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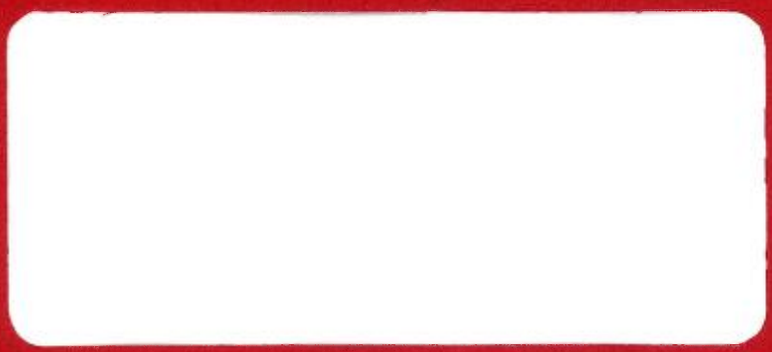
Environmental impact statement : extractive industry "Weavers Project" Old Northern Road, Maroota



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P.F. FORMATION

ENVIRONMENTAL IMPACT STATEMENT

EXTRACTIVE INDUSTRY
"WEAVERS PROJECT"

OLD NORTHERN ROAD, MAROOTA

June 88

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PREAMBLE

This Environmental Impact Statement has been prepared to accompany a Development Application by which Council's permission is sought to undertake various works involving the operating of an extractive industry (sand mining) on an area covering parts of Por 63 and Lot 3, Part Portion 66, Old Northern Road Maroota.

Some part extractive industrial activities has been completed and rehabilitated on Lot 3. Part of Portion 63 has been extracted in the past but these areas have not been rehabilitated.

The proposal addressed in this statement involves the extracting on Portion 63 of a low hill that is scarred by the previous mining operations; it is presently of no agricultural value. Although the completion of sand extraction and dam construction activities on Lot 3 are presently the subject of a separate Development Application, but Lot 3 is included in this proposal as it will be initially used as access to Portion 63 and for the location of processing equipment and stockpiles. The land will be progressively contoured and rehabilitated so that a smooth agriculturally productive slope runs from the northern side of Por 63 to the edge of the rehabilitated land on Lot 3.

The earlier Portion 63 operation involved the extraction of weathered Hawkesbury Sandstone and were carried out in conjunction with the construction of small farm dams. This operation has not been completed.

Extraction operations on Lot 3 have resulted in a relatively level agriculturally productive landscape and the completion of operations on the site, development consent for which works has been sought, will result in the construction of a groundwater sump.

FORM 4

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979 (SECTION 77(3)(d)).
ENVIRONMENTAL IMPACT STATEMENT

(i) This Statement has been prepared on behalf of P.F. Formation, C/- Mr. J. Graham being the proponent of the development application referred to below.

(ii) The Statement accompanies the development application made in respect of the development described as follows:-
Dam construction and transport of sand from the site and land rehabilitation.

(iii) The development application relates to the land described as follows:

Street: Old Northern Road

Locality/Suburb Maroota

Real Property description .... Portion 63, Parish of Frederick, County of Cumberland and,

.... Lot 3, D.P. 567166.

(iv) The contents of this statement, as required by clause 34 of the Environmental Planning and Assessment Regulation, 1980, are set forth in the accompanying pages.

(v) Name, Qualifications and Address of person who prepared Environmental Impact Statement:-

Collin C. Donges, MIS Aust., Dip. TCP., MRTPI, FRICS, MRAPI, DSip. Env. Stud., LGTCP, Dip. Leis. St., Regd Land Agent.

939 Old Northern Road, Dural, N.S.W. 2158.

(vi) Certificate
I, Collin C. Donges hereby certify that I have prepared the contents of this Statement in accordance with clauses 34 and 35 of the Environmental Planning and Assessment Regulation, 1980.

Collin C. Donges

DATE: 6·6·'88

EXECUTIVE SUMMARY

This Environmental Impact Statement has been prepared in response to a proposal by P.F. Formation to undertake various works including extractive industry, dam construction and land rehabilitation on the properties of Mr M Attard and Mr S Trovato on Old Northern Road at Maroota. The operation is to be known as the "Weavers Project".

Development consent is required for the proposal under the Environment Planning and Assessment Act 1979. The proposal is designated development under the terms of the Environmental Planning and Assessment Regulation 1980 and as such an Environmental Impact Statement must accompany the Development Application to Hornsby Shire Council.

Extractive Industry has previously been undertaken on both properties with a view to creating both increased water storage and arable land area. It has been reported that the owner of Lot 3, Mr. Attard, originally asked P.F. Formation to continue the extraction on his property when the previous operator proved unsatisfactory. Extraction and rehabilitation operations on his land are now nearly complete and having created almost 1.6 hectares of highly productive market garden created from a previously unuseable site have to that extent been very successful. The only remaining works to be completed are the excavation of a groundwater/catchment dam and associated landscaping. These operations are presently the subject of a separate development application to Hornsby Shire Council. However, Lot 3 is included in this proposal as the intention to lower the adjacent hillside on Portion 63 can be regarded as a continuation of the present operations, and facilities such as machinery, roadways and sedimentation controls will be shared.

Previous extraction on Portion 63 has been left incomplete and unrehabilitated. For the landowner to improve this area to agricultural production there is no economic alternative other than further extractive industry.

The Proposal

P.F. Formation proposes to complete extraction of weathered Hawkesbury Sandstone (eluvial sand) from a proposed damsite on Lot 3 and from a rugged, sloping retangular area of about 5 ha on Portion 63.

An estimated total volume of about 270,000 m^3 of sandstone is to be removed, processed into building and brickies sand and transported from the site over a four year period.

The objectives of the operation are to supply mortar sand to the Sydney building market; to raise capital from the sale of the sand; to increase the water storage capacity of both properties and rehabilitate the extraction site to agricultural production at the completion of operations. The rehabilitated land will be capable of supporting long-term orchard and market garden production.

The Physical and Biological Environment and Impact Potential

Weavers Pit is located on the properties, Lot 3, D.P. 567166 and Portion 63, Parish of Frederick, County of Cumberland. Both parcels have frontages to Old Northern Road. The land forms part of a shallow valley between Maroota Ridge and Marramara National Park and contains areas of markets gardens, orchards, water storage dams, pasture and extractive industry. Agricultural production, particularly gardening and orcharding, is heavily dependant on water supply, primarily from catchment dams within the properties. The nearest existing extractive industry operation is 1 km southwest of the site, within Baulkham Hills Shire and on the far side of Maroota Ridge.

Soils on the site are agriculturally marginal and erosion-prone but have been stabilised and made highly productive with appropriate management. Topsoil from the proposed extraction areas will be removed, stockpiled, contoured, fertilised and planted to provide visual and acoustic barriers around the site. The soil will then be re-used to rehabilitate the extraction area in the same procedure that has successfully improved the land within Lot 3.

Appropriate management techniques will be used to control erosion and sedimentation of the site and surrounds during operations; to this end Soil Conservation Service recommendations have been addressed in the proposal.

The Hawkesbury Sandstone is the dominant lithology in the Maroota district. The Weathered Sandstone occurring on the subject site is highly desirable to the building industry. The proposal, by itself or in combination with existing operations, will not have a significant impact on the reserves of this material, other than to maintain supply to the market place.

Noise control measures will be employed at all stages of the operation to ensure that acceptable noise levels will be achieved at all nearby properties potentially affected by the development.

Drainage through the properties is towards the southeast, through ephemeral channels. Most runoff is detained on the properties. All runoff from extraction areas will be detained in dams before discharging to a series of settling ponds in a tributary of Coopers Creek. No detrimental effect on water quality is expected from the operation.

The impact on groundwater during excavation and following prolonged agricultural usage of the groundwater resource will be negligible. No neighbouring properties will be significantly affected and no wider impact on the groundwater resource of Maroota Ridge is expected from this operation or from the combined effects of existing operations.

The area to be extracted is a heavily disturbed, cleared hillside presently incapable of supporting agriculture or quality native regrowth. No significant impact is expected on flora, fauna or biological habitats.

The dust generating potential of the operation has been shown by experience on Lot 3 to be low. Nevertheless, regular watering of dust generating areas such as roadways will be undertaken.

There is virtually no likelihood of archaeological material material being present on the site.

Land Use, Social and Economic Implications

The Maroota District is primarily a rural area with a number of small-scale extraction projects currently operating. The N.S.W. State Government has identified this general area as being an important source of construction sand for the Sydney Region. This Weavers area was in fact included in the draft Sydney Regional Environmental Plan 'Extractive Industry'.

The environmental impacts of this development are small and temporary in nature. Considerable attention has been given to minimising any such impacts and promoting rehabilitation of the land to high quality farmland. The progressive rehabilitation of Lot 3 during extraction, with its landowner benefits of improved land, water capacity and production potential, outweighs any temporary adverse impacts. The extraction proposal is at a small scale and has been designed to maximise sandstone recovery whilst minimising negative environmental impacts and maximising the area of useable rehabilitated farmland.

The proposal will not generate on Old Northern Road any increased traffic over and above that which was involved in the previous Lot 3 operation now subject of application for consent. The safety of motorists using Old Northern Road in the vicinity of the operation will not be compromised by trucks entering or leaving the access road.

The development does not itself demand, nor does it indirectly place a demand on, any community facilities provided by the Hornsby Shire Council. The site is accessed via Old Northern Road, - a main road administered by the Department of Main Roads, and does not place any immediately obvious demand or increased demand on the resources of Hornsby Shire Council.

The increasing scarcity of suitable and accessible fine aggregate sand for the Sydney Metropolitan Area has emphasised the importance of deposits at Maroota. The production/non-production of sand from the Maroota District has regional as well as local ramifications.

The consideration of alternatives to the proposal suggests that there are no viable counter proposals in which the above described objectives of the landowner and the applicant are achieved.

PART I OBJECTIVES OF THE PROPOSED DEVELOPMENT

The proposed development of this extractive industry aims to serve the needs of two identifiable parties:

i) the landowners; and

ii) the sand extractor (P F Formation).

The sand extractor will in turn be serving the needs of the Sydney building market. The sand extractor will be bound by all the requirements of this development proposal and by the development consent granted.

In the absence of demand for sand material from the construction industry in Sydney the sand extractor would have no incentive to utilise the resource on the subject property and to supply that demand. Without an extractive proposal the land owners would not have the opportunity for the land to be improved in a cost-effective manner, or to derive some temporary additional income.

The objectives of the landowners are:

a) to derive temporary income from the operation of an extractive industry on their properties, but only on the condition that extraction operations are totally rehabilitated to productive land;

b) to increase the available arable area on that property by rehabilitating the extraction area;

c) to increase the available water supply on their properties by joining and enlarging two existing dams on Portion 63 and by excavating a groundwater sump on Lot 3;

d) to increase the agricultural potential of the properties through increasing the area and quality of the new arable land, increased water supply and investment of income from the extractive industry in farm improvement;

e) to increase agricultural production from the properties;

f) to improve the 'drought proofing' of the properties by increasing water storage and enlarging the area of easily irrigable land;

g) to improve the value of the property, and

h) to improve the standard of living of the landowners and their families.

The objectives of the sand extractor are:

a) to efficiently obtain and effectively utilise a resource contained in the subject property;

b) to supply a strong demand from the Sydney construction industry for the use of the resource contained on the property;

c) to undertake a successful business enterprise;

d) to assist in satisfying the objectives of the landowner, and

e) to conduct operations in an environmentally sensitive and responsible manner.

The landowners desire improved land and income to carry out further improvements to their farms in order to create long-term viable commercial enterprises. The extractor can satisfy a market demand at the same time as satisfying the requirements of the landowners. The result of the proposed extraction will be an improved arable agricultural landform with an appearance compatible with the rural landscape, and an overall improved rural holding due to investments in farm improvement by the landowner.

The objectives of the proposed development are:

a) to improve the capacity and potential of an agricultural property by enlarging the water storage capacity of the site, creating an area of easily arable land providing capital for farm improvement;

b) to extract a regionally important resource material for use in the construction industry;

c) to satisfy a building market demand for competitively priced and readily available quality building and mortar sand material, particularly for increased development in the North West Sector of the Sydney Region;

d) to be undertaken and rehabilitated efficiently and effectively;

e) to minimise the potential for adverse impacts on the environment, the local community and the transport system during the conduct of the operation and following it; and

f) to provide a final landform which is of high quality, visually compatible with the rural environment and not a source of environmental disturbance.

The proposed development is formulated to satisfy these objectives.

PART 2:SITE INFORMATION

2.1 SITE LOCATION

The proposed development is to be located on two adjacent blocks of land identified as:

- Lot 3 (Volume 12333, Folio 228.), D.P. 567166.
- Portion 63, being the whole of the land in Certificate of Title Volume 4242 Folio 67.

- both within the Parish of Frederick, County of Cumberland.

The subject lands are located in the western part of Hornsby Shire, about 3 km north of Maroota and approximately 8 km south of Wisemans Ferry. Both parcels have frontage to Old Northern Road (Figures 1 and 2).

The proposed development site is contained within, and crosses the shared boundaries of, the subject lands, and occupies only a small portion of the total areas. The majority of the resource to be extracted is contained within Portion 63.

2.2 SITE ZONING

The subject lands are affected by the provisions of the Hornsby Shire Planning Scheme. Under this planning instrument the properties are zoned Rural 'C1' and Environmental Protection 7(e) "Valley Escarpment".

The Rural C1 - Zone covers the areas currently devoted to agriculture and sand-extraction. Within this zone agriculture may be carried out without the consent of Council. Extractive industries, however, may only be carried out subject to the obtaining of development consent.

The Environmental Protection 7(e) - zone embraces two small sections in the south eastern corner of Lot 3. The boundaries of these sections follow the

tops of escarpments in the subcatchments of two small tributaries of Coopers Creek. Within this zone although agriculture is permitted subject to development consent, but extractive industries are prohibited. The development site is not affected by the 7(e) zone.

Weavers Project is located on land zoned Rural 'C1'. This zoning acknowledges that extractive industries are a potentially compatible use in this zone. Development consent is required in order to ensure that appropriate consideration is given to the environmental implications of extractive development. The zoning does not indicate that extractive industries are considered to be incompatible in the locality and indeed, study of aerial photographs indicates that extractive industry has been quite a common use, over past years, in this sector of the Shire.

Although the deemed environmental planning instrument contains provision that agricultural uses, including, by deduction, dam construction and land husbandry improvement, do not require development consent in the zone, the proponent in this instance has declared that his primary purpose is generally related to extraction. He therefore seeks formal approval of this aspect of the works.

The geological deposit and extractive industry potential of part of the Maroota area have been canvassed by the Sydney Regional Environmental Study - Extractive Industry and specific regulations relating to the area have been released with the gazettal of the associated Regional Environmental Plan (R.E.P.). The aims of this plan include, amongst others:

(a) to facilitate the development of extractive resources in proximity to the population of the Sydney Metropolitan Area and to keep the costs of supplying extractive materials to the community to a minimum.

(b) to ensure that extractive industries are carried out in an environmentally acceptable manner.

Schedule 3(n) of the Regulations to the Environmental Planning and Assessment Act, 1979, list extractive industry as a form of designated

development. The activities to be undertaken on Portion 63 fall into this category and thus, an Environmental Impact Statement is required to accompany the development application.

In keeping with the aims of the R.E.P. which does not specifically refer to the subject properties, this Statement addresses the current and potential impacts of the extraction process and, where these impacts are significantly negative, recommends procedures to mitigate undesirable effects.

2.3 SITE DIMENSIONS AND ENVIRONMENT

Lot 3 has a total area of 50.5 hectares. Portion 63 covers an area of 16 hectares. The shared boundary being the southern boundary of Portion 63, has a length of about 920 metres. Relevant details are shown in Figure 3.

The Maroota area is primarily a rural district with farming allotments being confined to the crests of Maroota Ridge along which Old Northern Road passes in a north-south direction. The properties lie in the upper catchment of Coopers Creek which drains the eastern flank of the ridge and then joins the Hawkesbury River.

East of the properties lies Marramarra National Park and the dissected Hornsby Plateau which supports extensive stands of mature forest. The undeveloped land is generally of poor quality and capable of supporting little agriculture without improvement and irrigation.

2.4 EXISTING DEVELOPMENT AND LAND USE

Portion 63, purchased in 1969 by Mr & Mrs J Trovato, is still occupied by them as joint tenants. A house, garage and several small sheds are located near the access track on Old Northern Road (Figure 4). The owners are currently tending 4 irrigated market garden plots and 1 orchard plot on their holding. Another plot is under development following improvement by earthmoving and rehabilitation.

Three small dams serviced by small pumps supply water for the irrigation. Sand extraction and dam construction have previously taken place in the

eastern portion of the property and the activities cover about 5 ha (Photograph 1). Access to the property is via a sealed road which services the extraction area and the buildings located on the properties to the north. The track leaves Old Northern road at the southwestern corner of the property and thence crosses to and parallels the northern boundary.

Lot 3, purchased in 1985 by Mr and Mrs M Attard, is occupied by them as joint tenants. A house and several sheds are located at the western end of the property. Much of the developed land is given to market gardening and also a water supply dam. The remainder of the property is being utilised as market gardens and water storage with a substantial portion remaining covered by native vegetation. Sand extraction and landscaping have taken place in the mid-northern section of the property over an area of about 2.5 ha. The majority of this area has now rehabilitated to agricultural production (market gardening) and removal of a few stockpiles, some recontouring and enlargement of a groundwater sump are the only works remaining to be completed (Photograph 2).

Access to the extraction and rehabilitation site is via an unsealed track that follows the northern property boundary. The track leaves Old Northern Road at the north western corner of the property where it also serves as an access route to Portion 63 to the north.

The properties are located in a rural environment and are surrounded by land holdings being used for orcharding, market gardening, and poultry processing. To the east of the properties is native bushland. Property boundaries and buildings are shown in Figure 5. There are several other existing extraction operations within a 2 km radius of this site.

PART 3: EXISTING ENVIRONMENT

3.1 TOPOGRAPHY

Portion 63 slopes down to the east from about R.L. 230 m at Old Northern Road to a minimum of about R.L. 190. The property then rises into a low sandstone hill crest at R.L. 210 m, which forms the majority of the proposed extraction area. The maximum natural slopes over this hill are at about 12% gradient. However, previous sand extraction operations have left a number of steep slopes including a cliff between 3 m and 10 m high and 200 m long along the southern boundary (Photograph 3). The eastern end of the property slopes upward from a saddle on the eastern side of the hill, to a heavily vegetated hillside (Figure 4).

Lot 3 slopes downward to the east from about R.L. 225 at Old Northern Road and is close to level across the area of present extraction and completed rehabilitation. This is at about R.L. 180 m (Figure 4).

The topography of both properties has been modified by extractive operations. Water storage dams have been constructed on both properties and a previously rugged unproductive area of rocky scrub on Lot 3 has largely been transformed into flat, arable, highly productive farmland.

3.2 LAND CAPABILITY

The Sydney Region North West Sector Regional Environmental Study shows that the Land Capability for Rural Development of the properties is Class IV and Class VI. Class IV land is described as being suitable for grazing or occasional cultivation when soil conservation practices are used. These practices may involve pasture improvement, stock control, application of fertiliser and minimal cultivation for the re-establishment of permanent pasture. Class V land is described as unsuitable for cultivation and needing soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin.

The area has also been severely affected by drought several times during the last decade. Clearly, without extensive modification including supply of water, clearing of vegetation and redistribution and improvement of the soil, the agricultural potential of the undeveloped land is low. Such operations are time consuming and generally prohibitively costly. Dam construction and land rehabilitation with associated sand mining is one of the few affordable land improvement methods available to farmers in the district.

3.3 SOILS

The properties are located within the mapped extent of Walkers (1960) Hammondville Series. It occurs on the thinly laminated shales and sandstones of the Mittagong formation and characteristically has yellow podzolic soils. The soils are duplex in nature and typically consist of a thick (30 cm), well developed, sandy loam. A horizon over a yellow B horizon which becomes increasingly clayey with depth. The generalised soil profile typical of this area is described below.

1. A loose brown acidic sandy loam which occurs as a topsoil. Rock fragments and ironstone nodules may also be present.

2. A yellow earthy sandy clay loam which occurs as a subsoil.

3. A white sandy clay loam which is strongly weathered sandstone bedrock. (This is the material which is being extracted.)

The depth of the top two layers varies according to the slope gradient but is generally 10-30 cm. Topography exerts strong controls on the soil profile and thus the depth of topsoil and the extent of leaching (affected by drainage) is highly variable. Topsoil depth varies from more than, to less than adequate over relatively short distances.

The two subject properties have soils that are part of the sequence described above, however the thickness of the soils is variable (i.e. thin and discontinuous over steeper areas) and has been locally modified by agricultural improvements and extractive operations.

Except for the scrub covered portions of the hill on Portions 63 the proposed extraction area has largely been stripped of topsoil. This material is now stockpiled around the site.

3.4 GEOLOGY

The Maroota district lies within the Sydney Region in an area dominated by the presence of two major consolidated lithologies, i.e., the Hawkesbury

Sandstones and the Ashfield Shales. At Maroota these units are overlain on the ridge crests by a series of sedimentary deposits (refer stratigraphic sequence below).

AGE	UNIT	LITHOLOGY
Quaternary	Soils	Variable
Tertiary	Unnamed	Basalt
	Maroota Sand	Sand, gravel, clayey sand, and clay
Triassic	Ashfield Shale	Shale and laminite
	Hawkesbury Sandstone	Quartzose sandstone with shale lenses

The Maroota Sands have been systematically investigated by the Geological Survey of the N.S.W. Department of Mineral Resources (Uren 1973, Gobert 1975 and Etheridge 1980). However, little investigation of other important sand sources in the area, including those within the weathered Hawkesbury Sandstone being worked on the Weavers Project, has been undertaken.

The proposed Weavers Project covers an area of highly weathered Hawkesbury Sandstone with occasional clay lenses. It is similar to the association occurring further south towards Maroota (see Figure 6). Raw Hawkesbury Sandstone is generally massive with well developed cross bedding and intercalations of shale and siltstone. Bulk grain size is generally in the range of fine to medium sand but sorting is generally poor with some silt and pebble grains being present. The poor sorting is termed well graded in the sand industry and is highly desirable in fine aggregate sand. The weathered rock varies in colour from white to red-brown. Easy extraction

is facilitated by its soft and friable composition. Where the weathered zone has occurred consistently above the water table it is leached, to a loose white sandy soil known as eluvial sand (Etheridge 1980).

3.5 CLIMATE

Rainfall and temperature data were obtained from the Sydney Region North west Sector Regional Environmental Study. Average rainfall at the site is about 800 mm/year. Average maximum temperatures in January are about 28°C and average minimum temperatures in July are just under 4°C.

Wind data is available from a gauging station operated by the Bureau of Meteorology at Glenorie Post Office. (Appendix C) As Glenorie is located only 20 km. to the south, it is expected that site conditions would be broadly similar. However, the location of the extraction below a ridgeline could provide some sheltering effects.

During the whole of the year morning breezes predominantly occur in a sector between north west and south west with by far the majority of movements rising from the north west. For evening breezes, although May to August movements occur generally from between the same north west to south west sectors, the predominant annual movement is from the north-east to south-east sector with the greatest percentage coming from the east.

3.6 ACOUSTIC ENVIRONMENT

The existing acoustic environment likely to be significantly affected by the proposed development was determined by direct measurement of the background noise levels adjacent to several nearby residences closest to the site. This was done to determine what locations would be sensitive to noise generated from the site.

Appropriate standard measurement techniques were used to determine the average minimum noise level fluctuations (L90) or background noise, and the average maximum noise fluctuations (L10).

The positions of the noise measurement locations are shown in Figure 7 and the results shown in Table 1 below. Descriptions of the locations follows.

Table 1 - Statistical Noise Levels

Location	Date/Time	dBA			
		L90	L10	L1	L50
A	10th Feb 1988/8.55 am	35.5	53.0	60.8	42.0
B	10th Feb 1988/8.05 am	37.0	44.5	48.3	40.5
C	10th Feb 1988/8.25 am	38.0	61.0	72.8	45.0
D	10th Feb 1988/7.50 am	35.0	49.3	58.3	40.8

Background noise measurements were not recorded for residences 'E' and 'F'. Residence 'E' is on the subject site. Residence 'F' would have similar noise readings to residence 'D'. Previous acoustic studies at other residences along the Eastern side of Old Northern Road showed similar L10 levels of 33.5 to 38.8 dBA.

The main noise sources are traffic flow on Old Northern Road, activities of market gardeners, bird life and general community activity.

Location A This residence is located adjacent to Old Northern Road and at a similar level as the road. The residence is exposed to activities on the adjacent market gardens. Activity on a rural residence at the western side of the road was clearly audible.

Location B This residence is close to both the boundary of the proposed site and market gardens. A chicken feed processing plant is immediately adjacent to the residence but was not operating while the noise measurements were made, nor were there any truck movements associated with the plant recorded. Traffic on Old Northern Road was audible, birds, insects and general community activity resulted in a background noise level typical of the area.

Location C This residence is located close to Old Northern Road and experiences higher noise levels due to traffic movements.

Location D This residence is partially shielded from traffic movements on Old Northern Road. Other noise sources including birds, insects activity at the adjacent market gardens and distant aircraft.

Location E This residence is at a similar distance from the traffic as Residence 'D' and would be expected to have similar noise readings as 'E'. The residence is within a market garden and is subject to noise levels from this activity.

Location F This residence is further removed from Old Northern Road and from other extensive noise measurements would have noise levels from less than 35 dBA to less than 38 dBA depending on the extent of the general community activity and traffic flow on Old Northern Road.

There are further residences at longer distances from the site and along the western side of Old Northern Road. These residences are generally acoustically shielded from the site by natural topographical differences.

3.7 SURFACE WATER HYDROLOGY

The main elements of the existing surface hydrology, including drainage patterns and catchment boundaries, are shown on Figure 8.

The properties are both in the catchment of Coopers Creek which runs into Marramarra National Park. Both drain to the east from Old Northern Road with much of the runoff from the western end of both properties being detained in farm dams. Due to the construction of water storage areas and changes to the topography associated with agricultural practices and extractive industry, the drainage pattern over the two properties has been substantially modified from the original forested catchment.

Runoff from the western sector of Portion 63 is detained in two dams which have an overflow passing to a dam in Lot 3. The drainage pattern in the area east of the hill in this Portion has been heavily disturbed by the extraction activities and the construction of three settling ponds which hold all runoff from this small catchment.

Drainage from the western side of Lot 3 is detained in a pond used for irrigation purposes. East of the pond the land has been disturbed by mining and rehabilitation activities. This area is largely internally draining to a groundwater sump with any runoff from the rehabilitated area draining to the creek at the eastern end of the property. The tributary of Coopers Creek which drains the eastern end of both properties passes through a settling pond before discharging through a pipe underneath the farm track inside the southern boundary of Lot 3. Further downstream, in the largely undeveloped portion of Lot 3, two further dams have been constructed as part of irrigation measures (Figure 9). Hence, any water discharged from subject properties passes through an existing three-stage settling-pond system before discharging into Marramarra National Park.

As with most market garden lands erosion and sedimentation potential over the cleared sections of the properties is moderate. However, the erodability of the exposed sandstone is low, and exposed soil and extraction areas are now largely close to horizontal, thus minimising potential runoff and erosion. The small amount of sand and mud presently detained in existing dams indicates the low volume of material eroded from the site. As recontouring and rehabilitation operations continue the volume of eroded material will further reduce.

3.8 GROUNDWATER HYDROLOGY

The Weavers Project area generally consists of Quarternary soils overlying partially weathered Hawkesbury Sandstone. Fresher Hawkesbury Sandstone outcrops in places, particularly to the north and west.

The fresh Hawkesbury Sandstone is generally an impermeable rock. However, discreet fracture horizons occasionally occur in association with

shale bands and other lithology changes thus creating permeable, wet zones parallel to the major horizontal bedding planes. These aquifers are confined by the adjacent impermeable sandstone and often form perched aquifer systems above the regional water table. An overall bulk permeability to the sandstone is given by vertical regional fracture zones which allow slow vertical drainage between the discreet aquifers. (Figure 10).

Where a deep weathered profile is developed in the sandstone, the resulting eluvial sand is permeable and can itself form a perched aquifer over the fresh sandstone. Although dams or large wells sunk into this material can provide a good source of farm water supply, permeability is too low to yield significant supplies to boreholes.

A depression running through the properties, leading to Coopers Creek, drains an area of about 0.2 km^2. Within this surface catchment two registered bores exist within 200 m to the north of the northern boundary of the properties. Bore 15051 is on the ridge. It is 85 m deep and has a water level elevation of about RL 200 m. The aquifer is reported at an elevation between RL 181 and 151 metres. Bore 35725 is at approximately the same surface elevation as the existing dam on Portion 66, that is, RL 200. It is 155 m deep with no recorded water level. The aquifer intersection is recorded at a depth of 60.9 m (RL 131 approx).

Within this site an experimental groundwater sump has been sunk into the groundwater table (Dam 'F' Figure 9). It has maintained its water level at close to the ground surface independent of any rainfall.

There are also some small water seepages along the present boundary between the two properties. Dam 'E' is designed to trap runoff from their western ends. Water from the farm dams, used for irrigation, eventually percolates down to recharge the groundwater.

A detailed analysis of groundwater conditions on the site was carried out by Australian Groundwater Consultants and is contained in Appendix A.

3.9 VEGETATION

By far the majority of the Maroota plateau area containing the overlying sand deposit has been cleared and horticulturally developed. Both subject properties exhibit the same pattern with extensive clearing and planting of the flat areas. The hilly eastern end of Portion 63 has largely been stripped of vegetation during past mining operations although some native scrub and bush remains. The western section is now under intensive agricultural cultivation.

Although the larger, wider easternmost sector of Lot 3 retains relatively large areas of native bushland, its western end has been totally cleared with only a few scattered native trees remaining. The vegetation is dominated by either commercial crops or grasses.

Along the Old Northern Road boundaries of both properties a border of mature trees has been retained.

The vegetation on the Hawkesbury sandstone immediately adjacent to the cleared areas is typical of such ridge-gully systems throughout the Sydney Region. There is a high species diversity and considerable local variation in structure and composition.

The vegetation is predominantly a Woodland (tree crown cover 10-30%, average height 10-30 m) though on areas of particularly skeletal soil it may become a low Woodland (average tree height 5-10m) to low Open Woodland (tree crown cover less than 10%), and on local areas of poor drainage, verging on perched swamps, trees may be absent being replaced by dense substratum of shrubs and monocotylidons.

The dominant trees of the upper canopy are the Scribbly Gum (Eucalyptus haemastoma) and Red Bloodwood (Eucalyptus gummifera). Individuals may be single or multi-stemmed, and possess lignotubers.

3.10 FAUNA

The area affected by this proposal is within the ridge-top plateau which, due to agricultural activities, has long been denuded of natural vegetation.

It is most likely that the cleared areas are frequented only by mobile species with habitats established in the nearby bushland.

The area may support a variety of small reptiles such as Blue-tongued Lizards, various skinks and commonly occurring snakes. Possums and wallabies are known to inhabit the surrounding bushland and foxes and feral cats could also be expected.

It is significant to note that a number of bird species was observed in very close proximity to a nearby dam site (Portion 198) while extractive operations were underway.

A complete list of bird species observed and species that may exist in the area is given in Appendix B. During this study no evidence of rare or endangered species was found and the proposed development site is unlikely to possess any significant native fauna habitats.

3.11 ABORIGINAL ARCHAEOLOGY

Both properties have been heavily disturbed to considerable depths by past agricultural and more recent mining activities. The possibility of any archaeological relics remaining in the area is extremely low.

The only undisturbed area included in this proposal, is part of the hill on Portion 63. This area has previously been investigated for items of archaeological heritage significance without any discoveries of artefacts or drawings on exposed rock surfaces (Collin C. Donges & Associates 1986). No further investigations were deemed warranted.

3.12 TRANSPORT

Both properties are accessed via a sealed reserved road which intersects Old Northern Road (Figure 4). This road is also used by trucks associated with a chicken-feed plant operated by Camilleri Bros and located to the immediate north of Portion 63. This processing plant generates about 9 truck loads of material per day and is a long established use in the locality. The combined traffic of the two operations is considered to be well within the capacity of the road. Unpaved roads provide vehicle access within the properties from the proposed project area to the reserved road.

The main transport routes serving the Maroota area are Old Northern Road and Wisemans Ferry Road. These and other major and minor roads servicing the area are shown in Figure 11. The property is located approximately 2.5 km north of the intersection of Old Northern Road and Wisemans Ferry Road.

Old Northern Road where it passes the properties, is two lanes wide, and is relatively straight and in good condition. The speed limit is signposted at 100 km/hr. Line-of-site distances are good (300 m to the north and 200 m to the south) near the entrance to the properties and the road rises to the north. This situation provides for safe ingress and egress from the reserved road.

Old Northern Road currently carries a moderate flow of local and tourist traffic. The Department of Main Roads Annual Average Daily Traffic (AADT) volume (1983) on Old Northern Road at Maroota is 1780; at Mid Dural Old Northern Road is carrying an AADT Load of 6990 vehicles.

Vehicle counts were carried out on Old Northern Road about 2 km south of the study site during September and November 1987. Traffic volumes were monitored on each occasion for a period of one week using StreeterAmet pneumatic traffic counters. The November survey included classification of vehicles into sizes based on axle numbers and grouping as detailed in Appendix E. Both surveys collected data for traffic moving in both directions as well as individual lane counts. The range of hourly traffic movements for the November monitoring period is shown in Figure 12.

Weekday Traffic

- During 24 hours total number of vehicles passing along both lanes at the monitoring point ranged from 1032 vehicles to 1611 vehicles.

- Total traffic volume starts to rise after 6 am and experiences two peaks with up to about 110 vehicles per hour, in the commuting hours between 7 - 8 am and 4 - 7 pm. Daytime traffic volumes range from these peaks down to minimums of 70 vehicles per hour.

- Outside the daytime peak flows total traffic volumes drop off sharply.

- Truck movements predominantly occur between the hours of 5 am - 5 pm with between 5 and 11 vehicles per hour, or about 10% of total traffic, at those times. Outside these hours truck movements are irregular.

- There were no distinct concentrations of truck traffic, however slight peaks were noted between 8 - 9 am , 12 - 1 pm and 2 - 3 pm. These peaks did not coincide with peaks of car traffic movement.

Weekend Traffic

Weekend traffic patterns are distinctly different to those during weekdays. The differences are attributable to the heavy use of the road by recreational traffic heading for the Wisemans Ferry area and National Park areas to the north. Large increases in cars towing trailers were noted thus indicating that such vehicles were caravans, trailers and boats. Weekend usage of the road is up to 300% higher than weekday usage. Data used is for both weekend periods monitored. The following points were noted:

Saturday

- Total number of vehicles passing the monitoring point (both lanes) during 24 hours was 1754 - 2212 vehicles.

- Total traffic volume starts to rise later than during weekdays however by 10 am car traffic alone exceeds the comparable weekday total traffic volume.

- Peaks of traffic volume occur between 12 - 1 pm and 4 - 6 pm. Weekday peak volumes are exceeded between 10 am to 6 pm and all evening traffic volumes are higher than for corresponding times during the week. Late night car traffic does not drop below 40 vehicles per hour.

- Truck traffic volumes are comparable to the average weekday figures with a slight increase over the period 6 to 8 am. No major differences in truck traffic occur after this time although trucks appear to run later at night, and they make up a smaller proportion (5 - 6%) of the total traffic.

Sunday

- Total number of vehicles passing the monitoring point (both lanes) during 24 hours was 2911-3287 vehicles.

- Total traffic volume rises later than during weekdays, however between 10 am - 9 pm traffic volumes are 2 to 3 times the corresponding weekday volumes.

- Peaks of car traffic occur between 12 - 1 pm (251 vehicles per hour) and 3 - 4 pm (309 vehicles per hour).

- Truck movements are generally lower than weekday averages.

Truck Traffic

It is clear from the analysis of the data that truck traffic does not normally exceed 10% of the total daily traffic and is generally less. As a proportion of the total weekly traffic using Old Northern Road, only 6% are heavy trucks - 94% are smaller vehicles.

3.13 AESTHETICS/VISUAL AMENITY

The site is visually diverse and involves elements of woodland, pasture, ponds, rural buildings, orchards, original market gardens, extractive industry, unrehabilitated extraction sites, and vegetated rehabilitation zones. Neighbouring properties are similarly visually diverse and to the east is the visual bulk of the bushland of Marramarra National Park.

The existing development site may be viewed from Old Northern Road (about 450 m distant from the closest point of existing operations), the dwelling on

Lot 3, and the dwelling on Portion 63 (460 m distant from the closest point of operations).

Due to a dense, 40 metre wide band of trees along the northern boundary of Lot 2, the residences on that Lot to the south of the subject lands, has no sight lines to the development area. The dwelling on Lot 1 is about 500 m south of the Weavers Project and has lines of sight to the past and proposed extractive operations (Figure 5). Other distant views of the proposed activity from the south are obscured as the trees along the northern boundary of Lot 2, which are approximately 15 m high, shield the development site.

There are limited viewsheds and consequently, only limited numbers of residents and motorists can see the site. This, combined with the diverse visual quality of the predominantly agricultural area, means that the site is only of moderate visual sensitivity. Furthermore, the aesthetic value of the site has been degraded by previous, unrehabilitated extraction operations, particularly those on Lot 63.

On Lot 3 recontouring and rehabilitation operations have progressively improved the appearance of that eastern sector of the property which was previously scarred by unsuccessful dam-construction attempts. This area is now a level plane of market garden visually indistinguishable from others in the district.

3.14 SOCIO ECONOMICS

Land use in the Maroota area is consistent with that of a moderately populated urban fringe area. Much of the farmland has been developed from native bush during the last 20 years and numerous areas are presently undergoing clearing.

Following the failing economics of citrus orcharding and with increasing population densities in northern Sydney, market gardening is becoming a significant agricultural practice in the area. Some local small holdings are used for hobby farm purposes and rural industrial activity including poultry processing plants and aquaculture.

The damaging effects of drought and the reliance on water-intensive agriculture have prompted many farmers to excavate ponds or dams to contain rainwater, and, where possible, to tap the groundwater resource to 'drought proof' their properties and assure their financial security.

As market gardening has become the only economic landuse for some farmers, the pressure for arable land has created a need for development capital for land improvements. Land slopes suited to orcharding are not necessarily satisfactory for ground crops.

In the process of dam building and land levelling, and in the need to dispose of excavated sandstone, a regionally significant industry has developed in the supplying of building sand to the Sydney metropolitan area. The winning, processing and transportation of this sand is now an important local industry and local residents are employed in all aspects of the operations. Well managed and properly run extractive industries may be viewed as an integral part of the rural economy of the Maroota district.

Services in the area include a Primary School, a service station and a bushfire brigade station. The nearest shopping centre is at Glenorie to the south. Electricity is supplied throughout the area but domestic water supplies are generally reliant on rainwater and wells.

PART 4 EXTRACTION PROPOSAL DESCRIPTION

This section describes the extractive resources of the site and the nature of the proposed development and its operations.

4.1 THE SAND RESOURCE

The Maroota district is recognised as containing a regionally significant sand resource. Two types of sand material are located in the area. Tertiary "Maroota Sands", which are located in an area centred upon the Maroota Trignometrical Station, just to the south of the intersection of Wisemans Ferry Road and Old Northern Road, and Triassic Hawkesbury Sandstone which underlies the Maroota Sands and extends over a broader area. The sandstone contains occasional Ashfield Shale intrusions or lenses.

The proposed development site contains Hawkesbury Sandstone material underlain by a band of shale. The sandstone material is highly weathered and although hard in the ground, it is very friable and breaks down to sand particles upon extraction, exposure and processing. The sandstone material also has a high inherent water content as its structure permits easy vertical movement of water through the rock.

The resource below the proposed development site has a number of potential uses in the building industry e.g. filling sand, and construction sand. The resource is also in significant demand as mortar or brickie's sand. The weathered sandstone has a clay content of about 15% which provides ideal mechanical and working properties for use in bricklaying. The clay content means that bricklayers do not need to add chemical additives to the Maroota sandstone sand thus reducing construction costs.

The sandstone resource in the Maroota area occurs in a variety of colours - white, yellow, purple, black and in varying mid shades. Extraction operators in the area attempt to mix or blend colours of material in order to provide a consistent product or to meet particular market requirements. On the proposed site the colours of the material are predominently white, yellow and brown. The white sand is highly prized in the building industry. This

is due to the popularity of light coloured bricks and the colour compatibility of mortar made from this sand.

This material has in the past been excavated from both subject properties in order to enable farm dam construction, and, in the case of Lot 3, the repair and improve damaged and unuseable land. The operation on Lot 3 is near completion however considerable sand reserves still exist on Portion 63.

4.2 GROUNDWATER RESOURCE

Water moves vertically through the weathered sandstone until it encounters an impervious lens of shale. The shale prevents any further vertical downwards movement of water through the sandstone. Water within the sandstone is held in a pocket above the shale lens or moves horizontally over its rim. At the edge of the shale lens water might again continue to move downwards through the sandstone.

The nature of the relationship between the sandstone and shale provides that a considerable, but somewhat unpredictable, groundwater resource exists in those aquifers made up of water held in the sandstone above the shale lens. Excavation within the sandstone can encounter the layer of stored water held within the sandstone. Provided that the shale floor which holds the water within the sandstone is not punctured, an excavation within the sandstone will contain and retain groundwater and will recharge from rain and irrigation waters and from water travelling through the layer of sandstone.

Test-construction of a sump on Lot 3 has proved the availability of groundwater for the construction of the proposed dam. However, groundwater availability on Portion 63 is unknown and the dam to be constructed thereon is expected to largely rely on the containment of runoff.

4.3 SIGNIFICANCE OF THE SAND RESOURCE

The proposed operator, P.F. Formation, is currently supplying, from the Maroota area, about 40% of the Sydney Region's mortar sand requirements

(BIS-Shrapnel Pty. Ltd. (1987)). The utilisation of the resource on the proposed site will enable continuity of supply to a range of building and construction consumers who are relying upon P.F. Formation for material. Although the proposed development will be relatively small it is significant in the provision of access to material and in its place in a chain of supply.

Other sources of supply of mortar sand material occur within the Sydney Region, particularly at Londonderry (near Richmond) and Elderslie (near Camden). It is significant from the perspective of demand, that the Maroota sand is presently in greatest demand having the highest individual share of the Sydney market (BIS-Shrapnel Pty. Ltd. (1987)). The Maroota resource is also strategically placed to cater for rapidly developing residential areas in Hornsby and Baulkham Hills Shires. Should the Maroota resource not be available it would increase housing construction costs, but not necessarily heavy truck movements, in Hornsby and Baulkham Hills Shires. There would be greater transport costs involved with bringing sand from Londonderry or Elderslie.

4.4 HISTORY OF THE OPERATIONS

During 1986 Mr Michael Attard, landowner of Lot 3 D.P. 567166 approached P.F. Formation to undertake the construction of a dam needed to 'drought-proof' the property against the devastating effects of prolonged low rainfall as has occurred over several periods in the last decade. An ancillary part of the requirements was the reinstatement, and conversion to a productive state, of lands disturbed in an earlier, misguided attempt at dam construction in an unsuitable location. These activities are nearly complete but now await development consent.

For similar reasons akin to those of Mr Attard, Mr. Trovato, landowner of Portion 63, had also previously approached another extraction operator to construct a ground tank within his property. Further, landshaping of the area was to be undertaken to achieve a land form suitable for the planting of irrigated market gardens. Over the period 1984 to 1987 the operator removed, crushed and screened the sand deposits and marketed it to Sydney Region consumers as part of the landshaping goal. The site has not been used since April 1987 and has remain unrehabilitated.

4.5 PROPOSAL OBJECTIVES

The general objectives of the proposed development have been briefly addressed in Section 1. More specifically these objectives are as follows:

4.5.1 Production Objectives:

- total potential excavation from Portion 63 is estimated to be about 270,000 tonnes although considerable uncertainty exists in this figure because of the unknown quality of extractable weathered sandstone. Production of sand from the excavated sandstone varies according to the proportion of reject stone (generally about 20%), and its colour - i.e. some colours are unsaleable.

- production objectives are demand related. The maximum planned rate of output of the proposed development is 300 tonnes of sand per day. Due to equipment failures, bad weather and other circumstances it is unlikely however that such a level of production could be sustained over a long period. Realistically an annual level of production of about 60,000 tonnes is proposed (i.e. average of 210 tonnes per day). At such a rate of production the proposed development would have a maximum life of about 4 years.

Mr John Graham of P F Formation is familiar with the environmental problems associated with extractive activities in the area and will develop appropriate environmental safeguards to be incorporated into the project in accordance with his experience on these and other sites. These safeguards will be designed to:

- ensure that the land is rehabilitated to a useable form once extractive industries have ceased;

- maximise the efficiency with which extraction and product preparation is undertaken, and

- minimise negative environmental impacts.

4.5.2 Rehabilitation Objectives

Sand extraction is not an end use for the land on either lot. It is a means by which the land can be turned to improved agricultural production. It is envisaged that the rehabilitation will achieve several objectives allied to the protection of the environment i.e.

. the removal of the visual impact of extraction;

. the prevention of loss of valuable topsoil;

. the prevention of silt entering Coopers Creek after extraction has ceased;

. measures to reduce dust generation, particularly along the access road, and

. improvement to farm water supply from the contouring and grading of the land to maximise interception and storage of runoff in the newly constructed ground tank and enlarged dam.

Specific improvements to agricultural capacity include:

- a new market garden plot on Lot 3 of 1.6 hectares with the capacity to increase total production on the farm by about 30%. Most of this area has already been brought into production from previously unuseable land. The excavation of a groundwater sump of about 15,000 m^3 capacity will assure the supply of water to this area and thus maintain its productivity.

- on Portion 63 new market gardens totalling approximately 1.2 ha are proposed with new areas of orchards totalling approximately 2.5 ha. The new orchards will take the total number of on-site peach trees from 400 to 1000. Mr Trovato seeks the extra

orchards as a less labour-intensive source of income as he grows older. It is anticipated that the new land will eventually double the productive potential of the property to an annual output of 4800 cases of tomatoes and 3200 trays of peaches.

4.6 EXTRACTION OPERATIONS

Extraction operations follow the sequence described below.

1. Sedimentation and erosion control measures will be emplaced. Details of their construction and location are set-out at Section 4.8.

2. Vegetation has been previously cleared from most of the extraction site on Portion 63. Vegetation that remains will be cleared and stockpiled as part of the soil removal process.

3. Topsoil is removed from the ground surface in advance of the extraction operation. "Topsoil" will be considered as the 'A' and 'B' horizons described in Section 3.3 as this material is irregularly distributed and difficult to separate.

   The topsoil and any unuseable overburden will be separately stockpiled away from areas of future earthworks. Existing stockpiles on the hilltop on Portion 63 will have to be moved as mining approaches this area. Topsoil stockpiles will be formed into mounds by bulldozer or loader. Approximate dimensions will be: up to 4 m high, up to 24 m wide and as long as necessary. Slopes will be at a maximum of 1 in 3 and excessive breaking up or compaction of the soil will be avoided as much as possible. The maximum anticipated lifespan of the topsoil stockpiles is to be the lifetime of the mine (4 years) - but will generally be less as the oldest stockpiles would be the first used in rehabilitation operations. Temporary stockpiles may be created from time-to-time during stripping and rehabilitation operations. Where these

are expected to have a lifetime of 30 days or more they will be protected from erosion by applying a mulch and/or establishing grass cover.

Grass species to be used in stabilising the stockpiles could be white clover or kikuyu dressed with a NPK fertiliser at appropriate rates. When climatic conditions require, watering of the stockpiles will be carried out. This can be effected from the truck used to water the roadways as a dust suppression measure and can be carried out as part of these operations as frequently as necessary to maintain grass cover. The grass cover will be used as a turf farm to provide turf blocks to sprig the rehabilitation area with grass to aid the regeneration of ground cover.

Sedimentation control measures will be established around the base of each stockpile. To contain any eroded material such control would be in the form of a low bund or haybale wall. No leachate problems are anticipated with these or any other topsoil stockpiles.

Advice from the Soil Conservation Service (Parramatta) and from published guidelines (e.g. Soil Conservation Service, 1985) was utilised in the development of these procedures.

The stockpiles will be strategically located to form part of the noise control and visual impact control measures. These mitigation measures are further discussed in Section 4.8.

4. When the overburden has been stripped to expose the eluvial sand resource a bulldozer will be used to rip and push the easily-worked material into one of a number of large mounds in a working area (the development and location of the working areas is detailed in Section 4.8). The resource is relatively soft and is easily worked by on-site machinery without the need for blasting. The ripping process is not a noisy or difficult operation.

The working of the material and its exposure to the elements rapidly breaks down the sandstone into loose sand and resistant blocks (boulies). It is then easily worked by a front-end loader.

The deposit is progressively excavated by ripping and removing successive layers of sandstone for processing until either a predetermined base level or unuseable material is reached. It is not intended to excavate deeper than the final proposed ground level as indicated in figure 18.

5. The stockpiled sand will be transported a short distance by front end loader to a screening plant which will be located at a low level within the site, below the existing ground level where possible, close to the workings and surrounded by sound-screening stockpiles. Raw material and product stockpiles are typically conical in shape and up to 5-7 m high. Location of the screening equipment and stockpiles is further discussed in Section 4.8.

The diesel powered screening plant acts to further break up the sand and remove any foreign matter such as rocks and vegetation. The various grades of sand are then screened separately and directed to stockpiles in the immediate vici nity of the screening plant. If the clay content of the sand exceeds market specifications, washing may be required. Particular colours of sandstone (browns, whites etc) are selectively processed and stockpiled for removal.

Screening is a dry operation. Normally the processed sand would only be stockpiled for short periods before transportation as it would undergo processing when specific orders were received. However, to assure supply of a specific quality product for a particular client or project, relatively large stockpiles of material may be held on site. Such stockpiles would be carefully positioned to screen the operations of the pit from possible noise or viewsheds. Long term stockpiling would be avoided where

possible because of the demands placed on working space and hence the possible delay of rehabilitation procedures and dam enlargement.

Oversize material from the screening operation is conveyed to a reject stockpile adjacent to the cleaning plant. This stockpile is cleared and managed on a daily basis. The material is re-screened several times to further break it down. The resistant reject material is then stockpiled for incorporation into the rehabilitation program.

4.7 REHABILITATION OPERATIONS

As mining proceeds in a westerly direction and the worked-out area to the east becomes larger than required for mine operations, rehabilitation procedures will commence on the unused land. These procedures are relatively straightforward and has been used with considerable success on Lot 3 and on other P.F. Formation operations at Maroota.

The operations are as follows:

1. The exposed, mined sandstone is deep ripped along the contour by bulldozer to break up the sandstone to about 0.5 m depth to improve its drainage characteristics. General contouring is also carried out at this stage.

2. Course overburden and screening rejects (Boulies) are emplaced over the ripped sandstone to create a free-draining subsoil and build up the surface level.

3. Fine overburden and screening rejects (sand and gravel sizes) are emplaced and contoured to the final ground level.

4. Contour banks and small sedimentation dams will be provided to control erosion.

5. Following final contouring of a rehabilitated area, topsoil will be retrieved from stockpiles and re-spread over the area to a nominal

depth of 100 mm and cultivated to blend with the overburden. The soil ph will be adjusted to neutral with lime application, followed by application of NPK fertiliser and appropriate trace elements such as calcium to manufacturer's instructions for cropping or pasture on sandy soil. A quick growing crop such as lupins will be sown to stabilise the soil against erosion; fix nitrogen content and to provide an ideal mulching crop to improve the soil for subsequent agricultural usage.

Lupins may be substituted or followed by grasses, such as Serradella and Kikuyu in summer or white clover and oats in the winter, to further stabilise and improve the topsoil.

6. The soil will then be used for market gardening or grassed for subsequent orchard development. A typical free-draining rehabilitated soil profile is depicted in Figure 13.

On the flat areas intended for market gardening, immediate cropping of the soils with cauliflower or tomatoes may be tried if soil quality permits (as with Lot 3). On the sloping northern side of the property soil improvement followed by establishment of grass cover will be followed by planting of peach tree seedlings in association with localised soil improvement (fertilising and mulching) and irrigation.

These final stages of soil improvement will be the responsibility of the landowner and managed as he sees fit according to his needs and experience.

Another plot on Portion 63 has already been extracted and rehabilitated to improved condition. The area of about 1 ha (Figure 4) was previously in use for cropping but was of marginal value because of thin, poor soils and inadequate drainage which stunted plant growth. The area was lowered by extraction by up to 3 m and the sandstone ripped. The extraction rejects,

overburden and topsoil were replaced and cropping of cauliflowers, then tomatoes undertaken. The landowner considers this area to now be much superior to its original condition because of the reduced gradient, evenly distributed topsoil and improved drainage.

7. The steepest slopes planned for agricultural usage on Portion 63 are 1 in 3 (18°). These slopes will be constructed in the same manner as the flatter market gardening areas i.e. by replacing topsoil over compacted mining overburden and rejects over ripped sandstone. Experience on this and other local P.F. Formation operations has shown that the reconstructed 1 in 3 slopes are stable, and when vegetative cover is re-established, erosion resistant. No special technology is proposed for batter stabilisation, however appropriate methods will be applied in the unlikely event of slope instability.

No slopes will be constructed any steeper than 1 in 3. If such slopes remain (i.e. around dam sides and between Portion 63 and Lot 3) they will be in undisturbed sandstone which is extremely stable in even vertical cut slopes. Where necessary these areas will be seeded with native shrubs via hydromulching techniques or similar, to establish ground cover. This will protect the surface against any minor erosion that may occur and will visually improve the site.

4.8 MINE PLAN

The extraction strategy proposed has to address the needs of the two properties. These include:

i) the continuation of those Lot 3 operations which include the extraction of remaining sandstone by construction of a pond;

ii) completion of rehabilitation of extracted land on Lot 3 and the commencement of agricultural production as soon as possible;

iii) the processing of material excavated from Portion 63. This, during initial operations, will take place on Lot 3;

iv) the continued access by trucks, through Lot 3 to the extraction area on Portion 63;

v) the utilisation of existing sedimentation control measures on Lot 3 for runoff from the Portion 63 operations, and;

vi) the progressive extraction and rehabilitation of Por 63 while reducing the visual and noise impact to neighbouring properties and Old Northern Road.

The area to be extracted includes the eastern end of Portion 63 with three existing water storage/sedimentation ponds, and the low, sparsely vegetated, partially mined hill in the middle of the site. This area, which includes most of the non-productive land on the property, presently has low development potential due to topography, poor soil and damage from previous operations.

This area has been selected for extraction because:

- it is presently unproductive;

- it cannot be made productive without levelling and soil improvement;

- it is the best location on which to construct a dam to catch runoff from the western portion of the property;

- there is an area scarred by previous mining operations that cannot be economically rehabilitated;

also

- the area is adjacent to the existing operations on Lot 3;
- a cliff up to 10 m high forms the border between the 2 sites and it would be desirable to reduce the visual impact thereof and to remove the height difference between the properties
- the proposed extraction area has considerable reserves of high quality sand material;
- the site can be exploited with minimal impacts to surrounding properties and Old Northern Road because of the sheltering effects of the low hill to the west of the extraction site;
- a minimum of site preparation is required to start exploitation of the area and sectors not to be exploited immediately can remain under vegetation; and
- runoff from the site can be entirely contained in dams on the site and any discharges from the dam then pass through a series of settling ponds on Lot 3, thus reducing the potential for off-site impacts.

4.8.1 Dimensions of the Proposed Development

The excavations of Portion 63 will have a floor level below the proposed final rehabilitated ground level - this level will be determined by rock conditions encountered and the proportion of rejects to be incorporated into the rehabilitation operations.

The final depth of cut will be such that grades sloping to the south will not be less than 1% and any stockpiles will be positioned above appropriate

catch drains to allow the site to be totally internally drained to the dam in its southeast corner. Maximum depth of cut will be about 15 m below existing ground surface and the total extraction area is 310 m long by 190 m wide (Figures 14 - 18).

Utilising the excavation/rehabilitation procedure detailed in Sections 4.6 and 4.7, the following extraction strategy is proposed. The extent and location of these developments are illustrated in Figure 14.

4.8.2 Development Sequence

1. Construction of an access haul road from Lot 3 to the initial excavation area in Portion 63 will commence. Part of the existing cliff will be retained to help screen the new road and the subsequent mining operations from properties to the south. Completion of the excavation of the groundwater sump on Lot 3 will also begin with temporary location and operation of screening equipment on Lot 3 to process the material extracted.

   A washing plant may be installed to address demand for washed sand. Water for the washing operation will be pumped from Dam 3 down to the plant, used and pumped back up to a temporary settling pond located in Dam 1 (see Figure 4). The overflow from Dam 1 will pass into another small settling pond before discharging to Dam 2, the overflow from which will go to Dam 3. The settling ponds will be periodically excavated to maintain their efficiency. This will be a closed water system and under normal operation no outflow will occur from Dam 3 to Dam 4. Very little net water usage will result from this process.

   Erosion and sedimentation control measures will also be constructed at this stage to deal with any material released by subsequent earthworks.

2. The area previously excavated and not rehabilitated will be cleaned up by removing and processing existing raw material stockpiles and by relocating and seeding topsoil stockpiles.

Excavation of the area above Dam 2 will commence. This will require the temporary removal of the existing settling ponds and the construction of new ponds adjacent to Dam 2. Water will still be pumped from Dam 3 to the washing plant, used, then pumped to the new ponds, then allowed to drain to Dams 2 then 3. Excavation of the area will proceed by progressive benching and lowering of the surface until the final proposed ground level is reached. When excavation is complete the sedimentation ponds will be reconstructed on a larger scale.

3. Excavation of the enlarged dam covering the existing Dams 2 and 3 would then commence. This would initially involve the pumping out of Dam 2 and the excavation of the underlying rock to the final intended bed level of the Dam. A bund will be maintained between this area and Dam 3. Dam 3 could then be pumped out and excavated. This will involve the virtual removal of the present dam wall and the recontouring of the surrounding land. The bund wall will then be removed and the new dam completed.

The above operations are depicted in Figure 14.

When dam construction is completed mining will proceed in a westerly direction by ripping and removing successive layers of sandstone from north-south aligned benches. A new working area will be created allowing the relocation of screening and washing equipment from Lot 3 to an area adjacent to the new sedimentation ponds. This will allow the completion of the groundwater sump on Lot 3 (Figure 15).

Extraction will be continued in a westerly direction leaving the western side of the hill intact for as long as possible to ensure that visual and noise impacts are minimised. Dimensions of extraction areas and bench sizes etc will be determined by the sandstone conditions encountered.

The maximum length of working area afforded by the north-south layout of extraction benches allows for the selective extraction of particular colours and grades of sand, making the operations more efficient and allowing for the progressive rehabilitation of extracted ground as mining proceeds.

Benches will be excavated in such a manner as to ensure that machinery operations at or near existing ground surface are limited to as short a period as possible. Where operations are close to the surface machinery will operate behind temporary bund walls of stockpiled material.

4. Topsoil removal will take place only as the process of mining requires and minimum areas will be disturbed. New erosion and sedimentation control works will be implemented as required (Figure 15).

5. As space in the worked out area becomes surplus to requirements for stockpiling etc, final contouring of the first extracted sector of the site will be carried out by removal of remaining sandstone to a depth determined by the anticipated final ground level. Reject material will then be emplaced and the rehabilitation procedure followed. The settling ponds above the newly enlarged dam will remain in operation with the fine material periodically removed from the ponds being used for addition to the topsoiling operations.

6. Rehabilitation will follow extraction operations as space permits, with the settling ponds being removed and rehabilitated when processing operations are complete. As with Lot 3, most of the site should be rehabilitated by the time extraction has been completed (Figures 16 and 17).

4.9 EROSION AND SEDIMENTATION CONTROL

4.9.1 Sedimentation Controls

The extraction site is designed to be totally internally draining to water dams or sumps.

Lot 3 operations are drained to the east to a regularly emptied sediment trap (Dam 4) which then flows on through two substantial dams (5 and 6) on the property before discharging to Coopers Creek (Figure 9). Recent examination indicated that the first trap was operating very efficiently and that after 3 years of mining no significant volumes of sediment had progressed to either the second or third dams. Sediment will be removed from the dams if it approaches 50% of the dam capacity.

The sedimentation ponds used to settle fines from waters used in the washing of sand will remove the bulk of sediment before it is discharged to Dams 2 and 3. Any sediment that enters the dams will settle and will not be discharged. In the rare event of an overflow of the dams during heavy rains, the water must still pass through three further dams before being discharged from the Weavers Project site. It is unlikely therefore that environmentally significant volumes of sediment could be discharged from the site even during peak runoff events.

The proposed operations on Portion 63 are designed to be internally draining to Dam 3 at the southeast corner of the property. Sedimentation traps on all drains leading to the dam will prevent large volumes of sediment from entering it. These traps (either settling pits excavated into sandstone or gravel and haybale traps) will be regularly emptied to maintain their efficiency. The sediment removed will be processed along with other extracted material.

It is unlikely that more than a few cubic metres of sediment will accumulate in the dam during the period of mining. The capacity of the present dam is estimated at 10,000 m^3, and thus is proposed to be enlarged by excavating to the north to connect with the adjacent dam. It is

therefore very unlikely that the capacity of the dam will be seriously affected by sedimentation.

Nevertheless, in the unlikely event that sedimentation reaches unacceptable levels (i.e. 50%) of the dam capacity), a Kato long-arm excavator or similar equipment will be used to remove sediment from the dam. The sediment would then be processed with other excavated material or used in rehabilitation.

4.9.2 Control of Runoff

Where runoff is to be diverted away from operational areas or erosion-sensitive zones, trainer banks will be used in preference to cutoff drains. The banks will be temporary and may be removed and reconstructed to allow extraction as necessary. The banks will be constructed of compacted soil or overburden. Sediment traps made of haybale walls etc will be constructed along the banks to contain any eroded material.

Where cutoff drains are used they will be of shallow, trapezoidal cross section up to 1.5 m wide and 0.5 m deep. Side slopes in these drains will be at 1 in 3 gradient. These drains would be constructed only in areas stripped of topsoil and hence would be excavated within sandstone or overburden in which significant erosion is either not expected or is of no environmental consequence. Hence no special measures to line the drains are proposed. Sediment traps will be constructed to trap any eroded material before discharge to the dam. The maximum area to be drained by such methods is 3 to 4 ha, hence the amount of runoff to be contained is limited.

4.9.3 Timing of Erosion and Sedimentation Control Measures

Drainage and sedimentation measures including stripping of topsoil or any extraction operations will be constructed prior to any stage of development. Diversion bunds will be constructed as required by the topography and the stage of development i.e. much of the site is internally draining and does not receive runoff from upslope, hence not all areas will require protection measures.

4.10 SERVICES

No electrical or water services will be required or disturbed by the project.

Access will be gained to the site via the unsealed haul road through Lot 3. To reduce the possibility of visual disturbance and noise generation, the sealed road along the northern side of Portion 63 will not be used. Within the site turning and loading areas for trucks will be developed and modified as required during the extraction of the resource.

The equipment proposed to be used in the operation will include the following items (or equivalents):

1. Front End Loader
   CAT 966D
2. Bulldozer
   CATD9
3. Dry Screening Plant
   Powerscreen Mk II
4. Water Pump
   Atlas Copco, diesel powered.

4.11 ENERGY

The development will consume energy in the form of diesel fuel and gasoline used in the equipment described in 4.10 and in the trucks delivering the product to market. No other significant energy sources are planned and no viable alternative energy sources are available.

Conservation of energy will be practiced at all stages of the operation as a matter of sound operational economics, and the following measures will be undertaken to minimise energy consumption:

- stockpiles and plant will relocate in order to have minimum haul distances;
- multiple handling of material will be avoided wherever possible;
- roadways and machinery will be kept in good condition to maintain the efficiency of the operation.

PART 5 ENVIRONMENTAL IMPACTS AND MITIGATIONS

5.1 TOPOGRAPHY

Progressive topographic changes which will take place throughout the operation of the mine will be as follows:

i) The flat rehabilitated area of Lot 3 will be extended westward through the present extraction area to the existing dam. A groundwater sump will be excavated adjacent to the eastern side of the existing dam. Existing stockpiles of raw material, product sand and topsoil will be progressively removed, leaving the lot 3 extraction area completely level.

ii) Excavations on Portion 63 will commence at the eastern end of the project area and progress westwards, lowering and levelling the ground surface and creating a single dam at its southeastern corner.

iii) Excavation of the low hill will be staged to retain the maximum visual and acoustic shielding of the operations. Hence the western end of the hill will be the last area to be excavated, thus allowing for the progressive levelling and rehabilitation of the rest of the site while still obscurred from view. Raw material, product and rejects stockpiles will be located to provide maximum visual and acoustic shielding.

iv) The extraction area on Portion 63 will be lowered and levelled and rehabilitated so that it will almost parallel (at a higher level) than on Lot 3. The northern boundary of the rehabilitation area will have a bank (at 1 in 3 or shallower) below the existing road, and the new land surface will slope to the south at about 1%. Trainer banks will direct all runoff to the new dam. No stockpile mounds or reject material will remain and the ground will be contoured to blend as much as possible with the existing topography.

v) The major change resulting from the development will be the virtual removal of the partly extracted low hill on Por 63. The presently steep and rugged exposed areas and the sheer wall between the two properties will be removed.

The final landform over the project site will be a gently sloping orchard area leading down to a flat market garden separated from Lot 3 by a low bank. The landform will be more natural in appearance than is the presently scarred landscape and will be ideal for productive and efficient farming.

5.2 LAND USE

At present the extraction site is either undergoing extraction, is scarred and unproductive, or is unusable, rocky hillside with scattered scrub and regrowth.

During operations the site will be progressively given over to extractive industry and subsequent rehabilitation. When complete the site on both properties will be productive market gardens and orchards with new farm dams to support the new agricultural land. The rehabilitation operations will greatly improve the productive capacity of the site and the potential range of uses to which it could be turned.

In a report entitled "Extractive Industry in the Hawkesbury Region" the S.P.C.C. (1977) stated that

> "... as far as possible sand and gravel extraction be confined to areas where optimum resource utilization can be achieved with least environmental impact. In these areas the operations should be co-ordinated so that they are planned, programmed and concluded to minimize overall environmental problems and create areas that can be put to useful purposes as quickly as possible".

This point is reiterated in the recent report by the SPCC, "Water Quality in the Hawkesbury-Nepean River". (1983)

This extraction project has all the qualities required to satisfy the above Government recommendations.

- The extraction is being undertaken in an area of negligible ecological and nil archaeological significance and thus the potential for significant negative environmental impacts is low.

- Dam construction and land re-contouring will dramatically increase the agricultural potential of this site by increasing the total water supply available to the entire property. In addition, the Department of Agriculture has recognised the importance of conserving quality agricultural land for future generations. However, these lands need to justify their economic existence in order to avert pressures for rezoning to alternate land uses.

Due to the isolation and nature of the extraction operation it is not expected to significantly impact upon or to compromise the viability or economics of existing or future land uses in the district.

The extraction project will not generate chemical or sedimentary pollutants capable of causing deterioration of water quality in Coopers Creek and Marramarra National Park. The settling ponds which are an integral part of the extraction process act as sediment detention basins which effectively reduce off-site movement of any material.

5.3 SOILS

Topsoil that has been removed, for rehabilitation purposes, from existing extraction areas on Lot 3 is presently stabilised by grass. This soil is to be used to complete rehabilitation operations in Lot 3. No serious difficulties have been experienced with this soil either during storage (erosion etc), re-spreading or improvement to cropping.

Portion 63 has a limited amount of topsoil available for redistribution. However, during past extraction operations significant amounts of soil have been stockpiled for future use at the crest of the hill. It is expected that

this material, with minimal improvement, will be suitable for topdressing and rehabilitation measures.

All remaining topsoil which is both practical to recover and suitable for use as topdressing soil will be removed from the extraction path and incorporated into the rehabilitation programme. Maximum conservation of topsoil will be practised.

If necessary, testing of the soil and overburden will be carried out to determine fertility potential and the best method of improvement to productive garden soils. If the soil proves to be particularly poor its spreading will be followed by addition of organic matter such as mushroom compost and/or chicken manure. This mix will be irrigated to aid the soil 'growing' process. NPK fertiliser and trace elements (determined by testing) will follow and a mulch crop (e.g. lupins) established. The same process has also been used in the area to improve fine overburden material where there is a deficit of topsoil for rehabilitation.

All drainage works on both properties during both the extraction operations and the rehabilitation program will incorporate safeguards to prevent or reduce soil erosion. Measures will include construction and maintenance of diversion bunds bordering extractive areas. These will prevent water entering the site and direct outflow through sediment settling ponds.

Some topsoil stockpiles may remain in place for the life of the works (about 4 years), however most will be removed earlier and used in rehabilitation operations. The maintenance of topsoil stockpiles is discussed in part 4.

Stripping and stockpiling of topsoil will have a deleterious effect on the structure of the soil, however such effects are also produced by ploughing and cultivation. As experience on Lot 3 has already demonstrated, appropriate soil management techniques by the farmers will restore the soils to full productive capacity.

Existing levels of topsoil erosion are likely to increase temporarily between the time of initial soil disturbance and the establishment of a satisfactory ground cover. However, given that most of the site affected was

unimproved scrubland, minimal adverse impacts are expected on the physical and chemical properties of the topsoil.

The sandy subsoil exposed during mine operations will be susceptible to moderate water erosion but this will involve clean sandy material that will be trapped in drains and settling ponds and will hence have inconsequential impact outside the site. Due to a lower slope angle, the rehabilitated land is expected to have lower soil erosion potential then the present slopes.

The major impact of the extraction/rehabilitation activities on the soil will be an improvement in its suitability and potential for agricultural production (Figure 13).

5.4 GEOLOGY

The total potential reserves of 15 million tonnes of sand material in the Maroota area (Department of Environment and Planning estimate) are significant of the proposed 270,000 tonnes of material proposed for this development. At present rates of extraction, the approval of this development would not, in combination with existing operations create any significant impact on the Maroota deposit.

5.5 SURFACE WATER HYDROLOGY

During extraction operations over the works area, surface runoff characteristics are not expected to change greatly because most of the area to be affected is presently bare sandstone and debris. A relatively small area of sparsely vegetated Portion 63 hilltop will be the only area to be significantly altered in its runoff characteristics. Hence, surface runoff will not significantly increase over Portion 63 and will probably decrease from Lot 3 as rehabilitation operations progress.

When rehabilitation operations are complete on Por 63, runoff from the site should be significantly lower than at present. The subsoil will be free-draining sandstone and mine rejects. The topsoil will be evenly spread and

the site will be gently sloping. These factors will greatly increase water retention and reduce runoff. Drains will be maintained to direct runoff from around the area into the new dam. This will retain water for irrigation and will also continue to act as a sedimentation trap.

Water courses through the properties are ephemeral and discharge water only during periods of heavy rain. Most of this runoff is detained by the farm dams for use in crop irrigation and hence only a relatively small proportion of rainfall is discharged from the site.

Runoff patterns will change with water presently draining from Portion 63 into Lot 3 being contained within the property by drains and led to the new dam. Any overflow from the dam will flow into Lot 3 and pass through the existing series of three settling dams on the property before flowing into Marramarra National Park.

The capacity of the proposed dam on Por 63 will be about 19000 Ml and the groundwater sump on Lot 3 will hold about 15000 Ml.

The capacity of the dam on Portion 63 will be sufficient to hold the equivalent of 330 mm rainfall runoff from the extraction area if completely contained within the site. The existing spillway on the dam is over 3 m wide and maintains a minimum freeboard of approximately 1 m below the dam crest. The spillway is made of compacted sandstone, is heavily vegetated and has a capacity considerably in excess of the maximum probably discharge from the catchment of about 5 ha. The spillway discharges over undisturbed sandstone rock to the creek and sedimentation dam at the eastern end of Lot 3. The crest of the dam is a minimum of 3-4 m wide and is comprised of compacted overburden emplaced over undisturbed sandstone. The dam wall is stable and erosion resistant and will not need to be altered when the dam is enlarged.

The nett effect of the development will be to detain more water on each property and to alter the runoff characteristics of the site to a similar condition to those of surrounding orchards and gardens.

Water quality of the runoff discharged to Marramarra National Park should not change significantly. During extraction operations some increase in

sediment discharge in runoff can be expected, however this will be predominantly sandy in nature and will be adequately trapped by the new dam, and the succession of sediment traps in Lot 3. Furthermore, observation of the dams on both properties indicates that even fine suspended particles settle rapidly from the water (even in dams being used for washing operations on other sites) leaving typically clear water. No leachate problems are anticipated with the topsoil overburden or product mounds.

A conceptual hydrological cycle for the property is shown in Figure 19. Should the existing dams need emptying, for enlargement etc, the water will be allowed to settle until relatively clear and will be pumped into the creek and sediment dam on Lot 3. Turbid water will not be discharged.

Following the cessation of extractive activities and the completion of land rehabilitation there will be little change in the direction of drainage as the flows will be directed towards Coopers Creek. Contouring will ensure that no poorly drained areas or sites prone to erosion will be created.

5.6 GROUNDWATER HYDROLOGY

The proposed development includes:

- The enlarging of the existing groundwater sump on Lot 3 which will then act as both a groundwater and surface water storage.

  The lowest planned excavation depth is to be approximately RL 195 (within Lot 3). This depth will allow interception of groundwater as evident from the existing excavation. The groundwater yield from the excavation will be dependant on the local permeability and the intersection of fractures and joints of the underlying fresher rock.

- Portion 63 will be excavated and graded to give smooth gentle slopes between the road on the northern boundary and the southern boundary common with Lot 3. A dam will be constructed

by enlargement of the existing dam in the southeast corner of the Portion.

The existing rock face on the southern boundary shows some evidence of groundwater seepage along its base. However, extraction of sand in Portion 63 is not proposed below an elevation of RL 200. The area is proposed to be completed as agricultural land and it is not anticipated that any significant local springs will be intercepted.

During the period of mining, groundwater and surface water flows from the disturbed area will be intercepted within the property and settled, prior to discharging, either by irrigation of existing agricultural land or into Coopers Creek.

The impacts of lowering Portion 63 and enlarging the groundwater sump on Lot 3 have been investigated by Australian Groundwater Consultants. The details of the investigation are contained in Appendix A.

The influence of extraction of water from the proposed dam on nearby registered bores will be dependent on the quantity of the water removed and the amount of water recharged from surface runoff both within the proposed dam and the existing dam. Under the worst case where the water level is depleted to the base of the proposed excavation (RL 195m) the maximum possible effect on the two bores is a drawdown of 5 m. However based on an aquifer permeability of 0.1 m/day and an aquifer thickness of 5 m, a realistic drawdown at either bore of less than 0.1 m after 4 years is predicted.

Neither drawdown prediction is likely to affect the yield of either registered bore and the effects of these works on the surrounding groundwater are considered to be minimal.

However, extraction operations have been designed to maintain a water balance on the site and no nett usage of water is planned. Any water used in the works processes will be recirculated from the dams and no nett deficit or significant drawdown on the existing water table is anticipated.

Following rehabilitation, irrigation of crop land will cause a nett deficit in water usage but could not have effects greater than the worst case illustration above. Furthermore, some of the irrigated water will seep down to recharge the groundwater table and the recontoured site, by then more efficient at absorbing rainwater, will also benefit groundwater recharge.

The localised impact of the developments is considered to be minimal. Furthermore it is considered unlikely that the impact from this development by itself or in combination with any other extraction operation in the area will significantly impact the wider groundwater resource of Maroota Ridge.

There are no 'upstream' users to be affected other than the bores described. To the west is the crest of Maroota ridge and the probable boundary of the groundwater catchment for the site. To the east is undeveloped rocky bushland and another groundwater catchment boundary. 'Downstream' of the site, where there is unlikely to be any measurable impact anyway, is part of Lot 3 and beyond that Marramarra National Park.

The potential lowering of the groundwater table around the site is unlikely to have any effect on surrounding vegetation. The top of the groundwater table is likely to be below the root level of most plants and trees due to the thin soils and the close proximity of sandstone to the surface.

Consultations with the Water Resources Commission have indicated that they perceive no difficulties with the present impact of extractive industry on the groundwater resource at Maroota.

5.7 VEGETATION

The mining process and the construction of supporting access tracks and dams will be largely restricted to areas which now have little or no vegetative cover. On Portion 63 an area of only about 200 m^2 of scrub and trees remains on the proposed works area on the crest of the hill.

This vegetation is regrowth following clearing some years ago. On the western face of the hill the area which will be mined last supports some low scrub and a grassed field which has been used for growing tomatoes. A

small number of peach trees may be removed from the top of the orchard. The landowner considers these trees as useless because the poor drainage and shallow soils renders them unproductive and slow growing. No rare, threatened or endangered plant species are involved.

Following rehabilitation it is intended to establish, along the northern slope of the new land, a peach orchard as a continuation of the existing orchard along the western side of the hill. These new areas will be grassed to improve and stabilise the soil. The flatter southern side of the land will be used for market gardening.

Lot 3 when rehabilitated will be completely given over to market gardening as has already commenced on nearly half the area.

The effect on vegetation outside the properties will be nil. Dust deposition will not be at a significant level (by experience with Lot 3), and silt traps in the form of settling ponds will ensure that any water entering Coopers Creek will contain inconsequential levels of suspended particles that will not affect aquatic flora.

5.8 FAUNA

No evidence of rare or endangered special has been found in the study area. It is possible that some timid species may temporarily move away from bushland immediately adjacent to Por 63 until operations are completed.

As no significant habitats are being disturbed, little or no detrimental impact is anticipated on the wildlife through the construction of the dam. The construction of dams on the site has already probably improved the area as a habitat for transient wildfowl populations.

Silt traps in the form of settling ponds will ensure that water entering Coopers Creek will contain inconsequential levels of suspended particles and the effects on aquatic flora and fauna within the National Park will be undetectable. Dust and noise emissions will be minimised during the operation of the works and no adverse impacts are anticipated. At the

completion of extraction, the market gardens, by unintentionally supplying food to wallabies, possums and ducks that find the crops attractive, may provide habitat which is much better than the present scarred land.

5.9 LAND CAPABILITY

Whilst the project site will have no agricultural value during operation, except as water storage, at the completion of extraction and rehabilitation the agricultural capability of the extraction site will have been considerably enhanced with improved water supply, level gradients allowing easier cultivation and reducing erosion and well distributed topsoil. The slopes of no steeper than 1 in 10 will become Class 3 land in terms of Department of Agriculture classification and the 1 in 3 slopes will become Class 4.

5.10 ACOUSTIC ENVIRONMENT

The proposed operations will be undertaken with the machinery listed below. The noise emission levels set-out in Table 2, were measured during the normal operation of similar machinery at a nearby existing sand extraction site.

Table 2 - Proposed Sand Extraction and Processing Equipment

Description	Noise Level
Front End Loader	79-80 dBA at 7 m during loading Operations.
Bulldozer CAT D8G	86-76 dBA at 7 m to the side during ripping and pushing operations. 82 dBA at 7 m to the front. 80-81 dBA at 7 m to the rear.
Dry Screening Plant	79-80 dBA at 7 m (the chute and screen noise on this plant was markedly less).

5.10.1 Assessment Criteria

The proposed site will have a site area greater than 20,000 sq. metres and is therefore a scheduled premises under the Noise Control Act (1975). The site will be required to satisfy State Pollution Control Commission (SPCC) guidelines. The site will be required to comply with SPCC approval conditions and a Noise Control License will be held by the operators of the scheduled premises.

The noise control measures to be applied to the site have been designed to satisfy the SPCC guidelines.

The noise levels predicted have been calculated using procedures acceptable to the Noise Control Branch of the SPCC.

5.10.2 Noise Generating Activities

Sand extraction and screening will initially take place from the dam excavation site on Lot 3. Raw material bunds 3 - 5 m high will be constructed around all operation, thus controlling noise output except during the very first stages of excavation and the last phases of landscaping.

Excavation of the deposit on Portion 63 will commence from the eastern end of the site where effective topographical shielding exists. Noise shielding will be further reinforced by the use of terms of overburden along the northern and western boundaries of the site and around noisy equipment at all stages of the operation except for final rehabilitation.

Details of the extraction procedure and noise control measures are contained in Appendix D.

5.10.3 Impacts Upon Nearby Residences

The following discussion relates to dwelling houses, the locations of which are shown in Figure 7.

Residence 'A'

The combined noise level of plant and equipment for extraction Stages I to III will be 38 dBA and reducing to 35 dBA as the depth of extraction increases. These levels assume that the side of the bulldozer may be oriented towards the residence.

Thecontrol measures to achieve this noise level includes:

* distance attenuation of 40 dBA.

* acoustic shielding, provided by the existing topographical differences for Stages I to III and the placement of a 5 m

high berm along the Northern edge and at the face of the extractive area, of 11 dBA; as the depth of extraction increases the effectiveness of the acoustic shielding will increase to 13 dBA.

* excess attenuation for ground absorption of 2 to 3 dBA.

* safeguard measure of noise control panels on the diesel motors powering the sand processing plant.

The combined noise level during Stage IV will increase to 43 dBA as the side of the bulldozer is oriented towards the residence. The continued use of a 5 m high berm along the Northern edge of the extractive area and at the extraction face will provide 10 to 11 dBA acoustic shielding. The berms will need to be within 30 to 50 m of the machinery for maximum effectiveness. As the front or rear of the bulldozer faces the residence the noise level will reduce to 40 dBA.

Residence 'B'

The combined noise level for Stages I to III will be 44 to 47 dBA with the higher level occurring during the first period of extraction. These levels are also based on the side of the bulldozer facing the residence.

The control measures include:

* distance attenuation of 26 dBA.

* acoustic shielding by the berm of 14 dBA increasing to 15 to 19 dBA as the depth of extraction increases to 14 metres.

* minimum allowance for excess attenuation of 1 to 2 dBA.

For stage IV of the extraction operations the combined noise level will be 47 dBA reducing to 42 dBA as the front or rear of the

bulldozer faces the residence. The length of the extraction operation in this area is limited as the depth of removal of sand is 2 to 4 metres. A period of up to 3 months may be required to remove the sand at distances of less than 150 metres to the residence. A similar occurrence of noise levels will also apply during the shorter rehabilitation phase of the operations.

Residence 'C'

The occupants of this residence are the property owners and no further assessment of impact is considered necessary.

Residences 'D' and 'E'

A combined noise level of 38 dBA during Stages I to III and 44 dBA during Stage IV based on the following control measures:

* distance attenuation of 36 dBA.

* acoustic shielding for the plant of 18 dBA during Stages I to III and 11 dBA during Stage IV.

* acoustic shielding for the bulldozer of 14 dBA during the first three stages, reducing to 11.5 dBA for Stage IV.

* the acoustic shielding is provided by 5 m high berms as stated for the previous residential locations.

* excess attenuation of 2 to 3 dBA.

* noise control to the diesel motors on the sand processing plant.

Residence 'F'

A combined noise level of 42.5 dBA during Stages I to IV of the extraction operations. The noise levels apply for the closest distances between the residence and the location of machinery.

* distance attenuation of 37 dBA.

* acoustic shielding of 9 dBA.

* minimum excessive attenuation for ground absorption and vegetation effects.

* noise control to the sand processing plant as previously detailed.

* the acoustic shielding is based on the 5 m high berms being placed within 20 m of the machinery in the direction towards this residence.

The noise levels of equipment will be effectively reduced at the residential locations by operating machinery within close proximity to berms. As the extraction face extends the berm will be reformed at the new extractive corridor so that the noise control measure will be constantly in place.

During the major extraction from Stages II and III the depth of extraction will increase the acoustic shielding towards all residential locations except residence 'F'. This residence is at the greatest distance from the extractive area and will have noise levels less than 42.5 dBA through the use of berms.

During Stage IV of the operations an excess of noise would occur for a short time period to construct the berms. This would be repeated during the final stage of the extraction when rehabilitation is in progress.

5.10.4 Statement of Noise Impact

At the nearest residences to the extraction site the noise levels will generally be within acceptable guidelines levels. For short periods of time at the commencement and rehabilitation phases, noise levels will exceed the acceptable level by more than 2 dBA.

During the final stages of extraction the noise levels at the nearest residence on the Camilleri property (residence 'B') may exceed the acceptable levels by 1 dBA, but for only short periods of time. In many instances the combined noise levels from plant and equipment will be held to within 5 dBA of the background levels. It is likely that a degree of noise 'masking' will occur from the operation of the chicken feed plant next to the house and reduce the 'mild annoyance' level of noise impact predicted at this site during initial and final operations.

It is considered that the extraction operations will not have an unacceptable impact.

5.11 AIR QUALITY

The sandstone resource being extracted on the two properties has an extremely low dust generating potential due to its lack of very fine material and its inherent moisture content.

The previous extraction operations have indicated that the dust generation potential is insignificant and is less than that of nearby ploughed fields.

To further reduce dust generation potential, unsealed haul roads and other dust generating areas will be regularly watered as a precautionary measure. Watering will be carried out as frequently as required to remain effective.

5.12 ARCHAEOLOGY

The site has been heavily disturbed by a combination of land clearing, agricultural and extractive processes.

A previous archaeological investigation of the site by Haglund and Associates (Collin C. Donges & Associates, 1987) concluded that there was no visible archaeological material within the study area, that there is virtually no likelihood of such material being present below the surface and that the area does not warrant further archaeological inspection.

5.13 TRANSPORT

All access to the site will be via the sealed reserve road where it intersects Old Northern Road at the western boundaries of the two properties.

Within the subject properties access is gained by an unsealed road running along the northern boundary of Lot 3. This access is sealed, offers good visibility and has operated safely at the projected level of use for several years (as discussed in Section 3.12). Improvement works were undertaken on this intersection by P.F. Formation for the initial Lot 3 operation. These improvements included the surfacing of a length of the reserved road to provide for smooth runoff of vehicles from the main road. The access road within the property is graded and maintained to a smooth running surface while in use, to enable easy, efficient and noise-reduced access for vehicles.

Trucks have operated safely from this entrance at an average density of 20 movements per day for 3 years. A significant proportion of the daytime traffic along Old Northern Road is local in nature and its drivers are probably aware of the existing trucking movements at the location.

The proposed development, an extension of the suspended operations on Lot 3, will not generate any increase in traffic movements over the prior levels from the site.

At the proposed rate of production the development would generate a maximum of 15 truck loads of material per day (30 trucking movements); this would decline to a maximum of about 10 movements on Saturday mornings; at average rate of production about 10 daily truckloads of material would be produced. This rate of traffic generation would not interfere with the capacity of Old Northern Road nor cause of any loss of

safety on the road. Furthermore this level of useage is identical to that of the existing Lot 3 operation.

Trucking movements would take place between the hours of 7 am to 5 pm Monday to Friday, and between 7 am and 12 am on Saturday mornings. Approval has been sought for 15 truckloads per day to address periods of peak demand. P.F. Formation's experience in this area has shown that peaks are not sustained for any substantial periods, and that operations with approval for a greater level of truck use rarely achieve their approved use level.

This proposal will contribute on average about 2 to 3 trucking movements per hour to the traffic usage of Old Northern road during normal working hours. These movements therefore avoid the Saturday afternoon and Sunday peak times of traffic movement along Old Northern Road when 2 - 3 times the weekday traffic volume are typical, and when there are the highest numbers of drivers unfamiliar with local road conditions.

The road surface along the frontage of the subject properties is in good condition and does not appear to have deteriorated from the passage of heavy vehicles from the site. The continuation of this traffic is not expected to significantly affect the road.

It must be stressed that there is no increased volume of traffic generated from this proposal or any change to the present pattern of road usage. Local residents will not perceive a change in traffic patterns. It is also unlikely that the trucking movements generated by the operation will pose a significant safety hazard to motorists using Old Northern Road.

The maintenance of Old Northern Road is the financial responsibility of the Department of Main Roads, and no additional road maintenance costs will be incurred by Hornsby Shire Council in the unlikely event that road repairs should be needed as a result of this proposal.

5.14 AESTHETICS/VISUAL AMENITY

At present both properties have areas of active or past extraction which are of low scenic value and which contrast strongly with the surrounding

farmland and bushland. However, the limited viewsheds of the properties and the progressive rehabilitation of existing operations give the site only moderate sensitivity to further development.

On Lot 3 extraction operations have been ceased and rehabilitation of most of the site has produced a flat market garden area which is already in production. This area is now visually indistinguishable from most market gardens in the area and will further improve as crops develop and the groundwater sump is enlarged.

The scarred, previously extracted area on the eastern side of the hill on Portion 63 will be first affected by the proposed works. No significant visual change will result during the mining operations as the area is presently bare sandstone. To reduce visual impacts as well as noise propagation, bund walls of topsoiled and grassed overburden will be placed along the northern boundary. Little can be done to mitigate the view from the south. However, as there is only one dwelling with a view of the already bare area, no significant visual impacts are anticipated.

As extraction proceeds to the west, the western side of the hill will be preserved to obscure views from the road (Photograph 4). However, by the time the hill is lowered the rehabilitation measures will be proceeding from the eastern end of the site, thus creating the appearance of a farming operation, albeit at a lower level.

The owner of Portion 63 intends to plant the northern side of the rehabilitated area to peach trees - a continuation of the orchard on the northwestern side of the hill. The flatter southern side of the site is to be kept for market gardening and will appear similar to the adjacent Lot 3. The final landform of the site area will be predominantly level, with gentle slopes to the south and east.

The final appearance of both properties will be that of well managed orchards and market gardens consistent with the visual landscape of the Maroota area. All evidence of extraction will be removed and the landform will have a natural, though changed, appearance.

5.15 SOCIO ECONOMICS

The proposed development arises due to the demands and requirements of the Sydney building market and the economic needs and desires of the subject landowners.

The implications of the development for the social and economic conditions of the district are dominantly positive as the project will provide:

- supplementary income to the landowners;
- rehabilitation of previously damaged land on the subject properties;
- increased productive potential and drought-proofing of the subject properties;
- continued employment and income for P.F. Formation and its staff members, many of whom are local residents in an area with few other employment opportunities;
- income to local suppliers servicing the above, and
- reasonably priced, high quality building materials to the Sydney market.

In providing these benefits there are no significant negative impacts:

- there will be no increase in road usage generated by this development;
- the development does not itself demand, nor does it indirectly place a demand upon, any community facilities provided by the Hornsby Shire Council;
- improvements to the road entry to the site were carried out at the expense of P.F. Formation as will any maintenance;

- Old Northern Road is a Main Road (Main Road 181) which is administered by the Department of Main Roads and does not appear to place a demand or increase demand on Hornsby Shire Council's resources.

5.16 ALTERNATIVES TO THE PROPOSAL

Alternatives to the proposal detailed in this Statement fall into three areas, first the "do nothing" option, secondly alternative extraction areas on Portion 63 and thirdly, different extraction plans.

1. The "do nothing" option is not considered to be a realistic alternative because the existing damaged portion of Portion 63 cannot be economically rehabilitated by any other means. Reasons against this option include:

   - to leave the damaged area unrehabilitated is to ignore its economic potential, thus leaving it agriculturally and economically barren and prone to erosion.

   - the property is presently subject to drought damage because of unreliable water supply and there is no other economic alternative to sand extraction to develop new land close to its own reliable water supply.

   - the "do nothing" option would ignore the economic potential of the sand resource which is in strong demand as a building material for the Sydney metropolitan area.

2. Alternative extraction areas on Por 63 were not considered for the following reasons:

   - all other areas of the farm are presently in agricultural production;

- other areas cannot easily be extracted to leave an agriculturally useful landform close to a water supply while removing an economic amount of material;

- no other part of the farm requires rehabilitating, and

- other areas do not have the same degree of sheltering from potential visual and noise impact.

3. Alternative Extraction Plans were considered such as:

- truck access from the northern side of the property. This was rejected because of the increased potential for visual and noise impacts;

- stripping the entire area at the start of operations and progressively lowering the whole site. This was rejected as exposing too large an area to visual impact and to erosion, and

- alternative extraction procedures were considered but do not allow for the progressive extraction and rehabilitation of the resource while reducing visual and noise impacts to neighbouring properties.

Not rehabilitating the extraction site to agricultural production was not considered as an option as it is one of the major objectives of the development.

In conclusion, the agricultural potential of the property will be upgraded while simultaneously supplying a valuable and necessary raw material to the Sydney Region in a manner whereby the resources are used efficiently and with minimal adverse environmental impact.

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CONTRIBUTORS TO THE ENVIRONMENTAL IMPACT STATEMENT

Project Management and Assessment:	Collin C. Donges and Associates.
Hydrogeological Studies:	Australian Groundwater Consultants.
Acoustic Studies:	Dick Benbow & Associates Pty Ltd.

APPENDICES

APPENDIX A GROUNDWATER STUDY

COLLIN C. DONGES &
ASSOCIATES PTY.LTD.

HYDROGEOLOGICAL IMPACT OF SAND EXTRACTION ON PORTIONS 63 AND 66 (PART)

MAROOTA, N.S.W.

REPORT 3038
OCTOBER 1987

AUSTRALIAN
GROUNDWATER
CONSULTANTS
PTY LIMITED

HYDROGEOLOGICAL IMPACT OF SAND EXTRACTION OF PORTION 63 AND PORTION 66 (PART) MAROOTA, N.S.W.

CONTENTS

SUMMARY

Extraction of sand from Portion 66 (Part) and Portion 63, Parish of Cornelia, County of Cumberland is proposed. Excavation beneath the existing water table is proposed in part if Portion 66 to form a groundwater sump and dam. Recontouring of the entire extraction area and rehabilitation to useable land is proposed.

The affects of the works on the surrounding groundwater are considered to be minimal and no detrimental affects are anticipated on two nearby registered bores.

During mining, groundwater and surface water flows will be intercepted within the property and settled, prior to discharging either into Coopers Creek or onto existing agricultural land.

The groundwater and surface water collected are anticipated to be of low salinity and suitable for irrigation purposes.

1.0 INTRODUCTION

The extraction of sand from Portion 66 (Part) and Portion 63, Parish of Cornelia, County of Cumberland is proposed. The sand will be sold for building requirements and at the conclusion of mining the area will be rehabilitated for agriculture and an excavation in Portion 66 will be utilised as a water supply.

Australian Groundwater Consultants Pty Limited (AGC) have been engaged by Collin C. Donges and Associates Pty. Ltd. to assess the impact of the proposed extraction on the surrounding groundwater resources.

2.0 GEOLOGY

The property borders Old Northern Road aproximately 3 km north of Maroota (Figure 1). The road in the vicinity follows a ridge dividing two sub catchments of the Hawkesbury River.

The general stratigraphic sequence in the region is as follows:

AGE	UNIT	LITHOLOGY
Quaternary	Soils	Variable
Tertiary	Unnamed	Basalt
	Maroota Sand	Sand, gravel, clayey sand, and clay
Triassic	Ashfield Shale	Shale and laminate
	Hawkesbury Sandstone	quartzose sandstone with shale lenses

The Maroota Sand has been systematically investigated by the Geological Survey of the NSW Department of Mineral Resources. Etheridge (1980) presents a map of the distribution of the stratigraphic units and this has been used to prepare a map of the local distribution (Figure 1).

A general description of the main stratigraphic units follows (AGC, 1984).

Maroota Sand: comprises a sequence of interbedded clayey gravels, gravels, gravelly sands, pebbly sands, sands, and clay which range from unconsolidated to partly consolidated and disconformably overly the Hawkesbury Sandstone.

Significant amounts of heavy minerals are associated with the gravel fraction of the Maroota Sand and comprise zircon, rutile, with minor gold, platinum, ilmenite and sapphire. The Maroota Sand is in a channel system of alluvial origin and is deposited by an old Tertiary river system which first cut an erosional channel into the overlying Triassic bedrock. The sands obtain a maximum thickness of 39 m in the area south of Maroota; north of Maroota the maximum thickness is 5 m.

Hawkesbury Sandstone: is a quartz sandstone generally massive with well developed cross-bedding and intercalations of shale and siltstone beds. Bulk grain size is generally in the range of fine to medium sand but sorting is generally poor with some silt and pebble grains. Fresh rock occurs in scattered outcrops in the region and, in between, the sandstone can be weathered to a deep soil profile to depths up to 15 metres. The weathered rock is white to red-brown in colour, soft and friable. Where this weathered zone is consistently above the water table it is leached to give rise to loose white sand soil, which was referred to by Etheridge as eluvial sand.

Portion 63 and 66 generally consist of a shallow covering of Quarternary soils overlying partially weathered Hawkesbury Sandstone. Fresher Hawkesbury Sandstone outcrops in places, particularly to the north and west.

3.0 HYDROGEOLOGY

The fresh Hawkesbury Sandstone generally is an impermeable rock. However, discreet fracture horizons occur occassionally in association with shale bands or other lithology changes which give permeable zones parallel to the major horizontal bedding planes. These aquifers are confined by the adjacent impermeable sandstone and often form perched aquifer systems above the regional water table. An overall bulk permeability to the sandstone is given by vertical regional fracture zones which allow the slow vertical drainage between the discreet aquifers.

Where a deep weathering profile is developed in the sandstone, the resulting eluvial sand is permeable and can form a perched aquifer over the fresh sandstone. Dams or large wells constructed into this material can provide a source of farm water supplies but the permeability is too low to yield significant supplies to boreholes.

The Maroota Sand is generally more porous and permeable than the weathered or fresh sandstone and forms a reliable aquifer system where it occurs below the water table. The main groundwater resource exists in the deeper section of sands south of Maroota, and here constitutes an important source of irrigation water for the citrus orchards and market gardens. The water extraction methods require large diameter wells or dams which indicate a relatively low permeability and storage in the aquifer. In the area north of Maroota these sands have a restricted water resource potential due to their limited saturated thickness (approximately 1 m) and perched nature of the aquifer.

A review of water bores registered with the NSW Department of Water Resources (DWR) is summarised in Table 1. The locations are shown on Figure 1.

The drilling records show several layers of perched water intersections at variable depths in the total geological sequence. Bore 34628 demonstrates the relationship between the Maroota Sand aquifer at shallow depth and a deeper Hawkesbury Sandstone aquifer; there is significant difference in hydrostatic head which emphasises the perched nature of the Maroota Sand aquifer. This would also occur in the weathered Hawkesbury Sandstone where the higher permeability of the weathered unit overlying the less permeable rock would present a similar condition. Estimates of transmissivity for the Hawkesbury sandstone based on the available bore records are 0.06 to 2.03 m^2/day (AGC, 1984). The relationship between the various aquifer units is shown on Figure 2, which is diagramatic but based on an east west section line through the ridge as shown on Figure 1. The section is compiled from the topographic map, registered borehole records, and surface geology.

TABLE 1
SUMMARY OF
REGISTERED BORE RECORDS

Bore	Total Depth (m)	Standing Water Level (m)	Water Elevation (m AHD)	Yield L/s	TDS mg/L	pH	Strata/Comments
15051	85.3	30.4	200	0.44	fresh		
16348	73.1	30.4	187	0.13			
33197	76.2	40.2	87	0.08			clay & sandstone
34628	91.4	5.4	207	.23			sandy
		41.1	171	.13			sandstone
35725	155.4						abandoned
37737	124.6	54.8	82	0.96	2000	6.3	
37738	94.4	39.0	111	2.53		4.6	
38147	121.9	64.9	135	0.68		2.6	soft sandstone
		17.0	185				soft sandstone
		29.5	170.5				soft sandstone
		31.7	168.3				soft sandstone
48741	30.0	23.2	200	0.08			sandy
53898	31.0	6.0	177	0.5	56	5.1	
55962	22.0	2.0	183	0.43	fresh		
57460	76.0	24.8	116				sand
58504	15.2	3.6	141	0.38	good		
59118	6.0	5.0	184	0.5			
59742	23.2	7.6	179	1.52			
60147	46.0				150	5.1	sandstone

Note:where data is omitted it was unrecorded.

In general, the Maroota Sand and the eluvial sand (weathered Hawkesbury Sandstone) aquifers are perched on the fresh bedrock of Hawkesbury Sandstone. Where these perched aquifers are located high on the topographic ridge they would discharge either by overflowing at their margins or by slow vertical infiltration to the deeper aquifers. Where the deeper aquifers crop out or subcrop on the slopes of the ridges they discharge to creeks and gullies or to the pockets of weathered rock.

The groundwater quality throughout the area is generally of domestic quality. Available recorded salinities are presented in Table 1.

4.0 EFFECT OF SAND EXTRACTION AT PORTIONS 66 AND 63

Excavation and removal of sand has taken place from both properties in the past. Portion 66 has an area which has been mined and rehabilitated for agricultural use. It also has an existing dam and groundwater sump. A depression running through the properties, Coopers Creek, drains an area of approximately 0.2 km^2. Within this surface catchment two registered bores exist within 200 m north of the northern boundary of the properties. Bore 15051 is on the ridge, it is 85 m deep and has a water level elevation of approximately RL 200 m. The aquifer is reported at an elevation between RL 181 and 151 metres. Bore 35725 is at approximately the same surface elevation, as the existing dam on Portion 66, RL 200, it is 155 m deep with no recorded water level. The aquifer intersection is recorded at a depth of 60.9 m (RL 131 approx).

The existing dam on Portion 66 intercepts local runoff and also appears to reflect the groundwater elevation in the area. A small sump within the property approximately 20 m east of the dam displays a groundwater level similar to that of the dam.

It is proposed that excavations will include enlarging the existing groundwater sump and this will then act as both a groundwater and surface water storage. The lowest planned excavation depth is to approximately RL 195 m and this will be within Portion 66. This depth will allow interception of groundwater as evident from the existing excavation. The groundwater yield from the excavation will be dependent on the local permeability and the intersection of fractures and joints of the underlying fresher rock.

In previous studies (AGC 1984) the permeability in a similar area to the west was estimated at 0.1 m/day with a specific yield of 1%. As a guide to the performance of the proposed dam these values can be extrapolated to the area under study. Using standard transient flow groundwater analysis for a large diameter well (Kruseman and De Ridder, 1976) an average groundwater inflow over a two year period is estimated at 10 m^3/day. This is considered a minimum contribution as no allowance has been made for recharge.

The influence of extraction of water from the proposed dam on the nearby registered bores will be dependent on the quantity of water removed and the amount of water recharged from surface runoff both within the proposed and the existing dam. Under the worst case where the water level is depleted to the base of the proposed excavation (RL 195 m) the maximum possible effect on the two bores is a drawdown of approximately 5 m. Based on a permeability of 0.1 m/day and an aquifer thickness of 5 m, a drawdown at either bore of less than 0.1 m after 4 years is predicted. This is based on using standard groundwater transient flow equations and a recharge of 3% of annual average rainfall. (Average annual rainfall 889 mm, Bureau of Meteorology). Neither drawdown prediction is likely to affect the yield of either registered bore.

Extraction of sand in Portion 63 is not proposed beneath an elevation of RL 200. The area is proposed to be completed as agricultural land and it is not anticipated that any significant local groundwater springs will be intercepted.

During the period of mining, groundwater and surface water flows from the disturbed area will be intercepted within the property and settled, prior to discharging either by irrigation of existing agricultural land or into Coopers Creek.

5.0 SUMMARY

Extraction of sand from Portion 66 (Part) and Portion 63, Parish of Cornelia, County of Cumberland is proposed. Excavation beneath the existing water table is proposed in part if Portion 66 to form a groundwater sump and dam. Recontouring of the entire extraction area and rehabilitation to useable land is proposed.

The affects of the works on the surrounding groundwater are considered to be minimal and no detrimental affects are anticipated on two nearby registered bores.

During mining, groundwater and surface water flows will be intercepted within the property and settled, prior to discharging either into Coopers Creek or onto existing agricultural land.

The groundwater and surface water collected are anticipated to be of low salinity and suitable for irrigation purposes.

Yours faithfully

AUSTRALIAN GROUNDWATER CONSULTANTS PTY LIMITED

W.H. MORTON
PRINCIPAL

F.J. MOHEN
ASSOCIATE

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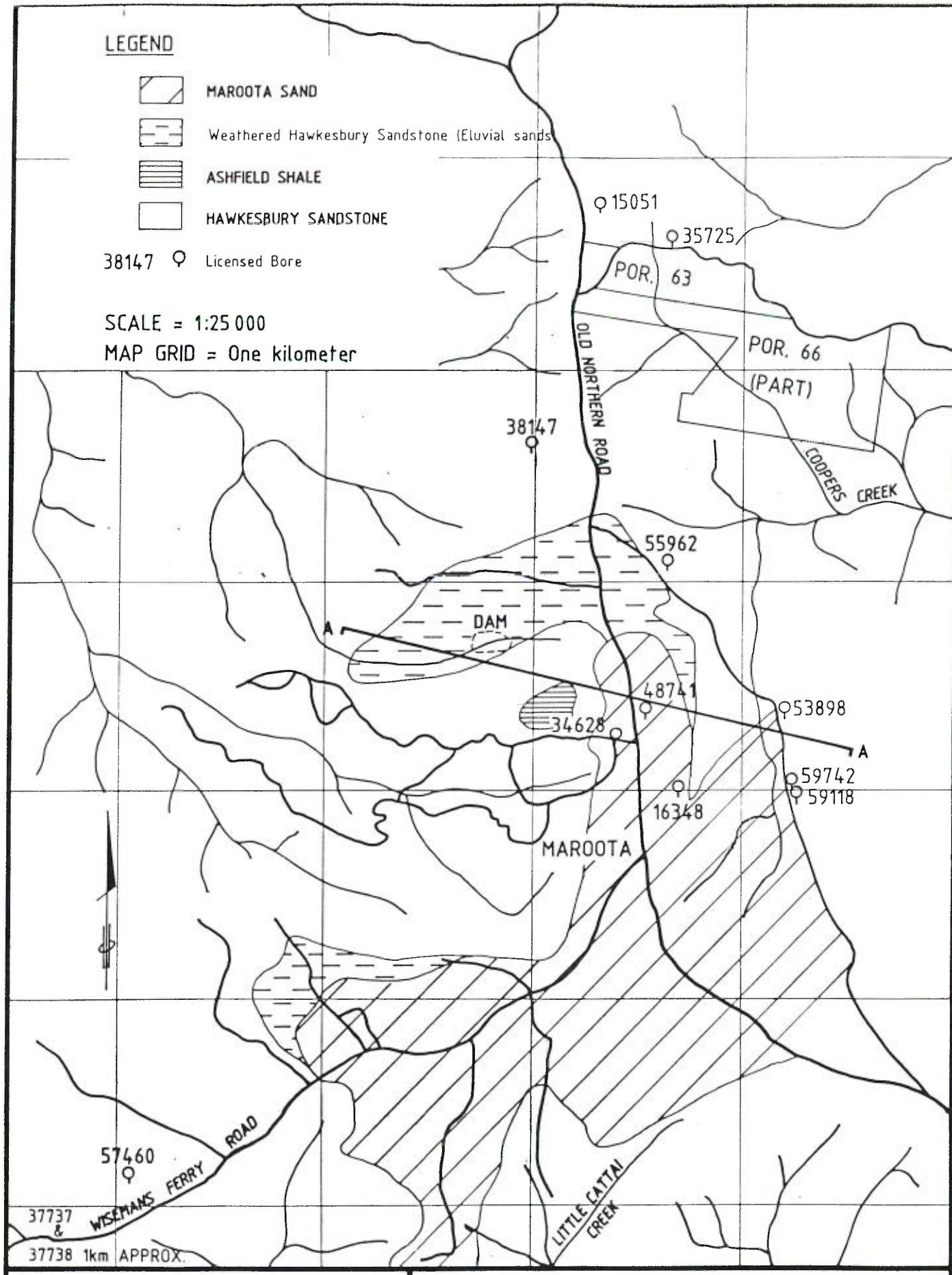

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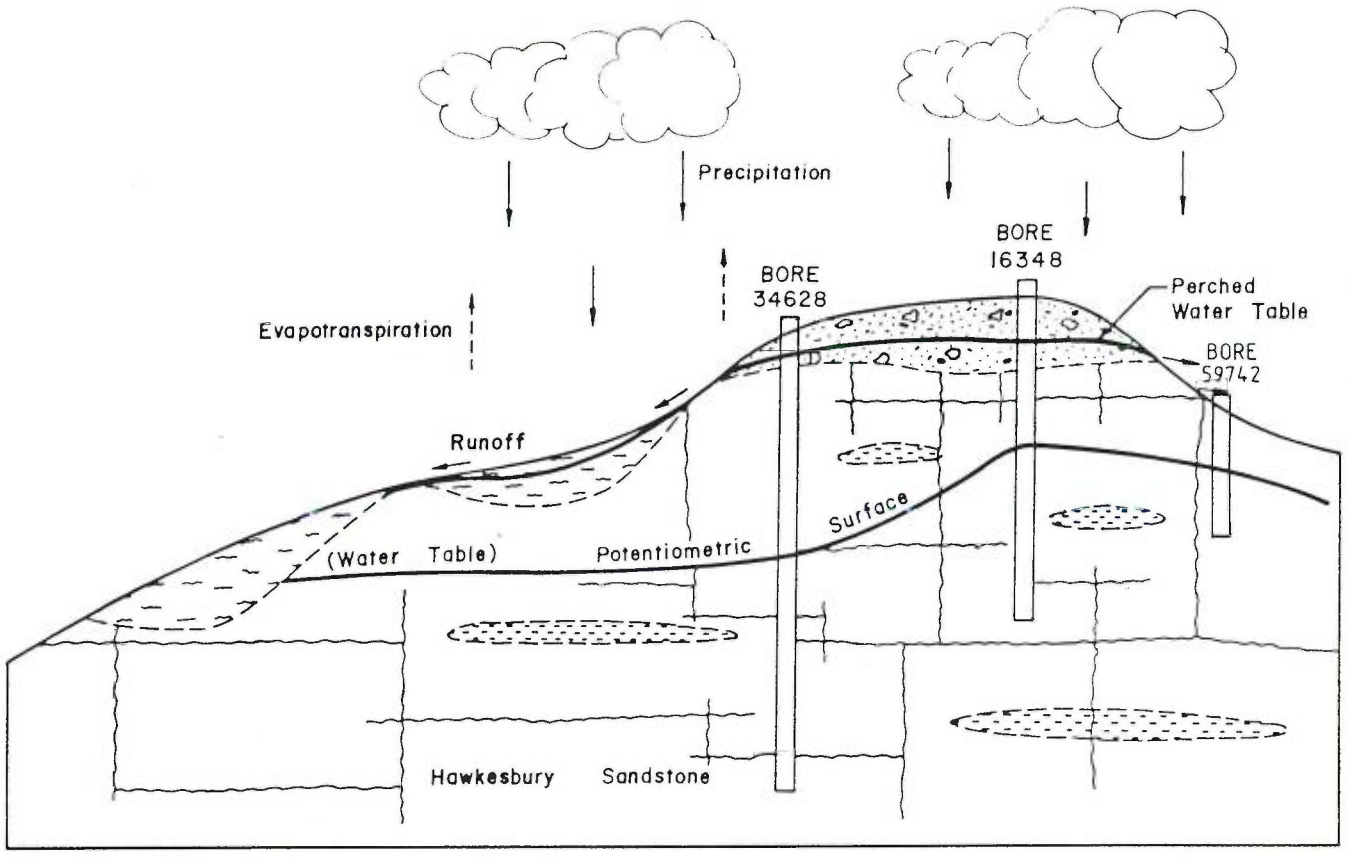
COLLIN. C. DONGES & ASSOCIATES PTY. LTD.

HYDROGEOLOGICAL REPORT

LOCALITY AND GEOLOGY

DATE OCT '87	DWG. No. 3038/1	FIG. No. 1

A (West) (East) A'



Not to scale

LEGEND

Eluvial Sand

Maroota Sand — Sand, gravel, silt and clay.

Hawkesbury Sandstone — Shale lense; Sandstone

Joints and groundwater flow paths thru rock

AUSTRALIAN GROUNDWATER CONSULTANTS PTY. LIMITED

COLLIN. C. DONGES & ASSOCIATES PTY. LTD.

HYDROGEOLOGICAL REPORT

HYDROLOGICAL SECTION AT NORTH MAROOTA

DATE OCT '87 | DWG. Nº 3038/2 | FIG. Nº 2

APPENDIX B FAUNA SURVEY

1. Species Observed on the Maroota Ridge

Australian raven	-	Corvus coronoides
Black-faced cuckoo shrike	-	Coracina novachollandiae
Black-backed magpie	-	Gymnorhina tibicen
Silver Eye	-	Zosterops lateralis or Z. l. lateralis
Fairy martin	-	Petrcygekudib aruek
Fork-tailed swift	-	Apus pacificus
Spine-tailed swift	-	Hirundapus caudaetus
White-backed swallow	-	Cheramoeca leucosternum
Welcome swallow	-	Hirundo neoxena
Red-Browed firetail	-	Emblema temporalis
Beautiful firetail	-	Emblema bella
Superb blue wren	-	Marurus cyaneus
Variegated wren	-	Malurus lamberti
White-throated tree creeper	-	Climacteris leucophaea
White-cheeked honeyeater	-	Phylidonyris nigra
Double-barred finch	-	Poephila bickenovii

2. A survey of literature indicates that the species as set out, below may also inhabit the region.

Striated thornbill	-	Acathiza lineata
Yellow thornbill	-	A. nana
Little wattlebird	-	Antochaera chrysotera
Noisy friabird	-	Philemon cornicalatus
Bell miner	-	Manorima melanophrys
Noisy miner	-	M. melanocephala
Regent honeyeater	-	Xanthomyza phrygia
White-eared honeyeater	-	Lichenostomus leucotis
Brown-headed honeyeater	-	Melithreptus brevirostris
White-naped honeyeater	-	M. lunatus
New Holland honeyeater	-	Phylidonyris novaehollandiae
Tawny crowned honeyeater	-	P. melanops
Eastern spinebill	-	Acanthorhynchus tenuirostris
European goldfinch	-	Cardvelis cardvelis
Spotted quail-thrush	-	Cinclosoma punctatum
Willie wagtail	-	Rhipidura leucophrys

Grey fantail	-	R. fuliginosa
Leaden flycatcher	-	Myiagra rubecula
Crested shrike tit	-	Falcunculus frontaltus
Eastern yellow robin	-	Eopsaltria australis
Hooded robin	-	Melanodryas cucullata
Flame robin	-	Petroica phoenicea
Scarlet robin	-	P. multicolor
Blackbird	-	Turdus merula

APPENDIX C METEOROLIGICAL DATA

MONTH	% CALM DAYS	AVE SPEED WINDS (KM/HR)	MAJOR WIND DIRECTION	HIGHEST WIND SPEED PER HR % OCCURRENCE	PREVAILING WIND DIRECTION
JAN	12	7.25	E	21-30 4%	SW-E
FEB	14	6.63	SW	21-30 8%	S-SW
MARCH	9	6.65	W	21-30 4%	S-NW
APRIL	10	6.65	NW	31-40 2%	SW-NW
MAY	7	9.22	NW	31-40 1%	W-NW
JUNE	8	8.83	NW	31-40 3%	SW-NW
JULY	7	7.29	NW	21-30 10%	W-NW
AUGUST	5	10.23	NW	31-40 6%	SW-NW
SEPT	7	10.17	NW	31-40 3%	SW-NW
OCT	7	12.22	NW	41-50 1%	S-NW
NOV	11	9.85	NW	31-40 3%	S-NW
DEC	11	10.22	E	41-50 1%	SW-E

9 a.m. Winds

MONTH	% CALM DAYS	AVE SPEED WINDS (KM/HR)	MAJOR WIND DIRECTION	HIGHEST WIND SPEED PER HR % OCCURRENCE	PREVAILING WIND DIRECTION
JAN	-	19.35	E	31-40 9%	NE-SE
FEB	2	14.10	E	31-40 8%	NE-S
MARCH	-	14.08	E	31.40 3%	E-SE
APRIL	2	10.52	E	31-40 3%	NE-SE &
MAY	-	11.96	NW	31-40 11%	SW-NW
JUNE	2	12.72	SW	41-50 3%	SW-NW
JULY	-	13.25	W-NW	41-50 1%	W-NW
AUGUST	2	17.54	W	51 2%	W
SEPT	2	17.34	E	41-50 4%	NE-E
OCT	3	16.66	E	41-50 1%	E
NOV	2	21.07	E	31-40 24%	E
DEC	-	23.73	E	41-50 3%	E

3 p.m. Winds.

APPENDIX D ACOUSTIC IMPACT STUDY

NOISE IMPACT STATEMENT

FOR PROPOSED

SAND EXTRACTIVE OPERATIONS

AT

TRAVARTO PROPERTY

OLD NORTHERN ROAD, MAROOTA

Prepared by R.T. Benbow
for Dick Benbow & Associates Pty. Ltd.

Report No. EE 1265 CC
February 1988

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CONTENTS PAGE

1.0 INTRODUCTION

The deposit of sand on the Eastern half of the Travarto Property off Old Northern Road at Maroota is proposed to be extracted and processed on site for use in the building and construction industry.

The purpose of this report is to assess the potential effects that noise emissions from these proposed operations could have on the residences closest to the site that are not associated with the extractive industry. This matter is clarified in the report. Noise control and safeguard measures that are considered necessary have been identified in the report.

2.0 ASSESSMENT CRITERIA

The proposed site will have a site area greater than 20,000 sq. metres and is therefore a scheduled premises under the Noise Control ACT (1975). The site will be required to satisfy State Pollution Control Commission (SPCC) guidelines. The site will be required to comply with SPCC approval conditions and a Noise Control Licence will be held by the operators of the scheduled premises.

The noise control measures to be applied to the site have been designed to satisfy the SPCC guidelines.

3.0 EXISTING ACOUSTIC ENVIRONMENT

The existing acoustic environment within the vicinity of the proposed site of the extraction industry was determined by direct measurement of the background noise levels adjacent to several nearby residences closest to the site. Reference was also made to several other measurements conducted in the Maroota area off Old Northern Road for previous acoustic studies. The measured background noise levels are presented in Table '1'.

These noise levels were measured using a Bruel & Kjaer Statistical Level Analyser, Model 4426. This instrument was fitted with a 12.5mm diameter microphone, a windshield was fitted over the microphone which was then mounted on a tripod approximately 1.2m above ground level. A period of measurement of 15 minutes was used. Calibration of the instrument before and after the measurement periods was conducted using a Bruel & Kjaer Calibrator Model 4230. Weather conditions during the measurement periods were acceptable. The location of the measurement positions are shown on the diagram in the Appendix.

The terms used to describe the existing environment are briefly explained. The background noise is described using the term L90. The L90 is that level of noise exceeded for 90% of the time and as such are the average minimum of the fluctuations in noise level that occur. The L10 level is that level of noise exceeded for 10% of the time and is the average maximum of the noise fluctuations.

TABLE '1' - STATISTICAL NOISE LEVELS

		dBA			
Location	Date/Time	L90	L10	L1	L50
A	10th Feb 1988/8.55am	35.5	53.0	60.8	42.0
B	10th Feb 1988/8.05am	37.0	44.5	48.3	40.5
C	10th Feb 1988/8.25am	38.8	61.0	72.8	45.0
D	10th Feb 1988/7.50am	35.0	49.3	58.3	40.8

For residences 'E' and 'F' noise readings were not recorded. At residence 'B' market gardening equipment was being used, noise readings would be similar to those at 'D'. Other noise readings at similar locations, such as location 'D', would also apply to the residence shown at location 'F'. Previous acoustic studies at other residences along the Eastern side of Old Northern Road showed similar L90 levels of 33.5 - 38.8 dBA.

The main noise sources are traffic flow on Old Northern Road, activities of market gardeners, bird-life and general community activity.

Description of Existing Noise Sources at Residences

A) This residence is located adjacent to the Old Northern Road and at a similar level as the road. The residence is exposed to activities on the adjacent market gardens. Activity on a rural residence at the Western side of the road was clearly audible.

B) This residence is close to both the boundary of the proposed site and market gardens. A chicken feed processing plant is immediately adjacent to the residence. Traffic on Old Northern Road was audible, birds, insects, and general community activity resulted in a background noise level typical of the area.

C) This residence is located close to Old Northern Road and experiences higher noise levels due to traffic movements.

D) This residence is partially shielded from traffic movements on Old Northern Road. Other noise sources included birds, insects, activity at the adjacent market gardens and distant aircraft.

E) This residence is at a similar distance from the traffic as Residence 'D' and would be expected to have similar noise readings as 'E'. The residence is within a market garden and is subject to noise levels from this activity.

F) This residence is further removed from Old Northern Road and from other extensive noise measurements would have noise levels from less than 35 dBA to less than 38 dBA depending on the extent of general community activity and traffic flow on Old Northern Road.

There are further residences at longer distances from the site and along the Western side of Old Northern Road. These residences are generally acoustically shielded from the site by natural topographical differences.

4.0 DESCRIPTION OF PROPOSED SAND EXTRACTION OPERATIONS

The full description of the proposed extractive operations is not duplicated in this report and reference should be made to the environmental impact statement for such details. The Travarto property would be operated as a sand extraction and processing industry on the lower half only. The first half of the property would continue to be used as a market gardening activity. The adjacent Attard property is now used exclusively for market gardening. The proposed site would be extracted in four stages beginning with extraction at the furthermost end of the property. Extraction would proceed from the boundary with the Attard property and progress across the width of the site towards the Camelleri property.

Stages I, II and III generally take place behind the highest part of the site and effective acoustic shielding exists. This naturally occurring shielding will be further reinforced by the use of berms of overburden. The sand will be extracted using a bulldozer which will rip and push the material from an extraction corridor up to 50m wide. The material at the end of the corridor is then formed into a ramp. The bulldozer operates along the ramp by again pushing the material so that it forms a stockpile adjacent to the plant area. A front end loader feeds the sand into the hopper at the processing plant. The major noise source is the bulldozer during both the ripping/pushing operation and transferring the material from the ripped area along the ramp to the plant area.

The noise emission level from the bulldozer decreases by 5 - 6 dBA to the front and rear. This reduction from the noise levels at the sides of the bulldozer enables improved noise control in the direction of the residences with direct line of sight to the extraction area. To provide the necessary noise control so that SPCC guidelines are met, the use of 3 - 5 m high berms of

overburden or sand will be required along the Northern and Western boundaries of the site.

The extraction of sand in the corridors will take place by the forming of a 3 - 5m high berm along the length of the corridor prior to extraction. The bulldozer will then operate in the corridor with noise control provided by the berm. When the sand in this corridor is extracted, the berm will be relocated to the edge of the next corridor and the operation conducted using acoustic shielding in the direction of the nearest residences and those with direct line of sight. This operational procedure would be applied for all stages of the development.

Stage IV of the development will involve removal of less depth of sand. There is also less naturally occurring acoustic shielding and consistent use of the berms will be required. It would be necessary to retain the processing plant behind a 5 m high stockpile at all times to adequately control the noise emissions from the front end loader and processing plant.

During final contouring and rehabilitation the equipment would operate without acoustic shielding. This would take place over a short period of time of less than two weeks. Market garden activity would also be proceeding during Stages II and III on the area that has been rehabilitated. Farming equipment would be in use while further extraction takes place.

The size of the sand processing plant typically used to screen the sand is limited. The plant consists of a dump hopper, conveyors and two sets of screens. Two diesel engines provide power to drive the conveyors and screens. The main noise emission sources are the diesel engines and chutes rattling at the outlet of the two screens. Mobile equipment would consist of a bulldozer and front end loader.

4.1 Times of Operation

It is proposed to operate the extractive operations and sand processing from 6.00am to 6.00pm, Monday to Friday, and 7.00am to 1.00pm Saturday.
The equipment would operate throughout the year. The processing plant operates continuously through the day and mobile equipment carry out several different operations on the site. The front end loader is normally operated near the processing plant. Mobile equipment would generally be used throughout the day.

4.2 Location of Operations

The locations of the operations relative to the residences are shown in Table '2'.

TABLE '2' - BUFFER DISTANCES

LOCATION	DISTANCE FROM EXTRACTION AREA	DISTANCE FROM PROCESSING PLANT
A	420 - 740	450 - 680
B	150 - 250	150
C	370 - 680	400 - 600
D	350 - 500	450 - 580
E	300 - 600	350 - 550
F	520 - 670	520 - 670

The distances vary because of the stages of development along the site. The topographical differences that occur are shown on diagrams in the Environmental Inspection Statement and will not be duplicated in this report. There are significant topographical differences for the majority of residences to Stages I, II and III of the development. Adequate noise control will be shown to be provided by the use of strategically located berms of overburden and sand. Adjacent to the plant area stockpiles of processed sand will be used in addition to

engineered noise control to the diesel engines.

4.3 Proposed Plant and Equipment

The proposed plant and equipment is shown in Table '3'. The noise emission levels were obtained from measurements at other existing sand mining operations. The bulldozer used at the adjoining property was also measured prior to this site ceasing operations. This bulldozer generated 5 dBA higher noise levels than a larger bulldozer operated at other extractive operations within the Maroota area. The higher noise emission levels will be used however as it is highly likely that this size bulldozer could be used on the Travarto property. The processing plant used at the adjoining property was also noticeably quieter with less chute rattling noise.

TABLE '3' - PROPOSED SAND EXTRACTION AND PROCESSING EQUIPMENT

DESCRIPTION	NOISE LEVEL
1. Front End Loader	79 - 80 dBA at 7m during loading operations.
2. Bulldozer CAT D8G	86 - 76 dBA at 7m to the side during ripping and pushing operations. 82 dBA at 7m to the front. 80 - 81 dBA at 7m to the rear.
3. Dry Screening Plant	79 - 80 dBA at 7m (The chute and screen noise on this plant was markedly less).

4.4 Truck Movements

The access route to the site will be along the boundary between Lots 3 and 63, i.e. Attard and Travarto properties. The

following times of operations would apply:

* At substantially reduced movements from 6.00am to 7.00am.
* At normal number of movements between 7.00am to 6.00pm.
* No movements outside 6.00am to 6.00pm.

To minimise noise emission levels from trucks entering or leaving this site being more discernible that traffic movements along Old Northern Road it is necessary that the following controls be applied:

1. Truck speed is limited to 20 km/hour.

2. Engine brakes on trucks are not used.

3. A warning notice be erected at the site entrance advising truck drivers of these conditions.

4. The entrance road be regularly graded to maintain a smooth surface.

Failure to adhere to these basic requirements of "driving neighborly" would justify the use of berms along the full length of the entrance road down to the start of the extractive site and for the full length of the Southern side of the road to Stage I of the development. Otherwise, potential nuisance to residents at 'A' and 'F' could result.

5.0 PREDICTED NOISE LEVELS

The noise levels have been predicted based on calculation procedures known to be acceptable to the SPCC.

The following would apply:

* 6 dBA attenuation for each doubling of distance from the plant and equipment area to the nearest residences. (Refer to distance attenuation chart in SPCC Environmental Noise Control Manual, 205-2).

* Attenuation due to topographical shielding. Plant location, use of stockpiles and construction of selectively placed berms to provide the required noise control and safeguard measures. (Refer to attenuation chart in SPCC Environmental Noise Control Manual, 228-1).

* Conservative allowance for excess attenuation provided by soft ground cover and vegetation.

* Engineered noise control to the diesel engines on the processing plant by placing 50mm thick acoustic panels around the engines on the sides and base. The panels would consist of a construction providing 15 dBA noise reduction. The use of the panels would reduce the engine noise emission by 5 dBA at 7 metres.

5.1 Plant and Equipment Noise Levels

The noise levels have been determined for Stages I to III and the final Stage IV. The diagrams in the Environmental Impact Statement show the extent of these stages and the working locations of machinery:

Residence 'A'

The combined noise level of plant and equipment for extraction Stages I to III will be 38 dBA and reducing to 35 dBA as the depth of extraction increases. These levels assume that the side of the bulldozer may be oriented towards the residence.

The control measures to achieve this noise level includes:

* distance attenuation of 40 dBA.

* acoustic shielding, provided by the existing topographical differences for Stages I to III and the placement of a 5m high berm along the Northern edge and at the face of the extractive area, of 11 dBA; as the depth of extraction increases the effectiveness of the acoustic shielding will increase to 13 dBA.

* excess attenuation for ground absorption of 2 to 3 dBA.

* safeguard measure of noise control panels on the diesel motors powering the sand processing plant.

The combined noise level during Stage IV will increase to 43 dBA as the side of the bulldozer is oriented towards the residence. The continued use of a 5m high berm along the Northern edge of the extractive area and at the extraction face will provide 10 to 11 dBA acoustic shielding. The berms will need to

be within 30 to 50m of the machinery for maximum effectiveness. As the front or rear of the bulldozer faces the residence the noise level will reduce to 40 dBA.

Residence 'B'

The combined noise level for Stages I to III will be 44 to 47 dBA with the higher level occurring during the first period of extraction. These levels are also based on the side of the bulldozer facing the residence.

The control measures include:

* distance attenuation of 26 dBA.

* acoustic shielding by the berm of 14 dBA increasing to 15 to 19 dBA as the depth of extraction increases to 14 metres.

* minimum allowance for excess attenuation of 1 to 2 dBA.

For stage IV of the extraction operations the combined noise level will be 47 dBA reducing to 42 dBA as the front or rear of the bulldozer faces the residence. The length of the extraction operation in this area is limited as the depth of removal of sand is 2 to 4 metres. A period of up to 3 months may be required to remove the sand at distances of less than 150 metres to the residence. A similar occurrence of noise levels will also apply during the shorter rehabilitation phase of the operations.

Residence 'C'

The occupants of this residence are the property owners and no further assessment of impact is considered necessary.

Residences 'D' and 'E'

A combined noise level of 38 dBA during Stages I to III and 44 dBA during Stage IV based on the following control measures:

* distance attenuation of 36 dBA.
* acoustic shielding for the plant of 18 dBA during Stages I to III and 11 dBA during Stage IV.
* acoustic shielding for the bulldozer of 14 dBA during the first three stages, reducing to 11.5 dBA for Stage IV.
* the acoustic shielding is provided by 5m high berms as stated for the previous residential locations.
* excess attenuation of 2 to 3 dBA.
* noise control to the diesel motors on the sand processing plant.

Residence 'F'

A combined noise level of 42.5 dBA during Stages I to IV of the extraction operations. The noise levels apply for the closest distances between the residence and the location of machinery.

* distance attenuation of 37 dBA.
* acoustic shielding of 9 dBA.

* minimum excessive attenuation for ground absorption and vegetation effects.

* noise control to the sand processing plant as previously detailed.

* the acoustic shielding is based on the 5m high berms being placed within 20m of the machinery in the direction towards this residence.

The noise levels of equipment will be effectively reduced at the residential locations by operating machinery within close proximity to berms. As the extraction face extends the berm will be reformed at the new extractive corridor so that the noise control measure will be constantly in place.

During the major extraction from Stages II and III the depth of extraction will increase the acoustic shielding towards all residential locations except residence 'F'. This residence is at the greatest distance from the extractive area and will have noise levels less than 42.5 dBA through the use of berms.

During Stage IV of the operations an excess of noise would occur for a short time period to construct the berms. This would be repeated during the final stage of the extraction when rehabilitation is in progress.

6.0 STATEMENT OF IMPACT

At the nearest residences to the extraction site the noise levels will generally be less than the acceptable noise levels. For short time periods at the commencement and rehabilitation phases, noise levels will exceed the acceptable level by more than 2 dBA. During the final stage of extraction the noise levels at the nearest residence on the Camelleri property may exceed the acceptable levels by 2 dBA, again this would not be for an extended period of time. In many instances the combined noise levels from plant and equipment will be held to within 5 dBA of the background levels.

It is considered that the extraction operations will not have an unacceptable acoustic impact although mild annoyance may occur to the nearest residence on the Camelleri property during the initial extraction, final extraction at Stage IV and during rehabilitation. A combined noise of 47 dBA is expected for a maximum of up to 3 months.

R.T. BENBOW
PRINCIPAL CONSULTANT

APPENDIX E TRAFFIC COUNTING CLASSIFICATIONS

AXLE SPACING IN FEET

VEH CLASS	VEHICLE TYPE	NO OF AXLES	AXLE 1 to 2	AXLE 2 to 3	AXLE 3 to 4	AXLE 4 to 5	AXLE 5 to 6	TOTAL WHEELBASE
1	Subcompact	2	5.5-8.3	-	-	-	-	5.5-8.3
2	Car, Pick-up, Van	2	8.3-11	-	-	-	-	8.3-11
3	2-Axle Light Truck	2	11-22	-	-	-	-	11-22
4	Bus	2	22-38.5	-	-	-	-	22-38.5
5	Car w 1 axle Trailer	3	5.5-11	5.5-16.5				11-27.5
6*	3-Axle Single Unit Truck	3	5.5-22	0-5.5				11-38.5
7*	2S1 Tractor-Trailer	3	5.5-16.5	16.5-38.5				22-44
8	Car w 2 Axle Trailer	4	5.5-11	8.3-16.5	0-5.5			16.5-38.5
9*	4-Axle Single Unit Truck	4	5.5-22	0-8.3	0-5.5			16.5-38.5
10*	3S1 Tractor-Trailer	4	5.5-16.5	0-5.5	5.5-38.5			22-55
11*	2S2 Tractor-Trailer	4	5.5-16.5	16.5-38.5	0-5.5	-	-	22-55
12*	3S2 or 3S2(S) Tractor-Trailer	5	5.5-16.5	0-5.5	11-38.5	0-11	-	38.5-55
13*	Other 5 Axle	5	5.5-16.5	0-22	0-22	0-22	-	38.5-66
14*	6 or more	6	5.5-16.5	0-5.5	0-38.5	0-22	0-11	38.5-66

TABLE 1: Vehicle Classes used in traffic study.

* Vehicle classified as a 'truck' for the purposes of traffic analysis.

APPENDIX F CLAUSE 35 CONSULTATION

New South Wales Government

Department of Environment and Planning

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

Telephone: (02) 266 7111 Ext 7235
Telex: DEP NSW 176826
Fax No.: 266 7599

Contact: V. Thomson

Our reference: ISN 86/1680

Your reference: B 718 CLD:PJ

25 AUG 1987

Collin C. Donges and Associates
Pty. Ltd,
P.O. Box 244,
DURAL. 2158 20

Dear Sir,

RE: PROPOSED EXTRACTIVE INDUSTRY, LOT 3, D.P. 567166, AND PORTION 63, PARISH OF FREDERICK, OLD NORTHERN ROAD, MAROOTA

Thank you for your letter of 12 August, 1987, indicating that you are consulting with the Director with regard to the preparation of an environmental impact statement (EIS) for the above consolidated development. Your stated reasons of operational efficiency and enhancement of opportunities to implement environmental safeguards to consolidate the two proposals are noted.

2. As development consent is required for the proposal and it is a designated development within the meaning of Schedule 3 of the Environmental Planning and Assessment Regulation, 1980, as amended, an EIS must accompany the development application to the Hornsby Shire Council. The EIS shall be prepared in accordance with clause 34 of the Regulation and shall bear a certificate required by clause 26(1)(b) of the Regulation (see Attachment No. 1).

3. In addition, pursuant to clause 35 of the Regulation, the Director requires that the following matters be specifically addressed in the EIS:

- Any possible effects on the nearby Marra Marra National Park e.g. depending on location of operations.
- Visual aspects
- Careful consideration should also be given to proposals for soil erosion controls.
- Any cumulative impacts associated with any adjacent extraction activities shall be addressed.

4. Attachment No. 2 is a guide to the type of information most likely to be relevant to the development you propose; not all of the matters raised therein may be appropriate for consideration in the EIS for your proposal; equally, the guide is not exhaustive.

../2

5. In preparing your EIS you should approach Hornsby Shire Council and take into account any comments Council considers may apply to its determination of the proposal.

6. Should you require any further information regarding this matter please do not hesitate to contact us again.

Yours faithfully,

B. Adams,
A/Manager, Environmental Assessment Branch,
AS DELEGATE FOR THE DIRECTOR

DEPARTMENT OF ENVIRONMENT AND PLANNING
ATTACHMENT No.1

STATUTORY REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENTS.

In accordance with Part IV of the Environmental Planning and Assessment Act,1979, an environmental impact statement (EIS) must meet the following requirements:

Pursuant to clause 34 of the Environmental Planning and Assessment Regulation,1980, as amended, the contents of an EIS shall include the following matters:

(a) full description of the designated development proposed by the development application;
(b) a statement of the objectives of the proposed designated development;
(c) a full description of the existing environment likely to be affected by the proposed designated development, if carried out;
(d) identification and analysis of the likely environmental interactions between the proposed designated development and the environment;
(e) analysis of the likely environmental impacts or consequences of carrying out the proposed designated development (including implications for use and conservation of energy);
(f) justification of the proposed designated development in terms of environmental, economic and social considerations,
(g) measures to be taken in conjunction with the proposed designated development to protect the environment and an assessment of the likely effectiveness of those measures;
(g1) details of energy requirements of the proposed development and measures to be taken to conserve energy;
(h) any feasible alternatives to the carrying out of the proposed designated development and reasons for choosing the latter; and
(i) consequences of not carrying out the proposed development.

The EIS must also take into account any matters required by the Director of Environment and Planning pursuant to clause 35 of the Regulation, which may be included in the attached letter.

The EIS must bear a certificate as required by clause 26(1)(b) of the Regulation.

DEPARTMENT OF ENVIRONMENT AND PLANNING
ATTACHMENT No.2

ADVICE ON THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR AN EXTRACTIVE INDUSTRY.

A definition of extractive industry may be found in paragraph (n) to Schedule 3 of the Environmental Planning and Assessment Regulation, 1980, (as amended). These industries are operations undertaken for the purpose of winning sand, gravel, clay, turf, soil, rock, stone or similar substances. The definition of extractive industry specifically excludes coal, petroleum or minerals which are prescribed under the Mining Act, 1973. Extractive industries may take the form of dredging operations, quarrying operations, turf farms or various forms of land excavation etc. Processing of extracted material on the same site as the winning of the material may also constitute an extractive industry.

Extractive industries have prompted considerable public controversy in the past since, among other things, they affect visual amenity, generate heavy vehicle movements, raise dust and cause disturbance through noise and blasting. This is the prime reason for designation of extractive industries under the Environmental Planning and Assessment Act,1979.

The purpose of this paper is to outline various issues relevant to the preparation and consideration of an EIS for extractive industries. It is intended to assist the preparation of the EIS. However, it is the applicant's responsibility to identify and address as fully as possible the matters relevant to the specific development proposal in complying with the requirements for EIS preparation (see Attachment No.1).

The matters nominated in this paper are not intended as a comprehensive identification of all issues which may arise in respect of an extractive industry. Some of the issues nominated may not be relevant to a specific proposal. On the other hand, there may be other issues, not included, that are appropriate for consideration in the EIS.

Information provided should be clear, succinct and objective and where appropriate be supported by maps, plans, diagrams or other descriptive detail. The purpose of the EIS is to enable members of the public, the consent authority (usually the Council) and the Department of Environment and Planning to properly understand the environmental consequences of the proposed development.

2/...

1. Description of the proposal.

The description of the proposal should provide general background information on the location and extent of the works proposed, an indication of adjacent developments, and details of the site, land tenure, zonings and relevant forward planning proposals and any other land use constraints.

The EIS should address the compatibility of the proposal with any regional strategy for extractive industries in the area and with the provisions of the Local Environmental Plans for existing and proposed development.

This section should provide specific information on the nature, intent and form of the development. It should, as far as possible, include such details as the processes involved (highlighting any proposed crushing or blasting), disposal of wastes, landscaping and site rehabilitation. A description should also be provided of associated operations such as the transport of materials and use of the end product if likely to have environmental implications.

Particular details that may be relevant include:

- Characteristics and economic significance of the resource
- Possible availability of alternative resources.
- Quantity of materials to be extracted.
- Methods of extraction / plans of operations.
- Details of any blasting and/or crushing.
- Effects of vibrations.
- Type of machinery and equipment to be used.
- Expected life of the operation.
- Number of persons to be employed.
- Hours of operation.
- Details of necessary stockpiling.
- Access arrangements - truck routes, truck numbers etc.
- Site drainage and erosion controls.
- Proposals for rehabilitation.

2. Description of the Environment.

This should provide details of the environment in the vicinity of the development site and also of aspects of the environment likely to be affected by any facet of the proposal. In this regard, physical, natural, social, archaeological and economic aspects of the environment should be described to the extent necessary for assessment of the environmental impact of the proposed development.

3. Analysis of Environmental Impacts.

Environmental impacts usually associated with extractive industries are listed below. Where relevant to the specific proposal, these should be addressed in the EIS, taking into account the adequacy of safeguards proposed to minimise them.

3/...

- The flow of any affected rivers or watercourses.
- The effect of the extraction on the sediment transport rate of any affected rivers or watercourses.
- The bed and bank stability of any affected rivers during and after completion of the operations.
- Any possible siltation, sedimentation or downstream effects of the operation.
- Any likely cumulative effects of the proposed operation when considered together with other operations in the vicinity.
- Details of floods and any likely effects of the operation on flood liability of surrounding lands.
- The possible effects of flooding on the operation.
- Effects on flora and fauna.
- The agricultural viability of the landholding.
- Likely noise/vibration disturbance caused by the operations, including transport operations, on nearby residences.
- Other impacts of trucking movements, including access over railways and onto highways.
- Dust nuisance likely to be caused.
- Effects on water quality of nearby watercourses.
- Disposal of waste material.
- Effects on the visual environment.
- Any likely affectation of sites of Aboriginal archaeological or European heritage value if located in the vicinity of operations.

In addition, any potential for hazard or risks to public safety and any proposals to monitor and reduce environmental impacts should be included.

4. Contact with relevant Government Authorities.

In preparing the EIS, it is suggested that authorities, such as those listed below, should be consulted and their comments taken into account in the EIS.

- The State Pollution Control Commission in regard to air, water and noise impacts and relevant pollution control legislation requirements;
- The Soil Conservation Service regarding appropriate erosion control and rehabilitation procedures;
- The Department of Agriculture if prime agricultural land may be affected by the proposal; and
- The Heritage Council of NSW if the proposal is likely to affect any place or building having heritage significance for the State; the National Parks and Wildlife Service if aboriginal places or relics are likely to be affected.

It is the responsibility of the person preparing the EIS to determine those Departments relevant to the proposed development.

FIGURES

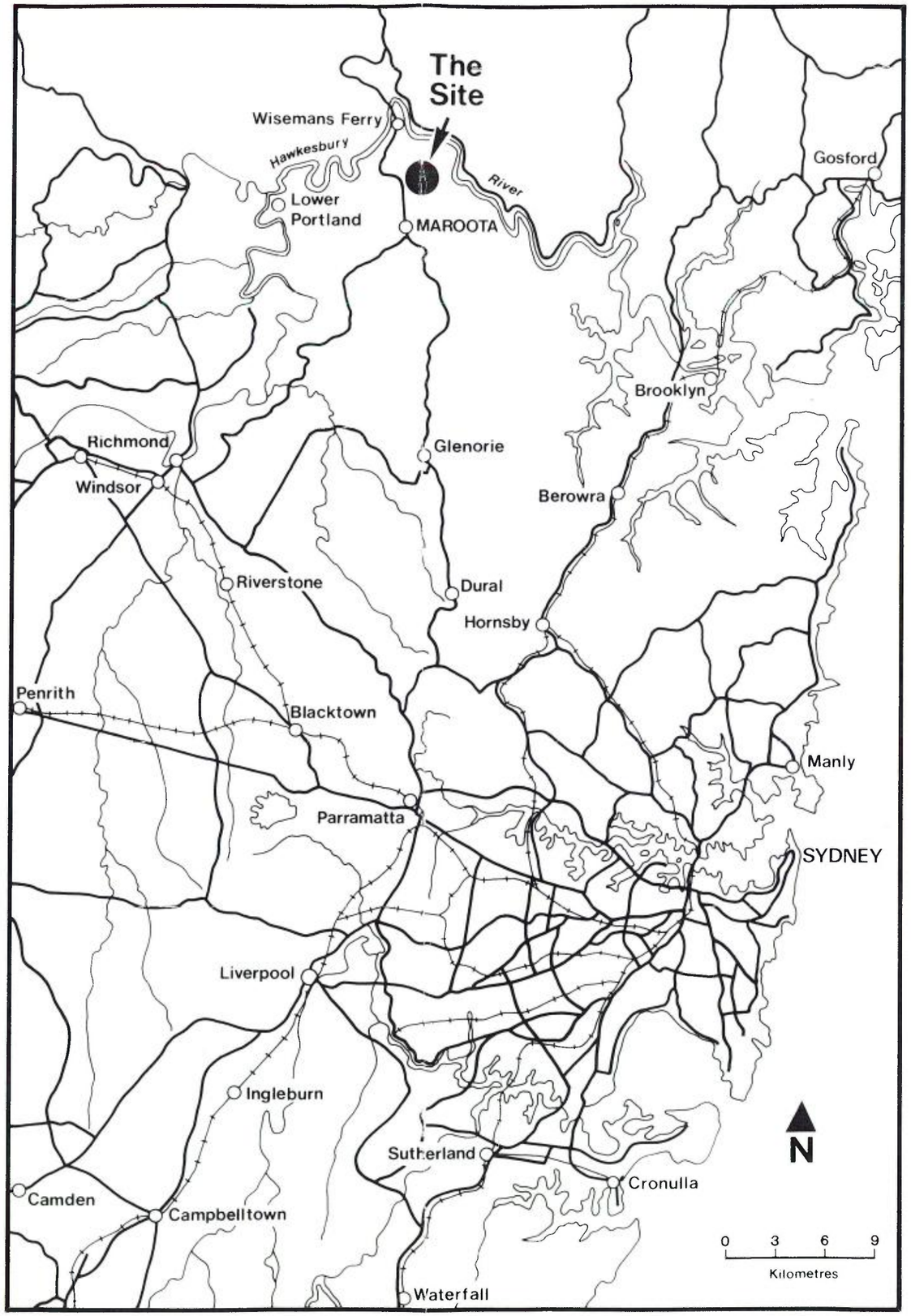


Figure 1: REGIONAL LOCATION

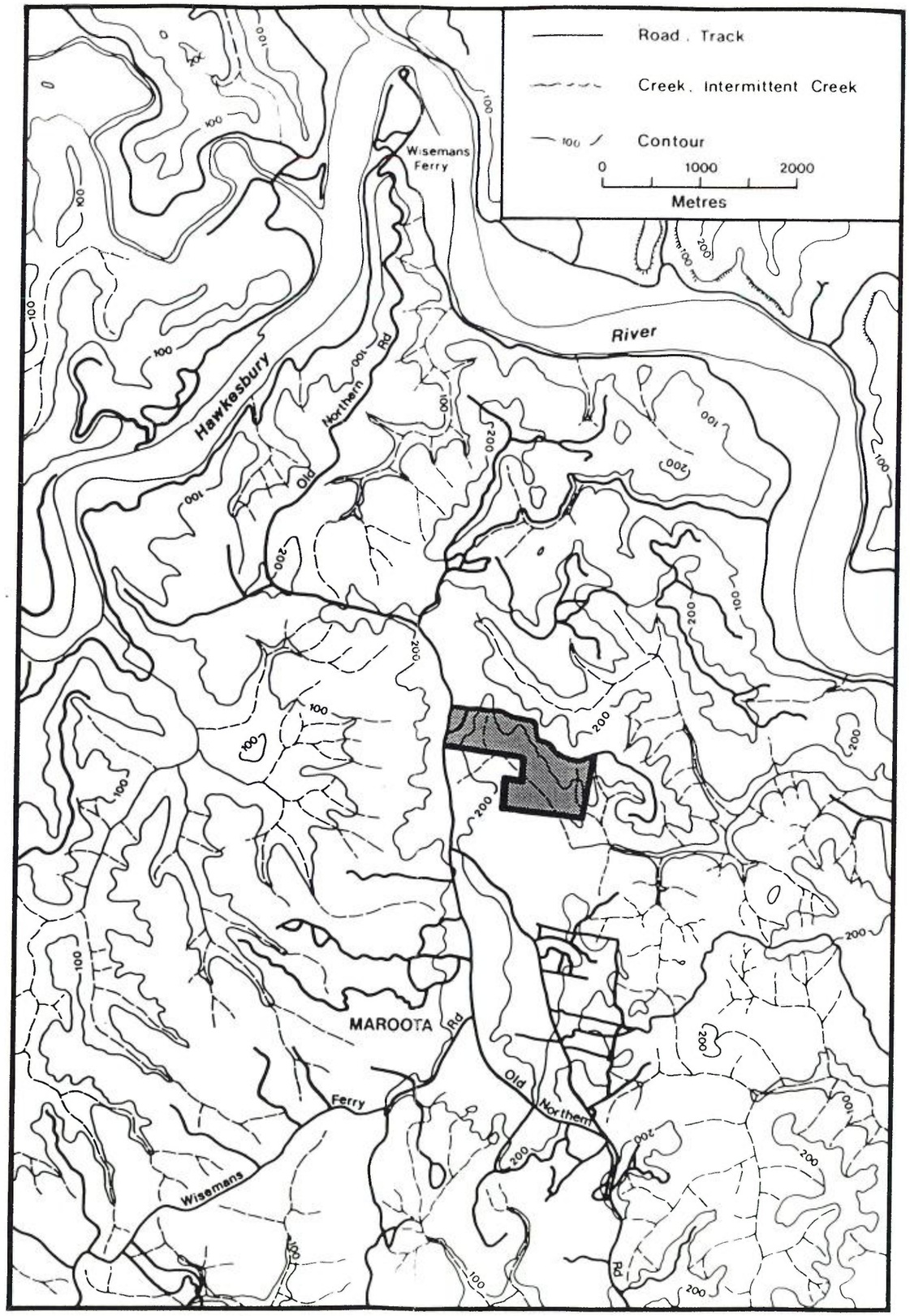


Figure 2: SITE LOCATION AT MAROOTA

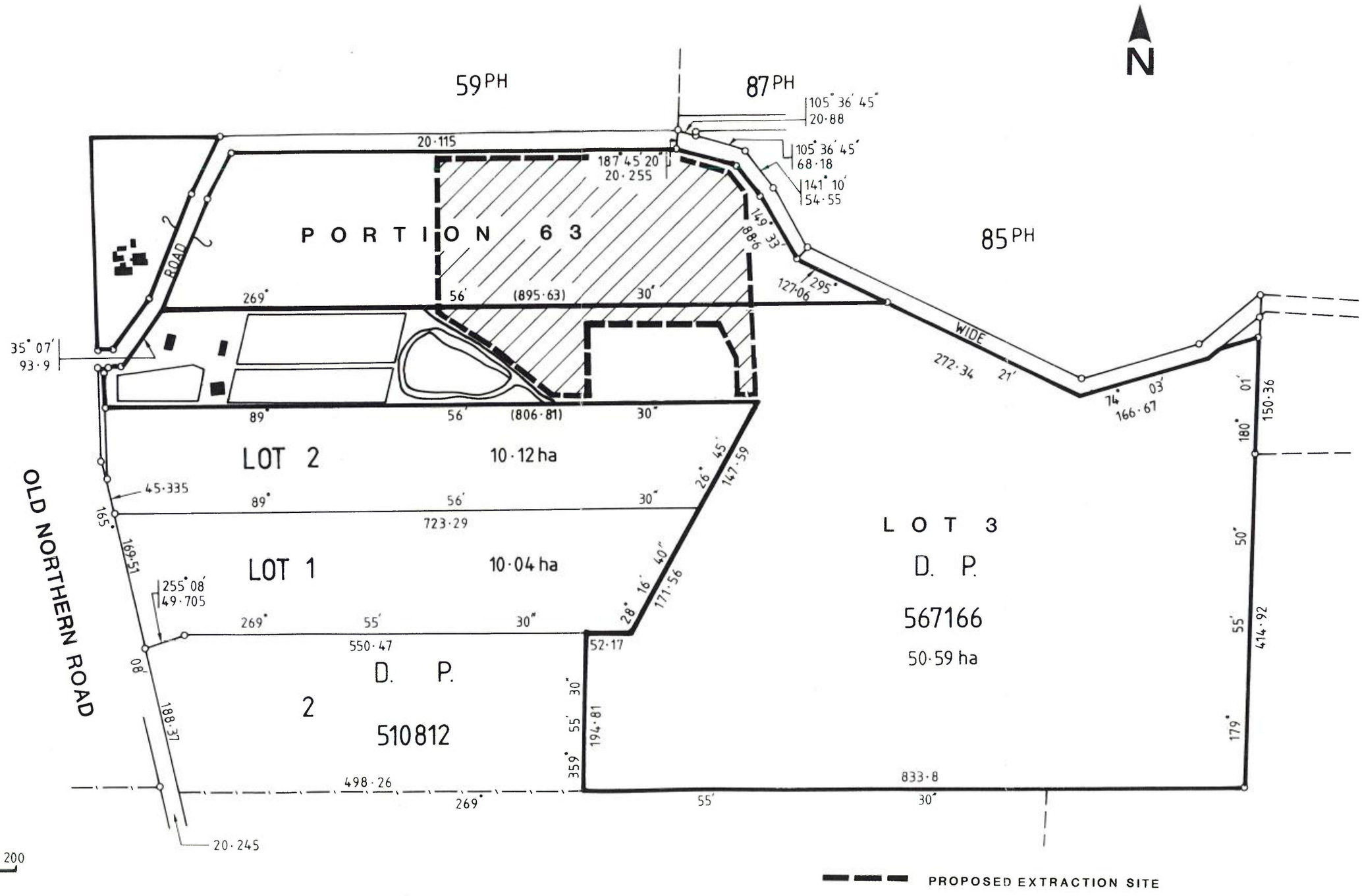


Figure 3 : PROPERTY BOUNDARIES AND LOCATION OF DEVELOPMENT AREA

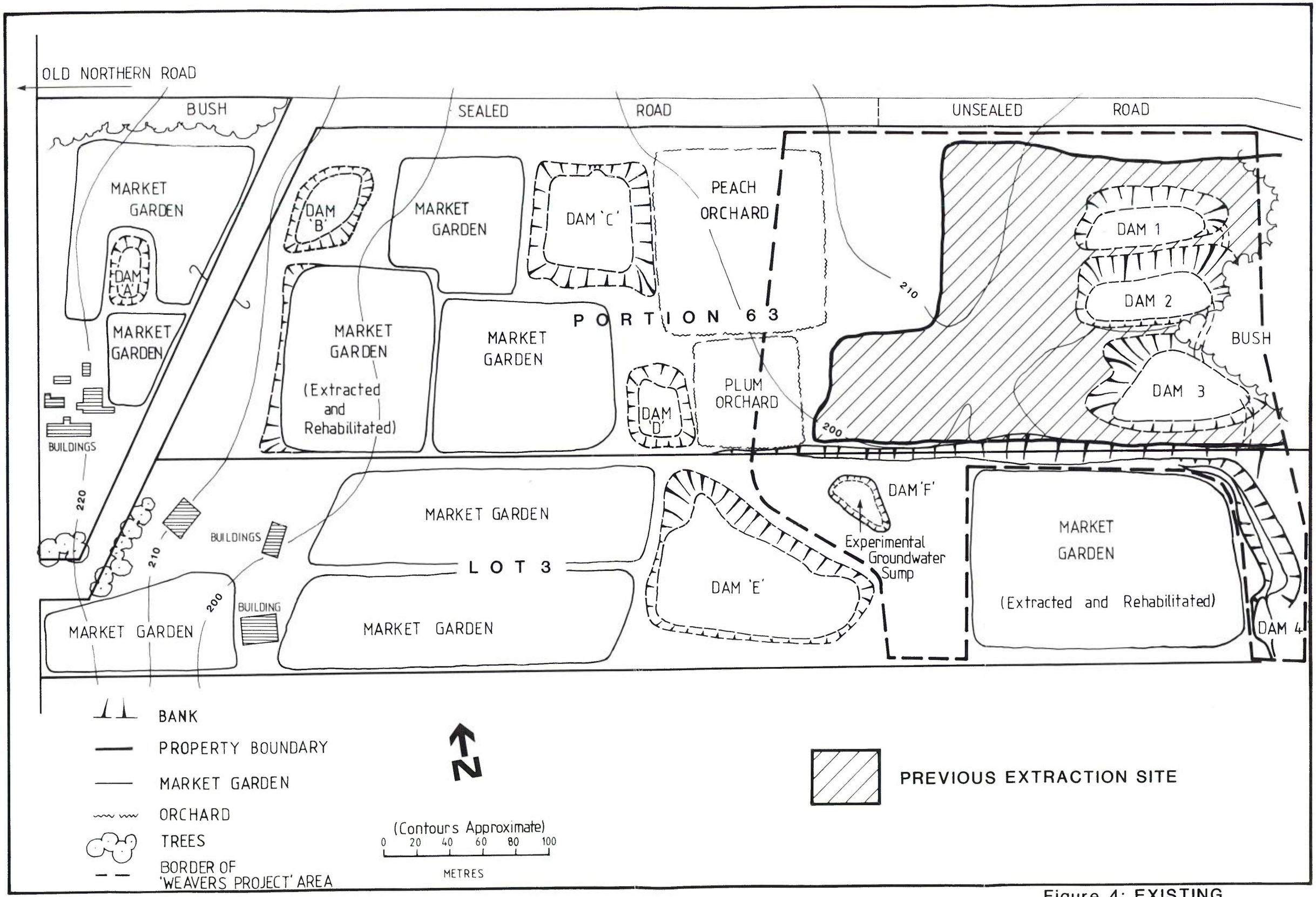


Figure 4: EXISTING TOPOGRAPHY AND LANDUSE LAYOUT

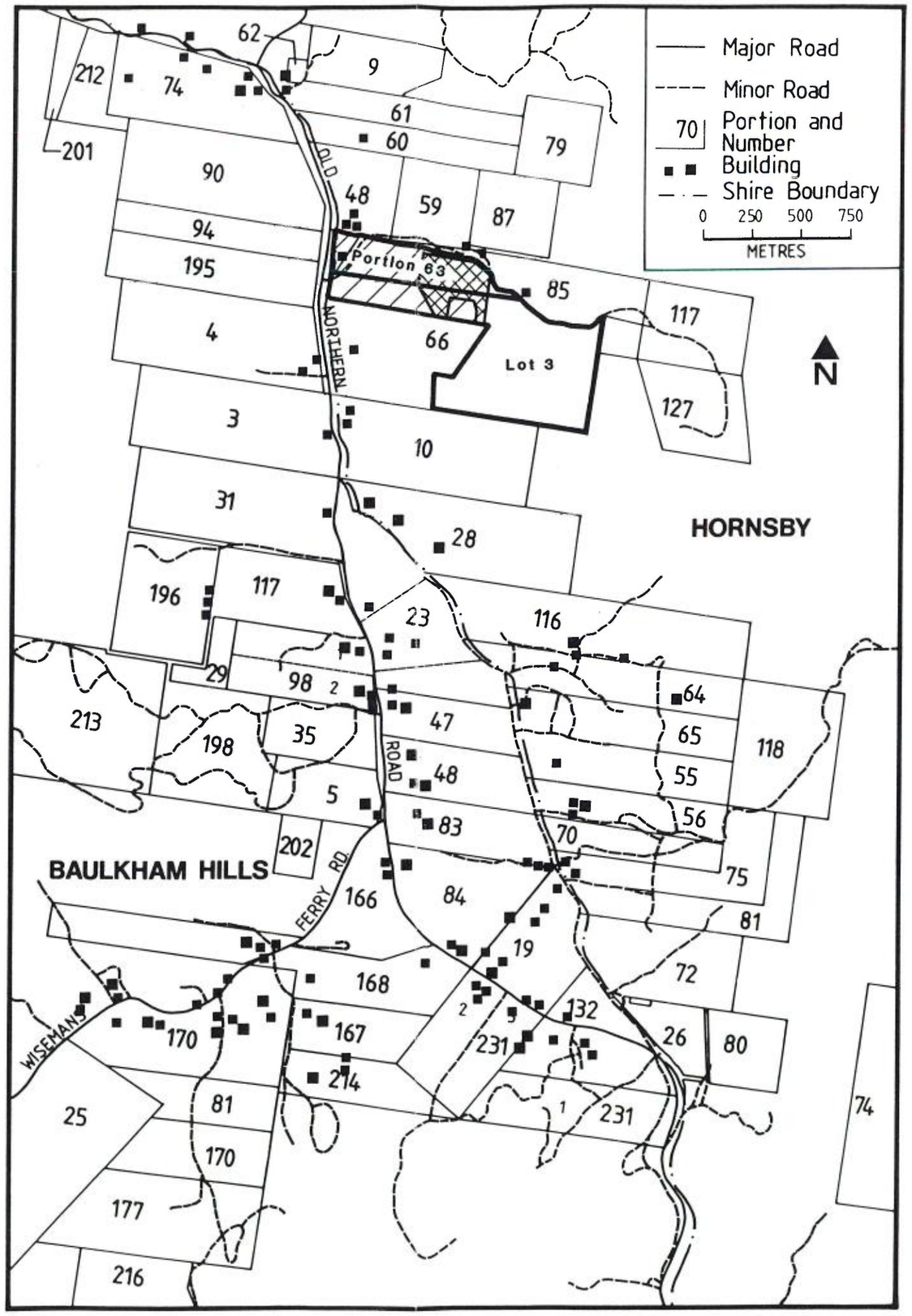


Figure 5 PROPERTY BOUNDARIES AND LOCATION OF DEVELOPMENT

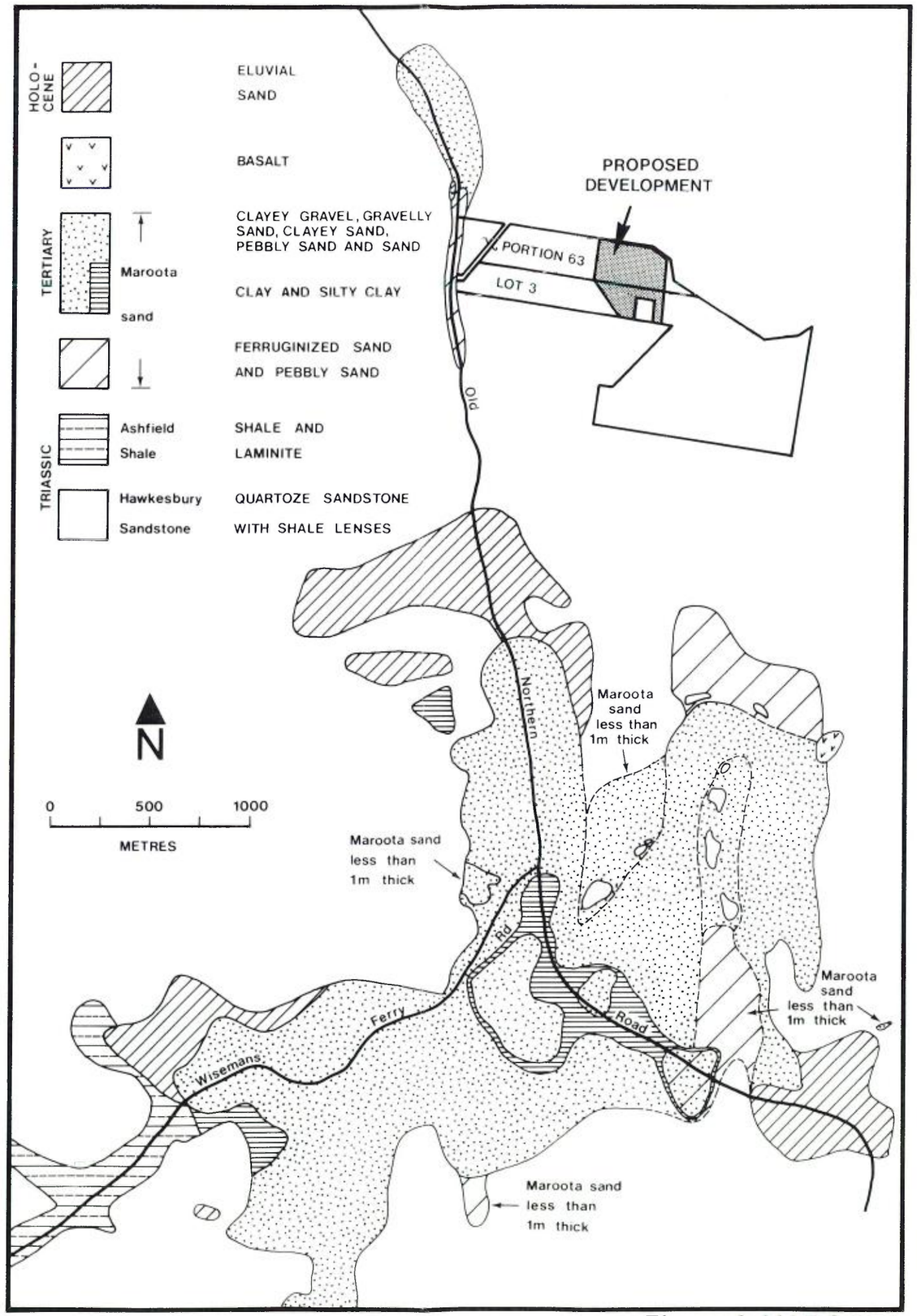


Figure 6: MAROOTA GEOLOGY

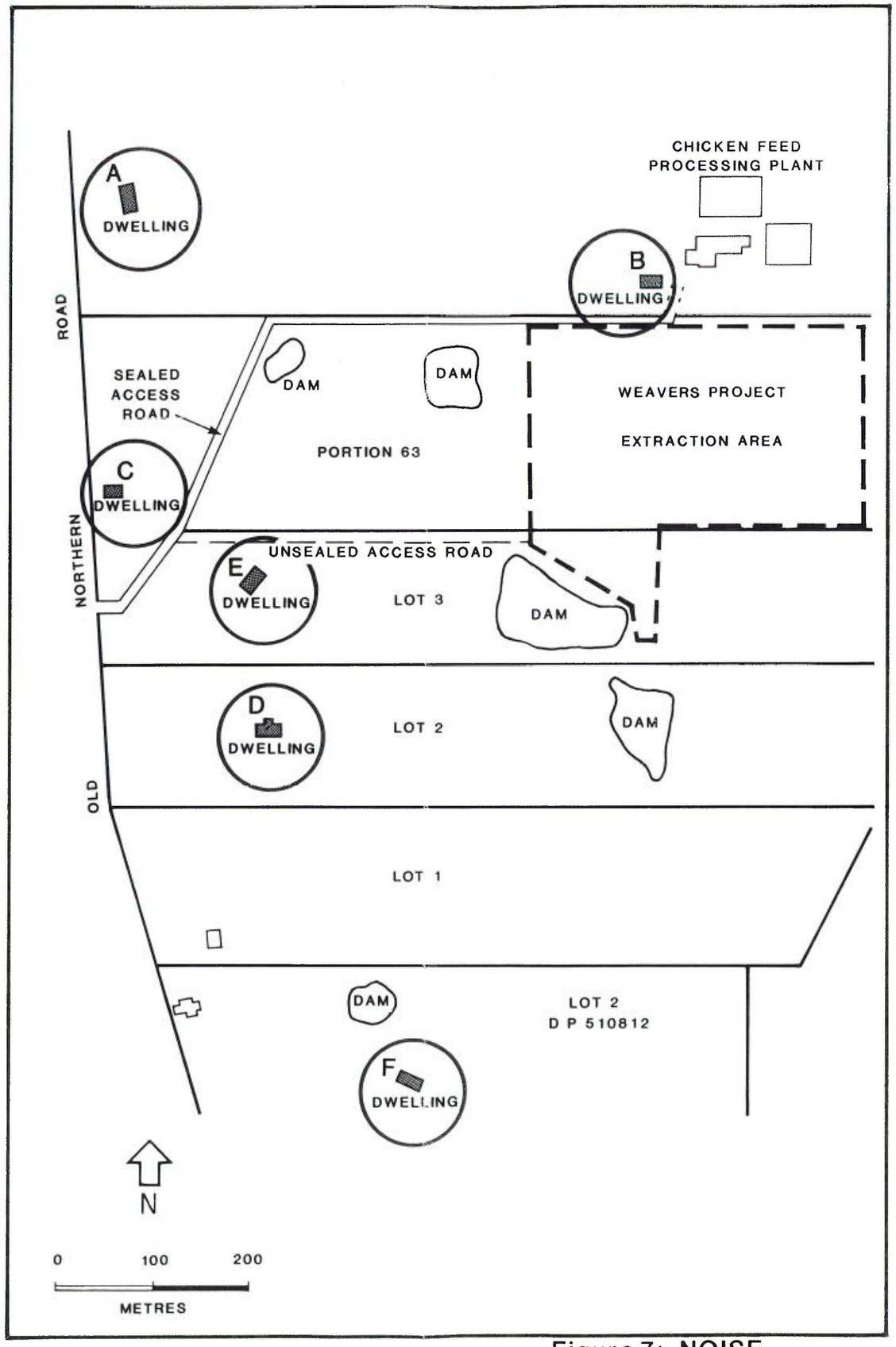


Figure 7: NOISE MEASUREMENT LOCATIONS

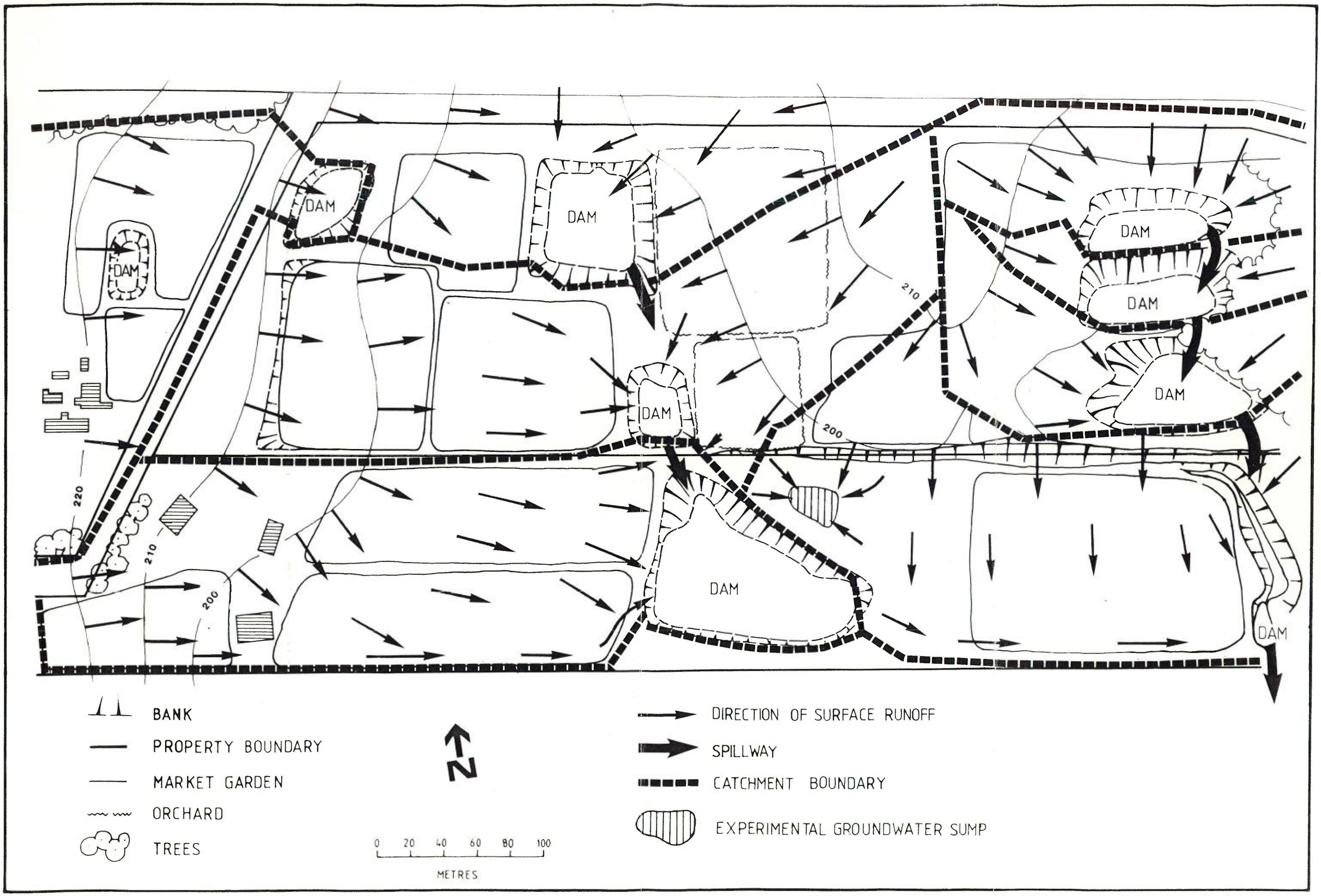


Figure 8: SURFACE WATER HYDROLOGY

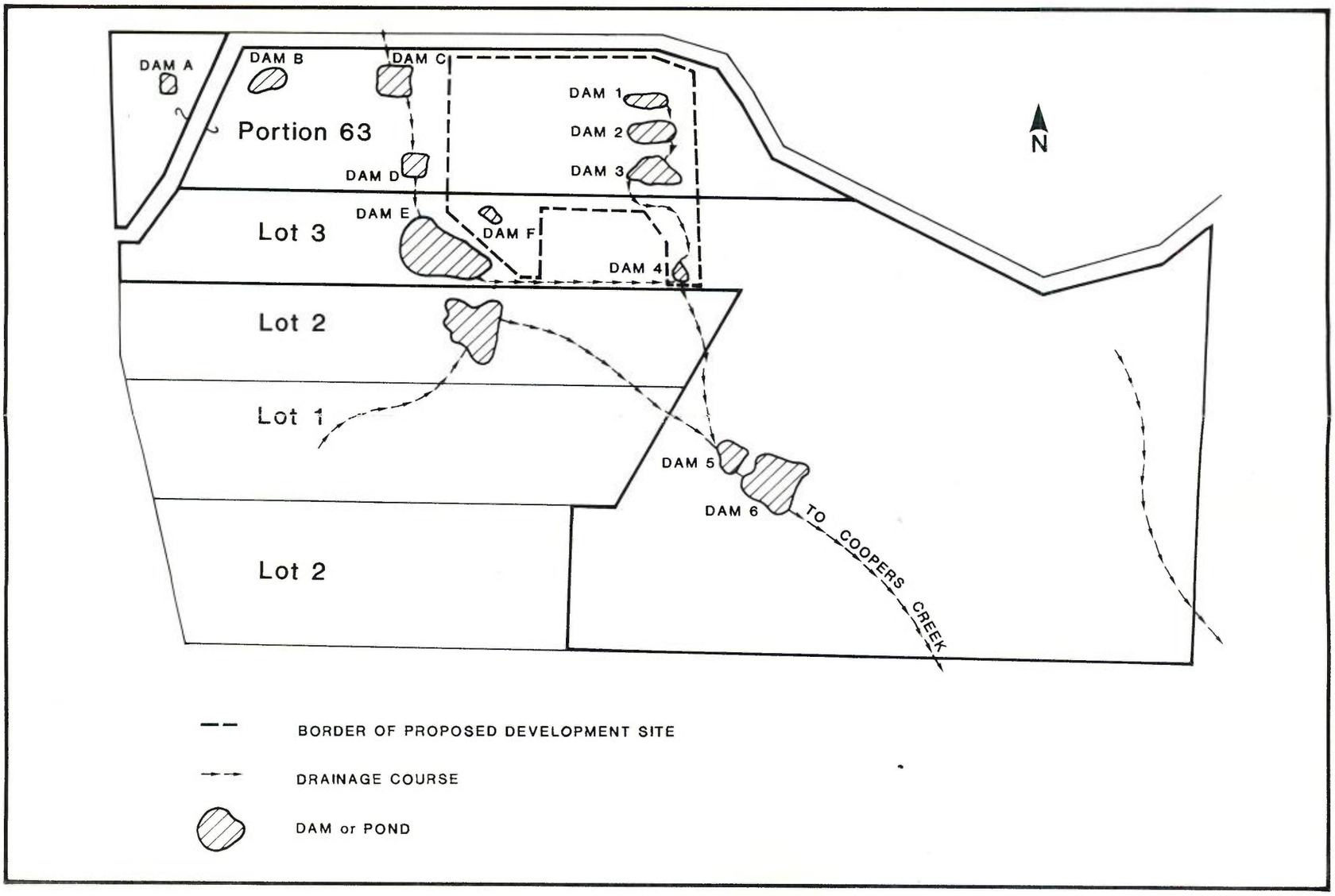
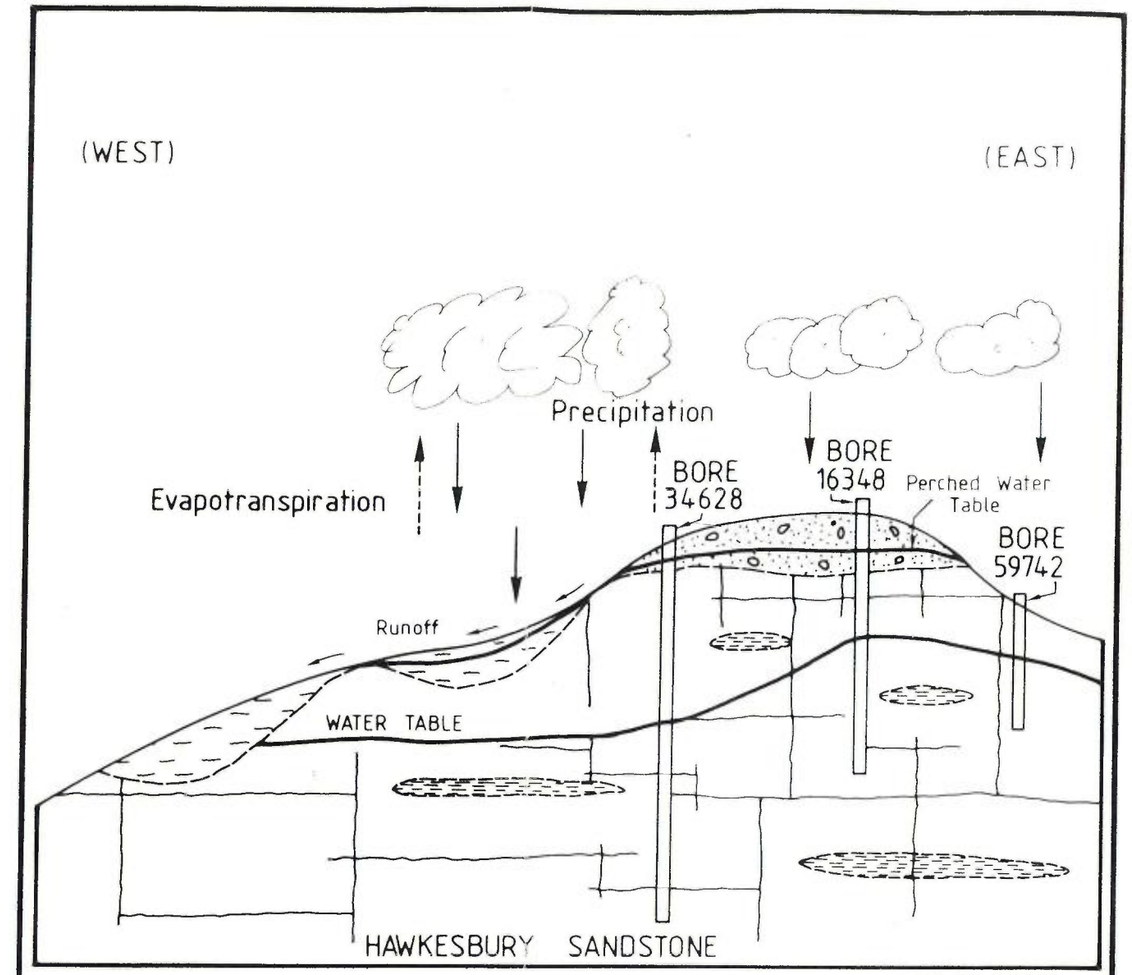


Figure 9 DRAINAGE PATTERN



NOT TO SCALE

LEGEND

- Eluvial Sand
- Maroota Sand — Sand, gravel, silt and clay
- Hawkesbury Sandstone — Shale lense
- Hawkesbury Sandstone — Sandstone
- Joints and groundwater flow paths through rock

Figure : 10 HYDROLOGICAL SECTION AT NORTH MAROOTA

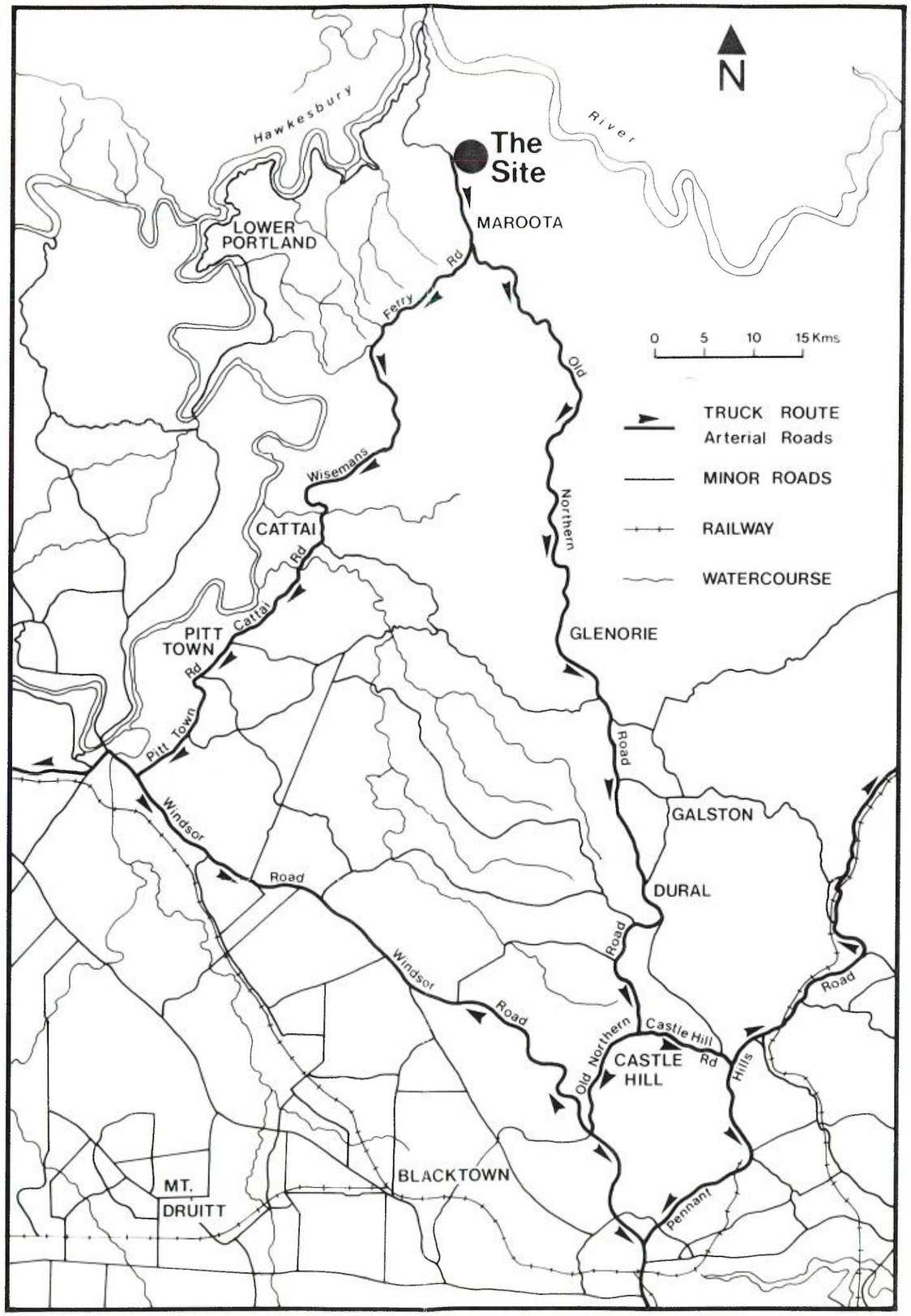


Figure : 11 MAJOR TRANSPORT ROUTES

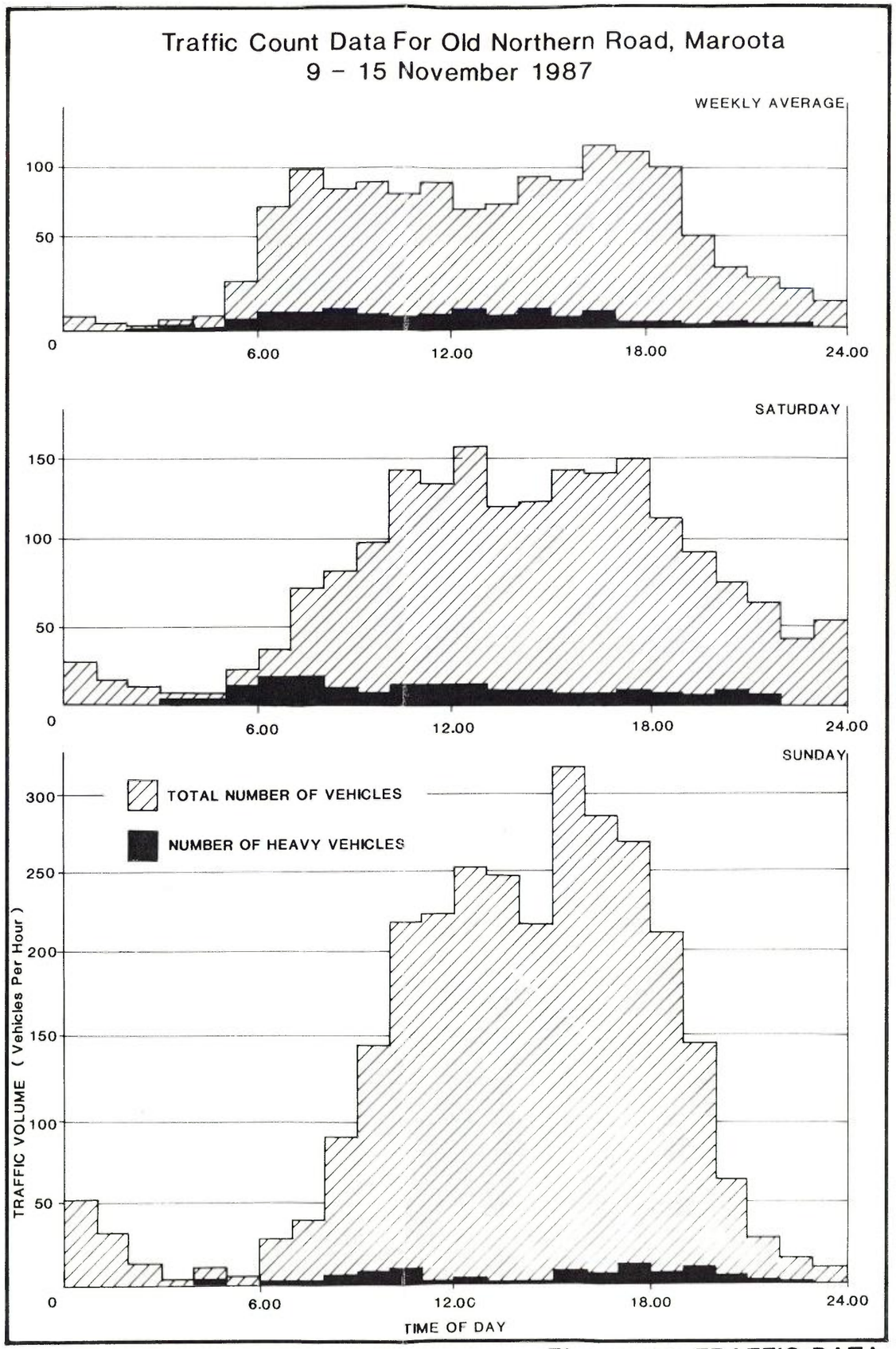
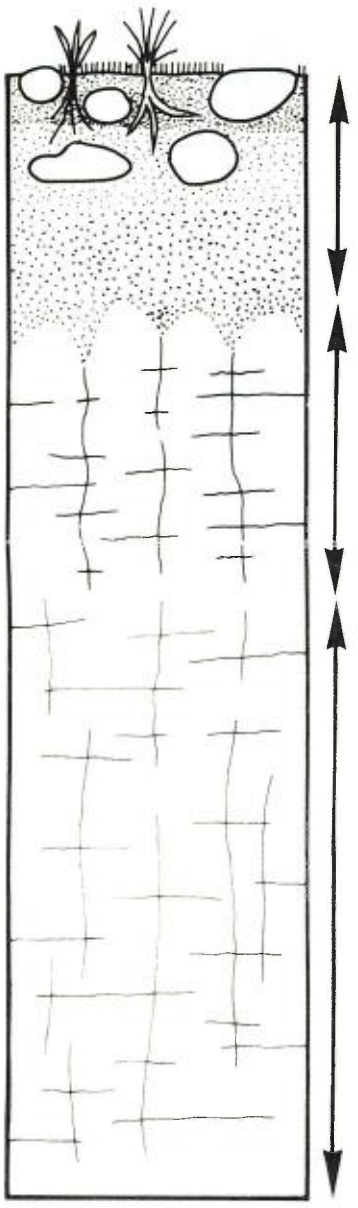


Figure 12: TRAFFIC DATA

TYPICAL NATURAL SOIL PROFILE ON SITE

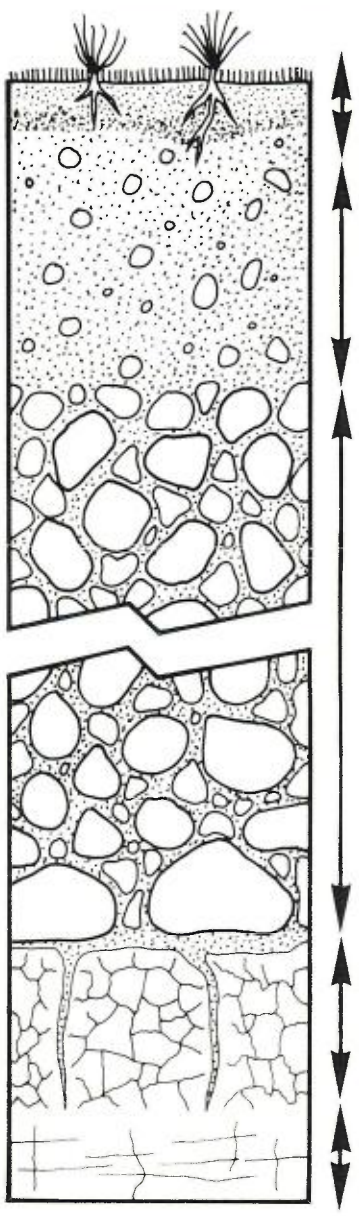


0 – 300 mm. 'A HORIZON'
SANDY DISCONTINUOUS TOPSOIL, NUMEROUS STONES, WEAK STRUCTURE.

'B HORIZON'
VARIABLE DEPTH UP TO 1 m. STRONGLY WEATHERED, IRONSTAINED CLAYEY SANDSTONE. WATER TABLE OFTEN PERCHED ON OR IN THIS UNIT.

1 . 3 m. – WEATHERED HAWKESBURY SANDSTONE (Eluvial Sand).

TYPICAL REHABILITATED SOIL PRORLE



0 – 100 mm. REPLACED ORIGINAL TOPSOIL, EVENLY SPREAD, FERTILISED AND MULCHED.

100 mm. – 500 mm.
SANDY OVERBURDEN AND FINE MINING REJECTS COMPACTED AND CONTOUR RIPPED

500 mm. – COARSE MINING REJECTS (boulies) TO PROVIDE FREE – DRAINING SUBSOIL.

RIPPED HAWKESBURY SANDSTONE.

UNDISTURBED HAWKESBURY SANDSTONE.

Figure13 : SOIL PROFILES

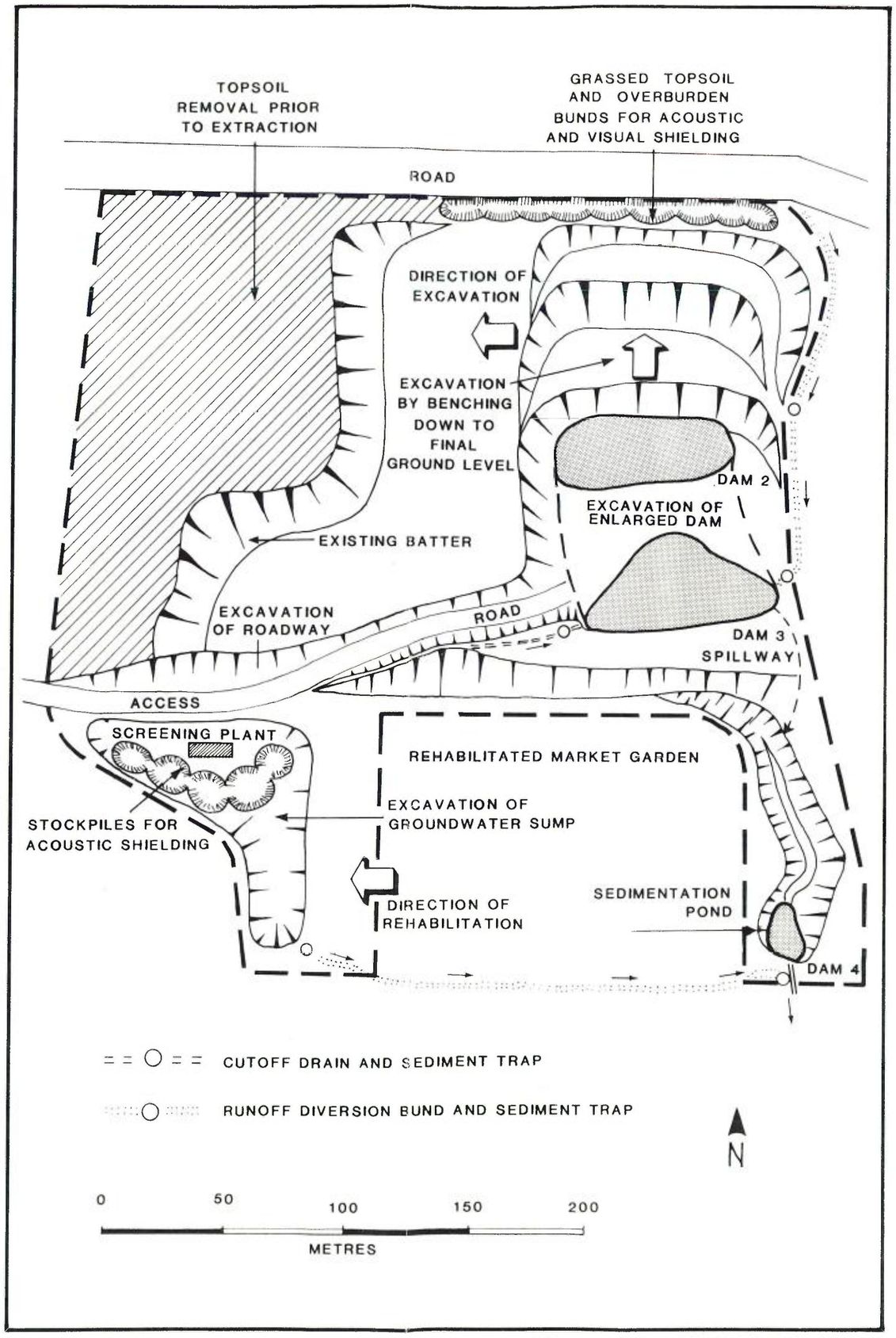


Figure 14: LAYOUT OF MINE OPERATIONS (1)

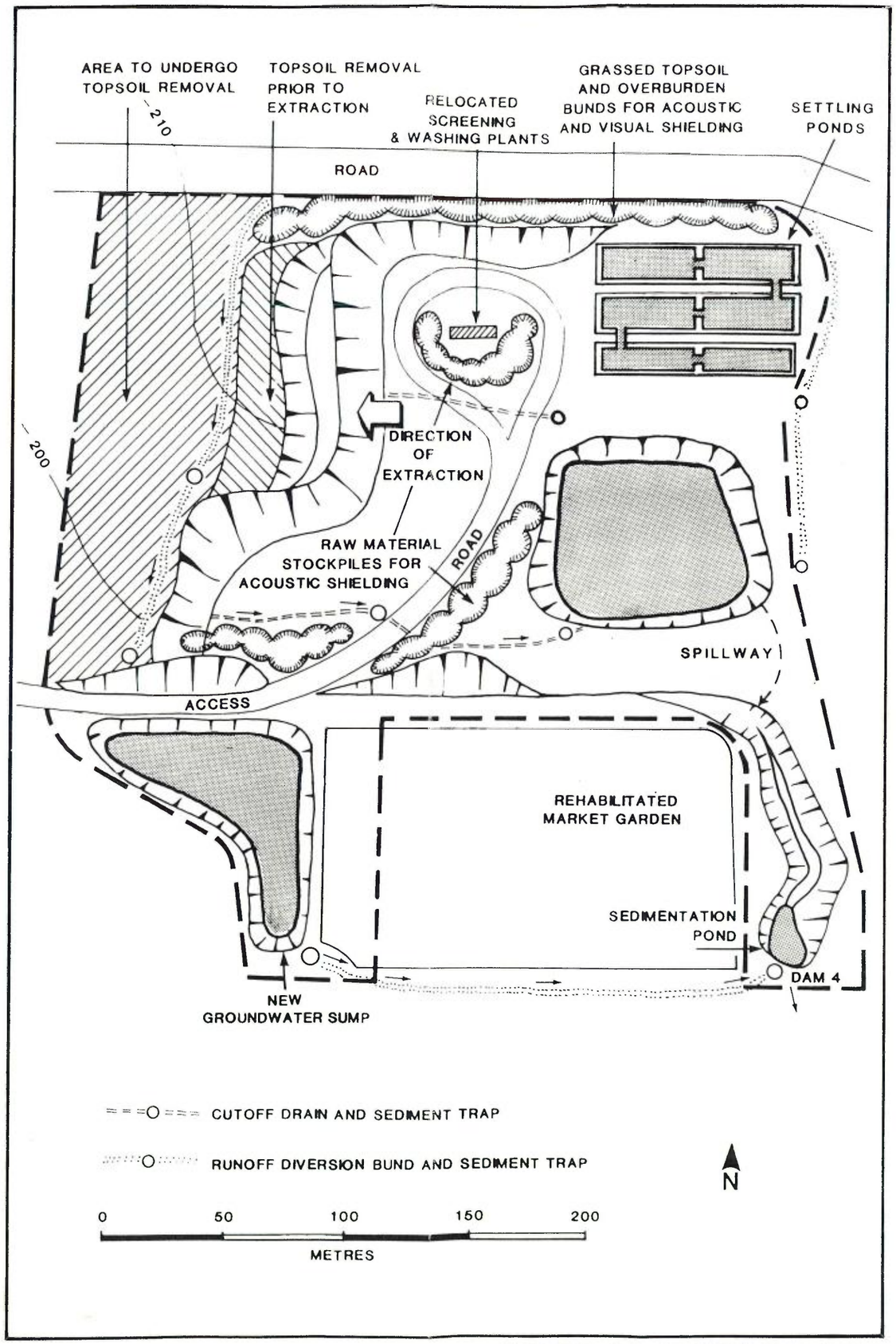


FIGURE 15: LAYOUT OF MINE OPERATIONS (2)

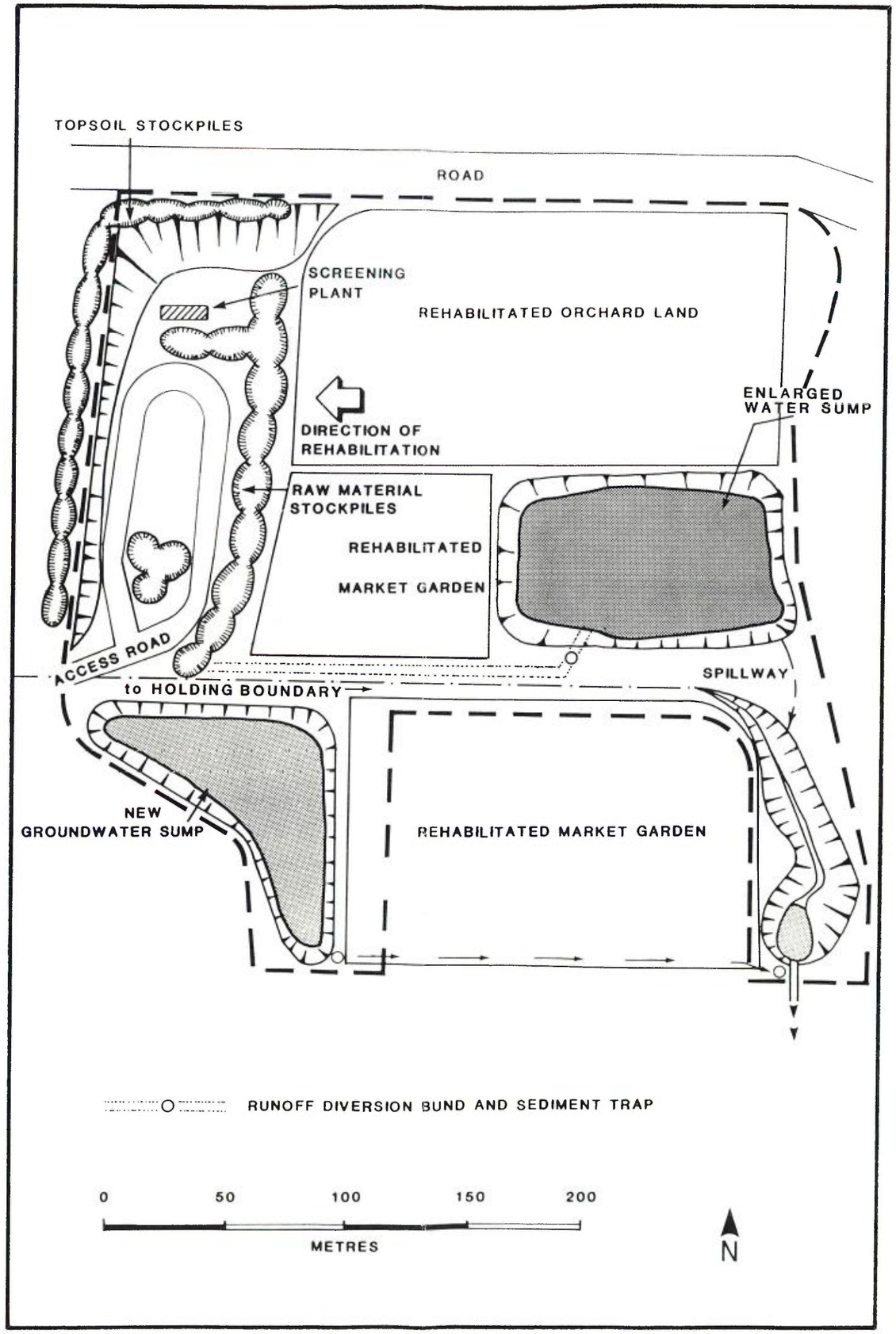


FIGURE 16: LAYOUT OF MINE OPERATIONS (3)

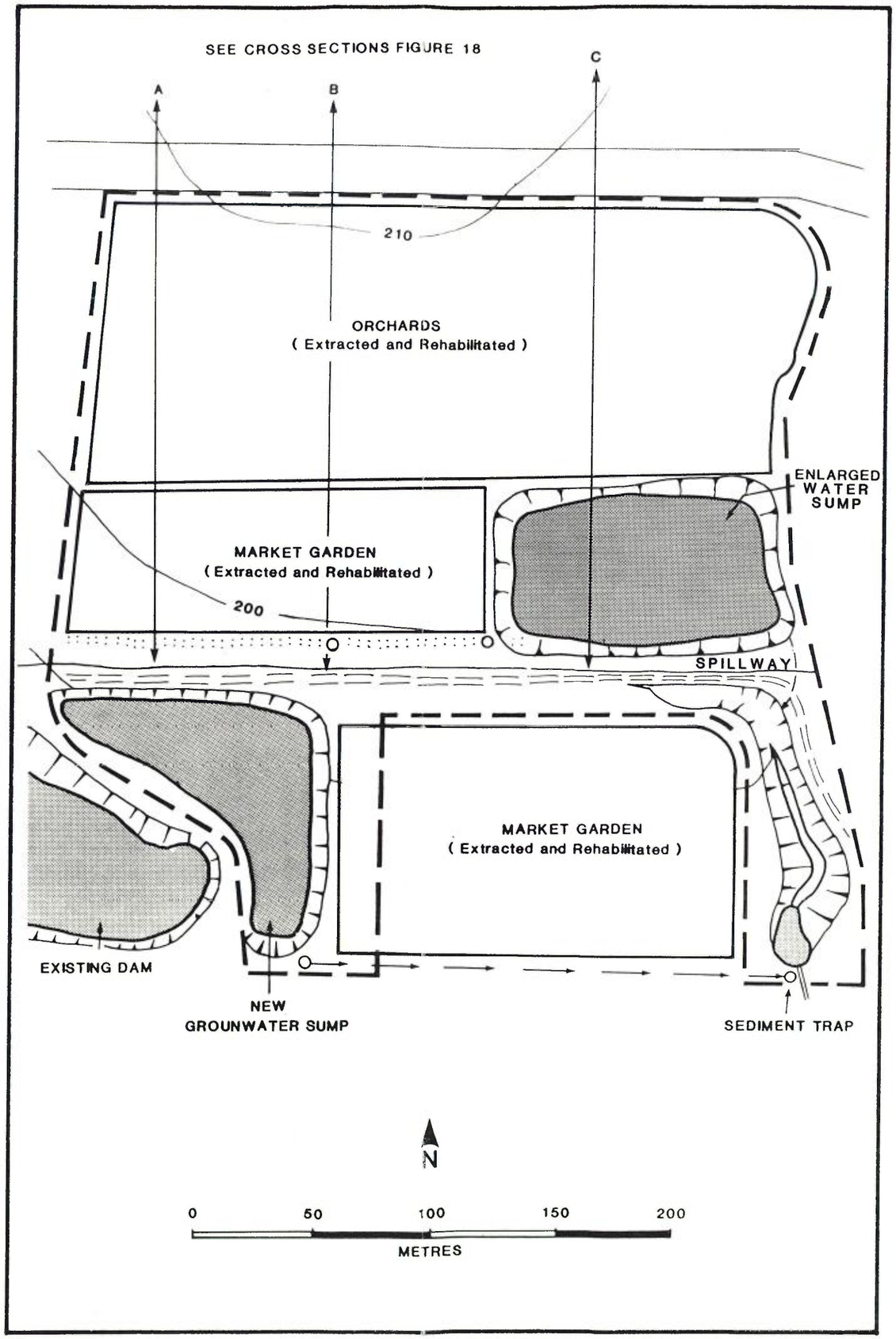


Figure 17: REHABILITATION OBJECTIVES

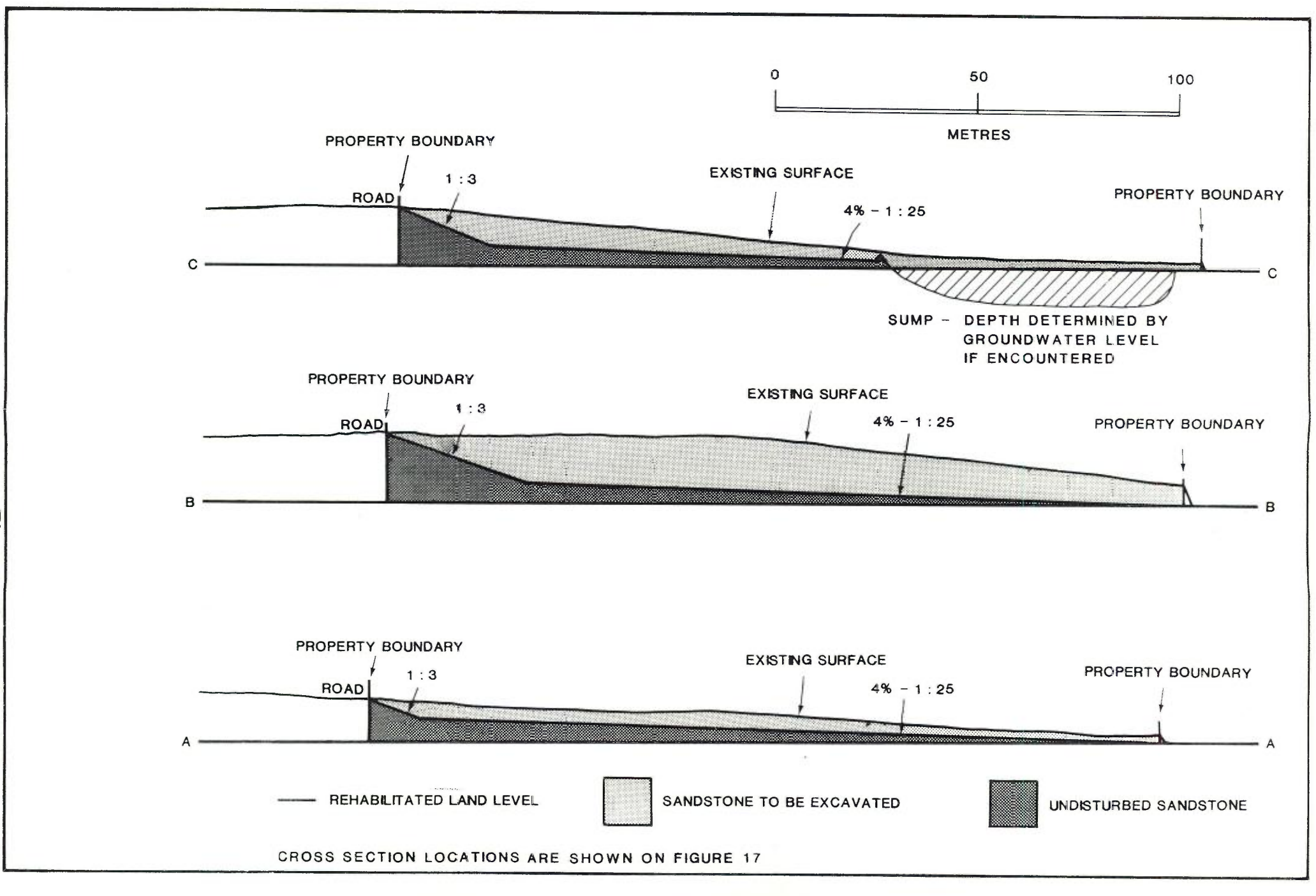


Figure 18: EXTRACTION AND REHABILITATION CROSS SECTIONS

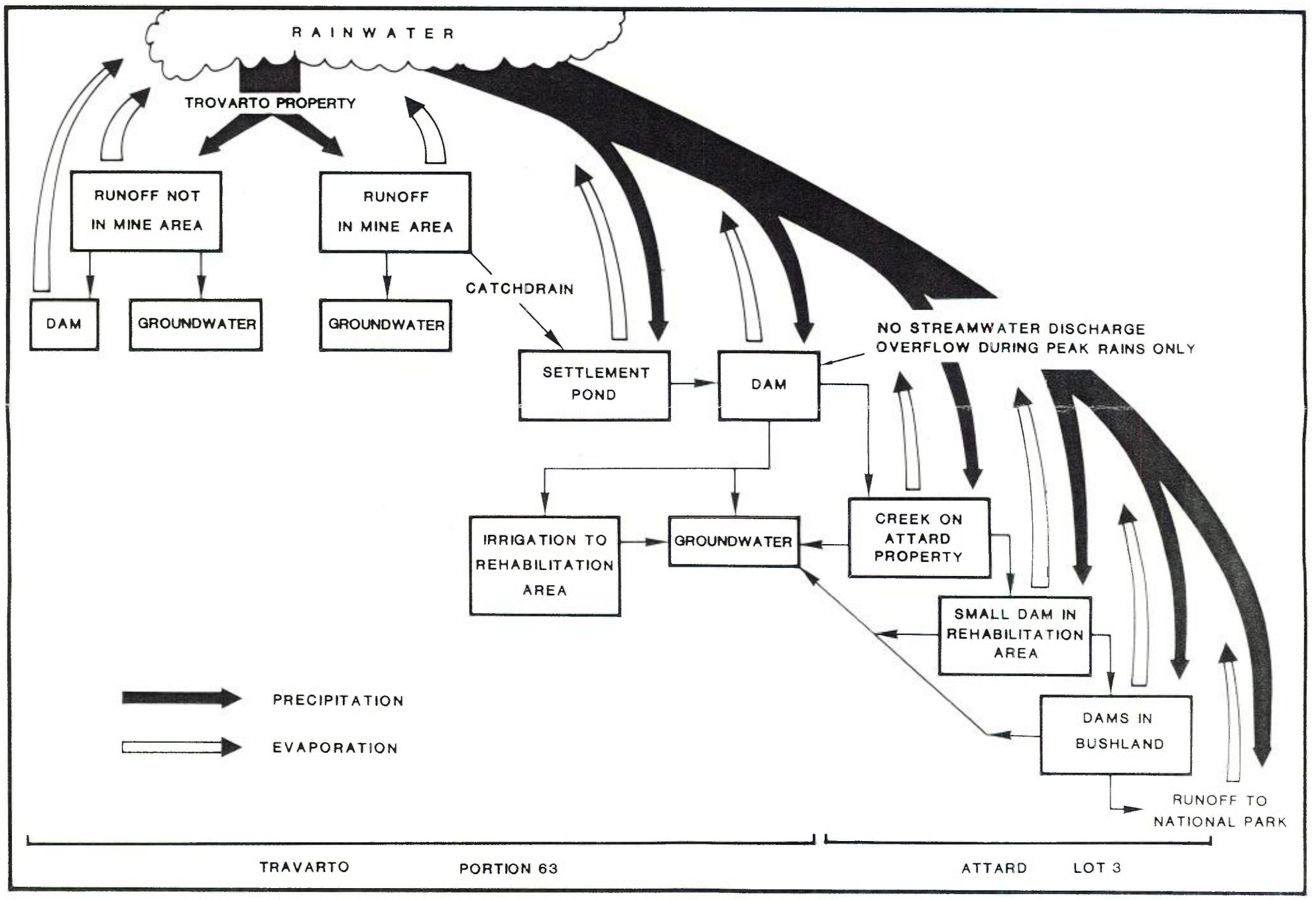


Figure 19: HYDROLOGICAL CYCLE

PHOTOGRAPHS

PHOTOGRAPH 1

This area at the eastern end of Portion 63 has been previously extracted and left unrehabilitated. The proposed extraction will commence in this area, and will result in the area being improved to gently sloping, productive farmland.

PHOTOGRAPH 2

This area on Lot 3 has been extracted and rehabilitated to highly productive market gardens. The area was previously agriculturally unuseable. To the left is dam 4 and to the right is the site of the groundwater sump (Dam F) to be constructed, and the remaining grassed topsoil stockpiles. The dense vegetation to the south of the site is apparent.

PHOTOGRAPH 3

The steep bank between Portion 63 (left) and Lot 3 (right). Extraction will remove this height difference and create level agricultural land.

PHOTOGRAPH 4

View towards the extraction area from the western end of Portion 63. To the right is the extracted and rehabilitated area on Lot 3. The main extraction site is obscured behind the low hill which will provide visual shielding until it is lowered at the end of the project.