, placed in the surplus overburden stockpile area or despatched from site.

Each extraction campaign would conclude with a program of activities to ensure that no sediment-laden runoff is possible external to the boundary of the extraction area during the intervening period until the next extraction campaign. A sump or similar structure of appropriate capacity would be left to ensure that internal runoff within the extraction area would be directed away from the area that would be the subject of the next extraction campaign.

2.5.3 Amenity Bunds

Figure 2.3 displays the amenity bunds that would be constructed on the northern, western and southern sides of the extraction area. Amenity bunds are not required on the eastern side of the quarry due to the natural topography and an existing row of trees on the "Mandurama" property, both of which would shield areas east of the property from visual and noise impact. The bunds would be constructed progressively, dependent on the availability of the subsoil and sandstone stripped from the extraction area. Sandstone extracted would be the preferred material for the bunds, particularly the southern and western bunds as these bunds would be potentially more permanent than the northern bund. Clay and weathered shale would also be used in bund construction depending on its quality and suitability for brick manufacture. Construction of bunds would commence with the northern and then western bunds to provide a visual barrier for residents on these sides of the extraction area as early as possible. Much of the extraction area is shielded to the north throughout Stages 1 to 3 of extraction, due to the natural topography. However, the face of the uppermost southern bench would progressively become more visible to residents on the north, so rehabilitation of this face would commence as soon as extraction to the first bench is completed.

Table 2.1 outlines the approximate dimensions and volumes of materials required for the three amenity bunds.

Table 2.1
Amenity Bund Dimensions

Amenity Bund	Height (m)	Base width (m)	Length (m)	Bund Base Surface area (ha)	Approximate Volume of subsoil/clay required (m^3)	Approximate Volume of topsoil required (m^3)
Northern	7	30-50m variable	365	1.1	38 000	1 900
Western	7	30	465	1.4	49 000	2 400
Southern	7	30	500	1.5	52 000	2 600
Total				**4.0**	**139 000**	**6 900**

The footprint of each amenity bund would be stripped of its existing topsoil. If appropriate, up to 0.5m of subsoil would be placed on the surface of the materials used to form each bund and moderately compacted. A 150mm layer of topsoil would be placed on the surface of the bund with mild compaction using the tracks of a bulldozer.

The outside slopes and tops of the amenity bunds would be revegetated with a quick growing cover crop for rapid stabilisation and a seed mix of native grasses and shrubs indigenous to the area and known to have high establishment success.

All bunds would be constructed to a height of approximately 7m above the existing surface. Bunds would have a top width of 2m and a 1:1 (V:H) grade on the inside slopes and a 1:3 (V:H) grade on the outside slopes to provide the maximum visual impact and noise attenuation possible.

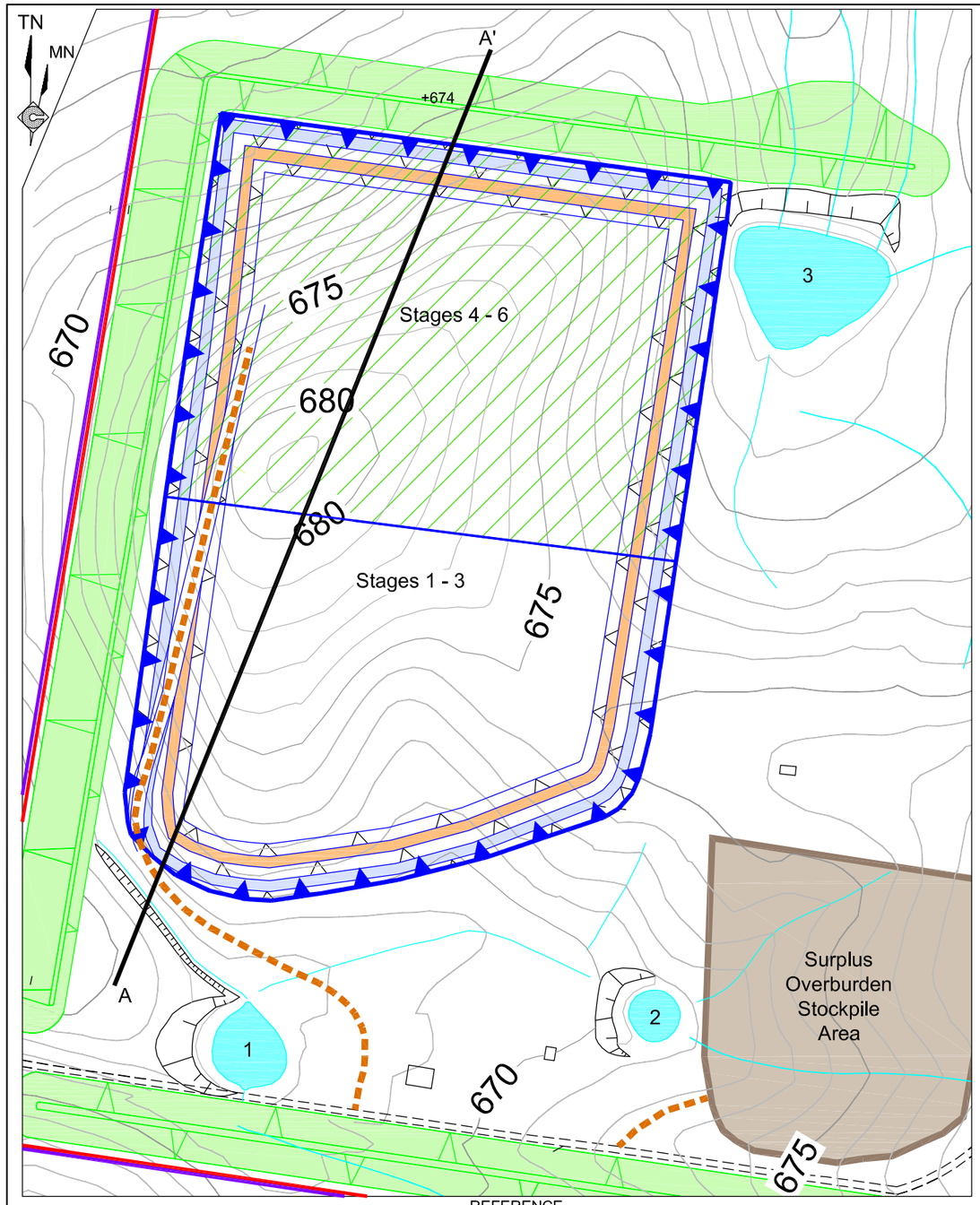
2.5.4 Staging

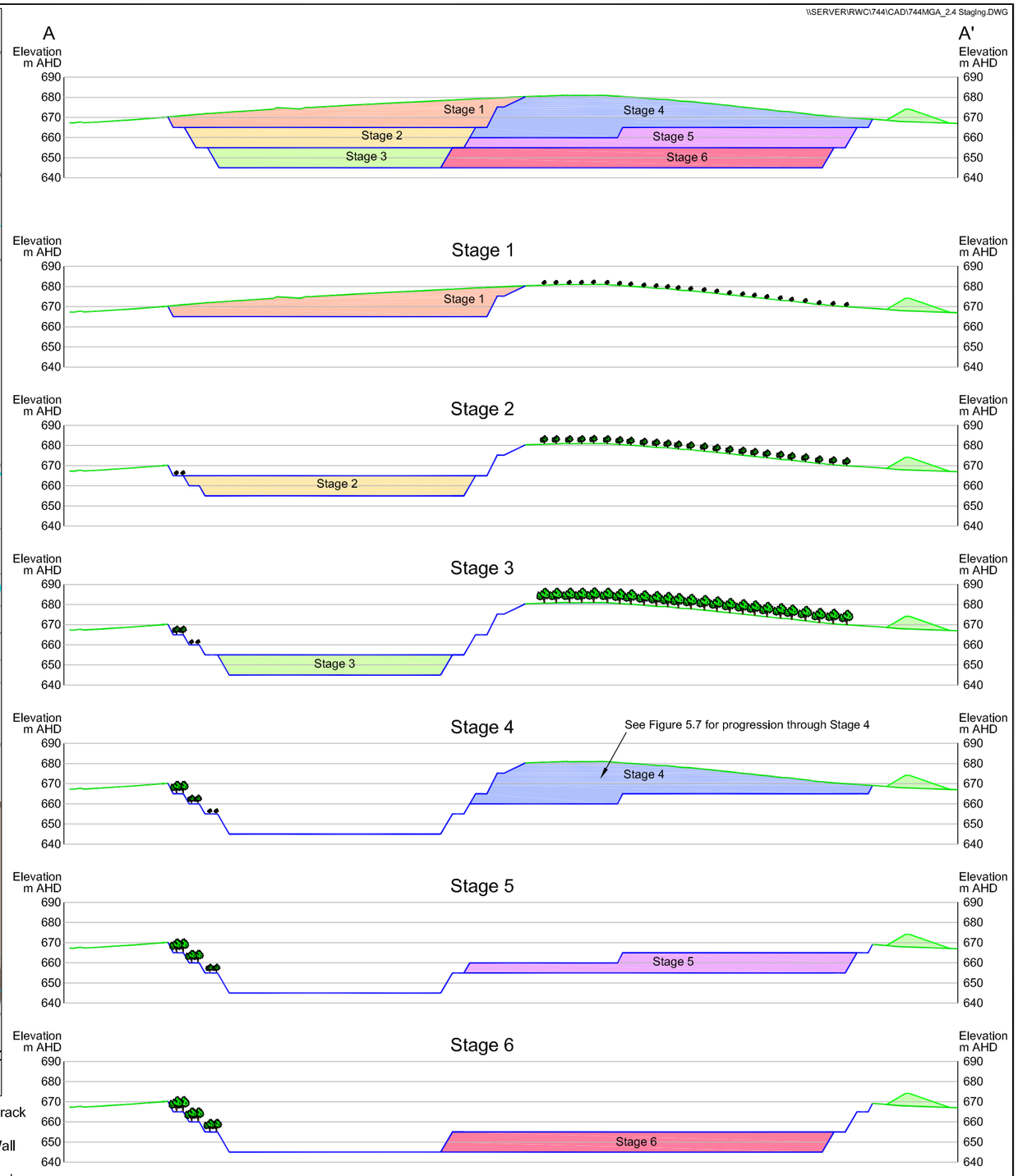
The six stages of extraction are shown in **Figure 2.4**. The first three stages would be on the southern side of the extraction area and Stages 4, 5 and 6 would be on the northern side of the extraction area. **Table 2.2** lists the estimated duration of each extraction stage and the approximate quantity of product clay/shale to be recovered.

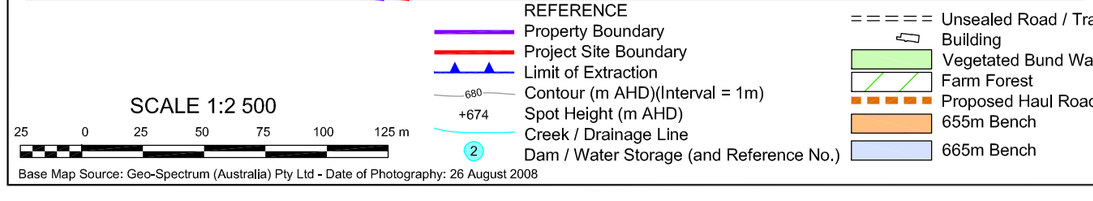
Table 2.2
Duration and Extraction Quantities of Product Clay/Shale for Quarry Stages

Stage	Depth (to m AHD)	Approximate Extraction Period	Extraction (t)	Cumulative Extraction (t)
1	665	Years 0 – 8	830 000	830 000
2	655	Years 9 – 13	650 000	1 480 000
3	645	Years 14 – 18	540 000	2 020 000
4	665	Years 19 – 23	540 000	2 560 000
5	655	Years 24 – 26	500 000	3 060 000
6	645	Years 27 – 30	540 000	3 600 000

The current plans for the extraction area depict the floor of the extraction area to be approximately 645m AHD. It is intended as part of the ongoing operation of the extraction area beyond the initial 30 year quarrying life to also establish through further exploration the type and quantity of shale beneath the 645m AHD level. In the event it is feasible to recover further shale at depth within the extraction area, project approval would be sought for this activity at that time.







Base Map Source: Geo-Spectrum (Australia) Pty Ltd - Date of Photography: 26 August 2008

Figure 2.4
EXTRACTION STAGES

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2.5.5 Equipment

The mobile equipment involved in the extraction operations would typically include the following.

- A scraper (e.g. Cat 637) for initial topsoil removal and subsoil/clay removal and construction of the amenity bund walls.
- A bulldozer (e.g. Cat D10) for topsoil removal beneath amenity bund walls and ongoing topsoil stripping campaigns, ripping and pushing up weathered shale and unweathered shale, ripping and pushing sandstone.
- An articulated haul truck (e.g. Cat 740) for re-location of ripped/broken sandstone within the extraction area and to the surplus overburden stockpile area.
- A front-end loader (e.g. Cat 966) for loading product clay/shale into highway trucks and ripped/broken sandstone into the articulated haul truck.

2.5.6 Campaign Duration

The extraction campaigns would typically produce approximately 2 000t per day or an average of 10 000t per week. Based on this weekly yield, each campaign would typically occur over a period of 4 to 6 weeks, depending on limiting weather conditions.

2.6 PRODUCT TRANSPORTATION

2.6.1 Introduction

The product clay/shale would be loaded into haul trucks by a front-end loader and transported to the Bowral Brick Plant. The loading of the trucks would invariably be carried out by the truck drivers themselves or one of the other operators on site throughout extraction campaigns.

Transportation of the product clay/shale from the quarry would be by road-registered trucks predominantly Monday to Friday. In special circumstances, such as following prolonged wet weather, transportation would be conducted on Saturdays and Sundays. This capability would allow the Bowral Brick Plant to remain operational after wet weather events.

The trucks would comprise both rigid and articulated configurations including truck and dog trailers with an average load capacity of approximately 30t. All trucks would be operated by an authorised contractor whose drivers have all been fully inducted and aware of the Proponent's Drivers Code of Conduct.

Further discussion on the transportation route and the proposed mitigation measures relating to the proposed traffic levels is provided in Section 5.1.

2.6.2 Internal Roads

The existing site access road within the Project Site from Berrima Road would be retained principally as a single-lane road with the last 400m sealed. **Figure 2.5** displays the alignment of the internal haul road from the site access road into the extraction area. The internal haul road within the extraction area would be located on the western side of the extraction area to maximise the acoustic shielding of trucks travelling into and out of the extraction area from the New Berrima township.

The existing bridge across Stony Creek along the site access road has been assessed as suitable for the proposed truck movements. The integrity/structure of the bridge would be reviewed periodically and if required repaired. All repair works would be undertaken with reference to "Guidelines for Controlled Activities Watercourse Crossings".

2.6.3 Transportation Route

The proposed transport route between the Project Site and the Bowral Brick Plant is shown on **Figure 2.5**. All trucks would exit the Project Site and turn left on to Berrima Road, turn right on to Taylor Avenue, follow the existing heavy vehicle route on the southern side of New Berrima to the Hume Highway and then the existing designated heavy vehicle transport route via the Hume Highway to Bowral Brick Plant. Transportation would not be via Berrima Road, north of the entrance to the Project Site, due to the 10t load limit which is imposed on this section of road. The distance between the proposed extraction area and the Bowral Brick Plant is approximately 23km by the prescribed route. Depending on demand, limited quantities of product clay/shale, including sandstone may be sent to other brick plants in Sydney or other sites requiring the material(s).

2.6.4 Traffic Volumes

Transportation of product clay/shale would be predominantly conducted Monday to Friday on a full-time basis. Assuming full-time transportation, up to approximately 2 500t of product clay/shale would be transported to the brick plant each week. With each load being approximately 30t, there would be approximately 17 loads per day, or 34 truck movements per day, for 5 days per week. This represents approximately eight or nine return trips for two trucks each day. Alternatively, if a two week per month campaign basis is adopted, there would be 34 loads per day, or 68 truck movements per day for 10 days every four weeks, This represents approximately eight or nine return trips for four trucks each day.

Following periods of prolonged wet weather, traffic volumes may need to be as high as 68 loads per day or 136 truck movements per day albeit only for a few days. This would allow the Bowral Brick Plant to quickly accumulate product clay/shale which it had not been able to access during the wet weather, thus enabling the plant to remain operational. This level of traffic movements would rarely occur, however, it is necessary to provide for this contingency to maintain the supply of raw materials for brick manufacture.

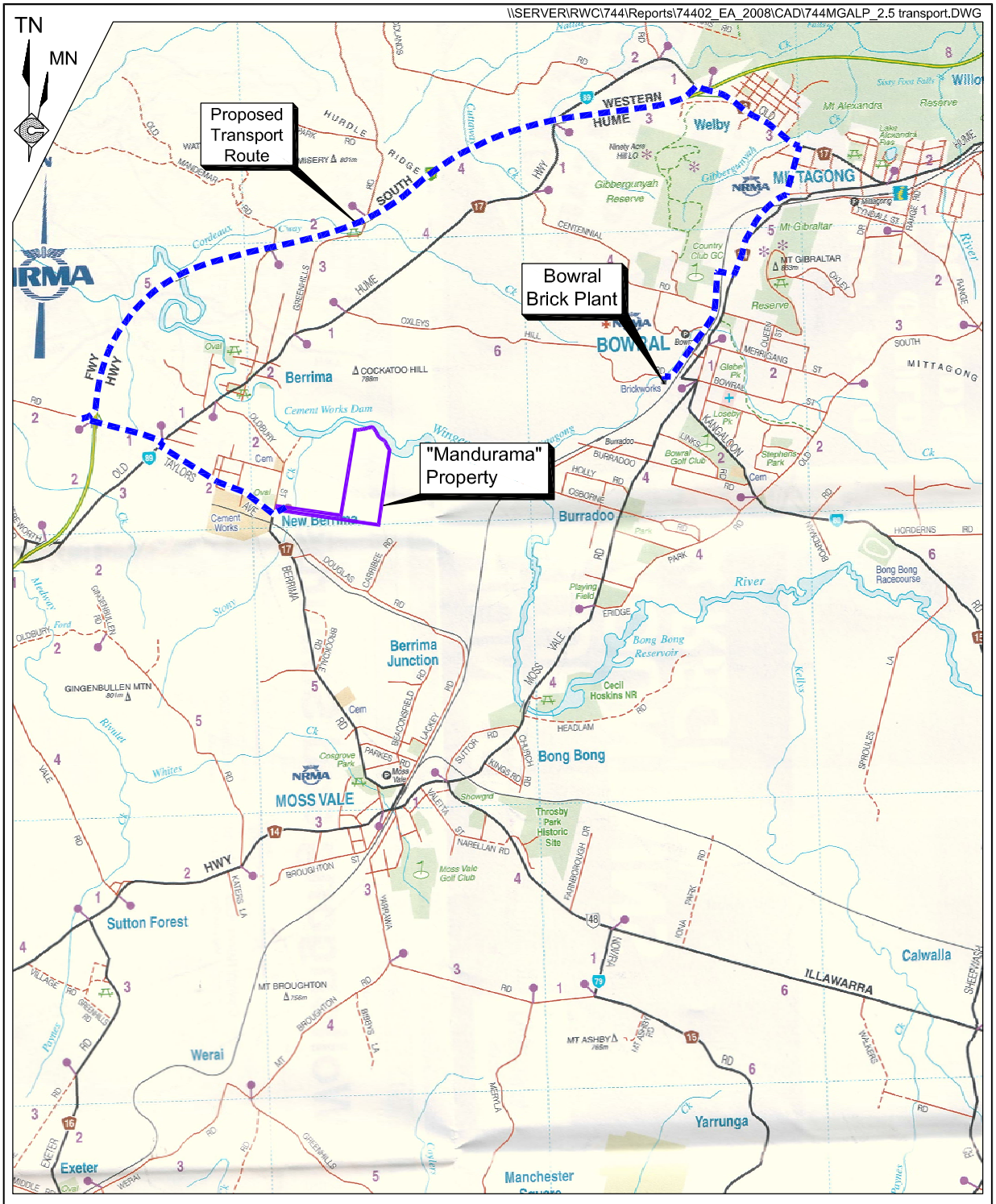

Figure 2.5
PROPOSED CLAY / SHALE TRANSPORT ROUTE

2.7 HOURS OF OPERATION AND PROJECT LIFE

2.7.1 Hours of Operation

The proposed hours of operation for site activities and despatch of product clay/shale are presented in **Table 2.3.** Transportation of product clay/shale would be predominantly undertaken on weekdays, however, transportation may need to be undertaken on weekends in special circumstances such as following periods of prolonged wet weather.

Table 2.3
Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Extraction Operations	7:00am – 5:00pm	7:00am – 2:00pm	nil
Product Clay/shale Despatch	7:00am – 4:00pm	7.00am - 4.00pm if required due to special circumstances	8.00am - 4.00pm if required due to special circumstances
Repairs & Maintenance	6:00am – 6:00pm	7:00am – 6:00pm	8:00am – 6:00pm

2.7.2 Project Life

The quantity of shale within the proposed extraction area is approximately 3.6 million tonnes. At an annual average production rate of 120 000t, the proposed extraction area would provide sufficient material for approximately 30 years. It is noted that geological testing throughout the entire Project Site has identified a total resource of approximately 8 million tonnes of shale. The Proponent intends to re-apply for a further project approval towards the end of the 30 year operational life to continue to provide the product clay/shale from the Project Site to the Bowral Brick Plant.

2.8 WASTE MANAGEMENT

2.8.1 Production Waste

All overburden and subsoil materials would be retained on site for the construction of bunds or for rehabilitation, or despatched from site by trucks, if suitable for the manufacture of bricks. No other production wastes would be produced.

2.8.2 Non-Production Waste

Domestic Wastes and Maintenance Consumables

General domestic waste would be segregated into recyclable and non-recyclable materials and removed from site by a licenced contractor or returned to the Bowral Brick Plant for collection at that site. All on-site bins would be fitted with lids. Any other waste generated would be removed to a facility licenced to receive these materials.

Waste Oils and Filters

No routine maintenance of trucks and machinery would be undertaken on the Project Site, therefore there would not be a regular source of waste oils or filters. In the event of emergency maintenance and repairs, small amounts of waste oils and filters would be stored temporarily in sealed containers in the on-site container and transported off site as soon as possible.

2.8.3 Sewage and Effluent Disposal

A portaloo would be established on site for use of the on-site personnel (when present) and truck drivers. The unit would be serviced on a regular basis by a local contractor.

2.9 UTILITIES AND SERVICES

The proposed quarry would not require any utilities or services connected on site. Reliance will be made upon the maximum harvestable right dam capacity for the on-site water supply for dust suppression. SEEC (2010) reviewed the water security for the proposed water supply and confirmed that the annual total water demand (8.05ML/yr) would be met 100% of the time from the harvestable right dam capacity of 4.59ML. No reliance would be placed upon the recovery of any groundwater from beneath the Project Site.

No fuel would be stored onsite as fuel would be transported to site, as required, by a local fuel supplier. Limited lubricants would be retained on site (and stored in a lockable container). Notwithstanding the absence of fuel storage on site, the Proponent would maintain a spill kit on site for use in the event of a spillage, hydraulic hose breakage etc.

Heggies (2010) record that the annual diesel usage for earthmoving equipment operating on site and to transport the clay/shale to the Bowral Brick Plant would vary from 148kL to 181kL per year. All road-registered trucks would be re-fuelled off site.

The Proponent promotes a high degree of energy efficiency throughout all facets of its business including product delivery.

2.10 EMPLOYMENT AND ECONOMIC CONTRIBUTION

Each extraction campaign would involve one machinery operator (full time) and a quarry manager (part time) for a period of 4 to 6 weeks, two to three times per year. Transportation of product clay/shale would involve up to four contracted truck drivers. Overall, the extraction and transportation of the product clay/shale would employ approximately four full time equivalent positions.

The Project would involve a capital investment value of approximately $1 million for the purchase and upgrade of equipment, site establishment and road construction.

2.11 SAFETY AND SECURITY

It is the Proponent's policy that each person employed on, or visiting the Project Site, is provided with a safe and healthy working environment. In order to achieve this, the Proponent would implement an induction and training program to achieve the following objectives.

- Ensure compliance with statutory regulations.
- Eliminate or control safety and health hazards in the working environment.
- Provide relevant occupational health and safety information and training to all personnel.
- Develop and review safe working practices and job training.
- Ensure all contractors adopt and maintain the Proponent's policy objectives and safety standards at all times.

Furthermore, as the proposed quarry is located largely amongst quiet agricultural areas with distant rural-residential areas and low density housing, procedures and controls would protect the safety of the neighbours and general public.

The following safety and security measures would be implemented.

- Installation and maintenance of standard agricultural perimeter fence around the active extraction area (see **Figure 2.3**);
- Installation of a lockable gate near Dam 1. This would be the only access to the extraction area and would be unlocked whenever either extraction activities or despatch of product clay/shale are in operation. Other gates in the perimeter fence would be kept locked at all times. The existing automatically controlled gate at the site access road entrance on to Berrima Road would be retained, allowing easy access for the residents and visitors to "Mandurama".
- Security and warning signs would be positioned at strategic locations around or within the extraction area indicating the presence of earthmoving equipment, deep excavations, steep slopes and possibly deep water. The positioning of signs would depend on the location of the extraction and transportation activities at any one time.
- Employee and visitor inductions would include safe working practices and regular follow-up safety meetings and reviews, when necessary.
- Where the internal road is adjacent to steep slopes, bunds would be constructed and maintained along the downslope margins of these roads to a minimum half the wheel height of the largest item of mobile equipment on-site.
- Strict compliance with all project approval conditions.

2.12 SITE REHABILITATION

2.12.1 Introduction

The Proponent would adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, areas where extraction and activities are completed are quickly shaped and vegetated to provide a stable landform. The progressive formation of the post-extraction landform and the establishment of a vegetative cover would also minimise the potential for adverse visual impacts, quarry-related air quality and surface water impacts on the surrounding environment.

The following sub-sections describe the Proponent's rehabilitation objectives and procedures and the proposed final landform on completion of all proposed extraction and transportation-related activities. It remains the Proponent's intention at this stage to re-apply for a further project approval to allow the Company to extend the lateral extent and potentially depth of the extraction area. As a consequence, the following sub-sections examine rehabilitation outcomes for the end of the 30 year period which could be easily modified to suit further development.

The proposed final landform, rehabilitation procedures and the selection of the revegetation species have been based on the long-term objective of returning as much of the disturbed area to its current use for grazing. It is noted that refinements to these procedures may be introduced, depending on the Proponent's plans to further develop the Project Site to maximise the extraction and utility of the total resource. These refinements would be reported in the relevant Annual Environmental Management Report prepared by the Proponent throughout the life of the Project.

2.12.2 Rehabilitation Objectives

The Proponent's rehabilitation objectives for all areas of quarry-related surface disturbance within the Project Site can be defined in the short term and long term.

In the short term, the objectives would be:

- to stabilise all earthworks, drainage lines and disturbed areas no longer required for extraction-related activities in order to minimise the risk of erosion, sedimentation and air quality impacts on the environment surrounding the Project Site; and
- to minimise the visual impacts of the extraction area, particularly from those residences on the northern side of Wingecarribee River through progressive rehabilitation.

The Proponent would ensure that progressive rehabilitation is undertaken as soon as practicable once an area is no longer required for extraction or transportation-related operations.

In the longer term, the Proponent's objective is to progressively provide a low maintenance, stable and safe landform that provides land capabilities on the completed extraction floor comparable with the pre-extraction land capabilities.

2.12.3 Final Landform

An important component in the rehabilitation of areas disturbed by extraction-related activities is the reconstruction of a landform that can support the proposed vegetation and subsequent land uses. **Figure 2.6** presents the final landform following the completion of all extraction and transportation-related activities.

The final landform would be a rectangular basin with a dam in the final sump location, collecting runoff from the 7.7ha internal area of the extraction area. The features of the final landform would be as follows.

- A basin landform within the extraction area with a gently sloping floor to the north. Walls of the basin would retain a maximum slope of 75º with the new horizontal benches progressively covered with selected overburden and supporting native shrubs and trees.
- A final dam with a capacity of approximately 2ML in the location of the final quarry sump.
- An access track to allow vehicular access to the basin.
- In the event there is no extension sought for the life of the quarry beyond 30 years, the amenity bunds would be removed and the recovered materials removed from site and/or placed on the extraction area floor. Sandstone and heavy subsoils would be laid down first and then the removed topsoil placed on top. The placement of this material on the extraction area floor would raise the surface by approximately 2m. The extraction area floor and bund areas would be revegetated with pasture species consistent with the existing pastures.

It is noted, however, that the retention or removal of the amenity bunds would be dependent on the Proponent's intentions for the future of the site. It is probable that, close to completion of the currently proposed extraction area, the Proponent would seek approval to extend the extraction area to maximise the recovery of the 8 million tonne resource. Similarly, assessment closer to the completion of extraction may identify an alternative preferable land use or determine that bund removal could cause the destruction of established habitat. If a further approval was granted for an extension of the extraction area and/or depth, the northern bund would be removed. Materials from this bund would be used in the construction of additional bunding required of the new development.

2.12.4 Final Land Use

The Proponent plans to establish improved pasture on the floor of the quarry and return it to its previous use as grazing land. The basin walls would be too steep for cropping or any machinery based activity, but would support stands of native trees and shrubs.

2.12.5 Rehabilitation Activities

Rehabilitation would be undertaken progressively as soon as practicable after sections of the Project Site are no longer required for extraction or transport-related activities. The following procedures would be implemented throughout rehabilitation to ensure the rehabilitation objectives identified in Section 2.12.2 are achieved.

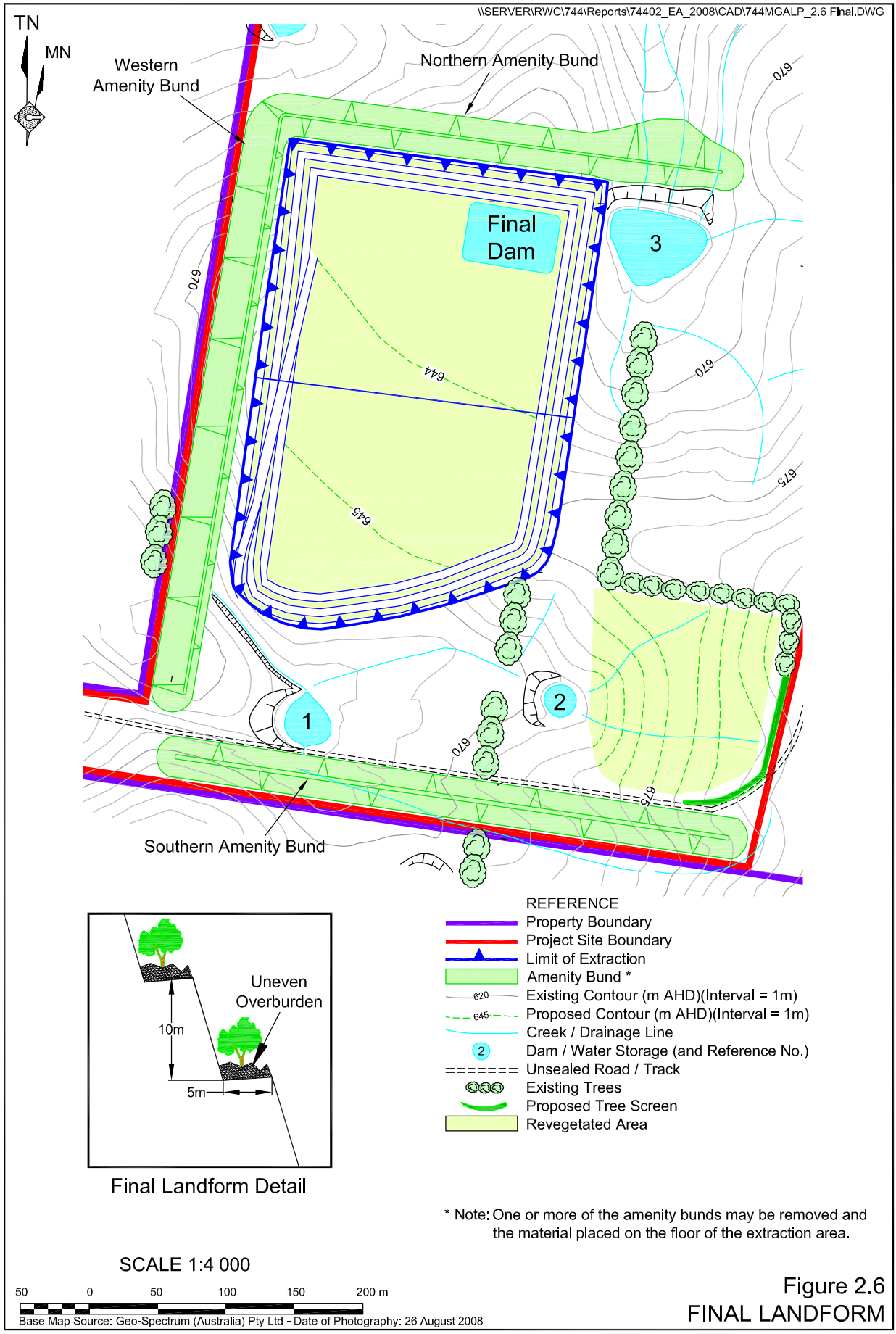

Figure 2.6
FINAL LANDFORM

i) Sediment and erosion controls would be re-instated as required around all areas of disturbance.

ii) The final extraction faces would have an average overall grade of 2:1 (V: H) at the end of the extraction period. Terminal benches would be backfilled with subsoil to a height of approximately 2m to 3m against the extraction face. The relief of the placed subsoil would be made irregular to retard and catch runoff. Topsoil would be spread and the areas vegetated. A quick growing cover crop would be seeded to provide rapid stabilisation. Trees and shrubs endemic to the area would also be planted by seed and/or tube stock. It is noted that rehabilitation of Stage 1 extraction faces should be quite advanced as excavation proceeds to Stages 3 and 4.

iii) The operational haul road into the extraction area would be regraded to suit any changed grades of the basin walls and used as an access track into the basin.

iv) The floor of the excavation area would be deep ripped following the progressive completion of excavation. Stockpiled overburden and materials from the amenity bunds would be used to re-surface the floor of the excavation area.

v) Topsoil would be applied over the deposited overburden/subsoil.

vi) The surface of the placed topsoil would be left even but 'roughened' to assist with infiltration of water and seed retention.

vii) Pasture species would be seeded over all arable areas and fertilisers applied as recommended. The pasture species would be selected by the Proponent's farm manager reflecting the stock being carried on the property at that time.

viii) Stock would be prevented from entering rehabilitated areas until pasture is well established.

ix) The area to be rehabilitated would be fenced and signs erected to restrict access to the area.

x) Rehabilitation would be monitored regularly as described in Section 2.11.7.

2.12.6 Infrastructure and Services

Following the completion of extraction and transportation activities, the Project-related infrastructure and services, such as the, site amenities, container, redundant fences and signage would be removed. Sections of the Project Site which has been compacted would be ripped. Topsoil would be spread over the areas to be rehabilitated and these areas would be seeded as described in Section 2.11.5.

2.12.7 Rehabilitation Monitoring, Maintenance and Reporting

The Proponent's commitment to effective rehabilitation would involve an ongoing monitoring and maintenance program throughout and immediately following the life of the Project. Areas undergoing progressive rehabilitation would be regularly inspected and assessed against the short and long term rehabilitation objectives outlined in Section 2.12.2.

During regular inspections, the following would be monitored.

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover.
- Success of pasture establishment, where present.
- Incidence of pasture attack by pests.
- Natural regeneration of native species on amenity bunds and benches within the extraction area.
- Adequacy of drainage controls.
- General stability of the rehabilitation areas.

Throughout the life of the Project, the following rehabilitation maintenance activities would be undertaken.

- Where monitoring indicates that rehabilitation success appears limited, the following maintenance activities would be initiated.
  - Re-seeding, re-topsoiling and/or the application of specialised treatments such as composted mulch and fertiliser to areas with poor vegetation establishment.
  - Protection against grazing by native animals.
  - Repair or reconstruction of drainage controls should existing controls be found to be inadequate.
- Where monitoring identifies excessive erosion and sedimentation, remedial works such as importation of additional fill, subsoil or topsoil material, or re-designing of water management structures would be undertaken.
- Where monitoring identifies actual or potential weed infestations, the Proponent would undertake appropriate weed control or eradication programs.

No time limit has been placed on post-extraction rehabilitation monitoring and maintenance. Rather, these activities would continue until such time as the rehabilitation objectives outlined in Section 2.12.2 are met to the satisfaction of the relevant government agencies.

The status of rehabilitation activities would be reported annually in the Annual Environmental Management Report.

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