EIS 1126

AB019855

A statement of environmental effects to accompany a development application for the continued quarrying of decomposed granite at Bullio, 40 KM WNW of Mittagong, NSW

Oupan Resources Pty Ltd
September 1995

Statement of Environmental Effects - Bullio Quarry, NSW

Prepared by

Don Reed & Associates P/L

In association with

Bell Cochrane & Associates

L95/0460

A STATEMENT OF ENVIRONMENTAL EFFECTS TO ACCOMPANY A DEVELOPMENT APPLICATION FOR THE CONTINUED QUARRYING OF DECOMPOSED GRANITE AT BULLIO, 40 KM WNW OF MITTAGONG, NSW

Prepared for Oupan Resources Pty Ltd

by

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in association with

Bell Cochrane & Associates

September 1995

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LIST OF APPENDICES

1. INTRODUCTION

1.1 Background

This Statement of Environmental Effects (SEE) has been prepared to accompany a Development Application (DA) for the continued development of a quarry on Lot 8, D 790251, Parish of Bullio, County of Camden, and Shire of Wingecarribee. The quarry is located on the Wombeyan Caves Road, approximately 40 kilometres west-north-west of Mittagong as shown on the attached locality plan (**Figure 1**) over page.

The subject site covers a total area of 3.736 hectares adjacent to the Wombeyan Caves Road. It is surrounded on all sides by semi-cleared rural land used for the grazing of cattle and sheep. The quarry site comprises a heavily scarred, steep sloping ridge visible at quite some distance from the west and north-west. No attempt has been made to date to rehabilitate the Bullio site. The existing site is clearly shown in the air photo (**Figure 2**), over page.

It is understood that decomposed granite may have been originally extracted from the site by Council for local roadworks. In more recent times the quarry material has been extracted by Mr Cec McDonald under a royalty arrangement with the landowner, Mr Mark Kracht. The freehold and quarry were purchased by Oupan Resources in March 1994. The current operations are being carried out under State Environmental Planning Policy N° 37 (SEPP 37) and this statement has been prepared to accompany a development application for the future continued development and rehabilitation of the quarry and to satisfy the requirements of SEPP 37.

1.2 Objectives of the Proposal

The proposal has three main objectives, these being:

(i) to allow the quarry operator to continue to meet growing market demand for the decomposed granite product;

(ii) to allow the operator to optimise the resource with an environmentally sustainable mine plan;

(iii) to allow the operator to progressively rehabilitate the site in conjunction with Soil Con;

1.3 Outline of the Proposed Development

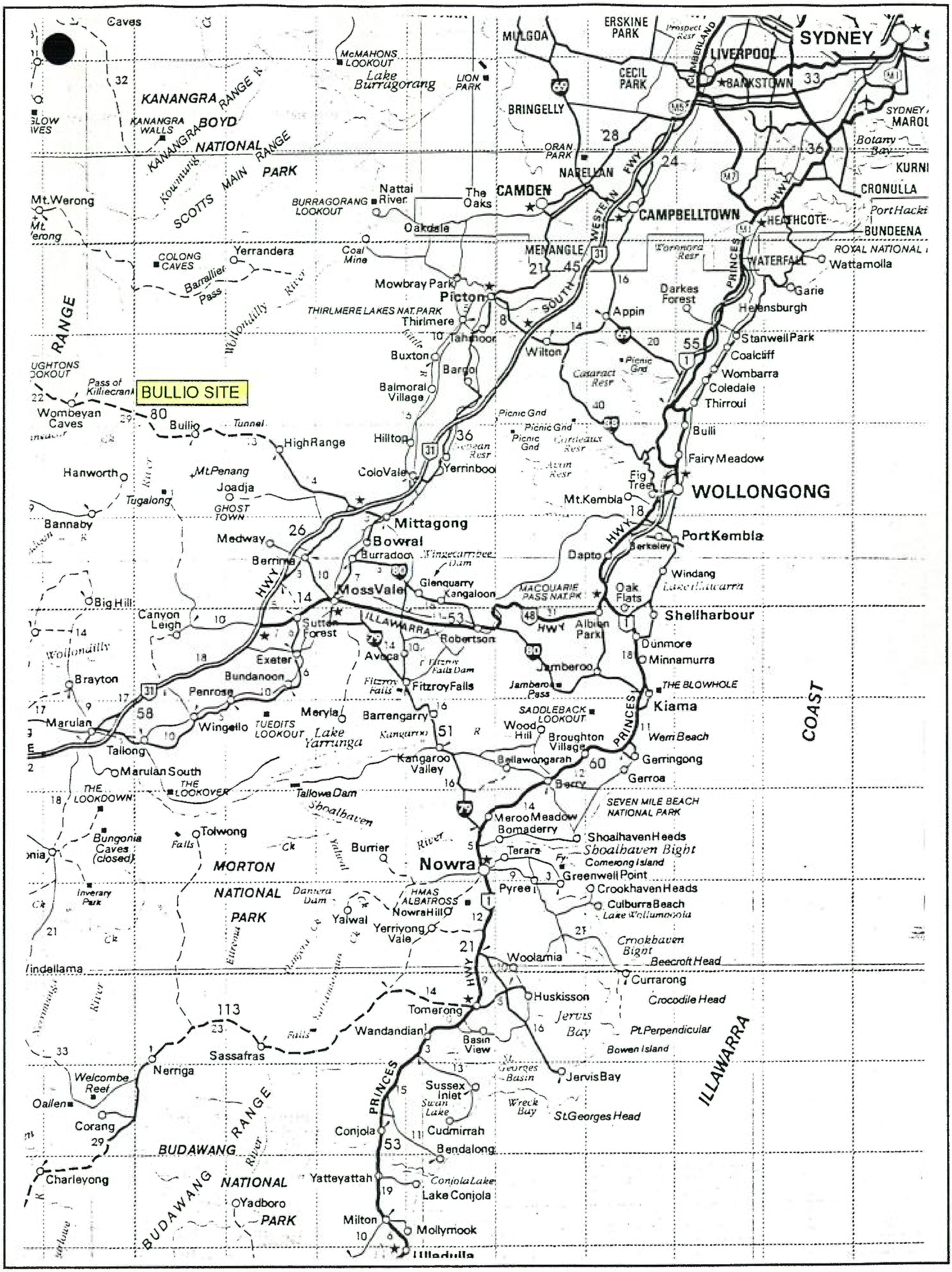
The Development Application to be lodged with Council seeks consent to:

(i) Quarry remaining decomposed granite reserves between RLs 640 and 575 at the site.

(ii) To quarry progressively from top to bottom with 10 metre benches being progressively rehabilitated.

(iii) To stockpile limited quantities of material on site for loading direct to trucks or for pre-screening (via a mobile screening unit) prior to loading.

(iv) To transport from the site not less than 12 000 tonnes per annum and not more than



BELL COCHRANE & ASSOCIATES Extractive Industries For **OUPAN RESOURCES PTY. LTD.**	DEVELOPMENT APPLICATION BULLIO SITE, N.S.W.
Author : *B.N., I.W.,* Project No. : *002-052*	**LOCALITY PLAN**
Drawing No. : *A3-199* FIGURE No.: **1**	
Revision : *0* Date : *13/09/1995*	

APPROXIMATE PHOTO SCALE 1:2000

0 50 100 150

Metres

Aerial Photography Flown By **LANDAIR SURVEYS March1995**

BELL COCHRANE & ASSOCIATES Extractive Industries
For

OUPAN RESOURCES PTY. LTD.

Author :	*L.A.S., I.W., B.N.*	Project No. :	*O02-052*
Drawing No. :	*A3-188*	FIGURE No.:	**2**
Revision : *0*	Date : *11/07/1995*		

DEVELOPMENT APPLICATION
BULLIO SITE, N.S.W.

1995 SITE PHOTO

DEVELOPMENT APPLICATION BOUNDARY

PROPOSED EXTRACTION LIMIT

NORTH

62 000 tonnes per annum and averaging a probable 20 000 - 30 000 tonnes per annum.

(v) To continue to operate the site according to guidelines laid down by Sydney Water, Soil Conservation Service, and the Environmental Protection Authority (EPA).

In undertaking the continued development of the Bullio quarry, Oupan Resources will take all necessary measures to safeguard the environment of the site. The company will monitor for possible impacts and implement an environmental management plan to mitigate potential adverse effects.

1.4 State Environmental Planning Policy N° 37 - Continued Mines and Extractive Industries (SEPP 37)

SEPP 37 took effect on 18 June 1993. It was introduced to enable mines and extractive industries within its scope to continue operating in a legal and environmentally responsible manner.

The policy affects all mines and extractive industries which need development consent to continue to operate but which lawfully began operations without development consent before planning controls came into force. The policy allowed a three month registration period and a two year moratorium during which existing operations could continue to operate without development consent provided they complied with the provisions of the policy.

Council advises that Bullio quarry is registered with Wingecarribee Shire Council in accordance with SEPP 37.

Under the provisions of the SEPP, a development would be classified as designated development and require the preparation of an Environmental Impact Statement (EIS) if:

- production increases by more than 50 000 tonnes compared with volume production from 1 July 1990 to 30 June 1991; or

- the Council (or, if there is a dispute, the Director of the Department of Planning) considers that the proposed operation is likely to significantly affect the environment, taking into account:

  (i) current impacts, with reference to current and past performance including consideration of noise, vibration, erosion, dust, water, traffic, and land rehabilitation or restoration; and

  (ii) future impacts with reference to changes to the character, nature or scale of the operation, existing vegetation, scenic character, or special features; and

  (iii) Department of Planning guidelines which, in addition to the above require consideration of the number and nature of complaints or expressions of concern that have been lodged regarding the current operation, particularly if those complaints have been substantiated and have led to remedial action or prosecution.

In reference to the existing and proposed operations of the Bullio quarry, it is submitted that:

- the proposed volumes of extraction are below the threshold of 63 005 tonnes (i.e. the 13 005 tonnes produced in 90/91 + 50 000 tpa) specified in SEPP 37;
- the current quarry operations do not adversely impact on the surrounding environment;
- the future quarry operations will not adversely impact on the surrounding environment when considering changes to the character, nature or scale of the operation, existing vegetation, scenic character or special features; and
- no complaints are known to have been made to Council.

After discussions with Wingecarribee Council it was considered that under Clause 20 of SEPP 37, the continued operation of Bullio quarry would not be deemed a designated development. Council advised that the development would be treated as an *advertised development* and would require the preparation of a comprehensive Statement of Environmental Effects (SEE) for lodgement with the Development Application.

1.5 Consultations

Various statutory authorities with responsibilities for land use or environmental matters were consulted about the continued development. Representatives from Soilcon, Sydney Water, the EPA and Council have inspected the site in the course of these consultations. Authorities contacted during the preparation of this SEE were.

(i) Wingecarribee Council;
(ii) Sydney Water;
(iii) the Department of Land and Water Conservation (Soil Con office, Moss Vale);
(iv) the Environmental Protection Authority (EPA).

Details of discussions and responses to issues raised by the various statutory authorities are provided throughout the report.

1.6 Scope and Content of the Report

The scope of this document has been determined by the requirements of SEPP 37, Council and other statutory authorities. In particular we have referred to Attachment 3 of the SEPP 37 guidelines which includes matters to be included in a Statement of Environmental Effects. Attachment 3 is attached as **Appendix A** to this report. A summary of major issues relevant to each of the statutory authorities is attached as **Appendix B**.

2. PLANNING CONTROLS

2.1 State Planning Policies

Relevant policies are deemed to be:

- SEPP 37: relative to Continued Mines and Extractive Industries;
- SEPP 11: relative to Traffic Generating Developments;
- SEPP 44: relative to Koala Habitat.

This Statement of Environmental Effects has been prepared in response to SEPP 37.

Council, as the consent authority, may need to consult with the RTA (through its locally delegated Traffic Committee) in relation to traffic on Wombeyan Caves Road, however, no substantial increase is expected over current levels. At the current annual production level of 19 800 tonnes, truck numbers can be calculated as:

19 800 tpa ÷ 245 cartage days (5 days x 49 weeks) ÷ 24 tonnes per truck
= 3 - 4 truck loads per day.

The company does not envisage deliveries exceeding an average of 5 - 6 trucks per day.

The site to be quarried has been extensively disturbed and shows no sign of actual or potential koala habitat. There is no known koala habitat in the vicinity of the quarry.

2.2 Local Planning Policies

The quarry site is within the area controlled by the Wingecarribee Local Environmental Plan (WLEP) which was gazetted on 12 January 1990. The site is zoned 5 (c) Special Uses (Water Catchment). Extractive industry is permitted with consent but only with the concurrence of Sydney Water.

Council advises that quarrying at the Bullio site pre-dated the WLEP and the site is registered as a Continuing Use under SEPP 37.

2.3 Statutory Authority Policies, Guidelines and Approvals

The development is permissible with the consent of Wingecarribee Shire Council. This document has been prepared in accordance with Council's requirements and other government authorities' guidelines and policies.

Additional environmental approvals will be required under other legislation, including:

- licences and approvals for the construction and operation of any pollution control or water discharge structures (including sedimentation dams) will be required under the Clean Waters Act and possibly the Clean Air Act. The Environment Protection Authority must issue relevant licences and approvals for operations to continue;

- a licence under the Dangerous Goods Act, 1975 must be obtained if fuel is to be stored at the site.

3. DESCRIPTION OF THE QUARRY OPERATION

3.1 Extraction Schedules

Extraction schedules are determined by market demand. That demand has been relatively consistent as shown by production history, i.e.

1989 / 90	14 467 tonnes
1990 / 91	13 005 tonnes
1991 / 92	13 500 tonnes
1992 / 93	12 611 tonnes
1993 / 94	9 327 tonnes
1994 / 95	19 800 tonnes
Mean x 6 years	13 800 tonnes per annum

Average annual production has ranged from approximately 9 400 to 19 800 tonnes over the last six years with substantial growth occurring during 1994/95. Growth during the last 12 months has resulted from increased demand for the reddish coloured, decomposed granite from the landscape market in particular.

According to SEPP 37 definition, the Bullio quarry can be classified as a non-designated (advertised) development providing production does not exceed 63 000 tpa. At this stage the company does not foresee production exceeding 30 000 tpa without improvement to Wombeyan Caves Road. Production of 30 000 tpa would generate an average five to six truckloads per day, i.e. 10 - 12 truck movements on Wombeyan Caves Road compared to the 1994 / 95 average of six to eight truck movements.

3.2 Quarry Planning

Quarry planning has been undertaken to optimise the extraction of reserves remaining within the area already disturbed by quarrying, whilst at the same time allowing the progressive rehabilitation of the site. The existing quarry site is shown in **Figure 2.**

Plans for the future quarrying and rehabilitation of the Bullio quarry site are included as **Figure 3** which is an A0 sized plan included inside the back cover of this report.

Key elements of the proposed quarry plan are that:

- all future extraction will be contained to within site boundaries (and buffers), below the 640 m contour as shown on **Figure 3A**;
- as such, the bulk of future extraction will be restricted to areas already disturbed by quarrying activities;
- peripheral spoon drains will be constructed to divert all run-off from above RL 640 around disturbed areas to minimise erosion of exposed quarry faces;
- buffer zones of ≥ 10 m width will be maintained inside the northern and southern boundaries of the subject site;

- the area to be initially quarried will comprise the existing quarry floor (in two benches down to RL 575) to provide a future dump area for non-decomposed granite boulders, which occur as floaters within the decomposed granite resource;

- following the quarry floor excavation all quarrying will progress from RL 640, downhill to allow both the optimisation of the resource and progressive rehabilitation of the site;

- future bench heights will be 10 m, inclined at 2V : 1H. Final bench widths will be 5 m sloped ≤ 2% into the hill and approximately 1% across the hill;

- individual benches will be accessed by in-pit haul roads (shown on figures 3A and 3B) from the south west corner of the quarry.

Details of the site water management (drainage, catchment and controlled discharge) are provided in Section 7 of this report along with information relative to:

- erosion and sediment control;
- slope stability;
- soil conservation;
- site rehabilitation;
- dust suppression; and
- noise control.

Advice will be taken from Council in relation to safety precautions and visual barriers between the Wombeyan Caves Road and the western perimeter of the quarry.

3.3 Extraction Methodology

The methods of extraction at Bullio will not change significantly from current practice. Drilling and blasting will not be required and all overburden, decomposed granite and fresh granite floaters will be quarried by:

- bulldozer (up to a Cat D 9L or equivalent); and/or
- a hydraulic excavator (up to 40 tonne machine) and/or
- a rubber-tyred front end loader (up to Cat 988 or equivalent).

Once drainage and water catchment infrastructure is in place, extraction of the Bullio hillslope will generally comprise the following activities:

- extraction of material within the bottom benches down to RL 575 (refer **Figure 3E**);

- construction of haul roads to benches developed at RLs 630, 620, 610, 600 etc (as shown on **Figures 3B and 3C**).

- stripping and stockpiling (or immediate re-spreading wherever possible) of overburden for subsequent rehabilitation;

- extraction of decomposed granite by bulldozer, hydraulic excavator or front end loader;

- movement of excavated, decomposed granite to lower benches either by dump truck (≤ 30 tonne capacity) or by pushover / gravity;

- extraction of fresh granite floaters for sale or dumping into the RL 575 bench / sump area;
- final profiling of completed benches to meet Soil Con criteria;
- progressive rehabilitation of benches from top to bottom;

3.4 On-site Processing

At current time all excavated granite is loaded to trucks at Bullio and either:

- transported direct to sales destinations; or
- transported to Welby for crushing and screening through existing plant.

Whilst this will generally remain the case, the applicant wishes to have the flexibility to conduct limited on-site processing if necessary. Such processing would be limited to:

- occasional hydraulic rock-breaking of granite boulders, either in situ or on the quarry floor; and/or
- dry screening of decomposed granite prior to transporting material off site.

Hydraulic rock-breaking of fresh granite boulders may be necessary (from time to time) to either:

- liberate them from working quarry faces; or
- reduce them to a manageable size.

Under these circumstances the hydraulic rock breaker would be attached to the hydraulic excavator and operated over limited periods of time. Such periods are estimated at several weeks per year, or less.

The sort of screen that would be required at Bullio is a "Powerscreen" type unit comprising a loading hopper, conveyor, single screen and radial stacker. The unit would be wheel-mounted and fully mobile.

3.5 Stockpiling / Loading of Quarry Product

Increased bench area from the proposed quarry operation will allow more scope for on-site stockpiling of ripped (and/or screened) granite. This in turn will allow more cost-effective extraction campaigns with larger machines (bulldozers, hydraulic excavators etc) being employed at the site for only a few days per month (on average) to excavate and stockpile 1 000 - 3 000 tonnes of granite at a time. Resultant stockpiles would be typically 3 - 5 m high with side wall batters of around 30°.

Material will be loaded to delivery trucks either direct from the working face (by hydraulic excavator or FEL) or from stockpiles by FEL.

3.6 Product Transport

Material leaving the site will in almost all cases be transported east-south-east via Wombeyan Caves Road to Welby, Mittagong or beyond. Material is usually transported from the Bullio site by either:

- a rigid eight-wheeler carrying 12 - 13 tonnes; or
- an eight-wheeler and dog trailer configuration carrying 24 - 26 tonnes.

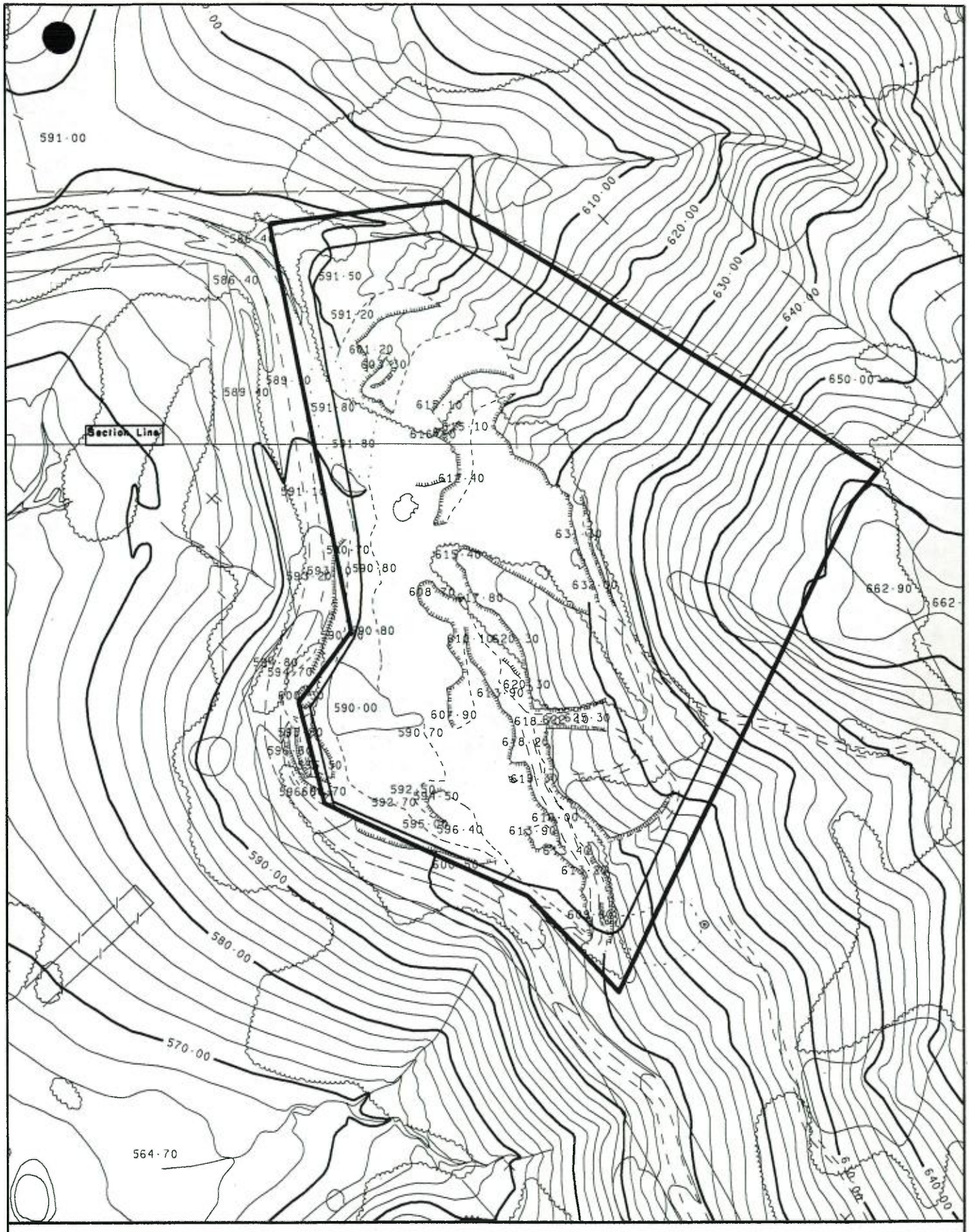
The drivers of these trucks have considerable experience with the Wombeyan Caves Road and its inadequacies and are at all times instructed to drive responsibly.

3.7 Hours of Operation

The Bullio quarry currently operates without any restrictions of operating hours. However, management advises that hours could be restricted (if necessary) to between 7am and 5pm, Monday to Friday. Owing to the higher incidence of weekend tourist traffic on the Wombeyan Caves Road, the company does not transport granite on weekends or public holidays.

Some limited Saturday work will be required for siteworks and maintenance only. The operators will also require approval to carry out remedial works on sire drainage and road during (or immediately following) heavy rainfall events.

site!



SCALE 1 : 2000

0 20 40 60 80 100m

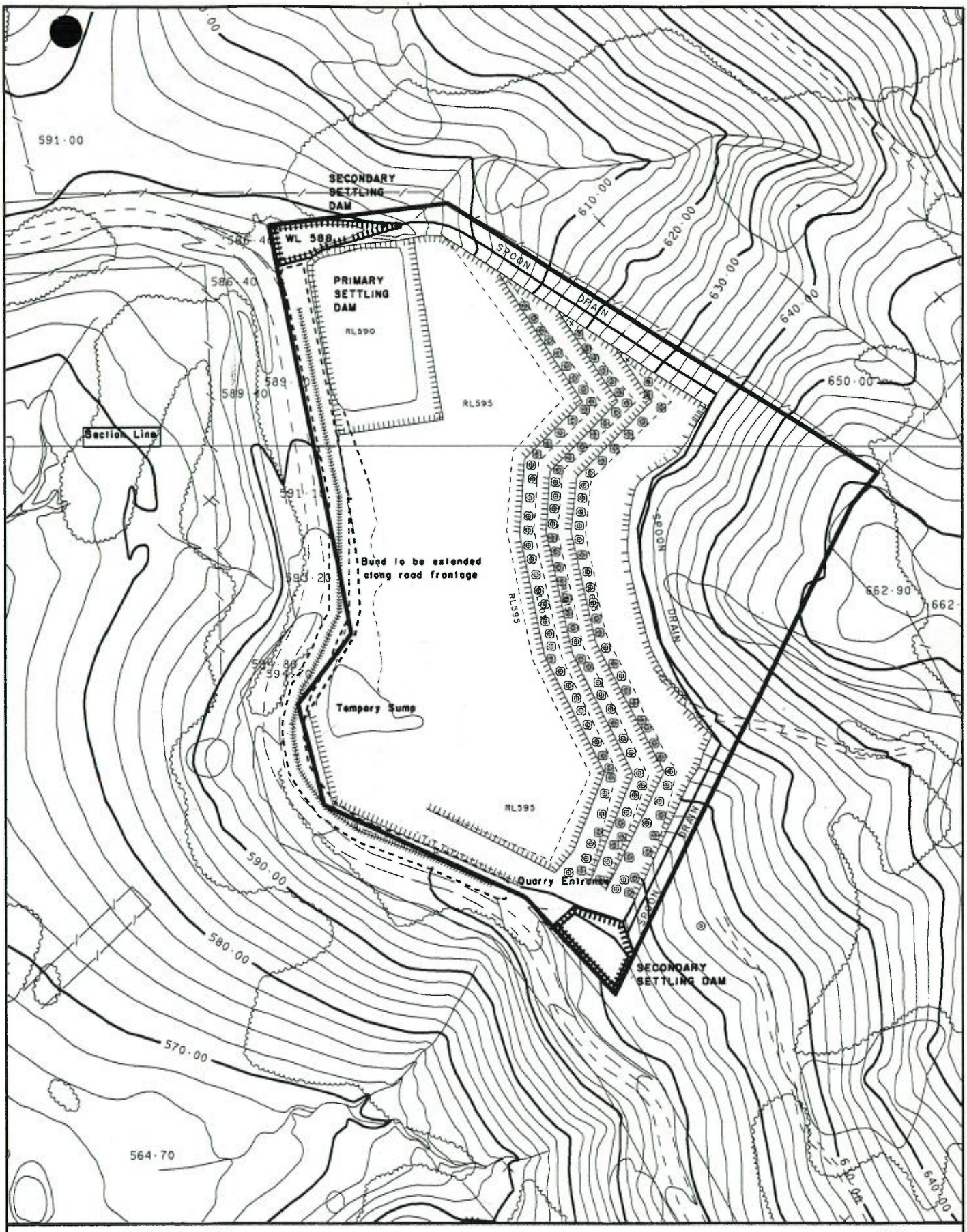
NORTH

Development Application
BULLIO SITE, N.S.W.

CURRENT SITE PLAN

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-200A	FIGURE No : 3A
Revision: 0 Date: 13/9/95	

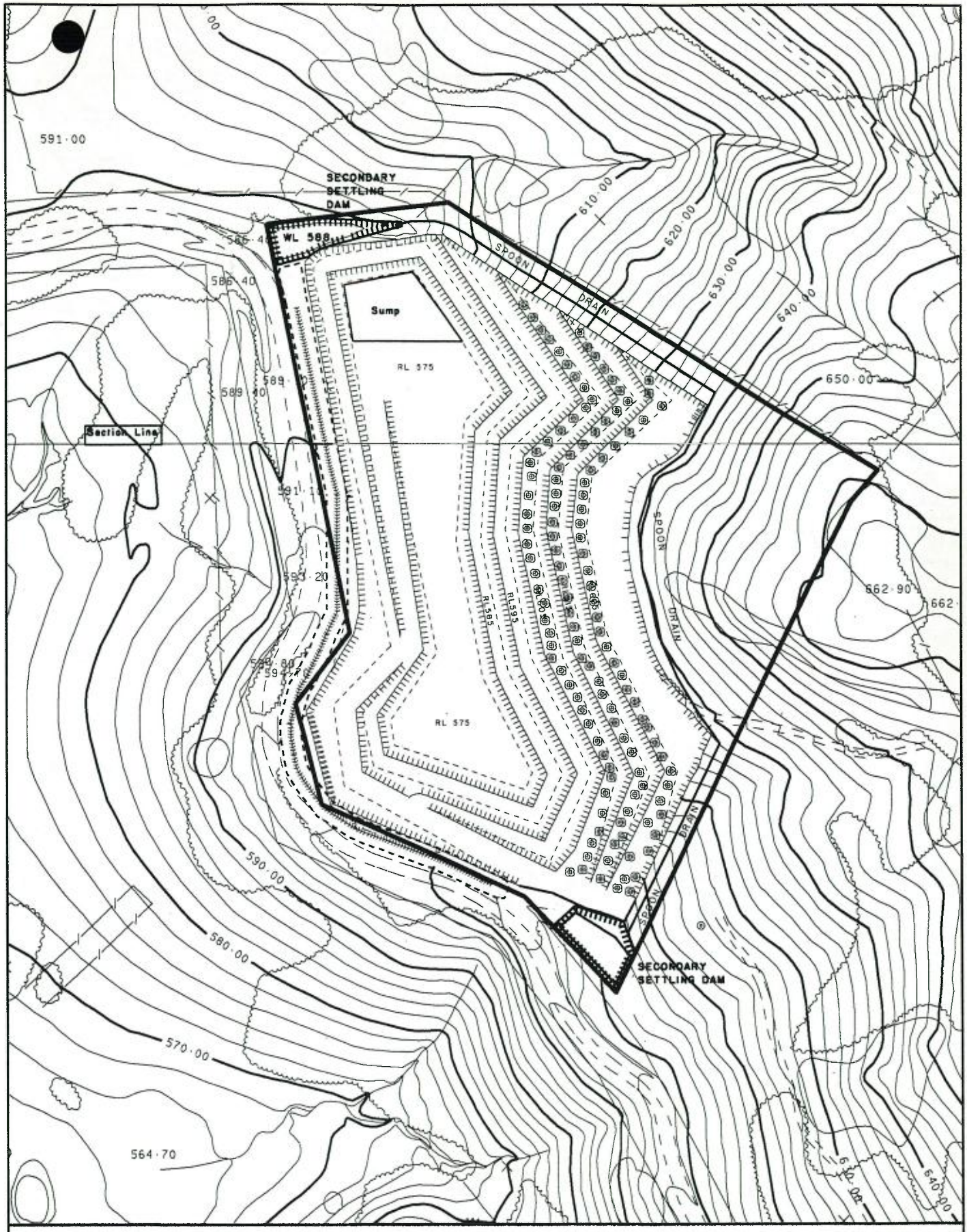


Development Application
BULLIO SITE, N.S.W.

INITIAL DEVELOPMENT PLAN

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-2008	FIGURE No : 3B
Revision: 0 Date: 13/9/95	



SCALE 1 : 2000

0 20 40 60 80 100m

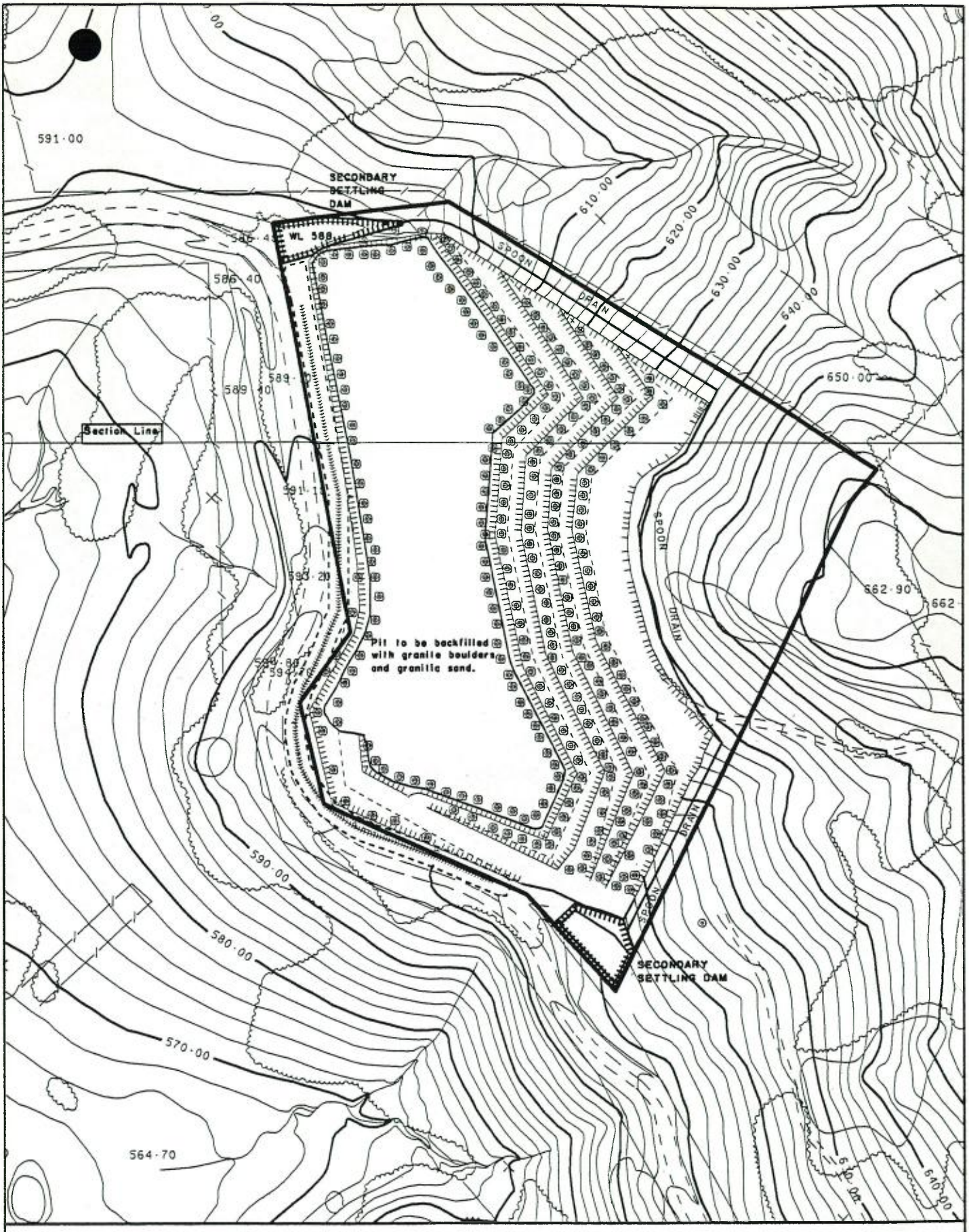
NORTH

Development Application
BULLIO SITE, N.S.W.

FINAL DEVELOPMENT PLAN

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-200C	FIGURE No : 3C
Revision: 0 Date: 13/9/95	



SCALE 1 : 2000

0 20 40 60 80 100m

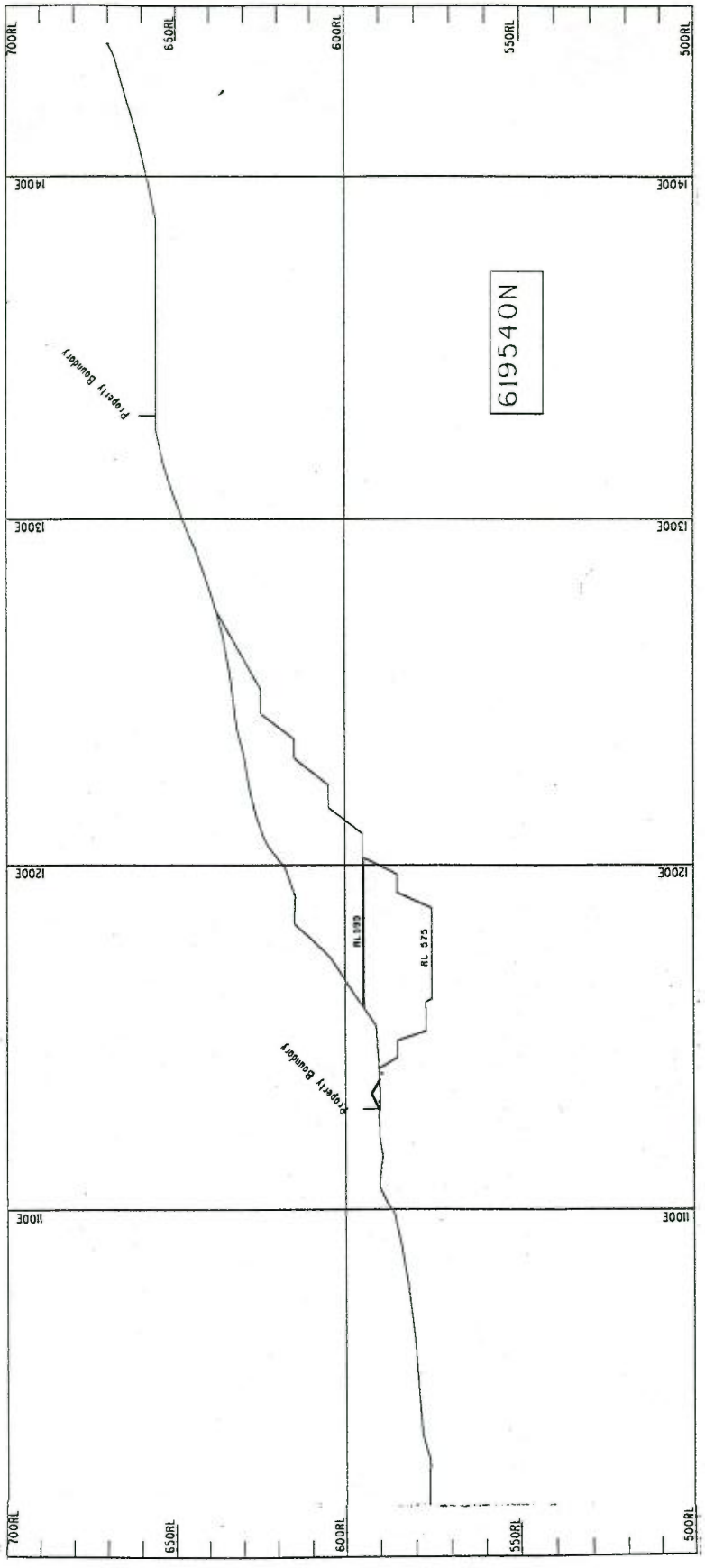
NORTH

Development Application
BULLIO SITE, N.S.W.

FINAL REHABILITATION PLAN

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-2000	FIGURE No : 3D
Revision: 0 Date: 13/9/95	



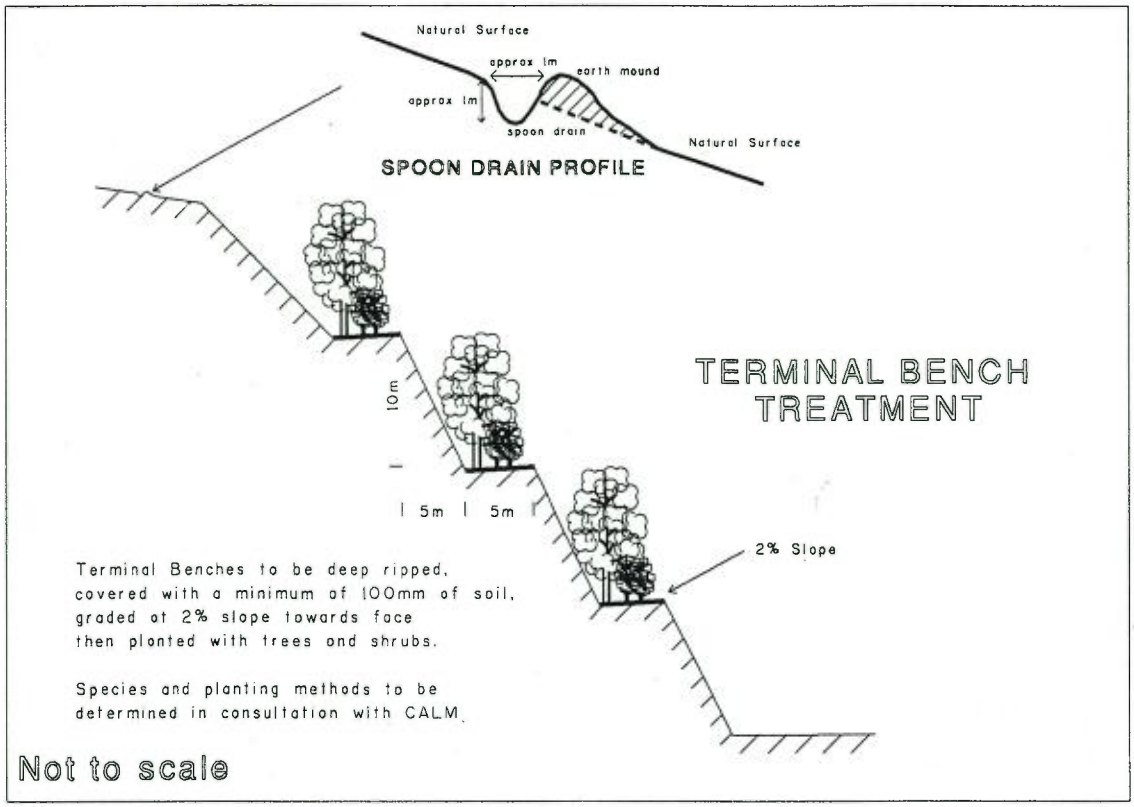
NORTH

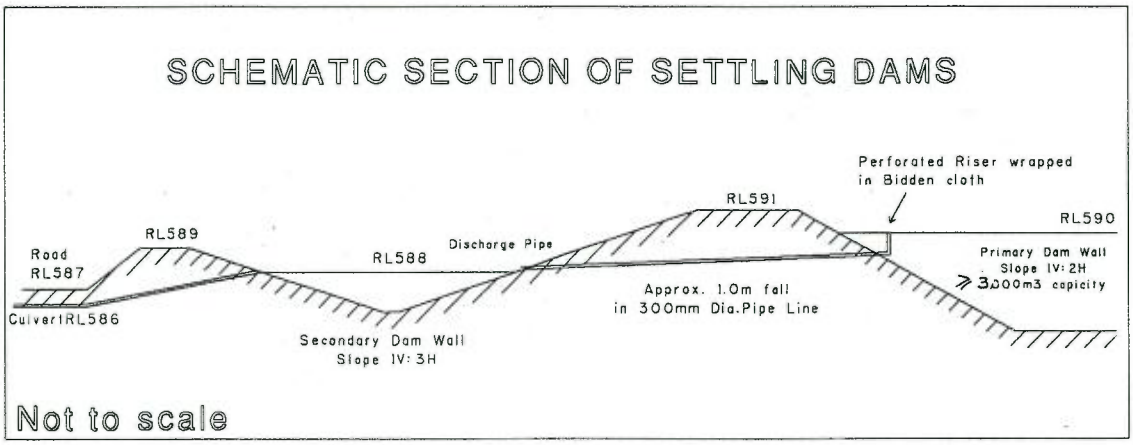
Development Application
BULLIO SITE. N.S.W.

CROSS SECTION

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-200E	FIGURE No : 3E
Revision: 0 Date: 13/9/95	





NORTH

Development Application
BULLIO SITE, N.S.W.

SETTLING DAM & BENCH TREATMENT DETAIL

BELL COCHRANE & ASSOCIATES Extractive Industries
for
OUPAN RESOURCES P/L

Author : L.A.S., I.W.	Project No : 002 52
Drawing No : A4-200F	FIGURE No : 3F
Revision: 0 Date: 13/9/95	

4. PHYSICAL DESCRIPTION OF THE SITE

4.1 Site Topography, Drainage and Historical Quarry Development

The following description is made with reference to **Figure 2**, i.e. the colour photo of the Bullio quarry site.

The total site comprises 3.736 hectares within the Development Application Boundary shown in yellow on Figure 2. The site has been extensively developed as a decomposed granite quarry since at least the early 1980s. It has been stripped and partially quarried up to approximate RL 640 which coincides with the red-lined extraction boundary shown on Figure 2.

Existing drainage lines occur:

- through the quarry itself;
- into the well defined gully running sub-parallel to the northern quarry boundary; and
- into a less distinct gully adjacent to the southern quarry boundary.

Run-off passing through the existing quarry is partially trapped within the two drainage sumps (visible within the quarry floor) before passing to the drain and culvert located in the north-west corner of the quarry. That culvert allows quarry discharge to pass under the road to the recently enlarged sediment dam clearly visible in the paddock west of the central quarry area.

Run-off from the undisturbed southern ridge passes through a culvert under the road adjacent to the south-west corner of the quarry. Run-off passes under the road into a steeply eroded gully thence to an older farm dam visible to the south-west of the quarry.

Historical quarry development can best be described as poorly planned and haphazard. Benches and access haul roads have been apparently developed by bulldozer operators without reference to any sort of formal plan.

Since taking over the quarry in March 1994, the current operators (Oupan Resources) have:

- cleared up the main bottom bench for stockpiling and loading of product;
- excavated the main drainage sump in the quarry floor;
- constructed a small, filter-cloth lined, sediment dam towards the north-west extremity of the current pit;
- carried out remedial works on the culvert in the north-west corner of the pit;
- significantly expanded and constructed the major settlement dam within the property to the west of the quarry;
- stockpiled fresh granite boulders at the northern end of the bottom bench; and
- constructed a haul road between the two bottom benches.

The formal quarry and rehabilitation plans contained with this report are prerequisite to any future optimisation of the resource and subsequent site rehabilitation. Current and future site topography is shown in Figures 3A - 3F.

4.2 Site Geology and Reserves

The Bullio quarry has been developed within a weathered granite ridgeline which comprises both:

- decomposed granite (estimated 70% - 80%); and
- rounded, fresh granite floaters sized to 15 - 20 tonnes (estimated 20% - 30%).

A significant portion of the decomposed (weathered) granite has a regionally unique, reddish colour which is proving to be very popular with landscape architects both in the Southern Highlands and Sydney. Decomposed granite also makes good quality fill and road pavement material.

Reserves of fresh and decomposed granite to be quarried under the proposed mine plan have been calculated (by Bell cochrane and Associates) at 600 000 m^3 in situ. Such figure equates to approximately 1.44 million tonnes at an average conversion rate of 2.4 tonnes / m^3 in situ.

The potential yield of decomposed granite from total material to be quarried at the site can be estimated as:

1 440 000 tonnes x 75% = 1 080 000 tonnes of decomposed granite.

The geology of the site is quite straightforward and typical of this sort of granite deposit. Growth in sales confirms market demand for the reddish coloured decomposed Bullio granite.

4.3 Site Use

With the exception of some very limited grazing upslope of the quarry, the subject site is used solely for quarry activities. In its current state the site is considered virtually useless for any other form of land use other than quarrying. Even after rehabilitation (as proposed) the site has little apparent rural or alternative potential other than fauna habitat.

4.4 Major Environmental Features Impacted

The major environmental features of the existing quarry site are:

- site topography and the steepness of the hillside;
- the removal to date of most of the soil and vegetative cover;
- the vulnerability of the current site to erosion;
- the subsequent potential for sedimentation (of surrounding watercourses) and dust generation; and
- the highly visible location occupied by the quarry.

5. ENVIRONMENTAL INTERACTIONS

The major interactions relate to the steepness of the site and the removal of all soil and vegetative cover (refer 4.4 above).

The other obvious regional interaction is relative to vehicular traffic travelling to and from the quarry.

6. RESULTANT ENVIRONMENTAL IMPACTS

The environmental impact of historical quarrying activities at the Bullio site are obvious to any informal passer-by. Those impacts are:

- the removal of tree and grass cover from the steep hillside;
- the removal of topsoil from the site;
- the loss of fauna habitat;
- the highly visible nature of the development from surrounding areas (over distance of many kilometres);
- the exposure of loose, weathered rock to the elements resulting in dust generation and erosion;
- resultant sedimentation of adjacent water courses;
- noise generated by quarry and transport activities; and
- the impact of trucks on Wombeyan Caves Road.

The removal of vegetative cover from the site is not considered particularly significant in terms of species removed. What is potentially significant, however, is the loss of cover and the exposure of underlying sediments to erosional forces. The apparent removal of topsoil from the site does present a potential problem in relation to future site rehabilitation. It is noted that the sandy loams overlying the steep granite slope are of a generally poor quality.

The loss of fauna habitat will primarily impact on feral species including rabbits and foxes which appear to have driven a high proportion of native species from the area. The size of the quarry development (<3 Ha) limits any impact. Future site rehabilitation should provide a range of habitats for a wider range of mammals, reptiles, birds and insects.

The impact of quarrying on local erosion and sedimentation appears to have been significantly arrested by the current operators who have constructed a number of sediment catchment dams. These basic measures will be significantly expanded and improved to ensure that there is minimal (if any) adverse impact from site run-off.

Noise is not considered an issue at Bullio as the nearest residence is located 0.75 km from the quarry and all neighbouring residences are topographically shielded. Neighbouring residences comprise:

1. the Halliday residence located approximately 750 m to the south-east at RL 620 and shielded from the quarry by an intervening ridgeline rising to RL 670 m;
2. The Kracht residence located approximately 800 m east of the quarry at RL 650 but shielded from the subject site by an intervening ridgeline rising to RL 680 m;

3. the Wollondilly Station located approximately 1 km south-east of the quarry at RL 620 m but shielded from the site by an intervening ridgeline rising to RL 670 m;

4. the Nature Camp located on the Wollondilly River (at RL 300 m) two kilometres south-east of the quarry site.

The major impacts of the development to date would appear to be related to the extreme visibility of the development from surrounding areas, and the impact of trucks on Wombeyan Caves Road. The latter was not designed for high volumes of any traffic and is extremely narrow and windy for the first 12 - 13 kilometres of the return journey towards Welby / Mittagong

The visual impact of the quarry is an established fact. The areal size of the scar will not be increased by the proposed development. Most importantly, the site needs to be benched as a prerequisite to effective rehabilitation. One of the most environmentally pleasing aspects of the plan is that the quarry will be worked then progressively rehabilitated from top to bottom.

Whilst the quarry is operational, trucks will need to transport product via Wombeyan Caves Road, however, the quarry generates relatively low sales volume and truck numbers will always be controlled. Whilst the quarry has a theoretical upper production limit of 63 000 tpa (which could generate up to an average 11 truckloads per day, i.e. slightly in excess of one per hour), Council has the opportunity to consider future restrictions through the Local Traffic Committee.

7. ENVIRONMENTAL PROTECTION

All of the protective measures nominated within this report have been discussed in detail with relevant authorities. In particular they have been discussed with:

- Council;
- Sydney Water (via Council);
- Soil Con; and
- the EPA.

Protection measures for the Bullio site are nominated under the following headings.

7.1 Diversion of Undisturbed Run-off around the Quarry

Run-off from areas undisturbed by quarry activities is to be diverted around the disturbed areas by a network of peripheral drains. These drains will be located, designed and constructed in accordance with the specifications laid down by the Moss Vale office of the Soil Conservation Service, NSW (Soil Con).

Spoon drains will be constructed up-slope of the disturbed quarry area (i.e. at approximated RL 640) to divert run-off to the northern and southern side of the quarry. The drains will be extended within the 10 m buffer areas down the north-east and south-east boundaries of the properties with run-off being directed to catchment areas in the southern and north western corners of the property.

A typical spoon drain profile is shown in **Figure 3F** although care will be taken (under Soil Con direction) to ensure that drains have an evenly rounded bottom profile, rather than a V-shaped profile which would be erosion prone.

Steeper drainage sections along the northern and southern boundaries will be armoured with fresh granite boulders to minimise any gully erosion. These peripheral drains will link into pre-existing run-off contours wherever possible.

The velocity of undisturbed run-off will be retarded by settlement dams located in the north-west and southern corners of the property. Those two dams are shown as Secondary Settlement Dams on **Figures 3B and 3C**.

The southern dam will collect undisturbed catchment run-off only. During periods of heavier rainfall that run-off will overflow the armour-faced dam to an existing culvert under Wombeyan Caves Road. Such run-off will then flow westward via an existing gully that is heavily eroded (refer Figure 2). Dependent on Soil Con and landowner consent, that gully can also be armoured with granite boulders from the quarry.

The Secondary Settlement Pond located in the north-west corner of the property is currently in existence but is the subject of correspondence from Sydney Water to Council dated 7 August 1995. That letter is attached as Appendix C. In order to address the concerns raised by Sydney Water, the quarry operator will:

- batter the gully head and banks to an acceptable gradient;
- line the earthworks with filter cloth as specified by Soil Con; and

- place rock armour over the chute and banks.

Care will be taken to ensure that the filter cloth is firmly keyed in and that the rock chute begins above the excavation and extends to the gully floor.

Sydney Water also point out that some minor erosion has developed in the table drain on the downslope side of the culvert passing under Wombeyan Caves Road from the settlement dam. Quarry management will confer with Soil Con to establish ground cover on this area and over all earthworks, batters and drains, exiting the quarry.

Sydney Water advise that these works will complement previous (and proposed) soil conservation efforts and that "the cumulative effects of these work will reduce the level of sediment entering Lake Burragorang and assist in improving water quality in the catchment".

The "previous works" referred to by Sydney Water refer particularly to the enlargement and re-profiling of the tertiary settlement pond located in the paddock west of Wombeyan Caves Road and shown in Figure 3.

7.2 Catchment of Disturbed Run-off

Disturbed run-off currently mixes with undisturbed, up-slope run-off before reporting to:

- a large sump in the quarry floor;
- a small, filter-cloth lined sediment dam in the northern portion of the quarry; hence
- the above described, Secondary Settlement Dam in the north-west corner of the quarry.

Under the proposed mine plan:

- only disturbed catchment run-off will be routed through the quarry;
- run-off from the three hectares of disturbed catchment will report to a newly constructed, primary settlement dam before passing to secondary and tertiary settlement dams.

The location of the proposed Primary Settlement Dam in the north-west sector of the quarry is shown in Figures 3B and 3C. The dam will cover approximately 1 500 m^2 and will have a capacity of $\geq$ 3 megalitres, i.e. $\geq$ 1 megalitre / hectare of disturbed catchment area.

The Primary Settlement Dam will be located adjacent to the Secondary Settlement Dam in the north-west corner of the quarry. It will be constructed as soon as the subject area is quarried to replace existing quarry floor sumps.

Although Soil Con will be consulted in relation to final dam design, it is proposed to be generally in accordance with that shown (in schematic section) in Figure 3F. A key feature of the design will be the bidden-cloth wrapped, perforated riser installed to pipe clear water from the primary to the secondary dam. Dam wall batters will be as shown unless otherwise specified.

Whilst the Primary Settlement Dam will be constructed as soon as the relevant area is quarried (i.e. 1995/96), it will not receive all run-off via gravity. Run-off collected in the quarry benches to be excavated to RL 575 will need to be pumped to the primary settlement pond until they are finally backfilled to current floor levels.

The RL 575 bench will itself be drained to a series of internal sumps for pumping. Obviously, as much run-off as possible will be directed/drained from upper benches direct to the Primary Settlement Sump.

Sediment collected in the Primary Settlement Sump can be periodically excavated, de-watered and transported off-site as either product or waste. De-watered slimes can be:

- blended with road pavement materials off-site;
- sold as a raw material for brick-making or ceramics;
- sold as liner material to regional landfills; and/or
- dumped into non-putrescible landfills such as that proposed at the brickworks site in Bowral.

7.3 Dam and Water Course Stability

All dam and water courses will be designed and constructed in consultation with Soil Con's Moss Vale office. One of the advantages enjoyed by the site in this regard is the abundance of fresh granite armour (and gabion material) produced along with the decomposed granite. Such material is available to reinforce all drainage and catchment structure.

7.4 Erosion and Sediment Control

Potential for site erosion will be minimised by:

- diversion of undisturbed run-off around the actual extraction area;
- armouring of all peripheral drainage systems (as described above);
- re-profiling of quarry benches (see below) to retard and direct run-off flow; and
- progressive site rehabilitation.

Potential for off-site sedimentation will be minimised by:

- construction and operation of the above-detailed settlement dams; and
- any other reasonable measures (including silt stop fencing) nominated by Soil Con.

7.5 Site Discharge - Water Quality

Water discharged from the site (i.e. from secondary and/or tertiary settlement dams) will be monitored to ensure compliance with water quality specifications (relative to pH turbidity and suspended solids in particular) laid down by the EPA and Sydney Water.

The quarry operators will be required to apply for and procure approvals and a licence to discharge under the Clean Waters Act, 1970.

7.6 Dust Suppression

Working areas of the quarry have the potential to generate dust, particularly during dry conditions. Excavation and truck turn-around areas can be water sprayed (by pump) providing water is available from settlement dams. It is proposed that this be done on discretionary basis as it is in the interests of operator comfort to limit dust.

A major contributor to dust suppression on the current site will be progressive rehabilitation, including irrigation. It is understood that the site would only require EPA licensing / approval under the Clean Air Act should crushing equipment be operated at the site. There is no current proposal to operate crushing plant at Bullio.

7.7 Noise Control

Noise will be generated at the site by:

- periodic campaigns of excavation, likely to average less than one week per month and always between 7am to 5pm, Mondays to Fridays only;
- the arrival, loading and departure of trucks;
- dam construction and maintenance works; and
- site rehabilitation works.

Any future noise generated at the Bullio site will be essentially as it is today with some increase relative to higher production tonnages.

Given the acoustic shielding of the site from neighbours, noise is not considered an issue at Bullio. This opinion is shared by Council and EPA officers with whom we have held discussions.

7.8 Truck Numbers

As an advertised development, the Bullio quarry operation is restricted from producing in excess of 63 000 tonnes per annum. Truck numbers that would be generated by such production can be calculated as:

63 000 tonnes per annum ÷ 245 work days ÷ 24 tonnes / truck = 10.7 per day.

To date, however, maximum annual production has been 19 800 tpa (÷ 245 ÷ 24) = 3.4 truck loads per day.

Future production will be market driven and at this stage the operators do not envisage annual sales exceeding 30 000 tpa (÷ 245 ÷ 24) = 5.1 truck loads per day.

The above figures represent annual averages and must be doubled to calculate truck movements per day.

7.9 Progressive Site Rehabilitation

The Bullio site is so heavily scarred from quarrying activities to date that it cannot be rehabilitated without being topographically re-profiled. The option of recreating a natural batter (from RL 640 down to the existing floor level) is ruled out by the steepness of the site. Any such batter would be graded at 2H : 1V or steeper and would be extremely difficult to stabilise and successfully vegetate.

The proposed, benched rehabilitation scheme has been designed after consultation with Council and Soil Con. The scheme allows for the remaining resource to be optimised and will leave the property able to be progressively rehabilitated.

The topographic features of the proposed site rehabilitation are shown in figures 3B, 3C, 3D and in sectional view in 3F. Key features of these proposed programs are:

- bench heights of ≤ 10 m equating to the growth height of species to be planted;
- bench face inclinations of 2V : 1H to ensure long term slope stability and allow growth of some creepers etc;
- bench widths of 5 m to allow the planting of at least two rows of trees;
- bench floor inclinations of ≤ 2° inwards to entrap irrigation water;
- bench inclination of ≤ 1° to ensure that water does not pool and erode remaining faces;
- spreading of available topsoil on benches to help promote growth of planted species;
- the possible importation of topsoil (dependent on Soil Con recommendation) if available material is insufficient;
- the planting of native species (particularly wattles) able to be grown in limited soil cover and rainfall;
- irrigation of revegetated areas as required;
- ongoing maintenance of rehabilitated benches;
- the employment of Soil Con to act as the advisory consultant in relation to all aspects of site rehabilitation.

After the excavation of the bottom benches (down to RL 575 as per Figure 3E) all subsequent excavation at Bullio will be staged from the top benches, downwards. Once benches are excavated to final profiles, quarrying activities will be moved downhill leaving the upper bench to be topsoiled and planted. Such sequencing will be repeated until the "quarried-out" hillside is finally rehabilitated. The "islands" of unquarried granite remaining between the western perimeter of the quarry and Wombeyan Caves can either be left "as is" or quarried, dependent on Soil Con / Council preferences.

As upper benches are rehabilitated, up-slope spoon drains can be relocated downslope (at Soil con direction) to make stormwater run-off available for irrigation.

Finally, it is again stressed that Soil Con will be consulted throughout the rehabilitation process with regard to:

- final slope profiles;
- topsoiling;
- selection of species for planting;
- planting methodology (seed, stock etc) and densities;
- irrigation and quarry drainage.

7.10 Landscape Design and End-Use

The rehabilitated Bullio quarry should be less obvious (as a "worked out" quarry) when viewed at greater distance from the site. Although it can be expected to be recognisable for what it is at close range, it should blend into the surrounding landscape when viewed from a distance (say > 0.5 kilometre) once replanted species reach full growth.

The current quarry operator has no long term plans for the subject site other than quarrying and subsequent rehabilitation. Under these conditions the site will effectively become a 3.76 Ha fauna habitat.

8. JUSTIFICATION OF THE PROPOSAL

The proposed development can be justified on environmental grounds alone, i.e.:

- the Bullio site must be topographically re-profiled (benched) in order to be effectively rehabilitated;

- the benching and subsequent replanting of the site can only be achieved in a commercially viable manner if revenue is available through continued quarry activities.

Thus it can be argued that the long term rehabilitation of the site is dependent on carefully planned and controlled quarrying under conditional development consent.

Further justification for the proposed development relates to:

- regional demand for the Bullio quarry product; and
- the ongoing employment of one man full-time and several others part-time.

9. ALTERNATIVES

The availability of alternative resources (of reddish coloured decomposed granite) is not considered relevant to this report. This is the case providing the major justification for the development relates to site rehabilitation.

The alternatives considered at Bullio have been in relation to future quarrying and subsequent site rehabilitation. Alternatives considered in this regard have been:

1. to carry out minor earthworks only then seed and leave the site;

2. to batter from RL 640 down to the bottom bench (i.e. at < 2H : 1V), seed then leave;

3. to batter from the top of the property (RL 660) down to the bottom bench (i.e. at > 2H : 1V), seed then leave;

4. to bench from RL 660 down to the bottom bench, then rehabilitate as proposed; or

5. to purchase adjoining properties, rehabilitate the existing faces (as proposed) and develop a large scale quarry "behind" the hill.

Option 1 would result in:

- the non-availability of the Bullio product to existing markets;
- zero return on funds invested to the quarry owner; and
- an unstable slope and long term scar at Bullio.

Option 2 has been previously discussed and ruled out because of the difficulty in re-establishing vegetative cover on a slope exceeding 2H : 1V.

Option 3 might provide a marginally improved environmental solution (i.e. once works are completed in the long term) but would:

- significantly increase the scar in the short term; and
- prove economically non-viable to the quarry operator.

The feasibility of **Option 4** would need to be tested geologically. Even if "quarriable" resource is confirmed on upper slopes, the option:

- is less environmentally acceptable; and
- is not required commercially by the operator.

Option 5 would still require the proposed works to be carried out and would need to be considered as a separate application, possibly a designated development.

After discussions with the quarry owner, Council and Soil Con in particular, the applicant has determined the proposed development to represent the best environmental, technical and commercial option for the Bullio site.

10. CONSEQUENCES OF NO DEVELOPMENT

As indicated above, the consequences of "no development approval" would include:

- the discontinuation of supply of the Bullio product to established regional and Sydney markets;
- the loss of one full-time and several part-time jobs;
- significant financial loss to the quarry owner/operator;
- the probable adoption of Option 1 as the only affordable rehabilitation option;

Under these circumstances the Bullio quarry site would be left as:

- a relatively unstable hill slope with long term erosion and sedimentation problems; and
- a highly visible scar.

Under the above circumstances it can be contended that the proposed development is the only responsible option available to the operator, Council and statutory authorities.

11. SPECIFIC MATTERS REQUIRING ATTENTION

All of the major issues to be addressed at Bullio are summarised within **Appendix B**. Matters highlighted within this report include:

- resource optimisation to continue to allow the quarry operator to supply regional markets and generate sufficient cash flow to fund progressive site rehabilitation;
- environmentally and commercially sustainable quarry planning and method;
- slope stabilisation and re-profiling as a prerequisite to long term site rehabilitation;
- controlled drainage and catchment of stormwater run-off from disturbed and undisturbed areas;
- minimisation of the potential for erosion and the [water-borne] transport of sediment, off site;
- progressive site rehabilitation from worked-out upper benches, downwards;
- continued and long term consultations with the Soil Conservation service in relation to site rehabilitation.;
- hours of operation and truck numbers.

12. SUPPORTING DOCUMENTATION

Figures 1 - 3 comprise:

1. a general location plan;
2. a recent air photo of the site;
3. a 2m interval topographic survey of the site and surrounds;
4. quarry plans and sections;
5. rehabilitation plans and sections;
6. conceptual design for site drainage and settlement dams;

13. CONSULTATION

Consultations have been held with various parties as a prerequisite to the preparation of quarry and rehabilitation plans and the compilation of this document. Parties consulted have been:

- Mr Steven Smith as site representative for the quarry owner, Oupan Resources;
- Mr Basil Natoli of Bell Cochrane who has been employed as consultant geologists, surveyors and draftpersons;
- Mr Ian McNeill of Council;
- Mr Guy Van Owen of the Soil Conservation Service;
- Mr Rob Aubrey and Ms Claire Hendly of the EPA.

Messrs Frank Bewley and Ross Wallis inspected the site on behalf of Sydney Water and provided a written report to Council (copied to Soil Con) which was subsequently forwarded to DRA and is attached as Appendix C.

All aspects of this application have been discussed with one or more of the above-listed parties.

Appendix A

Extractive Resources

STATE ENVIRONMENTAL PLANNING POLICY NO. 37 —
CONTINUED MINES AND EXTRACTIVE INDUSTRIES

GUIDELINES ON IMPLEMENTATION AND USE

New South Wales Government
Department of Planning

ATTACHMENT 3

Matters to be Included in a Statement of Environmental Effects

The matters to be included in a statement of environmental effects for a continued mine or extractive industry that has been prepared to meet the requirements of clause 22 of the SEPP, are as follows:

1. A statement of the objectives of the development, for example, type of product and markets to be supplied.

2. A description of the physical characteristics of the proposed development, both on-site and off-site, including transportation of products, and detailing particulars of previous operations, based on information provided in accordance with policy schedule 1.

3. The present planning controls applying to the site of the development and previous controls which applied.

4. The principal features of the existing environment on-site and in the general area, including any aspects of the environment which might be affected by the development.

5. Identification of interactions between the various parts of the development and any aspects of the environment that is or is likely to be affected by the development.

6. Analysis of the likely environmental impacts or consequences of carrying out the development, with particular reference to the matters identified in clause 20(1)(b) of the policy.

7. Measures to be taken in conjunction with the proposed development to protect the environment and a documentation of the likely effectiveness of those measures. This includes any site rehabilitation or restoration needed as a result of previous operations and the relationship of the integration of future operations to the overall development on the site.

8. Justification of the proposed development in terms of environmental, economic and social considerations.

9. Any feasible alternatives to the carrying out of the proposed development and the reasons for choosing the latter.

10. The consequences of not carrying out the proposed development.

11. Specific matters for consideration.

In addition to the matters listed above, particular regard must be given to the following matters:

(a) relationship and extent of the proposed future development to the total completed scheme

(b) where appropriate, the integration of the proposed development with development previously carried out

(c) the sequence of extraction

(d) the management or control of water resources including where relevant:

  (i) water quality of any lake or other waterbody

  (ii) flood control

  (iii) stability of watercourse bed and embankment

  (iv) water depth of any lake or other waterbody

  (v) source of water in order to fill any lake or waterbody (including the quantity of water from that source) and

(e) the rehabilitation and restoration of the land including:

  (i) soil conservation

  (ii) structural stability

  (iii) landscape design

(f) any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.

12. Supporting documentation

(a) Maps, plans, photographs to illustrate the existing and proposed development, including land rehabilitation or restoration.

(b) Results of material quality tests where relevant.

13. Consultation and approvals

(a) Documentation that all appropriate consultation with relevant authorities has been undertaken and necessary approvals have been or will be sought.

Appendix B

Appendix B

Issue	Council	Soilcon	EPA	Syd. Water
1. Statement of Objectives				
- Continue to meet market demand	x			
- Optimise resource with sustainable mine plan	x			
- Rehabilitate site	x			
2. Planning Controls				
- Current	x			
- Previous	x			
3. Description of Quarry Operation				
- Extraction schedules / sensitivities	x	x	x	
- Quarry planning	x	x	x	
(ie, plans, sections, descriptions)	x	x	x	x
- Site boundaries, buffers, batters etc	x	x	x	
- bench inclinations / gradients				
(ie, 3D, ie lateral (2) and vertical)				
- Extraction methodology	x		x	
- On-site processing	x		x	
- Stockpiling / loading of quarry product	x		x	
- Description of previous operations	x			
- Product transport	x			
4. Physical Description of the Site				
- Site survey / topography	x	x	x	x
- Site geology	x			
- Site use (rural and quarry)	x			
- Major environmental features impacted	x	x	x	x
5. Environmental Interactions				
- resultant from stripping, quarrying & rehab	x			
(ie, removal of soil cover, changed slopes etc)				
6. Resultant Environmental Impacts				
- flora / fauna	x			
- visual	x			
- site drainage	x	x	x	x
- erosion / sedimentation	x	x	x	x
- dust	x		x	
- noise	x		x	
- transport	x		x	
- progressive site rehabilitation	x	x	x	x
7. Environmental Protection				
- Diversion of undisturbed runoff around quarry	x	x	x	x
- Catchment of disturbed runoff	x	x	x	x
(ie, drainage plans, dam design etc)				
- Dam & watercourse stability / armour	x	x	x	x
- Controlled discharge (perforated risers etc)	x	x	x	x
- Erosion and sediment control	x	x	x	x
- Dewatering and disposal of silt	x	x	x	
- Site discharge / water quality	x		x	x
- Dust suppression	x		x	
- Noise control (hours, production levels etc)	x		x	
- Limit on truck numbers	x		x	
- Rehabilitation of worked out benches	x	x	x	x
(ie, reprofiling, topsoil, planting, irrigation etc)				
- Landscape design / consultants	x	x	x	x
- Slope stability	x	x	x	x
- Soil conservation / topsoil stockpiling	x	x		
- Selection of plant species / Soilcon	x	x		

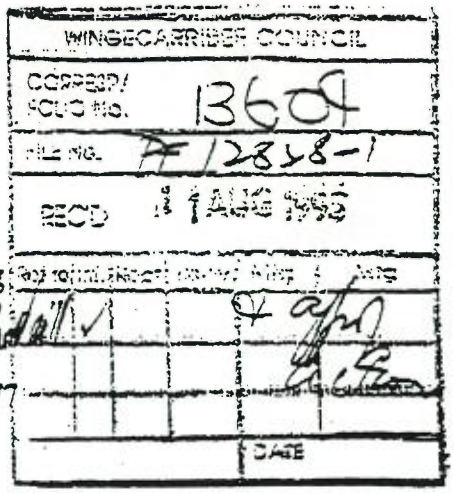
Bullio Quarry - Summary of Major Issues

- Determination of planting densities	x	x		
- Creation of habitat for native flora / fauna	x			
8. Justification of Proposal				
- Environmental / site rehabilitation	x			
- social / employment	x			
- commercial / regional significance of resource	x			
9. Alternatives				
- regional alternatives (other sites)	x			
- site specific alternatives	x	x		
(ie, closure, optimisation or progressive rehab)				
10. Consequences of no Development				
- cut supply to regional markets	x			
- loss of two (or more) jobs	x			
- unstable / "unrehabilitatable" site	x	x	x	x
11. Specific Matters Requiring Attention				
- Disturbed area only to be quarried	x	x	x	x
(ie no significant expansion of disturbed area)				
- Site rehabilitation requires reprofiling / quarrying	x	x		
- Development necessary to clean up site	x	x	x	
- Improved aesthetics / visual aspect	x		x	
12. Supporting Documentation				
- Air photographs	x	x	x	x
- Topographic surveys	x	x	x	x
- Quarry plans and sections	x	x	x	
- Rehabilitation plan	x	x	x	
- Drain and dam designs	x	x	x	x
13. Consultation and Approvals				
- Council	x			
- Soilcon / CaLM		x		
- EPA			x	
- Sydney Water				x

Appendix C

Sydney WATER

Appendix C



Ref: 215078F7

04/08/95

The Director
Environment and Planning
Wingecarribee Council
PO Box 141
MOSS VALE NSW 2577

Dear Sir,

On July 21, Frank Bewley and Ross Wallis inspected soil conservation works conducted on private property near Kracht's quarry (on the Wombeyan Caves Rd). We also took the opportunity to assess some of the soil loss from the quarry and felt that some further comment was required.

It appears some works have been undertaken to control soil loss from the quarry, with other soil conservation activities planned for the near future. We would like to draw your attention to the following points:

(1) A gully head has developed above the culvert. Unless appropriate control is undertaken, water movement through the quarry will continue to deposit sediment into the catchment and the gully head will progressively work its way up the drainage line. This head will be particularly active because of the extra water being diverted down the gully as part of the proposed drainage program of the quarry.

Suggested rehabilitation of the site would include battering the gully head and banks to an acceptable gradient, lining the earthworks with filter cloth and placing rock over the chute and banks. It is important that the filter cloth is keyed in and that the rock chute begins above the excavation and extends to the gully floor.

(2) Some minor erosion has developed in the table drain on the downslope side of the road.

(3) It is essential that some vegetative cover is returned to the site as quickly as possible. On all earthworks, batters and drains (excluding those directly relating to functioning of the quarry), establishment of a vegetative ground cover using a suitable pasture mix (with fertiliser) and/or Kikuyu should be attainable.

Head Office

115-123 Bathurst Street, Sydney, NSW 2000, Australia PO Box A53, Sydney South, NSW 2000, Australia

Phone (02) 350 6969 DX 14 Sydney

SYDNEY WATER CORPORATION LIMITED ACN 063 273 548

Sydney Water feels that these works will compliment previous (and proposed) soil conservation efforts. The cumulative effects of these works will reduce the level of sediment entering Lake Burragorang and assist in improving water quality in the catchment.

Please contact Ross Wallis on (047) 742 018 at our Warragamba Catchment Services office should you require further discussion on this matter.

Yours faithfully,

B. Waldron

Brian Waldron
A/Catchment Unit Manager
7.8.95

c.c. Guy VanOwen

CURRENT SITE

FINAL DEVELOPMENT

INITIAL DEVELOPMENT

FINAL REHABILITATION

Section Line

SECONDARY SETTLING DAM
WL 588

SPOON DRAIN

Sump
RL 575

PRIMARY SETTLING DAM
RL590

RL595

Bund to be extended along road frontage

RL595

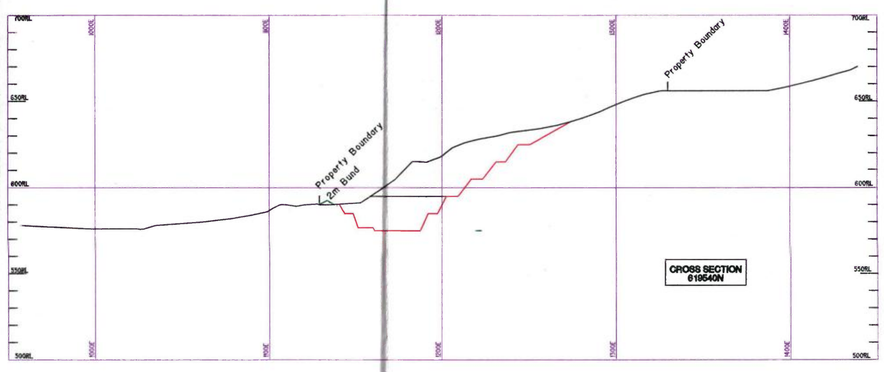
Tempory Sump

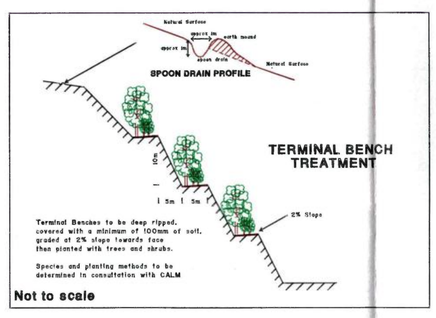
Quarry Entrance

Pit to be backfilled to with granite boulders and granitic sand.

NORTH

CROSS SECTION
619540N





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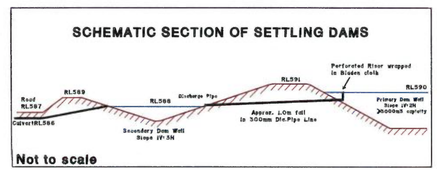

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LEGEND

- DEVELOPMENT APPLICATION BOUNDARY
- PROPOSED EXTRACTION LIMIT
- TITLE / PROPERTY BOUNDARY
- TOP OF EXCAVATION / FILL
- TOE OF EXCAVATION / FILL
- APEX OF EXCAVATION / FILL
- SLOPE CHANGE LINE EXCAVATION / FILL
- VEGETATION OUTLINE
- FENCE LINE
- UNSEALED TRACK / ROAD
- SEALED ROAD / KERB LINE
- WATERCOURSE / DAM OUTLINE
- BUILDING / STRUCTURE
- DRAIN LINE
- STOCKPILE / DUMP OUTLINE
- 500N — CROSS SECTION LINE
- POLE
- 500N / 300E — LOCAL / AMG GRID
- INTERMEDIATE CONTOUR
- 40.00 — INDEX CONTOUR
- 35 · 20 — SPOT HEIGHT at decimal point
- SURVEY MARK

SCALE 1:2000

0 20 40 60 80 100 120 140 160 180 200

METRES

HORIZONTAL DATUM : A.M.G.(Approx.)
VERTICAL DATUM : A.H.D.(Approx.)
CONTOUR INTERVAL : 2 metre
Site Topography & Detail Digitised by LANDAIR SURVEYS from Aerial Photography flown 30/3/95

BELL COCHRANE & ASSOCIATES Extractive Industries for
OUPAN RESOURCES PTY. LTD.

Development Application
BULLIO SITE, N.S.W.

DEVELOPMENT & REHABILITATION PLAN

Showing Current Site, 50% Developed, 100% Developed and Final Rehabilitation

Author : L.A.S. & B.C.A	Project No : C02_052
Drawing No. : NS-309	FIGURE No. : 3
Revision : 1 Date : 11/9/1995	