EIS 1528

AA067840

Environmental impact statement, proposed poultry sheds, Lot 146 DP 755253, Kirks Road, Mangrove Mountain

CONACHER TRAVERS
environmental consultants

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED POULTRY SHEDS
LOT 146 DP 755253
KIRKS ROAD
MANGROVE MOUNTAIN

DECEMBER 1998
REF: (8065)

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Form 2

Submission of Environmental Impact Statement (EIS)
prepared under the Environmental Planning and Assessment Act 1979 Section 77

EIS prepared by
name
qualifications

address

in respect of

Mr Phillip A. Conacher
B.Sc.(Hons), Dip.Urb Reg Planning, M.Nat.Res.
Conacher Travers
70 Hills St
GOSFORD NSW 2250

Development Application
applicant name
applicant address

land to be developed: address
Lot no. DP MPS, vol/fol etc
proposed development

David Kettle Consulting Service Pty Ltd
PO Box 653
GOSFORD NSW 2250

Lot 146 DP 755253
Parish of Popran, County of Northumberland
Erection of 6 Poultry raising sheds.

or

☑ map(s) attached

Environmental Impact Statement

☑ an Environmental Impact Statement (EIS) is attached

Certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge
- it is in accordance with clauses 51 and 52 of the Environmental Planning and Assessment Regulation 1994, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Signature
name
date

P.A. Conacher
PHILLIP ANTHONY CONACHER
DECEMBER 22ND 1998.

TABLE OF CONTENTS

SECTION 4
continued

SECTION 5
PROJECT EVALUATION

REFERENCES

APPENDIX 1
CORRESPONDENCE
APPENDIX 2
FLORA AND FAUNA SURVEY
AND THREATENED SPECIES ASSESSMENT
CONACHER TRAVERS PTY LTD
APPENDIX 3
STORMWATER AND NUTRIENT MANAGEMENT
MORSE McVEY PTY LTD
APPENDIX 4
POTENTIAL IMPACTS ON GROUNDWATER ASSESSMENT
SYDNEY GROUNDWATER COMPANY
APPENDIX 5
NOISE AND ODOUR EMISSIONS ASSESSMENT
PETER STEPHENSON AND ASSOCIATES PTY LTD
APPENDIX 6
TECHNICAL DATA FOR CHEMICALS USED
APPENDIX 7
CLIMATIC DATA
APPENDIX 8
PEST CONTROL PLAN & WASTE MANAGEMENT

EXECUTIVE SUMMARY

The proposal to erect six poultry raising sheds on the subject land has been determined to be a designated development due to the location of the site within 500 metres of another poultry farm. A detailed assessment of the site and proposed development in relation to flora and fauna, groundwater, noise, odour, nutrient runoff and stormwater management has been undertaken by specialist consultants in these particular fields.

The proposed development is for the erection of six poultry raising sheds on a cleared area of agricultural land. This will require regrading of approximately four hectares of gently sloping land and erection of six sheds 152 metres long, 14.5 metres wide and 5 metres in height. A total of approximately 1,050,000 chickens per annum will be raised over five 10 week growing cycles.

This Environmental Impact Statement (EIS) has assessed the site and proposed development in relation to the potential environmental impacts with particular emphasis on groundwater impacts, nutrient generation, noise and odour emissions. This EIS has identified that the proposed development, with the incorporation of the appropriate ameliorative measures identified in the specialist reports, is compatible with the site and is not likely to result in any significant environmental impact to surrounding areas or the water quality of the catchment.

SECTION 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This Environmental Impact Statement (EIS) has been prepared by *Conacher Travers* to provide details on matters required to be addressed within an Environmental Impact Statement for a proposal to erect six poultry sheds on agricultural land at Mangrove Mountain. Section 1 of the EIS provides background information relevant to the proposal, while Sections 2 and 3 provide details on the proposed development and site characteristics. Assessments of the potential environmental impacts and proposed mitigative measures are provided in Section 4. Section 5 provides an evaluation of the proposed development. Detailed specialist reports are included in the Appendices.

There is currently an approval from Gosford City Council to erect six poultry sheds on the site which was subject to the preparation of an EIS in 1995. The approved sheds have dimensions of 108m x 12.1m x 4.6m high. However due to changes in the design of sheds for the growing of poultry it has been decided to seek an amendment to the current approval and construct six sheds 152 metres in length. Gosford Council have determined that this change is shed size warrants the submission of a new application accompanied by an updated EIS.

1.2 PROPOSED DEVELOPMENT

The development proposed for the site is the construction and operation of six poultry raising sheds on the subject site at Kirks Road, Mangrove Mountain. The sheds will be located in an area which contains cleared agricultural land currently utilised for vegetable growing and which has a current approval for six poultry sheds. Full details of the proposed development are included in Section 2 of this Environmental Impact Statement, with brief details provided below:

- Each poultry raising shed will be constructed from a steel frame with the roof constructed of galvanised metal. Walls will consist of a low concrete block wall with the upper portion of the wall will be constructed of fibrous cement sheeting. Each shed will measure approximately 152 metres in length by 5 metres in height by 14.5 metres in width.

- Each shed will house approximately 35,000 chickens on a sealed, compacted natural earth/clay base with a sliding door at each end and with exhaust fans for ventilation.

- The enterprise will be operated by the property owner by contract raising chickens on a 10 week rotational basis where chickens are delivered from

the hatchery and housed in the sheds for eight weeks. After eight weeks they are collected and taken to a processing factory at Newcastle for slaughter and processing.

- After the birds have been removed for processing the sheds are cleaned out and disinfected by contract cleaners. Manure is removed from the site by contractors for processing into fertiliser.

- Total annual production of poultry will be approximately 1,050,000 birds.

1.3 LOCATION AND ZONING

The subject land is known as Lot 146 DP 755253, Parish of Popran, County of Northumberland, Kirks Road, Mangrove Mountain within the Gosford City Council local government area. The site is located approximately 17 kilometres west of Gosford. The location of the site in a regional and local context is shown in Figures 1.1. Lot 146 covers an area of approximately 17 hectares with the proposed development covering approximately 4 hectares.

The subject land is zoned 1(a) Agriculture. The property is adjoined to the north, east and south by land zoned 1(a) Agriculture. To the west the subject land adjoins land zoned 7(b) included in the Popran National Park, as shown in Figure 1.2. Figure 1.3 is an enlarged aerial photograph of the site and adjoining areas showing the types of surrounding development.

1.4 PLANNING CONSIDERATIONS

Zoning

The land is zoned 1(a) Agriculture under the provisions of Interim Development Order N°122. An extract from the zoning map of the area is included as Figure 1.2. Poultry sheds are permissible with the consent of Council in the 1(a) Zone.

Environmental Planning and Assessment Regulation, 1994

Schedule 3 of the *Environmental Planning and Assessment Act* 1979 defines a number of specific uses of land which may be determined as a "Designated Development" under the Act. The Schedule includes "livestock intensive industries" which includes "poultry farms" for the commercial production of birds (such as domestic fowls, turkeys, ducks, geese, game birds or emus) whether as meat birds, layers or breeders and whether as free range or shedded birds that are located:

a) within 100 metres of a natural waterbody or wetlands; or
b) within a drinking water catchment; or
c) within 500 metres of another poultry farm; or

d) within 500 metres of a residential zone or 150 metres of a dwelling not associated with the development.

In order to assess whether the proposed development would be classified as "designated development" an analysis of the locality was undertaken and is summarised below.

Site Analysis

The relevant matters for consideration under Schedule 3 are as follows:

(a) Natural Waterbody

A natural waterbody flows in a southerly direction approximately 200 metres to the south of the location of the proposed poultry sheds. The location of the proposed poultry sheds have a minimum achievable setback from the southern boundary of 150 metres which provides areas for the installation of stormwater detention and nutrient control pond between the proposed sheds and existing dam which is upslope of the southern most watercourse.

(b) Drinking Water Catchment

The proposed development site is within the Ironbark Creek catchment which is not within a drinking water catchment for Gosford City Council area.

(c) Another Poultry Farm

An inspection of the 1994 1:25,000 aerial photograph indicates that there is one poultry farm (consisting of three sheds) within 500 metres of the site. These poultry sheds are located approximately 270 metres to the north-east of the site of the proposed sheds. The Regulation classifies the development of poultry sheds within 500 metres of an existing shed as a "designated development" therefore this proposed development is considered to be designated development due to the location of the proposed sheds within 500 metres of an existing poultry farm.

(d) Residential Zone and Other Dwellings

The closest off-site dwelling is situated approximately 220 metres south-east of the development site with another dwelling located approximately 260m to the north east. All of the nearest dwelling houses outside the current property ownership of the subject land are more than 150 metres from the site of the proposed sheds. There are no residential zones within the vicinity of the site.

Conclusions Regarding Designation of the Proposed Development.

The assessment provided above has identified that the proposed development is located on a site which falls within the parameters established under Schedule 3 of the EPA Regulation as "designated development" due to its location within 500 metres of another poultry farm. The application is therefore submitted to Council as a development application accompanied by this Environmental Impact Statement which is required due to the fact that the proposed development is considered to be a designated development.

A number of government authorities were consulted in accordance with the requirements of the EP&A Act and EP&A Regulation to obtain relevant requirements for consideration and inclusion in the EIS. Copies of correspondence from each of these authorities are included in Appendix 1. A summary of the matters required to be addressed from each government authority consulted, additional to the statutory requirements for preparing an EIS is provided below:

Department of Urban Affairs and Planning

- The potential impact of the proposal on the objectives of Sydney Regional Environmental Plan (REP) No.8 - Central Coast Plateau Areas - SREP 20 Hawkesbury Nepean Rivers.
- Consultation with relevant local, State and Commonwealth government authorities, service providers and community groups including the Department of Land and Water Conservation, National Parks and Wildlife Service, NSW Agriculture, Environmental Protection Authority and Wyong City Council.
- Potential cumulative effect of the proposed development.
- Potential bushfire hazard issues.
- Matters detailed in the Department of Urban Affairs and Planning publication 'Poultry Farms: EIS Guideline'. This document outlines requirements for the assessment of environmental issues associated with the proposed development including cumulative impacts, odour, noise, dust, lighting and visual impacts, traffic and road impacts, drainage and stormwater systems, flooding, wastewater and solid waste management and the disposal of dead birds.

NSW National Parks and Wildlife Service

- Matters referred to in NPWS brochure "General Guidelines for Impact Assessment".

NSW Fisheries

- No matters required to be addressed additional to the statutory requirements for preparing an EIS.

NSW Agriculture

- No matters required to be addressed additional to the statutory requirements for preparing an EIS.
- Provided a list of issues of particular interest to NSW Agriculture and suggested reference to the "NSW Poultry Farming Guidelines" produced by NSW Agriculture.

Environment Protection Authority

- Provided no formal reply during the consultation process.

Hawkesbury Nepean Catchment Management Trust

- Proposed to satisfy the Trust's Policy on water quality and quantity.
- Site management to satisfy the NSW Agricultures Poultry Farming Guidelines.
- Pest Control should not adversely affect native fauna.
- Farm management should avoid soil contamination.
- Drainage and water recycling to be addressed.

Department of Land and Water Conservation

- Wastewater and Effluent Disposal.
- Groundwater.
- Surface with Supply and Water Quality.
- Groundwater Assessment.
- Erosion Control and Soil Conservation.
- Vegetation clearing.

Gosford City Council

- No specific requirements for inclusion in the EIS other than issues previously addressed.

Approvals Required.

Gosford City Council is the consent authority for the proposed designated development. No other approvals or consents from other authorities are required for this development application.

1.5 PREPARATION OF ENVIRONMENTAL IMPACT STATEMENT

This EIS has been prepared by *Conacher Travers* on behalf of the applicant, David Kettle Consulting Services and the landowners Mr and Mrs Vassiliadis. To address specific matters relating to the various aspects of environmental assessment the following specialist subconsultants were engaged.

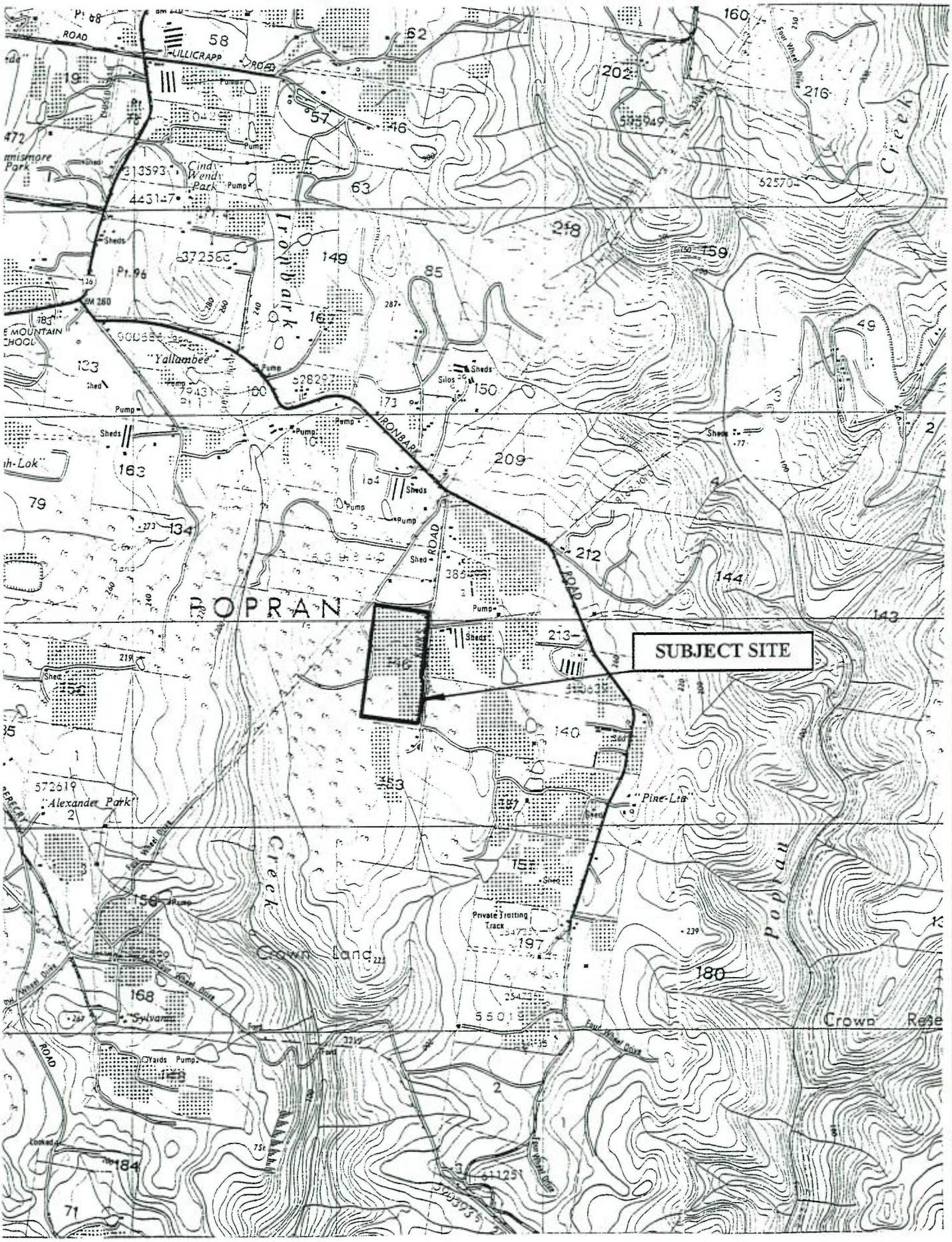
- *Conacher Travers Pty Ltd*
  Completed a Flora and Fauna Survey and assessment in relation to threatened species. (Report included as Appendix 2).

- *Morse McVey Pty Ltd*
  Completed a Stormwater and Nutrient Management Report incorporating AUSQUAL nutrient analysis. (Report included as Appendix 3).

- *Sydney Groundwater Company*
  Completed an assessment of potential impacts on groundwater. (Report included as Appendix 4).

- *Peter Stephenson and Associates Pty Ltd*
  Completed an assessment of noise and odour emissions for the proposal based on a previous survey of the site (Report included as Appendix 5).

- *Stephen Thorne Pty Ltd*
  Completion of survey and contour plans for the site.



N

SCALE 1:25,000
CONTOUR INTERVAL 10 METRES

FIGURE 1.1
LOCATION

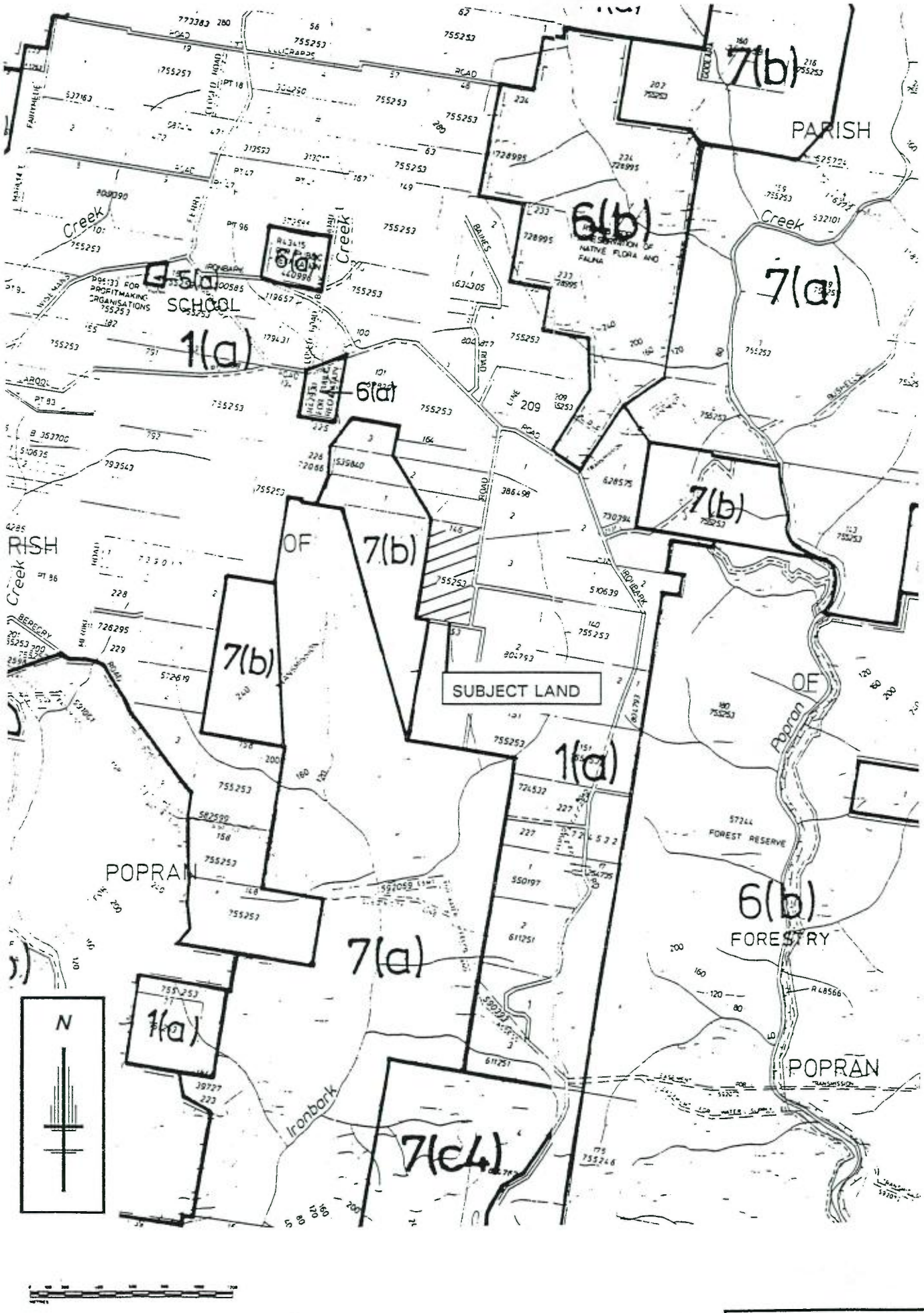


FIGURE 1.2
ZONING

FIGURE 1.3
ENLARGED AERIAL PHOTOGRAPH OF SITE

SECTION 2

DESCRIPTION OF THE PROPOSAL

2.1 PROPOSED DEVELOPMENT

The objective of the proposed development is to improve the agricultural and economic productivity of the land, to increase capital investment and to develop part of the site for poultry growing to supply the chicken meat market.

The proposed development involves the construction of six poultry sheds on an area of cleared land currently used for vegetable production. The sheds will be built on approximately 4 hectares of land in the southern section of the site in an area used for vegetable growing upslope from the existing dam.

The poultry sheds will be supplied with water from an existing bore which will be pumped to storage tanks for reticulation to automatic waters within each shed.

Each shed will measure approximately 152 metres long x 5 metres high x 14.5 metres wide and will be constructed with a galvanised iron roof, with a low concrete dwarf wall below fibro cement walls. The poultry shed floors will be a clay base floor treated with Weslig 120 and compacted with optimum moisture and compaction to create an impervious floor. Sheds will be separated by an 15 metre wide accessway which can be revegetated with Kikuyu Grass to minimise dust generation and to control soil erosion.

Runoff from the shed roofs will be collected by the guttering/downpipe system and conveyed via underground stormwater pipes to a grassed waterway which feeds into a large clay-lined farm dam with an approximate surface area of approximately 9000m2 and estimated capacity of approximately 36,000 cubic metres (36 mega litres).

Regrading of the area of the proposed sheds will be required to create a level foundation for shed construction and for the associated loading area. This will require the creation of a cut-batter approximately 1.5 metres in height at the western end of the sheds. Following regrading of the site to provide a level clay lined shed floor this earth floor is treated with a soil stabiliser 'Weslig 120' which is a non-toxic, natural organic powder derived from timber products. This material is mixed with the base or floor material and sets to a hard impervious base which can support light machinery and frequent cleaning. Details on 'Westlig 120' are provided in Appendix 6.

The location of the proposed sheds in the southern part of the site is shown in Figure 2.1 while Figures 2.2 provide details of the shed design.

2.2 POULTRY FARM MANAGEMENT

The proposed poultry farm will be managed by the existing landowners, from Monday to Sunday between 7am to 5pm. A poultry raising enterprise operates on a 10 week cycle where under contract arrangements with a poultry processing company, the birds are delivered to the farm (approximately one day old) and raised in the sheds until they are up to eight weeks old.

The 10 week cycles are staggered, depending on the number of sheds available, so a continual supply of birds at varying weights is available. Work is completed either by farm staff or specialist contractors as outlined below:

1) Farm Staff

Farm staff are responsible for vaccination, daily removal of dead birds for disposal, general maintenance of all machinery, including motors operating the feeding machine and water pumps, chicken shed mechanics (window opening), lighting and gas heating and electrical fans for controlled temperature. Cleaning and disinfecting is undertaken in the last 10 days of the 10 week cycle for each shed. Dead birds are disposed of into a proprietary brand chicken composter which is weather and vermin proof and composts dead chickens for use as pasture and garden nutrients. Composters are cleaned out in conjunction with shed cleanouts at the end of the growing cycle with waste material removed by contractor from the site composted material is not stockpiled or used on the site.

2) Contractors

Contractors deliver chickens once every 10 weeks per shed with up to 35,000 chickens delivered for each shed giving approximately 210,000 per growing cycle for the six sheds. Contractors supply their own forklift for unloading the crates of chickens. Normally three to four pick-ups are completed within the last two weeks of a 10 weeks cycle for all sheds as differing weights are required by the processing company.

Feed is delivered by contractors with normally three to four deliveries per shed per cycle. Waste is also removed by contractors. Normally one to two semi-trailer loads are removed for each 10 week cycle. Contractors provide their own front end loader and truck for removing the waste from the site.

Following cleanout of the shed floors the ceiling and walls are washed down with a diluted heavy duty detergent (such as Farm Clean) using a high pressure, low volume water sprayer. Runoff from the internal areas of the shed does not occur as the concrete walls prevent runoff from leaving the internal areas and the quantity of spray water (approximately 3,000 to 4,000 litres) is not sufficient to cause runoff from the shed which has a total floor area of 2,200m^2. Cleaned areas

are then sanitised with Glutaplus which is sprayed onto the ceiling, walls and floors and then left to dry. Further technical details on the use of Farm Clean and Glutaplus are provided in Appendix 6.

2.3 TRANSPORT AND TRAFFIC GENERATION

The proposed development on the subject site will generate additional traffic volumes including approximately 10 truck movements per week for poultry feeding, shed cleaning, and poultry delivery and removal. The type of trucks entering the site will be semi-trailers with cages for chicken delivery and pick-up, an enclosed 12 tonne truck for feed delivery and a semi-trailer type tipper for removing the poultry manure. Traffic movements to and from the proposed development will be via an internal farm track which enters the site from Kirks Road to the east of the property. Trucks entering and leaving the site will travel along Kirks Road and Ironbark Road to Wisemans Ferry Road. Wisemands Ferry Road is bitumen sealed and is capable of accommodating the additional traffic movements within the existing design and surface finish. Kirks Road is an unsealed gravel formation and truck movements should be restricted to 40km/hr to reduce dust generation.

2.4 WASTE MANAGEMENT AND PEST CONTROL

The sheds are enclosed within a roofed area and the concrete dwarf wall prevents runoff entering or leaving the sheds. The floors of the sheds are kept dry to prevent disease. Internal drinking water is supplied through a reticulated dripper system thereby preventing over-watering and boggy ground conditions within the sheds. The litter on the floor absorbs any moisture from poultry droppings which are relatively dry due to the type of feed supplied.

The proposed development is not expected to produce any liquid waste. Surface water runoff from areas outside of the sheds will drain into grassed waterways which are to be located downslope and between the sheds and which flow into the detention basin to be located in the southern section of the site.

Solid waste is removed from the shed by contractors at the end of the 10 week growing cycle for each shed and loaded directly onto tip trucks. Floor litter is not stockpiled outside of the shed area. Waste material is removed from the site by contractors and converted to organic fertiliser for use as a soil improver and fertiliser in the agricultural or horticulture industry. An expected volume of approximately 40m^3 or the equivalent to two semi-trailer loads of manure will be removed at the end of each 10 week cycle for each shed.

A pest control program will be implemented as part of the animal husbandry procedures. Measures to control pest species (rodents) will include:

- slashing around buildings and surrounds to keep vegetation, rubbish and any material harbouring vermin at a low level;
- routinely setting traps to control numbers of mice and rats;
- sealing of storage silos;
- no stockpiling of chicken shed litter or manure;
- daily removal of dead chickens to a commercial brand chicken composter;
- regular monitoring of program for effectiveness.

A pest management plan is detailed in Appendix 8 of this EIS.

KIRKS ROAD

GRAVE ROAD

CONIFER

TREELINE

341.985

ACCESS

OPEN

CLEARED

LOADING AREA

OPEN DRAIN

METAL SHED

BRICK COTTAGE R.M.B. 4410

F/C COTTAGE

DRAINAGE DEPRESSION

COMPOSTERS

AREA

4% GRADIENT

UNDER

CULTIVATION

146

D P 5 5 2 5 3

PROPOSED POULTRY SHEDS

568.7

30 m SETBACK FROM BOUNDARY

20.115

228.715

UNFORMED ROAD

PUMP SHED

DAM

298.925

LEVELLED AREA

TOP

BANK

278.805

1

D . P .

5 3 9 8 4 0

NOTE : RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES IS APPROXIMATE ONLY.

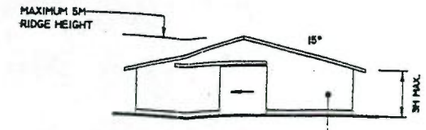
NOTE : A.H.D. SCALED FROM CMA MAP - MANGROVE 9131-3-N.

0 50

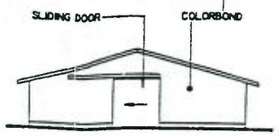
SCALE 1:2,000

FIGURE 2.1
SITE DETAILS AND PROPOSED DEVELOPMENT

STEPHEN THORNE & ASSOCIATES PTY.LTD REGISTERED SURVEYORS	SITE DETAIL PLAN LOT 146 IN D.P. 755253 RMB 4410 KIRKS ROAD, MANGROVE MOUNTAIN
SUITE 8 No. 42 MANN STREET, GOSFORD 2250 TELEPHONE (02) 4323 1255 FAX (02) 4324 2226	DEC. 98 DATE · 1 : 2000 SCALE · SCALED A.H.D. LEVEL DATUM · 3348 DRAWING No.



END VIEW



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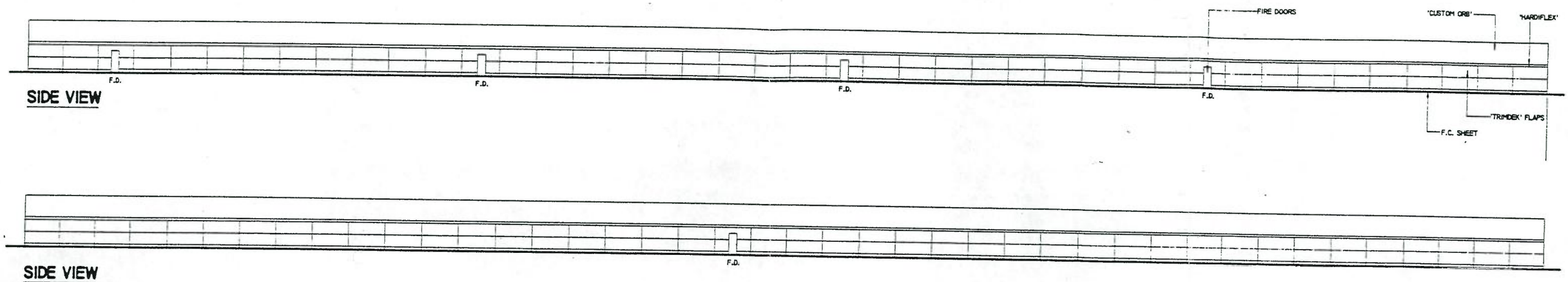
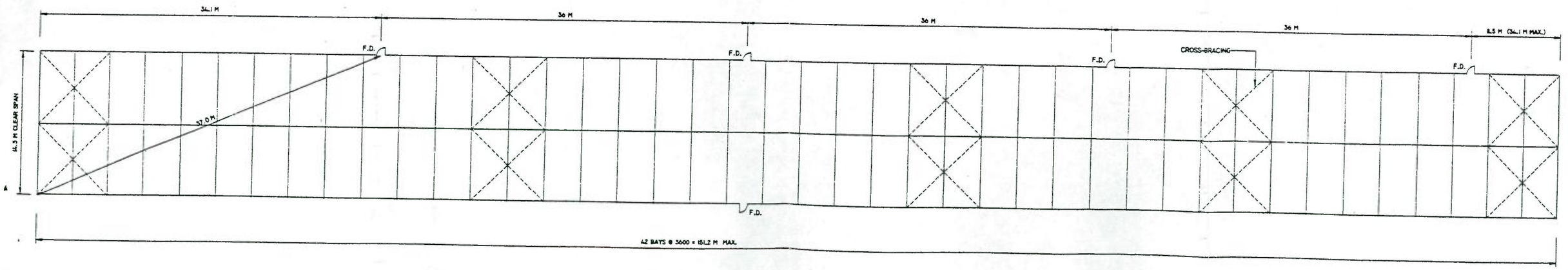


SIDE VIEW



LAYOUT

FIGURE 2.2
SHED DESIGN DETAILS

	DETUNE PTY. LTD. TRADING AS. CHRIS BRATBY B.E., M.I.E.(AUST), C.P.ENG. CONSULTING STRUCTURAL & CIVIL ENGINEER PH:(02)43281112 P.O. BOX 2300 GOSFORD 2250	GENERAL ARRANGEMENT	JOB No.: 981622	CHECKED: C.W. BRATBY C.P.ENG. DRAWN: A.M.
		PROPOSED POULTRY SHED R.M.B. 4410 KIRKS RD. MANGROVE MTN. FOR MR. J. VASSILIADIS.	DATE: 8-5-98	SCALE: U.N.O. 1:400
			DRAWING No.: (A1) 162201	SHEET 1 OF 2

SECTION 3

SITE CHARACTERISTICS

3.1 TOPOGRAPHY

The subject site is located on the plateau area of the Hunter Range which separates the eastern coastal slopes from the valleys and slopes towards the Hawkesbury River catchment.

The topography of the site and surrounding area consists of gentle uniform slopes with gradients of between 3-9% and a predominantly southerly aspect. The topography of the subject land and local area is shown in Figure 1.1 while a contour plan of the site is provided as Figure 2.1.

The elevation of the subject land is between approximately 250m and 270m AHD.

3.2 GEOLOGY AND SOILS

The site is geologically located in the north-eastern portion of the Sydney Basin where Hawkesbury Sandstone is the dominant geological formation. This geology is dominated by sub-horizontal, massive or cross bedded medium to coarse grained sandstone. Shallow soils overlaying sandstone are present in the northern part of the site.

The site is located within the Somersby Soil Landscape (Murphy 1992). This soil landscape is characterised by deep Yellow Earths and Earthy Sands comprising up to 20cm of loose, quartz sand topsoil overlying yellow brown sandy clay loam subsoil. The area of the proposed sheds contains a shallow sandy and gravelly soil (up to 1200mm in depth) overlaying a weathered sandstone material.

The typical properties of these soils include high permeability, low available water capacity, low fertility and high acidity. Soils of the Somersby Soil Landscape unit have moderate limitations for cultivation and low limitations for grazing. A description of the Somersby Soil Landscape as summarised by Murphy (1992) follows:

Somersby Soil Landscape

> ***Landscape*** *- gently undulating to rolling rises on deeply weathered Hawkesbury Sandstone plateau. Local relief to 40m; slopes <15%. Rock outcrop is absent. Crests are broad and convex, slopes are long, and drainage lines are narrow. Extensively cleared low eucalypt open-woodland and scrubland.*

Soils *- moderately deep to deep (100-300 cm)Yellow Earths (Gn2.24, Gn2.21, KS-Gn2.24, KS-Gn2.21 and Earthy Sands (uc5.22, KS-Gn%.22) on crests and slopes with Grey Earths (Gn2.94) in poorly drained areas and Leached Sands (uc2.23) and Siliceous Sands (Uc1.22) along drainage lines.*

Limitations *- localised permanent and seasonal waterlogging, moderate erosion hazard, stoniness, very low soil fertility, highly permeable soil.*

These soils are common throughout the area and have generally been cleared of natural vegetation and used for agricultural production such as grazing, citrus orchards and vegetable growing and for industrial development. They have a moderate to high erosion hazard which indicates that appropriate erosion and sediment control measures should be implemented with any future land disturbance.

3.3 DRAINAGE CHARACTERISTICS

The subject land is within the catchment of Ironbark Creek (Figure 3.1), which flows into Mangrove Creek and then the Hawkesbury River. The subject land is located at the upper end of the catchment. This catchment is not classified as a drinking water catchment as it does not flow into Mangrove Dam or Mangrove Creek weir.

Site runoff flows into a grassed waterway which is located in the central part of the subject site. This grassed waterway direct runoff into a dam with an estimated capacity of approximately 36,000 cubic metres. Any overflow from this dam flows into downstream dams located to the south of the site prior to flow into the creek system. No other farm dams are located on the site.

Two bores are located on the site but are not currently used for irrigation. Water for the proposed poultry sheds will be obtained from the southern most bore which has recently been installed and is licenced with the Department of Land and Water Conservation.

3.4 FLORA AND FAUNA CHARACTERISTICS

The location of the proposed poultry sheds has been totally cleared of natural vegetation and is consistently used for vegetable production. Due to the clearing and current land use the site of the proposed sheds has a very low habitat value for natural vegetation or fauna. The extent of vegetation on the site is shown in Figure 1.3. Due to the cleared nature of the site a detailed fauna and flora survey was not completed but the site was assessed for threatened species habitat as detailed in Appendix 2.

3.5 ABORIGINAL ARCHAEOLOGY

The area of the proposed poultry sheds has been extensively cleared and farmed for agricultural purposes. It is unlikely that the site to be utilised for poultry sheds would contain any aboriginal archaeological evidence. The paddock does not comprise the geological or hydrological features which generally contain evidence of aboriginal use and occupation in the Central Coast region and has been under cultivation for many years. No rock outcrops are present on the land to be disturbed.

3.6 LAND USE AND AGRICULTURAL CAPABILITY

The subject site is zoned 1(a) Agriculture under the provisions of Local Environment Plan N° 122 (Gosford City Council).

The site of the proposed poultry sheds is classified as part Class 4 and Class 1A Agricultural land as identified in the Maps accompanying Sydney Regional Environmental Plan N° 8 Agriculture on the Central Coast Plateau Areas (Figure 3.2). The land is currently utilised for poultry production. Land uses in the locality include orchard plantations, cleared land for pastures and other agricultural crops, quarrying operations and poultry production.

A poultry farm consisting of three sheds is located approximately 270 metres to the north-east while dwellings are located 260m (north-east) and 220m (south-east) from the proposed sheds.

3.7 VISUAL CHARACTERISTICS

The visual characteristics of the surrounding area are a combination of agricultural development and open forest. The views of agricultural development from the development site are limited due to topography and tree cover.

The proposed development site is visible from Kirks Road which carries a limited amount of local traffic, various farm related machinery movements and trucks servicing other poultry and flower growing enterprises in the locality.

The views into the southern section of the subject land where the proposed development is to be located are restricted from Kirks Road due to the topography and tree cover along the boundaries of the site. Due to the topographic position and tree cover along the boundaries of the subject land the views from within are limited and are of dam, cleared vegetable farm, farm sheds and a small section of Kirks Road. Screened views to the dwellings and sheds to the south are present.

3.8 EXISTING SERVICES

Electricity is currently supplied to the existing packing sheds and the houses present on the property. Water is available from a bore for agricultural purposes. Water for domestic purposes is provided from rainwater tanks. Access to the property is via Kirks Road which is unsealed. Irrigation water is supplied from the existing dam.

3.9 NOISE AND ODOUR LEVELS

A noise and odour survey by Peter Stephenson and Associates (Industrial Pollution Consultants) commissioned by *Conacher Travers* has been undertaken for the proposed development. The objective of this survey was to determine the sound pressure and odour emission levels from an existing poultry farm facility and a proposed poultry farm site with reference to relevant regulations including the *Noise Control Act* 1975 and the *Clean Air Act* 1961.

With reference to this survey, it is expected that the existing noise levels would be low (between 43.3dB(A) for LA10,T and 26.8dB(A) for LA90,T) which is to be expected in an area of rural nature with low traffic volumes and absence of noise generating industry.

Results from this assessment indicated that existing odour levels from an established poultry shed was between 628 OUm^3 and 835 OUm^3. Odours from these sheds were not detectable when measured approximately 400 metres from the sampling location. The background odour level at the Kirks Road site was 1114 OUm^3 which was attributed to decaying algae growth on the dam at low levels.

The complete Noise and Odour Emission Assessment Report prepared as a base line study is provided as Appendix 5.

3.10 CLIMATE

The climate of the area is influenced by its location near the coast which provides a controlling maritime effect. Climatological data is available for Mangrove Mountain and Peats Ridge. Rainfall is relatively high with a mean average of 1,255mm at Mangrove Mountain and 1,276mm at Peats Ridge. Rainfall is summer dominant with a drier period in late winter and early spring.

Temperatures vary between mean monthly maximums of 15.5°C in July to 27.3°C in January. Summer humidity if often in the 60-70% levels but falls to 20-25% in winter.

Winds are mainly from the west and north, particularly during the summer period.

Appendix 7 provides details of climatic information from a weather station on Waratah Road located approximately 4 kilometres to the north of the site.

3.11 CONCLUSIONS REGARDING SITE CHARACTERISTICS

The site is considered to be well suited for the location of the proposed poultry sheds due to the existing zonings and land use, environmental characteristics, services available and climate. This is supported by the Guidelines for Poultry Farming prepared by NSW Agriculture (1994) which identify that sites for poultry sheds should:

- Be located in a region with a high potential for long term sustainability in terms of the production and marketing costs, infrastructure and services;
- Be isolated from other poultry farms;
- Avoid areas identified for future development likely to be incompatible with poultry farming;
- Provide a good balance between economic, physical and technical requirements;
- Be sufficient to accommodate future expansion of the farm, while maintaining recommended separation distances;
- Minimise potential impacts on surroundings;
- Avoid areas prone to natural hazards such as floods or bushfires;
- Have available power and water of suitable quality and in sufficient quantity to meet peak demands.

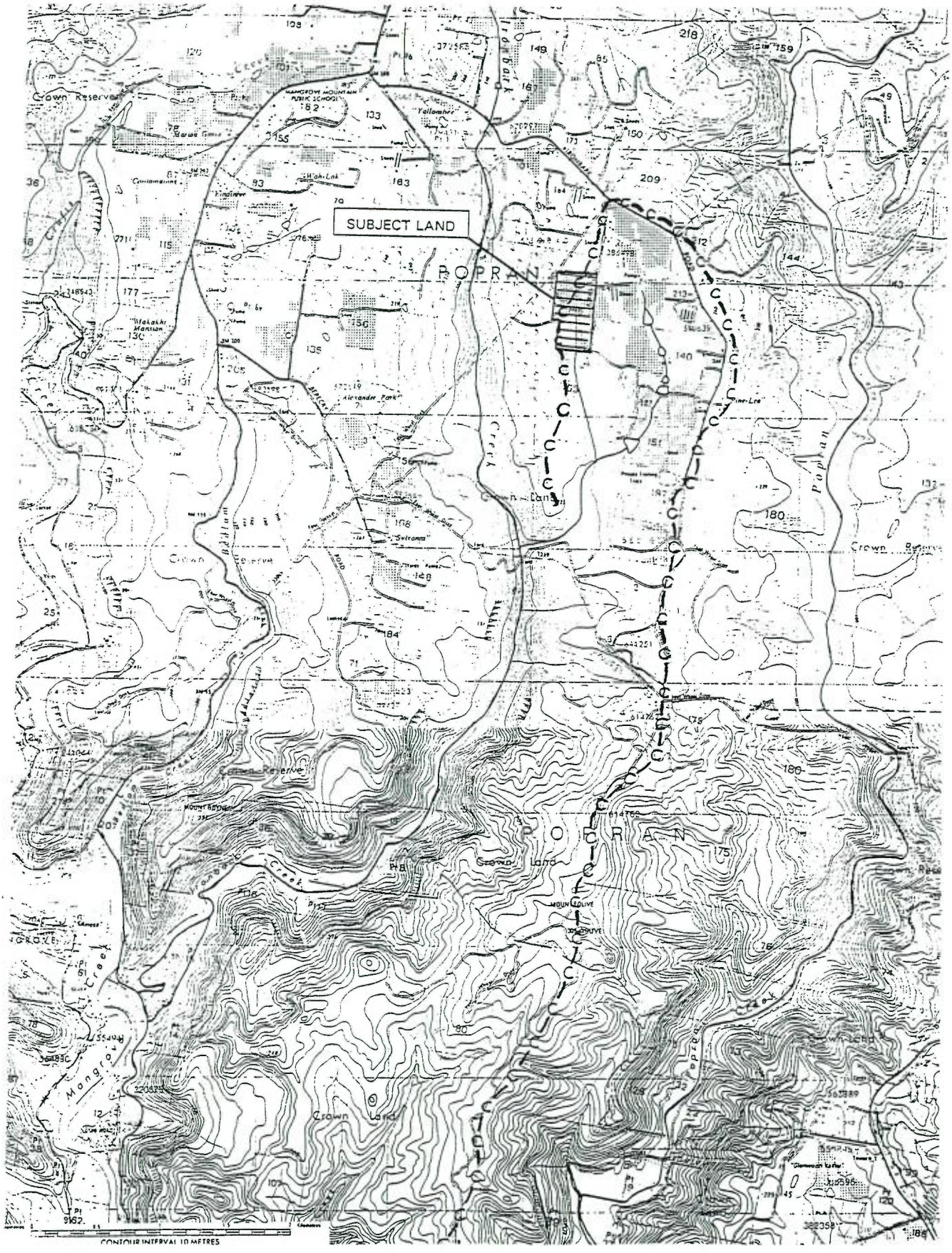


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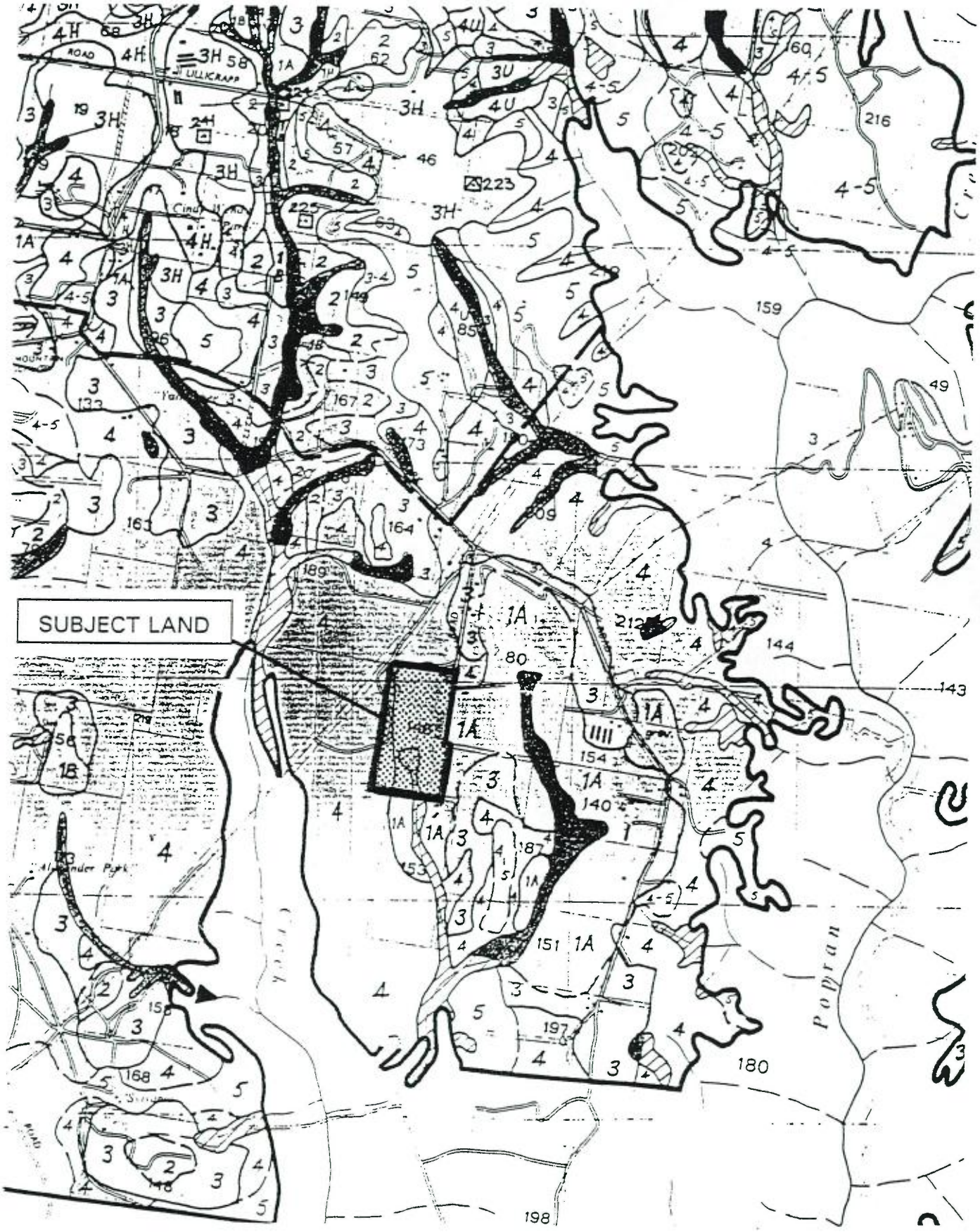
FIGURE 3.1
DRAINAGE CHARACTERISTICS



CLASS 1A - SOIL PROFILE > 2 METRES IN DEPTH
CLASS 4 - SOIL PROFILE 0.5 TO 1.0 METRE IN DEPTH

FIGURE 3.2
AGRICULTURAL LAND CLASSES

FROM SREP N° 8

SECTION 4

POTENTIAL ENVIRONMENTAL IMPACTS PROPOSED ENVIRONMENTAL SAFEGUARDS AND DEVELOPMENT CONTROLS

The proposed works have the potential to cause both short and long term adverse and beneficial environmental impacts. This section outlines these potential impacts and identifies measures which can be implemented to reduce the potential adverse environmental impacts.

4.1 POTENTIAL SOIL EROSION

The existing sandy soils will be disturbed and displaced during regrading for construction of the poultry sheds within a restricted area of the subject site. This disturbance will create soil instability and increase the erodibility of the soil, especially during times of high rainfall. Details on appropriate erosion and sediment control measures to be implemented are provided below. All topsoil material present on the site to be developed should be stripped and stockpiled separately to the subsoil material that will be regraded for the shed platforms.

This risk of soil erosion can be minimised during the site disturbance stage of development by the installation of appropriate soil conservation measures which would include:

1) The provision of a geotextile sediment filter fence below the areas of disturbance.

2) The installation of an upslope runoff diversion bank along the southern area to collect surface runoff from above the construction area.

3) Construction of a sediment trap downslope of the regraded area.

4) The seeding and grassing of disturbed areas around the poultry sheds to provide a vegetative cover and stabilise disturbed soils.

The primary role of this vegetative cover is to provide surface stabilisation against soil erosion. Secondary roles of revegetation include improving water infiltration rates, decreasing surface runoff, decreasing dust generation and improving the scenic qualities of the development site. The site is currently used for poultry production and all runoff from two existing poultry sheds flows into a detention basin on the southern boundary of the site. A concept plan for Erosion and Sediment Control is provided in Appendix 3. A more detailed plan would be provided with any future building application for the proposed sheds which would incorporate any specific requirements of the relevant review authorities.

4.2 IMPACTS ON WATER QUALITY

Runoff from the shed roofs of the proposed development and surrounding areas will be directed to a detention basin via a grassed waterway and the stormwater system. This detention basin will be built above an existing storage dam to handle increased flows as a result of the development and to protect water quality to downstream waterways. Water runoff from within the sheds will not occur as the floor of the shed is required to remain as dry as possible to reduce disease and discomfort to the birds. An impervious clay base on the floor of the sheds, treated with 'Weslig 120' to improve compaction and to create an impervious seal, will ensure that seepage to the underlying rock strata does not occur.

The proposed detention basin will retain runoff from the site which may provide water for re-use for existing agricultural activities. It is not expected that overflow from the proposed detention basin will have any significant effect on the water quality within Ironbark Creek as it will be of sufficient storage capacity and design to ensure that quality of overflow water is within the acceptable parameters for water quality from agricultural areas. This detention basin will be 2030 cubic metres and is designed to have a detention storage time of 14 days with a design capacity for the 1:20 year storm.

Due to the nature of the site and the existing farm management practices it is expected that the owner of the property would manage the operation so that soil waterlogging and soil erosion do not occur. The experience of the operator and the well managed nature of the existing property supports the case that the proposed poultry sheds will be operated in an efficient and practical manner with minimal opportunity to significantly affect water quality.

The Stormwater and Nutrient Management Report (Appendix 3) has assessed the proposed development and determined that with the reduction in vegetable production in the areas of proposed sheds that an overall decrease in nutrient generation will result from the proposed development. This report concluded that the proposed detention basin was of sufficient size and appropriate design to contain runoff and prevent off-site sedimentation and to reduce the levels of nutrients in runoff from the site.

The Groundwater Impact Assessment (Appendix 4) has assessed the proposed development and found that the proposed design and operation of the sheds will prevent downward infiltration of chemicals and protect the quality of dam waters and the groundwater system. This report concluded that no adverse groundwater impacts are expected from the proposed development.

4.3 IMPACT ON THREATENED SPECIES

Potential impacts to threatened species are generally through habitat disturbance associated with the clearing and construction phases of development. However

due to the cleared nature of the site it is not expected that the construction activity would disturb flora and fauna present on the subject site and is not likely to cause disruptions to off-site populations or breeding behaviour in either the short or long term due to the expansive areas of natural bushland to the north and east of the proposed development.

The flora and fauna assessment completed for the site (Appendix 2) concluded that the area chosen for the proposed development is of low value as habitat for threatened flora and fauna and that the proposed development is not likely to have a significant effect on any threatened species or their habitats.

4.4 IMPACTS ON SURROUNDING LAND USES AND CUMULATIVE IMPACTS

The overall cumulative impact is expected to be low as the land is zoned for agriculture and the development of poultry sheds is considered to be an important agricultural land use on the Central Coast Plateau. The proposed location of the sheds has been selected for both efficiency of land use and to minimise potential impacts on adjoining farms. The main impacts of the proposed development on surrounding land use are the potential impacts on traffic generation, noise, odour, dust and visual amenity, as discussed below.

The proposed development will result in an increase in cumulative impacts. There are four other poultry farms within three kilometres of the site and this development will increase the intensity of poultry farms in the locality but with the implementation of the appropriate runoff control measures and nutrient management measures cumulative impacts will be minimised to acceptable standards.

4.5 IMPACTS ON VISUAL AMENITY

Because of their building style and need to build poultry sheds with strong lightweight materials of a light colour for cooling purposes poultry sheds are generally highly visible on the agricultural landscape. Whether these sheds are visually degrading is questionable as they are now a recognised as an important land use and industry in the local and regional area.

Due to the topography and vegetation of the site the proposed sheds would be largely screened from offsite areas and therefore the proposed construction of six poultry sheds on the subject site is not considered likely to have a significant negative impact on the visual amenity of the local area. The site has limited views from public areas and is well screened by the planted trees along Kirks Road. These trees will provide screen to the proposed sheds when viewed from the east and due to limited views from other areas the visual impact is not considered to be significant. The planting of a screen of trees to the south of the shed area will provide a visual screen to the residence to the south.

4.6 POTENTIAL NOISE IMPACTS

To determine noise generation levels of an existing operation a testing procedure was conducted by Peter Stephenson and Associates on an existing eight shed poultry farm at Mangrove Mountain as part of the previous EIS in 1995. The location of the acoustical survey was approximately 5 kilometres north-west of the subject property. The results showed that low noise levels (within the Environmental Protection Authority acceptable limits) were generated by neighbouring poultry sheds 400 metres to the north-east of the measurement location. These recorded noise levels were within the permitted range for noise levels in relation to the Environmental Protection Authority requirements. The nearest residence on the adjoining land is approximately 220 metres to the south-east of the proposed sheds.

These findings are based on an existing poultry farm of a larger size than the proposed poultry farm. It is therefore expected that the potential noise generation of the proposed poultry sheds will be less than that of the existing poultry farm at Mangrove Mountain which was subject to the acoustical survey.

4.7 POTENTIAL ODOUR IMPACTS

To determine the odour generation potential of existing poultry sheds air samples were taken at an existing eight shed poultry farm at Mangrove Mountain. These samples were determined by Peter Stephenson and Associates to have an odour level of between 628 OUm^3 and 835 OUm^3 . Air samples measured on the subject site of the previous survey indicated a background odour level of 1114 OUm^3. The report by Peter Stephenson and Associates concluded that the odour levels measured at the sheds are within the recommended limits and should generally disperse within a distance of approximately 150 metres. These measurements are based on a poultry farm larger than the size of the proposed poultry farm addressed this report therefore, it is expected that the odour generation potential would be much less than the existing poultry farm at Mangrove Mountain. The Noise and Odour Report has identified a variety of standard site management practices to reduce the potential odour generation levels as identified below:

- Prevent entry of drainage/seepage water into poultry sheds and storage facilities from the rain, irrigation sprinklers and surface water;
- Adjust fogging system and waterers to minimise the amount of moisture reaching manure or litter and prevention of anaerobic conditions developing in the waste;
- Install vegetative screens or tree buffers to channel odours away and diffuse any pungent odours;
- Provide adequate shed ventilation in keeping with bird comfort. Ground level discharge can cause unacceptable odour several hundred metres from the shed. Extractor fans that blow odour upwards may be necessary;
- Ensure all sheds are appropriately cleaned out after every batch;

- Maintain and adjust waterers and feeders to prevent spillage.

These measures are generally incorporated into the normal operation of a poultry shed and are part of the general hygiene, quality control and shed design.

4.8 POTENTIAL DUST GENERATION

Dust generation is likely to occur from traffic movements along unsealed tracks, manure stockpiles, shed cleanouts, bare soil and uncovered trucks. To control and minimise dust generation the following measures are considered appropriate to future management:

- Controlling the speed of vehicles within the property to a maximum of 20 km/hour to reduce air turbulence and dust generation;
- Lightly spraying floor litter with water during shed cleanouts;
- Covering all loads on trucks carting shed litter and manure;
- Maintaining a vegetative or gravel surface on all disturbed areas around the poultry sheds so that dust is not exposed to wind or other dust generating forces.

Additionally, if dry weather conditions are prevailing and dust generation from internal property roadways becomes a local problem, spraying the road surfaces using a water cart on the days when traffic generation is likely to be at a peak (eg. during pick-up days), will reduce the potential for dust generation to occur and will minimise discomfort to nearby residents.

4.9 POTENTIAL TRAFFIC GENERATION

Additional traffic generated as a result of the proposed development will include up to five internal trips per day by the manager and staff of the poultry operation and an average of 10 return truck movements per week (with a maximum of 15 per week depending on the activity) to either deliver or pick-up birds, deliver feed or to clean out the sheds. Additional irregular traffic movements will be generated by Department of Agriculture inspections and inspections by the contract administration team responsible for monitoring the progress of bird development and poultry farm management. These additional traffic generation figures are considered to be well within the capacity of the existing road and intersection layout and would be negligible on the local road network given the current use of the roads by agricultural related trucks, machinery and passenger vehicles.

4.10 PEST CONTROL

Although pest and vermin have the potential to impact on the proposed poultry farm, the following strategies will be incorporated into general farm management to minimise these potential impacts:

- keep building surrounds clear of vegetation, rubbish with regular slashing of grass;
- all feed storage silos to be suitably sealed;
- stockpiles of feed, manure, rubbish should be kept to a minimum;
- dead birds and manure to be removed from sheds regularly;
- exclusion of pests from access to the poultry sheds, feed and water;
- regular setting of rat and mice traps to control pest numbers.

Details of a Pest Control and Waste Management Plan are provided in Appendix 8 of this EIS.

With appropriate vermin control potential adverse impacts of rodents on adjoining areas of open forest will be controlled.

4.11 BUSHFIRE HAZARD MANAGEMENT

The proposed sheds are to be located with at least 30 metres setback from the adjoining areas of National Park. This setback distance was previously identified by Gosford Council in order to minimise potential damage from bushfires. The area of land between the poultry sheds and National Park would be managed as a fuel free zone with a Kikuyu Grass vegetative cover and absence of trees and shrubs. This will reduce opportunity for spread of bushfires from the adjoining National Park.

As the proposed sheds are non combustible rural style sheds and not habitable dwellings the provision of a 30 metre setback is considered an adequate setback to manage potential bushfire hazard affecting the proposed development.

4.12 CONCLUSION

The proposed development with the incorporation of the proposed environmental protection measures is expected to have minimal long term environmental impacts on the surrounding area. The environmental safeguards proposed during the construction and operational phases will ensure that impacts on the local environment are minimised while efficient management of the poultry production enterprise in conjunction with the existing poultry production operation will provide better opportunities for long term sustainable agricultural use of the property.

SECTION 5

PROJECT EVALUATION

5.1 ALTERNATIVE PROPOSALS FOR THE USE OF THE SUBJECT SITE

The site is zoned as 1(a) Agriculture under the provision of Local Environmental Plan N° 122 Gosford City Council, which allows for agricultural activities on land appropriately zoned. The land is currently utilised for poultry production.

The first alternative is for the use of the site for grazing purposes. However, stock grazing is not an activity pursued by the current landowners and farm managers and is not considered a viable economic alternative. A second alternative to the proposed development is to continue the existing agricultural production to include the area of the proposed poultry sheds. Detrimental impacts on the environment are also possible from this alternative, such as erosion of cultivated soil, nutrient runoff impacts of fertilisers, and possible long term sedimentation impacts on the waterways surrounding the subject site.

Alternative locations for the proposed sheds are limited due to: the configuration of the allotment; locations of existing houses and infrastructure and the topography of the site. Therefore it has been determined that the proposed location of the sheds is the most appropriate position on the site. This site was previously identified by Council as the most appropriate location for poultry sheds.

5.2 JUSTIFICATION OF THE PROPOSED DEVELOPMENT OF POULTRY SHEDS

Clause 34(f) of the Environmental Planning and Assessment Regulation (1980) requires that the proposed development be supported by a statement to justify it in terms of environmental, economic and social considerations.

5.2.1 Environmental considerations

Although the proposed development could potentially generate adverse environmental impacts these impacts could easily be controlled and minimised through the application of the appropriate development controls and environmental safeguards discussed in this EIS and the supporting specialist reports. The potential for significant adverse impacts on water quality, fauna habitat, flora and air quality (dust, odour and noise) to occur is considered to be minimal given the requirements for the proposed poultry sheds to operate within stringent guidelines required by both the Department of Agriculture and the poultry raising and processing industry.

5.2.2 Economic considerations

The construction of the poultry sheds will have long term economic benefits to the local and regional economies. These will accrue from increased rural productivity, capital expenditure, employment opportunities and other benefits due to the multiplier effect of increased economic activity in the rural sector.

5.2.3 Social considerations

The social disadvantages arising from the proposed development will be limited to the immediate surrounding areas through increased levels of traffic and possible noise. However, these are considered to be outweighed by the increased social benefits which follow increased agricultural production and efficient farm management.

5.2.4 Agricultural Considerations

The proposed development is a legitimate and appropriate agricultural use on land zoned for agricultural purposes. The Central Coast Plateau is an important poultry producing area and the proposed development is compatible with the changing nature of agricultural production within the region.

5.2.5 Planning Considerations

The proposed development is compatible with the existing zone and surrounding land uses. The minimal and controllable environmental impacts are not considered to be of a significant level that would be adverse to the aims and objectives of SREP N°8 or SREP N°20 (Hawkesbury Nepean River).

5.3 CONSIDERATIONS OF PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The proposed construction of poultry sheds on this allotment is considered appropriate in relation to the principles of ecologically sustainable development for the following reasons:

i) The proposed sheds are to be erected on land already cleared;
ii) The proposed development is compatible with the surrounding area;
iii) Areas of significant natural vegetation or fauna habitat will not be required to be cleared for construction of poultry sheds;
iv) Potential environmental impacts have been identified and can be controlled through the implementation of appropriate environmental safeguards and development controls.

Specifically in regards to the principles of ecological sustainable development the following matters are addressed, as required under Clauses 51 and 84 of the Environmental Planning and Assessment Regulation (1994).

a) ***The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.***

Appropriate environmental protection measures are proposed as part of this development. The proposed poultry sheds are to be located in an area where no significant vegetation or fauna habitat is present. It is considered that the proposal would not result in any serious or irreversible environmental damages and that appropriate and acceptable environmental protection measures can be implemented with the proposed development.

b) ***Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.***

The proposed development will result in a positive improvement to inter-generational equity, in that sediment and nutrients in runoff can be appropriately managed to improve the quality of runoff water leaving the site. Additionally the erection of poultry sheds on cleared areas would reduce the need to clear other vegetated areas for the erection of poultry sheds.

c) ***Conservation of biological diversity and ecological integrity.***

The proposed development will not require clearing of any significant areas of natural vegetation or fauna habitat. Therefore development of the proposed site for poultry sheds is not likely to compromise any area of value in regards to biological diversity or ecological integrity. The land will remain zoned 1(a) Agriculture thereby ensuring that appropriate land use and development controls are in place to allow for future development with the conservation of areas with biological diversity and ecological integrity in other zones such as the adjoining National Park area.

d) ***Improved valuation and pricing of environmental resources.***

The development of the proposed site for poultry sheds is likely to result in an increased land value to the existing land. Future rehabilitation and revegetation will increase the numbers of native trees and shrubs currently growing on the site. It is unlikely that the proposed development will affect the pricing of environmental resources as the development will be restricted

to existing cleared areas and not require disturbance to environmentally significant or environmentally sensitive areas.

5.4 CONCLUSION

The development of the poultry sheds on the subject site will enable the expansion of existing operations into a more profitable area, and is a significant capital investment into the local economy. An established market for the proposed product already exists in local and regional areas.

The proposed development will have minimal long term environmental impacts on the surrounding area. The environmental safeguards proposed during the construction and operational phases will ensure that impacts on the local environment are minimised while efficient management of the poultry production enterprise in conjunction with citrus production will provide better opportunities for long term sustainable agricultural use of the property.

REFERENCES

Benson D.H. (1986) The vegetation of the Gosford - Lake Macquarie 1:100,000 Vegetation Map Sheet. Cunninghamiana 1(4):467-489.

Briggs & Leigh (1988) Rare or Threatened Australian Plants, Australia National Parks & Wildlife Service, Special Publication.

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Environmental Planning and Assessment Act (1979) NSW Government.

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Murphy, C.L. (1992) Soil Landscapes of the Gosford Lake Macquarie 1:100,000 sheet. Soil Conservation Service of NSW, Sydney.

National Parks & Wildlife Service (1998) Wildlife Atlas database for the Gosford 1:100,000 Scale Map Sheet 9131.

NSW Agriculture (1994) Guidelines for poultry farming.

APPENDIX 1
CORRESPONDENCE

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

General Manager
Gosford City Council
PO Box 21
GOSFORD NSW 2250

Dear Sir,

RE: REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

An EIS is required to accompany a Development Application to Gosford City Council as the location of the proposed sheds is within 500 metres of an existing poultry farm and is therefore classified as designated development in accordance with Schedule 3 of the EP&A Regulation. The area of the proposed sheds is totally cleared of native vegetation and is currently used for vegetable growing.

In order to ensure that the EIS covers the relevant issues could you please advise as to whether your department has any additional matters for inclusion in the EIS which are not already incorporated into Schedule 2 of the EP&A Regulation.

Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P A CONACHER
CONACHER TRAVERS

49 Mann Street, Gosford NSW 2250
PO Box 21, Gosford. DX 7211 Gosford
Telephone: (02) 4325 8222 Fax: (02) 4323 2477
www.gosford.nsw.gov.au Email: goscity@gosford.nsw.gov.au

GOSFORD CITY COUNCIL

Telephone: (02)4325 8345/8840 Please QuoteAssessment Team 2/lp
Mr J Gray
DA 20199
27 November 1998

Conacher Travers
PO Box 89
GOSFORD NSW 2250

Development Application No 20199 - Proposed Poultry Sheds on Lot 146 DP 755253 Kirks Road Somersby

Dear Sir/Madam

I refer to your letter dated 6 November 1998 concerning the above matter.

Council's considers that the issues in respect of this development will be similar if not the same, as those involved in the previous application for the site, prepared by Integrated Site Management and Planning.

Particular regard should be had to any specific requirements of relevant government departments.

Yours faithfully

Jim Gray
Senior Town Planner

P:\PLANNING\LETTERS\NEWTEAM2\GRAY\20199A.WPD

New South Wales Government
Department of Urban Affairs and Planning

Mr Phil Conacher
Conacher Travers (P) Ltd
PO Box 89
GOSFORD NSW 2250

Contact: Chris Ritchie

Our Reference: 1494/00209/001

Your Reference:

Proposed Poultry Farm – Lot 146 DP 755253, Kirks Road, Mangrove Mountain, Gosford

Dear Mr Conacher

Thank you for your correspondence of 21st October 1998 seeking consultation with the Director General for the preparation of an environmental impact statement (EIS) for the above development.

Under clause 55 of the *Environmental Planning and Assessment Regulation 1994*, (the Regulation) you should consider the following issues when preparing the EIS:

- Consistency of the proposal with Sydney Regional Environmental Plan No 8 "Central Coast Plateau Areas and Sydney Regional Environmental Plan No 20 (No 2-1997) "Hawkesbury Nepean River";
- The potential cumulative effect of the development; and
- Potential Bushfire hazard issues.

Attachment No. 1 outlines the statutory matters that must be included in the EIS under clauses 54 and 54A of the Regulation.

The Department's EIS Guideline '**Poultry Farms**' contains the type of information most likely to be relevant to your proposed development. Not all the matters it contains may be appropriate for consideration in your EIS; equally, it is not exhaustive. The Guideline is available for purchase from the Department's Information Centre, 1 Farrer Place, Sydney or by calling (02) 9391 2222.

You should consult with Gosford City Council and take into account any comments Council may have in the preparation of the EIS. The EIS should also address other issues that emerge from consultations with relevant local, State and Commonwealth Government authorities, service providers and community groups. This should include the Environment Protection Authority.

Should you have any enquiries regarding this matter please contact Chris Ritchie on (02) 9391 2085.

Yours sincerely

David Mutton 9/11/98
Acting Director
Development and Infrastructure Assessment

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

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

(c) the likelihood of air, noise or water pollution arising from the development or activity;
(d) the impact of the development or activity on the health of people in the neighbourhood of the development or activity;
(e) any hazards arising from the development or activity;
(f) the impact of the development or activity on traffic in the neighbourhood of the development or activity;
(g) the effect of the development or activity on local climate;
(h) the social and economic impact of the development or activity;
(i) the visual impact of the development or activity on the scenic quality of land in the neighbourhood of the development or activity;
(j) the effect of the development or activity on soil erosion and the silting up of rivers or lakes;
(k) the effect of the development or activity on the cultural and heritage significance of the land.

An environmental impact statement referred to in Section 78A(8) of the Act shall be prepared in written form and shall be accompanied by a copy of Form 2 of the Regulation signed by the person who has prepared it.

Procedures for public exhibition of the EIS are set down in clauses 57 to 61 of the Regulation.

Attention is also drawn to clause 115 of the Regulation regarding false or misleading statements in EISs.

Note

If the development application to which the EIS relates is not exhibited within 2 years from the date of issue of the Director-General's requirements, under clause 55(7) of the Regulation the proponent is required to reconsult with the Director-General.

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DEPARTMENT OF URBAN AFFAIRS AND PLANNING

Attachment No. 1

STATUTORY REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT UNDER PART 4 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

In accordance with the *Environmental Planning and Assessment Act 1979* (the Act), an environmental impact statement (EIS) must meet the following requirements.

Content of EIS

Pursuant to Schedule 2 and clause 54A of the *Environmental Planning and Assessment Regulation 1994* (the Regulation), an EIS must include:

1. A summary of the environmental impact statement.
2. A statement of the objectives of the development or activity.
3. An analysis of any feasible alternatives to the carrying out of the development or activity, having regard to its objectives, including:
   (a) the consequences of not carrying out the development or activity; and
   (b) the reasons justifying the carrying out of the development or activity.
4. An analysis of the development or activity, including:
   (a) a full description of the development or activity; and
   (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that are likely to be significantly affected; and
   (c) the likely impact on the environment of the development or activity, having regard to:
      (i) the nature and extent of the development or activity; and
      (ii) the nature and extent of any building or work associated with the development or activity; and
      (iii) the way in which any such building or work is to be designed, constructed and operated; and
      (iv) any rehabilitation measures to be undertaken in connection with the development or activity; and
   (d) a full description of the measures proposed to mitigate any adverse effects of the development or activity on the environment.
5. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.
6. A compilation, (in a single section of the environmental impact statement) of the measures referred to in item 4(d).
7. A list of any approvals that must be obtained under any other Act or law before the development or activity may lawfully be carried out.
8. For the purposes of Schedule 2, the principles of **ecologically sustainable development** are as follows:
   (a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
   (b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
   (c) Conservation of biological diversity and ecological integrity.
   (d) Improved valuation and pricing of environmental resources.

Note

The matters to be included in item (4)(c) might include such of the following as are relevant to the development or activity:

(a) the likelihood of soil contamination arising from the development or activity;
(b) the impact of the development or activity on flora and fauna;

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

Mr Jerry Bolla
Department of Agriculture
PO Box 581
GOSFORD NSW 2250

Dear Mr Bolla,

RE: REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

An EIS is required to accompany a Development Application to Gosford City Council as the location of the proposed sheds is within 500 metres of an existing poultry farm and is therefore classified as designated development in accordance with Schedule 3 of the EP&A Regulation. The area of the proposed sheds is totally cleared of native vegetation and is currently used for vegetable growing.

In order to ensure that the EIS covers the relevant issues could you please advise as to whether your department has any additional matters for inclusion in the EIS which are not already incorporated into Schedule 2 of the EP&A Regulation.

Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P A CONACHER
CONACHER TRAVERS

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

Ms Lou Ewins
Manager - Planning Unit Sydney Zone
National Parks and Wildlife Service
PO Box 1967
HURSTVILLE NSW 2220

Dear Ms Ewins,

RE: REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

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In order to ensure that the EIS covers the relevant issues could you please advise as to whether your department has any additional matters for inclusion in the EIS which are not already incorporated into Schedule 2 of the EP&A Regulation.

Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P A CONACHER
CONACHER TRAVERS

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

P. A. Conacher
Conacher Travers Environmental Consultants
PO Box 89
GOSFORD NSW 2250

Our ref: 97/358
Your ref: 8065

Dear Sir / Madam

RE: Environmental Impact Statement -
Poultry Sheds, Lot 146 DP 755253
Kirks Road, Mangrove Mountain

Thank you for your letter dated 6 November 1998 seeking advice from the National Parks and Wildlife Service (NPWS) on the above proposal.

The NPWS has a statutory responsibility for the protection and care of native flora, native fauna and Aboriginal sites, and for the management of NPWS reserves. Accordingly the NPWS has an interest in ensuring that potential impacts to these attributes are appropriately assessed.

To assist you in this regard, it is recommended that the matters referred to in the attached guidelines be addressed in your assessment where appropriate. The attached guidelines also provide information on any approvals that may be relevant under the National Parks and Wildlife Act and a summary of the Service's databases which may be of assistance to you in your assessment.

If you have any questions concerning this matter, please do not hesitate to contact me on (02) 9585 6920.

Yours sincerely

Katharine Sale 3/12/98
A/Environmental Planning Manager
SYDNEY ZONE

Sydney Zone
6th Floor
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 9585 6442
Tel: (02) 9585 6678

NSW NATIONAL PARKS AND WILDLIFE SERVICE

GENERAL GUIDELINES FOR IMPACT ASSESSMENT

The National Parks and Wildlife Service (NPWS) has an interest in the potential impacts of proposals on the following:

- areas of native vegetation;
- areas of potential value as habitat for native fauna;
- sites and places of Aboriginal cultural heritage, including areas of archaeological potential; and
- land dedicated under the *National Parks and Wildlife Act 1974* (*NP&W Act*).

If these attributes are anticipated to be present in your study area and / or likely to be impacted, it is recommended that assessments by a suitably qualified person be undertaken to determine the extent of impact. The NPWS suggests that the following basic details be included in the assessments:

- the qualifications and experience of the person undertaking the work; and
- a detailed description of survey methodology including survey design, sampling methods, weather conditions, time and duration of surveys and location of any survey sites and transect lines.

Specific issues that are recommended to be addressed by the assessments are detailed below.

General information

- description of the proposal and the way in which the environment will be modified;
- map(s) placing the proposal in a regional and local setting;
- applicability of Local Environmental Plans, Regional Environmental Plans and State Planning Policies to the proposal;
- information on the current and past land uses of the site and that of the surrounding area; and

- appropriately scaled maps which identify the location and extent of any areas of native vegetation and fauna habitat and Aboriginal cultural heritage value in relation to the area of proposed development.

Impacts

- prediction of the likely impact of the proposal on land dedicated under the *NP&W Act*;
- prediction of the likely impacts of the proposal on areas and items of natural significance, such as native vegetation and fauna habitat, and on Aboriginal heritage sites and areas of cultural significance. This should include consideration of any off-site impacts; and
- assessment of measures available to minimise the impact of the proposal on these attributes, including potential conservation options, alternative development options and monitoring programs, if appropriate.

Native flora, fauna and threatened species

The following information is considered necessary to assess the potential impact of a proposal:

- detailed description and mapping of all vegetation communities in the study area;
- identification of any vegetation communities or plant species which are of local, regional or state conservation significance (including threatened species, populations, ecological communities or critical habitat listed under the *Threatened Species Conservation (TSC) Act*). The criteria for establishing significance should be documented;
- description of known or expected fauna assemblages within the study area;
- identification of fauna habitat likely to be of local, regional or state significance (including habitat of threatened species, populations, ecological communities or critical habitat listed under the *TSC Act*);
- identification of habitat corridors and linkages between areas of remnant native vegetation which may assist faunal movement through the area and an assessment of the conservation significance of these; and
- prediction of the likely impact of the proposal on the above attributes (quantification of the extent of impact where practical).

In addition to these general requirements, there are specific requirements relating to the assessment of a proposal and its potential impact on threatened species, populations, ecological communities, their habitats and critical habitat.

The provisions of the *TSC Act* and related provisions of the *Environmental Planning & Assessment Act* should be considered when undertaking the assessment of a proposal. In addition to the *TSC Act* itself, further information on the provisions of the *TSC Act* may be obtained from the Department of Urban Affairs and Planning Circular No. A13 (12 December 1995). The NPWS has also produced Information Circulars

on the *TSC Act* which may be obtained by contacting the NPWS Information Centre on (02) 9585 6333.

Concurrence provisions

Where a consent authority determines that a proposal is likely to have a significant effect on threatened species or their habitats, a species impact statement (SIS) must be prepared in accordance with the requirements of the Director-General of the National Parks and Wildlife Service. If, after considering the SIS, a consent authority intends to grant approval to a proposal that will have a significant effect on threatened species or their habitats then the concurrence of the NPWS is required. If the Minister for Urban Affairs and Planning is the consent authority the concurrence of the NPWS is not required, but consultation must occur with the Minister for the Environment before development consent is granted.

The process and timeframes for development applications that require concurrence are detailed in Division 2 of the *Environmental Planning and Assessment Regulation 1998*.

Aboriginal heritage

General issues

For the purposes of these guidelines Aboriginal heritage is considered to include "relics" and places of significance to Aboriginal communities.

Under the *NPW Act*, a 'relic' is defined as any deposit, object or material evidence (not being a handicraft made for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains (as defined within the meaning of the *NPW Act*). Relics are confined to physical evidence. Aboriginal 'relics' are commonly referred to as Aboriginal sites.

An "Aboriginal place" is a place which has been declared so by the Minister for the Environment because he or she believes that the place is or was of special significance to Aboriginal culture. It may or may not contain physical relics.

It should also be noted that there are places in the landscape which have particular meaning for Aboriginal people, for example, spiritual areas or natural mythological areas. Although these areas are not protected under the *NPW Act*, unless they contain physical remains of Aboriginal occupation or have been declared an 'Aboriginal place', it is recommended that the potential impact of proposals on such places also be considered in the assessment process.

Assessment process

It is recommended that an assessment be conducted of the Aboriginal cultural values of the study area if the proposal involves disturbance to substantially unmodified ground surfaces. If the study area is considered to have archaeological potential or cultural significance then it is recommended that a survey and assessment be undertaken in accordance with NPWS guidelines. These guidelines are contained in the NPWS' publication "Aboriginal Cultural Heritage: Standards and Guidelines", which may be purchased by contacting the NPWS' Cultural Heritage Conservation Division on (02) 9585 6571.

Should any Aboriginal archaeological sites be present in the study area, you should consider the requirements of the *NP&W Act* with regard to Aboriginal relics. Under s90 of the *NP&W Act* it is an offence to knowingly damage or destroy relics without the prior permission of the Director-General of the NPWS.

In assessing Aboriginal heritage values, consideration should also be given to whether the study area is likely to contain places of cultural significance to the Aboriginal community. It should be noted that places of cultural significance to the Aboriginal community are not limited to archaeological sites. An assessment of cultural significance should involve consultation with community representatives and if necessary, documentary research to establish whether there are any places of traditional or historic significance to the Aboriginal community.

Integrated Development Assessment

Under recent amendments to the *EP&A Act*, a range of approvals and licences issued by various agencies have been integrated with the development approval process. Section 91 of the *Environmental Planning and Assessment Amendment Act 1997* lists the approvals of agencies which are included in the integrated development assessment (IDA) process.

This includes Section 90 approvals under the *NP&W Act* regarding consent to knowingly destroy, deface or damage or knowingly cause or permit the destruction or defacement of or damage to an Aboriginal relic or Aboriginal place. Where a relic or an Aboriginal place is known to occur on land prior to the lodgement of a development application, and the development proposal will damage, deface or destroy the relic or Aboriginal place, thereby requiring a consent to destroy from the Director-General of the NPWS, the NPWS will become an approval body.

It should be noted that where a relic or Aboriginal place is found to occur on land after a development application is lodged, separate NPWS approval will still be required under Section 90 of the *NP&W Act.*

The NPWS has prepared detailed guidelines to assist councils and applicants in the IDA process (copies available upon request). The guidelines outline the role of the NPWS in the IDA process and describe the information that needs to be submitted in

an integrated development application. In summary, two types of information are required:

- Aboriginal cultural heritage assessment which involves consultation with the Aboriginal community groups. The NPWS is committed to working in partnership with the Aboriginal community groups in the management of Aboriginal sites and requires community assessment of any Aboriginal site management; and
- Archaeological assessment which involves the assessment of Aboriginal sites and their management based on archaeological heritage criteria.

Environmental impact statements

Where an environmental impact statement (EIS) is required to be prepared for an integrated development, the Director-General of the Department of Urban Affairs and Planning (DUAP) must request each approval body to provide their requirements in relation to the EIS. If the approval body does not provide those requirements within 14 days then the Director-General of DUAP must inform the applicant and the applicant must consult with the approval body to obtain its requirements for the EIS.

If an EIS is to be prepared for an integrated development that involves a Section 90 approval under the *NP&W Act*, the NPWS will be requested to provide its requirements for the EIS. In this situation, the NPWS requirements for the EIS are the same as for any IDA proposal that requires a Section 90 approval under the *NP&W Act*. These requirements are detailed in the attached guidelines.

Databases

The NPWS has two GIS databases which may provide information of use to you if you proceed to undertake further assessment. These are:

- Atlas listing of fauna and flora records in NSW;
- Aboriginal Sites register.

The material from these databases is available upon written application and the receipt of the appropriate fee. If you are interested in obtaining access to the Atlas database, please contact the Data Licensing Officer, GIS Division, on (02) 9585-6684. Records from the Aboriginal Sites register may be obtained upon written application to the Registrar, Cultural Heritage Conservation Division, on (02) 9585-6471.

Further Information

For further information please contact:

Manager, Environmental Planning Unit
Sydney Zone
NPWS
PO Box 1967
Hurstville NSW 2220

Ph - (02) 9585 6674
Fax - (02) 9585 6442

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

Mr John Klein
Hawkesbury Nepean Catchment Management Trust
PO Box 556
WINDSOR NSW 2756

Dear Mr Klein,

RE: REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

An EIS is required to accompany a Development Application to Gosford City Council as the location of the proposed sheds is within 500 metres of an existing poultry farm and is therefore classified as designated development in accordance with Schedule 3 of the EP&A Regulation. The area of the proposed sheds is totally cleared of native vegetation and is currently used for vegetable growing.

In order to ensure that the EIS covers the relevant issues could you please advise as to whether your department has any additional matters for inclusion in the EIS which are not already incorporated into Schedule 2 of the EP&A Regulation.

Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P A CONACHER
CONACHER TRAVERS

Hawkesbury Nepean
CATCHMENT MANAGEMENT TRUST

13 November 1998

Conacher Travers
Environmental Consultants
P.O. Box 89
GOSFORD NSW 2250

Contact: Tony Towers
Our Ref: LM\GO\EIS
mang-kirk-poul
Your Ref: 8065

Dear Mr Conacher,

PROPOSED POULTRY FARM: LOT 146 DP 755253, KIRKS ROAD, MANGROVE MOUNTAIN

Thank you for your letter seeking our requirements regarding the EIS for this proposal. The Trust's general requirement is that the EIS address the impact of the proposal upon the Hawkesbury-Nepean River and, in this location particularly Ironbark Creek.

Specifically, the EIS should indicate the way in which the following criteria will be achieved:

1. The proposal should satisfy the Trust's policy on water quality and quantity:
   - *Any water flow or changes in flow from the site should not alter the downstream natural hydrology (frequency or peaks) for all events up to the one in two year storm event (30 minute event), and should not alter the downstream peak levels for events up to the 1 in 100 year event.*
   - *Surface runoff should not compromise the: ANZECC Guidelines standard for healthy rivers - aquatic ecosystems, water supply for livestock; and NHMRC Guidelines for recreational water quality - visual amenity and primary contact recreation.*
   - *Groundwater should be protected from the impacts of any contaminated surface waters and/or leachate.*

   We therefore recommend that particular regard be given to erosion and sediment controls during both construction and operation; the quality and quantity of existing and likely future surface flows; control of run-off and waste waters; and any potential infiltration into the ground water and effects on water bores.
2. Site management should satisfy the NSW Agriculture's Poultry Farming Guidelines. The cumulative impact of similar uses in the area should also be taken into account.
3. Pest control (as discussed on page 35 of NSW Agriculture's Poultry Farming Guidelines) should not adversely affect native fauna.
4. Farm management should avoid soil contamination under and immediately around the sheds and any stockpiles.

Hawkesbury-Nepean Catchment Management Trust, 68 Mileham St, (PO Box 556), Windsor NSW 2756
Tel: (02) 4577 4243 Fax: (02) 4577 4236

5. Drainage from the roofs will also require particular care to prevent concentrated flows causing erosion. The potential for water conservation by using water from the extensive roof areas should be assessed.

The EIS should also address the provisions of Sydney REP No. 20 Hawkesbury-Nepean River (No. 2-1997)

Should you wish to discuss any matter raised in this letter, please contact the Trust's staff.

Yours faithfully

MALCOLM HUGHES
Program Leader, Catchment Planning

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

District Manager
Department of Land and Water Conservation
PO Box 1235
GOSFORD NSW 2250

Dear Sir,

RE: REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

An EIS is required to accompany a Development Application to Gosford City Council as the location of the proposed sheds is within 500 metres of an existing poultry farm and is therefore classified as designated development in accordance with Schedule 3 of the EP&A Regulation. The area of the proposed sheds is totally cleared of native vegetation and is currently used for vegetable growing.

In order to ensure that the EIS covers the relevant issues could you please advise as to whether your department has any additional matters for inclusion in the EIS which are not already incorporated into Schedule 2 of the EP&A Regulation.

Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P A CONACHER
CONACHER TRAVERS

your ref: 8065
our ref: ER 1015

LAND & WATER CONSERVATION

CONACHER TRAVERS ENVIRONMENTAL CONSULTANTS
70 HILLS STREET
GOSFORD 2250

ATTENTION: Mr P A Conacher

FAXED 18/12

Friday, 18 December, 1998

Dear Sir

EIS REQUIREMENTS FOR POULTRY SHEDS AT LOT 146 DP755253, KIRKS RD, MANGROVE MOUNTAIN.

I refer to your letter dated 6 November 1998 requesting this department's comments in regard to the above proposal. I apologise for the delay, but the Department has now reviewed this matter and provides the following information addressing the principle issues:

1. SURFACE WATER SUPPLY

The EIS must address issues related to potential water quality impacts and measures to address water quality concerns relating to the proposal, including but not limited to;

a. Water supply and water quality controls on water management to the development. This should be developed as a water balance to the site, and should include a detailed discussion on any wastewater disposal which may be required for the site.

b. The assessment for the application must specify the required volume or source of supply to the proposal. The sizes of dams on the site, and an analysis of the adequacy of supply to the development during extended dry periods must be included. An assessment of current supply levels from surface as well as groundwater sources must be submitted to Council, as well as an assessment of the increased draw on existing supplies to the proposed development, and any decrease in reliability of supply.

c. Site drainage management, with particular reference to the management of Ironbark Ck, tributaries of which flow on either side of the site. The EIS must explain how drainage toward Ironbark Creek is to intercepted and stored or treated before release, and any anticipated changes in water quality that will occur. Any storage of site water to be harvested may require a licence under Part 2 of the Water Act, and restrictions on the type or extent of water use may exist. The EIS must include information on the segregation of clean stormwater runoff from roofs and site runon from any solids disposal or contaminated area runoff. Any on site disposal of liquid waste must be isolated from clean runon to the property.

d. Site waste management must be discussed, including the disposal of solids and bird carcasses, transport of solid waste and any irrigation or other on-site disposal of liquid waste. Soil assessments, including long term waste acceptance must be examined, and any on-site disposal system justified.

2. WASTE WATER AND EFFLUENT DISPOSAL

The site currently has no buffer area surrounding any natural watercourse crossing the property. This may have impacts on the quality of dam water, or on runoff quality leaving the site toward Mangrove Creek.

The location of any carcass disposal/compost area may reduce the buffering capacity of grass cover between the sheds and creek systems. The application must include an identification of the protective measures to be

installed between the shed area and creek systems. The assessment must explain how wastewater from the sheds (from washdown) will be disposed of, and how clean stormwater will be segregated from dirty water from the shed complex. Any on site disposal of wastewater must be explained in detail, with detailed soil assessments, wet weather storage and reserve disposal areas clearly identified.

In addition, any monitoring requirements, a monitoring plan for the dams and surface watercourses, and a contingency plan to clean up any spillages or waste movement from the site into watercourses leaving the site must be included in the assessment.

3. GROUNDWATER

For an activity that is likely to have either high nutrient loads or elevated levels of bacteria or viruses, the environmental assessment should contain a section addressing the potential for groundwater contamination. The main threat to groundwater is where waste generated (both liquid and solid) from the activity are disposed on-site.

Groundwater issues to be considered include, but not limited to, the following:
- identify depth to groundwater table (as a general rule the Environment Protection Authority set a minimum depth to water table of 3 m for the disposal of effluent).
- outline suitability of the soils attenuation capacity, infiltration rates and potential buffering capacity i.e., life expectancy for nutrient removal;
- provide a description of the physical and chemical characteristics of aquifers, including flow direction, flow rate, recharge and discharge areas;
- assess potential impacts to water quality and likely effects on any adjacent ecosystems;
- identify surrounding water users (both groundwater and surface water);
- if required, disposal of diseased or dead produce;
- water supply for proposed activity;
- the extent of any buffer zones to watercourses or adjoining properties;
- an outline of any current or proposed groundwater and soil monitoring program;
- a rehabilitation or contingency plan in the event groundwater contamination is clearly identified;
- water balance that takes into consideration the application procedure, rate and duration of application and wet weather storage facilities.

All test bores and excavations below groundwater level must be licensed prior to their construction.

4. SOIL CONSERVATION

In relation to soil erosion, sedimentation and land degradation in general the Department advises that the (EIS) should address at least, but not be limited to the following issues:-

- topography and landform
- soil type and soil erodibility
- acid sulfate and potential acid sulfate soils
- vegetation management and Native Vegetation Conservation Act (1997), if applicable
- Protected Land (Native Vegetation Conservation Act 1997), if applicable
- erosion and sediment control strategy, including techniques

I trust the above information is of assistance in regard to your consideration of this proposal. Should there be any further enquiry in this matter, please contact Mr Jeff Hunt, Resource Planning Manager, at our Newcastle Office on 02 49299850.

Yours Faithfully

Jeff Hunt, Resource Planning Manager
Resource Assessment and Planning, Hunter Region

Conacher Travers
Environmental Consultants

Gosford Office:

70 Hills Street, Gosford 2250
PO Box 89 Gosford 2250
Ph. 02 4325 0828
Fax 02 4325 0758
ispm@iniaccess.net.au

6 November 1998

Our Ref: 8065

Regional Manager
Environment Protection Authority
PO Box 1135
CHATSWOOD NSW 2057

Dear Sir,

RE: **REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENT**
POULTRY SHEDS - LOT 146 DP 755253
KIRKS ROAD, MANGROVE MOUNTAIN

We have been engaged by the owner of the above land to prepare an Environmental Impact Statement (EIS) for the proposed erection of six poultry sheds within the area identified on the attached map.

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Your prompt response to this request would be very much appreciated. Please do not hesitate to contact the undersigned if you require any additional information.

Yours faithfully,

P.A. Conacher.

P A CONACHER
CONACHER TRAVERS

NO RESPONSE RECIEVED

APPENDIX 2

FLORA AND FAUNA SURVEY
AND THREATENED SPECIES ASSESSMENT
CONACHER TRAVERS

CONACHER TRAVERS

environmental consultants

THREATENED SPECIES ASSESSMENT

PROPOSED POULTRY SHEDS
LOT 146 DP 755253
KIRKS ROAD
MANGROVE MOUNTAIN

NOVEMBER 1998
(REF: 8065E)

Conacher Travers Pty Ltd - ACN 083 610 173

Gosford - 70 Hills Street, PO Box 89 Gosford 2250 • **phone: (02) 4325 0828** • fax: (02) 4325 0758 • email: dunnart@bigpond.com

Wyong - 4 Hope Street, PO Box 9 Wyong 2259 • **phone: (02) 4353 1010** • fax: (02) 4351 2563 • email: bushfire@bigpond.com

PREFACE

This Threatened Species Impact Assessment Report has been prepared by *Conacher Travers* for the proposed development of poultry sheds at Mangrove Mountain. This Report provides an assessment of the flora present, existing habitats and the potential for the proposed development to significantly impact on threatened species according to Section 5(A) of the *Environmental Planning and Assessment Act* 1979 and the *Threatened Species Conservation Act* 1995.

PHILLIP ANTHONY CONACHER B.Sc.(Hons), Dip.Urb Reg Planning, M.Nat.Res.

Director
Conacher Travers

DAVID TAYLOR B.Nat.Res.(Hons)

Ecologist
Conacher Travers

TABLE OF CONTENTS

1. INTRODUCTION

Conacher Travers have been engaged by David Kettle Consulting Services to assess the subject site in relation to the significance of the vegetation present and potential habitat for threatened species to determine whether or not a Species Impact Statement should be prepared for the proposed development according to the provisions of the *Threatened Species Conservation Act* 1995 and Section 5(A) of the *Environmental Planning & Assessment Act* 1979. The development proposed for the site is the construction of six poultry raising sheds in an area of land cleared of natural vegetation and utilised for vegetable production.

2. SITE CHARACTERISTICS

The subject site is located at Lot 146 Kirks Road, Mangrove Mountain (see Figure 1). The land comprises approximately 14 hectares of gently sloping land (2-4% gradients) which is cleared and currently used for vegetable growing. Elevations ranges from 330 to 345 metres AHD. The site of the proposed development has a southerly aspect. Drainage is via grassed waterway into a farm dam located in the southern portion of the site. Overflow from this dam flows into Ironbark Creek. Location plans and an aerial photograph of the site showing the cleared nature of the land is provided in the Environmental Impact Statement prepared to accompany the Development Application.

3. FLORA CHARACTERISTICS

3.1 Flora Survey Methodology

To determine the likely and actual occurrence of plant species on the subject site the following field survey work was undertaken to supplement previous flora surveys of the area and literature reviews. The methods utilised for the flora survey included:

Literature Review

- A review of available literature for nearby areas was undertaken to obtain reference material and background information for this survey. These documents are listed in the References Section of this Report.

- The NSW National Parks & Wildlife Service Wildlife Atlas Database (NSW NPWS 1998) records for the Gosford 1:100,000 scale map sheet were cross-referenced with Schedules 1 and 2 of the *Threatened Species Conservation Act* 1995. This provided a predictive list of threatened species with a possibility of occurring in habitats similar to those found on site.

Aerial Photograph Interpretation

- Aerial photographs at 1:3,000 and 1:25,000 scale were utilised to identify the extent of vegetation with respect to the site and surrounding areas.

General Field Survey

- A general field survey was conducted to determine the occurrence of threatened plant species and the distribution of vegetation communities throughout the subject site. This survey was undertaken on 19 October 1998.

3.2 VEGETATION DESCRIPTION

The subject land is agricultural in nature with the majority of the site cleared for vegetable growing and associated agricultural development.

This area has been cleared of all native vegetation for the purposes of agricultural activities. The vegetation in these areas is dominated by weed species, introduced pasture species and agricultural crops. This community is distributed across the majority of the site. Landscape gardens and ornamental tree plantings are present near the dwellings and along Kirks Road.

3.3 THREATENED FLORA SPECIES

The National Parks & Wildlife Service Wildlife Atlas Database (NSW NPWS 1998) flora records were cross-referenced with Schedules 1 and 2 of the *Threatened Species Conservation Act* 1995 to determine the known occurrences of threatened species in the Gosford area. Using this base list, a habitat assessment was carried out for those threatened species known to occur within a ten kilometre radius of the site. Details on threatened species identified in the Wildlife Atlas search with a known distribution in the local are included in Table 1.

None of these species were observed on the subject site during the flora survey. An assessment of the occurrence of habitats of these species on the site is provided in Table 1 and an assessment of the likely impact of the proposed development on these species is provided in Section 4 of this Report. It is considered that the area of proposed development does not provide any suitable habitat for threatened flora species due to the cleared nature of the site and current ongoing land management associated with vegetable production.

TABLE 1 THREATENED FLORA SPECIES OF THE AREA			
SPECIES	**GROWTH FORM AND HABITAT REQUIREMENTS**	**CONSERVATION STATUS**	**COMMENTS**
Acacia bynoeana	Erect or low spreading shrub 0.2-1m tall. Grows on sandy soils in heath, woodland and open forests from Morisset to Berrima and Mittagong.	Royal NP (population unknown) and Blue Mountains NP (population unknown).	No suitable habitat is present. Not observed during floristic survey.
Caladenia tessellata	Terrestrial orchid with inflorescence to 25cm high. Grows in sheltered moist places in forests on clay loam or sandy soils and especially on stony laterites on coastal tops, south from Swansea on the Central Coast, South Coast & Southern Tablelands.	Munmorah State Recreation Area (population unknown).	No suitable habitat is present. This species was not observed during floristic survey.
Eucalyptus camfieldii	Mallee or small tree to 4m tall with fibrous bark and heart-shaped juvenile leaves. Grows on shallow sandstone soils bordering coastal heath from south of Port Stephens to the Royal National Park.	Brisbane Waters NP (population unknown), Ku-ring-gai Chase NP (<1,000 plants), Royal NP (<1,000 plants) and Sydney Harbour NP (<1000 plants).	No suitable habitat is present. This species was not observed during floristic survey.
Grevillea shiressii	Shrub 2 to 5m tall. Grows along creek banks within open forests in sandy soils on Hawkesbury Sandstone. Restricted to Gosford area, only known in Brisbane Water National Park.	Brisbane Water NP (<1,000 plants).	No suitable habitat is present. This species was not observed during floristic survey.
Olearia cordata	Shrub to 2 metres tall. Grows in open forest and open shrubland on sandstone between Wiseman's Ferry and Wollombi.	Wollemi NP (<1,000 plants), Yengo NP (<1,000 plants) and Wiseman's Ferry Historical Site (<1,000 plants).	No suitable habitat is present. Not observed during floristic survey.
Prostanthera junosis	Low spreading shrub to 30cm tall. Grows in heath on sandy soils. Restricted to Somersby Plateau.	Brisbane Water NP (>1,000 plants).	No suitable habitat is present. Not observed during floristic survey.

TABLE 1 (Continued)			
Tetratheca glandulosa	Spreading shrub to 20cm high. Grows in sandy or rocky heath or scrub from Mangrove Mountain to Blue Mountains and Sydney.	Dharug NP, Garigal NP, Brisbane Water NP and Ku-ring-gai Chase NP. (Populations numbers in these reserves unknown).	No suitable habitat is present. Not observed during floristic survey.
Tetratheca juncea	Prostrate shrub to 1m tall. Stems flattened with reduced leaves and a grass-like appearance. Grows in sandy or swampy soils in heathland, woodlands and open forest chiefly in coastal districts from Bulahdelah to Tuggerah and inland to Maroota.	Glenrock SRA (>1,000 plants), Awabakal Nature Reserve (<1,000 plants), Munmorah SRA (<1,000 plants), Lake Macquarie SRA (population unknown).	No suitable habitat is present. Not observed during floristic survey.
Velleia perfoliata	Perennial herb to 50cm high. Grows in heath on shallow sandy soil over sandstone from the Hawkesbury district to the upper Hunter Valley.	Wollemi NP (<1,000 plants), Yengo NP (<1,000 plants).	No suitable habitat is present. Not observed during floristic survey.

4. FAUNA CHARACTERISTICS

4.1 Fauna Survey Methodology

An initial site inspection revealed that all of the subject site has been cleared and is used for vegetable production and that there is no suitable habitat within the area of the proposed development which is likely to be utilised by threatened fauna. For this reason a detailed fauna survey including trapping, bat surveys and owl surveys was not carried out. Instead a detailed habitat assessment of the proposed development site was undertaken to determine the suitability of the habitats present for use by threatened fauna species. The methods used to conduct this habitat assessment include:

Literature Review:

- Review of local resource documents.
- Review of the NSW National Parks and Wildlife Service Wildlife Atlas Database (NSW NPWS 1998) containing listings of threatened fauna species for the Gosford 1:100,000 scale map sheets.

Habitat Assessment:

- Survey of the site to assess the various habitat characteristics which might be suitable for threatened species.

- Survey of each tree within the area of the proposed development for the presence of hollows and for evidence of use by fauna species.

Herpetofauna Survey

- Frog species were targeted using habitat searches, spotlighting and call detection methods.

4.2 Fauna Habitats

The fauna habitats present on the site include:

- Cleared farming land;
- Scattered areas of pasture cover;
- Aquatic habitats associated with the farm dam.

The location of the proposed poultry sheds will be in existing cleared areas which is currently used for vegetable growing. Disturbance to fauna habitats as a result of the construction and operation of the proposed poultry sheds is expected to be minimal.

4.3 Threatened Fauna Species

To determine the likely and actual occurrence of fauna species on the subject site a habitat assessment was undertaken to supplement literature reviews. The National Parks & Wildlife Service Wildlife Atlas Database (NSW NPWS 1998) for the Gosford 1:100,000 map sheet was utilised to determine the occurrence of threatened species in relation to the site and surrounding areas. Using this base list, a database search was carried out for those threatened species previously recorded as occurring on and within a ten kilometre radius of the site. Details on the threatened species recorded within ten kilometres of the site and those threatened species known to occur in similar habitats in the Gosford district are provided in Table 2.

Table 2 also provides an assessment of the suitability of the habitats present on the site for the threatened species recorded in the area. and which occur in similar habitats to those present on the site.

TABLE 2 RECORDED AND EXPECTED THREATENED FAUNA OF THE AREA		
COMMON NAME *Scientific Name*	**PREFERRED HABITAT**	**COMMENTS**
Giant Burrowing Frog *Heleioporus australiacus*	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. Distribution Limit- N-Near Singleton. S-South of Eden	No suitable habitat present.
Green and Golden Bell Frog *Litoria aurea*	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. Distribution Limit - N-Byron Bay. S-South of Eden	No suitable habitat present.
Green Thighed Frog *Litoria brevipalmata*	Found in rainforests and open forests within or at the edge of streams, swamps, lagoons, dams and ponds. Distribution Limit - N-Border Ranges National Park. S-Near Gosford	No suitable habitat present.
Stuttering Frog *Mixophyes balbus*	Terrestrial inhabitant of rainforest and wet sclerophyll forests. Distribution Limit - N-Near Tenterfield. S-South of Bombala.	No suitable habitat present.
Red-crowned Toadlet *Pseudophryne australis*	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Individuals can also be found under logs and rocks in non breeding periods. Distribution Limit- N-Pokolbin S-Near Wollongong	No suitable habitat present.
Stephens' Banded Snake *Hoplocephalus stephensii*	A nocturnal and partly arboreal species that inhabits open and closed forest communities sheltering under bark, in hollows and under exfoliating slabs of granite. Distribution Limit- N-Border Ranges National Park S-Gosford.	No suitable habitat present.
Glossy Black-Cockatoo *Calyptorhynchus lathami*	Open forests with *Allocasuarina* species and hollows for nesting. Distribution Limit - N-Tweed Heads. S-South of Eden.	No suitable habitat present
Barking Owl *Ninox connivens*	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. Distribution Limits- N-Border Ranges National Park S-Eden	No suitable habitat present.
Powerful Owl *Ninox strenua*	Forests containing mature trees for shelter or breeding & densely vegetated gullies for roosting. Distribution Limits - N-Border Ranges National Park. S-Eden	No suitable habitat present.
Masked Owl *Tyto novaehollandiae*	Open forest & woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. Distribution Limit - N-Border Ranges National Park. S-Eden	No suitable habitat present.
Sooty Owl *Tyto tenebricosa*	Tall, dense, wet forests containing trees with very large hollows. Distribution Limit - N-Border Ranges National Park. S-South of Eden	No suitable habitat present.

TABLE 2 (Continued)		
Spotted-tailed Quoll *Dasyurus maculatus*	Dry and moist open forests containing rock caves, hollow logs or trees. Distribution Limit- N-Mt Warning National Park S-South of Eden.	No suitable habitat present.
Parma Wallaby *Macropus parma*	Inhabits rainforests and wet and dry sclerophyll forests with a dense understorey and associated grassy patches. Distribution Limit - N-Border Ranges National Park. S-Morton National Park.	No suitable habitat present.
Koala *Phascolarctos cinereus*	Inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees. Distribution Limit - N-Tweed Heads. S-South of Eden	No suitable habitat present.
Squirrel Glider *Petaurus norfolcensis*	Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. Distribution Limit - N-Tweed Heads S-Albury	No suitable habitat present.
Yellow-bellied Glider *Petaurus australis*	Tall mature eucalypt forests with high nectar producing species and hollow bearing trees. Distribution Limit- N-Border Ranges National Park. S-South of Eden.	No suitable habitat present.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	Rainforests, sclerophyll forests and woodlands. Distribution Limit - N-North of Walgett. S-Sydney	No suitable habitat present.
Common Bentwing-bat *Miniopterus schreibersii*	Prefers areas where there are caves, old mines, old buildings, stormwater drains & well timbered areas. Distribution Limit - N-Border Ranges National Park. S-South of Eden.	No suitable habitat present.
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Recorded roosting in caves, old buildings and tree hollows. Distribution Limit- N-Border Ranges National Park S-Pambula	No suitable habitat present.

5. SEPP N° 44 - KOALA HABITAT PROTECTION

A survey of the subject site for potential Koala habitat was undertaken to determine the relevance of State Environmental Planning Policy N° 44 - Koala Habitat Protection. As the site is cleared land no species of Koala feed tree listed on Schedule 2 of SEPP N° 44 were observed on the subject site. As the density of Koala feed trees on the site (0%) is less than 15% of the total number of trees present, the site is not considered to be 'Potential Koala Habitat' in accordance with the requirements of SEPP N° 44.

6. IMPACT ON THREATENED SPECIES

Potential impacts on threatened species or their habitats are expected to be minimal due to the already cleared nature of the land and absence of suitable habitat for threatened species. It is considered that the construction activity is not likely to cause disruptions to off-site populations or breeding behaviour in either the short or long term due to the cleared nature of the site and the naturally vegetated areas adjoining the site to the west which provide better quality, less disturbed habitat for threatened species.

In accordance with the *Threatened Species Conservation Act* 1995, several matters need to be considered to determine whether there is likely to be a significant effect of threatened species. As identified in Section 5(A) of the *Environmental Planning and Assessment Act* 1979 the following matters need to be addressed to determine whether or not a significant effect on threatened species, populations or ecological communities or their habitats is likely to result from the proposed development.

(a) **in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to placed at risk of extinction,**

No threatened flora species were observed on the site and threatened flora species are not expected to occur due to the cleared nature and ongoing management of the site. No viable local populations of threatened flora species are expected to be placed at risk of extinction as the proposed development will be restricted to previously cleared areas currently used for vegetable production.

The proposed development will not result in the removal of any significant areas of threatened fauna habitat and will not disrupt any populations of threatened fauna. Therefore it is considered that the proposed development is not likely to disrupt the life cycle of any threatened species such that a viable local population of the species is likely to placed at risk of extinction.

The impact of the proposed development on threatened species and their habitats is not considered to be significant as the proposed development is to be undertaken within the existing cleared areas and there are extensive areas vegetated areas providing better quality and more suitable habitats within the local area and in local conservation reserves. It is concluded that the life cycles of threatened species identified in the local area are not likely to be disrupted such that any viable local populations are placed at risk of extinction.

(b) **in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,**

No endangered populations have been identified in the local area within the provisions of the *Threatened Species Conservation Act* 1995 therefore this matter does not require further consideration at this stage.

(c) **in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,**

The proposed development will be situated in areas of cleared agricultural land. The habitat value of the area proposed for development with regard to threatened species is low. Approximately 4 hectares of cleared agricultural land will be affected by the proposed development. Cleared agricultural land is common in the local area and in the region. It is not considered that the construction of six poultry sheds affecting approximately 4 hectares of cleared agricultural land will remove or modify a significant area of known habitat for threatened species in the region.

(d) **whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,**

The proposed development will take place in an area of agricultural land which does not comprise any significant habitat area for threatened species and which does not provide a connective link for fauna movement. The proposed development is not expected to isolate any areas of known habitat for threatened species from currently interconnecting or proximate areas of habitat.

(e) **whether critical habitat will be affected,**

Critical habitats, as defined under the *Threatened Species Conservation Act* 1995, have not been identified in the local area. Therefore, no critical habitat will be affected by this proposed development.

(f) **whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region,**

An assessment of the presence of threatened flora species found in the local area within regional conservation reserves is provided in Table 1. The conservation status of the threatened fauna species listed in Table 2 within regional conservation reserves is unknown (SFNSW 1995).

An assessment of the distribution and conservation of the habitat types within the Sydney Basin Region has not yet been made. However, habitat areas of threatened species are conserved in a number of conservation reserves within the district including Lake Macquarie State Recreation Area and Dharug, Yengo, Popran, Brisbane Water and Bouddi National Parks. The habitats of threatened species of the area are considered to be represented in the nearby conservation reserves. The regional conservation of these habitats is however unknown.

(g) **whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,**

The proposed development has not been identified as a threatening process in the *Threatened Species Conservation Act* 1995, therefore this matter does not require further consideration at this stage.

(h) **whether any threatened species, population or ecological community is at the limit of its known distribution.**

None of the threatened flora species listed in Table 1 are at the limit of their known distribution in the Mangrove Mountain area, although *Prostanthera junosis* is restricted to the Somersby Plateau. An assessment of the distribution of threatened fauna species listed on the NSW National Parks and Wildlife Service Wildlife Atlas Database (NSW NPWS 1998) for the Gosford 1:100,000 scale map sheet indicates that none of the threatened fauna species as identified in Table 2 are at the limit of their known distribution in the Mangrove Mountain area.

7. CONCLUSION

In conclusion, it is considered that the proposed development is not expected to impact significantly on either threatened species or their habitats. The anticipated low level of impact is primarily due to the cleared nature of the site in relation to the extensive areas of nearby bushland. The vegetation on the site is not part of, or in the vicinity of, vegetation corridors that would provide significant areas for fauna movement and is isolated from other areas of a similar vegetation structure. A field survey of the site did not reveal the presence of any threatened species or habitats of threatened species within the area to be developed.

Based on the habitat assessment and information provided in this report it is concluded that:

i. No threatened fauna or flora species were identified on the site.

ii. The site is of low value as habitat for threatened species.

iii. The proposed development is not likely to have a significant effect on threatened species or their habitats.

iv. A Species Impact Statement should not be required for the proposed development.

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APPENDIX 3

STORMWATER AND NUTRIENT MANAGEMENT
MORSE McVEY PTY LTD

Water Quality

Assessment Report

Lot 146 DP 755253

RMB 4410 Kirks Road

Mangrove Mountain

Prepared by:

22/12/98

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Contents

Summary

This water quality assessment report was conducted on behalf of the owners of lot 146 DP 755253, RMB 4410 Kirks Road, Mangrove Mountain in support of a development application for the construction of six (6) sheds for growing chickens.

The soils at the site belong to the Somersby Soil Landscape which is characterized by deep Yellow Earths and Earthy Sands comprising up to 20cm of loose, quartz sand topsoil overlying yellow brown sandy clay loam subsoil. The main constraint to the construction of proposed development is the relatively high infiltration capacity of the soil.

It is proposed to construct earth swales to capture runoff from the site and to direct the runoff to a water quality control pond. The water quality control measures proposed in this Plan will show a significant reduction in the export of Phosphorus and Nitrogen from the site and will improve the water quality of water leaving the site. The water quality control Pond will have the following features:

- a permanent pool that will provide 14 days residence time for the removal of phosphorus and nitrogen;
- a surcharge pool that has the capacity to store the first12.5mm of runoff from the site, which will also act as an on site stormwater detention basin; and
- a fringing macrophyte zone to provide biological removal processes.

Water quality modelling using the program AUSQUAL indicates that the Hawkesbury River system will be better off in relation to suspended solids, phosphorus and nitrogen, given the construction of the proposed water quality control features.

1. LOCATION

The subject land is known as Lot 146 DP 755253, RMB 4410 Kirks Road, Mangrove Mountain. The site is approximately 17 kilometres north-west of Gosford and 24 kilometres west to south-west of Wyong. The site is located at grid reference 313 090 on the 9131-3-N Mangrove 1:25 000 Topographic Map.

The proposed development within the site covers approximately 3 hectares of the 16 hectare property.

2. CLIMATE

The climate of the area is influenced by its location near the coast which provides a controlling maritime effect. Rainfall is relatively high with a mean average of 1, 255mm at Mangrove Mountain and 1, 276mm at nearby Peats Ridge. Rainfall is summer dominant with a drier period in late winter and early spring.

3. TOPOGRAPHY

The site is located on the plateau area of the Hunter Range. This range separates the eastern coastal slopes towards the Hawkesbury River catchment. Slope gradients on the site range from 4% to 8% with an easterly to southerly aspect.

The topography of the site and surrounding area is gently undulating with slopes between 5-15%. Steeper slopes are present along the main watercourses of Popran and Ironbark Creeks, located east and west of the site respectively.

The elevation of the site is between 250m and 270m AHD.

4. GEOLOGY AND SOILS

The site is located within the Somersby Soil Landscape, as described by Conacher, 1995. The Somersby Soil Landscape which is characterized by deep Yellow Earths and Earthy Sands comprising up to 20cm of loose, quartz sand topsoil overlying yellow brown sandy clay loam subsoil. The typical properties of these soils include high permeability, low available water capacity, low fertility and high acidity. They have a moderate erosion hazard which indicates that appropriate erosion and sediment control measures should be implemented with any future land disturbance.

The design of sediment basins has been based on the following information provided from the soil landscapes Gosford Sheet published by DLWC:

- K-factors range from 0.27 to 0.46;
- Type C topsoils; and
- Dispersible Type D subsoils.

Soil loss at the site is estimated to be 180 cubic metres per hectare per year. Further information on soil loss equations are shown in Appendix VII.

5. DRAINAGE AND GROUNDWATER

The site is within the catchment of Ironbark Creek, which flows into Mangrove Creek. Mangrove Creek is a tributary of the Hawkesbury River. The relationship between the site and the surrounding catchment is shown in Figure 2. The land is located at the upper end of the catchment which also includes Kirks Road.

Drainage of the site is to the south in a well defined broad drainage line. The drainage line has been eroded in recent years to land use. The property is currently used for vegetable production and is all cleared and cultivated.

A large dam is located at the southern boundary of the property The dam has a capacity of about 35 ML and we are advised that it rarely spills into the neighbours property.

The sandy clay soils at the site allow inflow to shallow groundwater reserves in the area. The following strategies will be put in place to prevent infiltration of polluted water into the subsoil:

- defined drainage swales will be lined with a compacted clay base; and
- the water quality control pond will have a plastic or clay liner.

6. WATER QUALITY

6.1 Sediment and Erosion Control

6.1.1 Definition of Erosion and Sedimentation

Erosion is the detachment and removal of soil materials from a given area by the processes of wind, water and/or gravity. It can occur naturally over long geological periods, however, accelerated erosion often results from human activities (Hawkesbury-Nepean Catchment Management Trust, 1995).

Sedimentation involves the deposition of eroded materials in areas on-site, off-site on neighbouring land, within street gutters, drains, bushland and/or waters. Subsequent run-off events may wash the sediment further downslope or downstream (Hawkesbury-Nepean Catchment Management Trust, 1995).

Most human induced erosion occurs in a relatively short time period during, and immediately after land development and/or the construction stage. The potential for erosion exists whenever vegetation is removed, soil is disturbed and/or overland flow

of stormwater runoff is altered (Hawkesbury-Nepean Catchment Management Trust, 1995).

Erosion and sedimentation can result in filling of natural wetlands, covering and degrading natural vegetation, turbidity of waters (decreasing the amount of light reaching aquatic plants), scouring and smothering aquatic life and decreasing drainage capacity in watercourses and drains. This last effect often leads to increased flooding and river erosion. (Hawkesbury-Nepean Catchment Management Trust, 1995). Eroded fine sediments and fine organic materials also pose problems as they are primary carriers of chemical pollutants such as nutrients and heavy metals.

6.1.2 Erosion and Sedimentation Control Standards

All proposed development within the City of Gosford must comply with the Council's, Hawkesbury-Nepean Catchment Management Trust's Erosion and Sediment Control Policies and the NSW Department of Housing's Soils and Construction manual (the "Blue Book"). The Policies require that all building, development, subdivision and activity proposals involving:

(i) the disturbance of the existing surface of the earth or the placement of fill thereon, and/or result in change to the shape of the land;
or
(ii changes in the rate and/or volume of runoff entering a watercourse or flowing over land,

are to be accompanied by an Erosion/Sedimentation Control Plan (Appendix XIII).

6.1.3 Erosion And Sedimentation Control

The Erosion and Sedimentation Control Plan is to be based on the following principles:

- all runoff from surrounding land is to be diverted away from the area to be disturbed, where legal and possible;
- all polluted runoff is to be retained and treated on site;
- disturbance of vegetation is to be minimised;
- all disturbed areas are to be stabilised, preferably with vegetation as soon as possible after earthworks completed;
- works are to be appropriately staged to minimise the disturbed area;

- all structures are to be inspected and maintained to ensure that they are in working order (Gosford City Council, 1992).

6.2 Nutrient Pollution

6.2.1 Definition of Nutrient Pollution

Nutrients are essential for the growth and development of plants and animals, with the main nutrients measured in water quality being nitrogen and phosphorous. As nutrients are transported in water, nutrient pollution occurs when excessive nutrients are transported via stormwater flows into a natural waterway or waterbody. This often results in a change in the biological balance of the natural system which frequently leads to an explosive growth of algae and other plants. Native flora and fauna then may be harmed or possibly killed as a result of a decrease in oxygen and direct smothering from the rapid plant growth (Gosford City Council Environment Program, 1997).

Potential sources of excess nutrients include fertilisers, manure, pet faeces, organic litter and detergents.

6.2.2 Nutrient Control Standards

All proposed development within the City of Gosford must comply with the Council's Nutrient Control Policy and include a Nutrient Control Plan, detailing those works necessary to provide nutrient control for the proposed development or Building Application.

6.2.3 Nutrient Control

The principal forms of nutrient control are:

- deposition and trapping of fine sediment particles which often have nutrients attached to their surfaces (approximately 85% of phosphorous can be attached to clay sized particles, while 70-80% of the nitrogen content can be isolated as particulate matter);
- the release of free nitrogen gas to the atmosphere through the denitrification process; and
- biological absorption into plant tissue (as occurring in constructed wetlands or vegetated filter strips) (Gosford City Council Environment Program, 1997).

6.2.4 Disinfection

Operation of the chicken sheds involves the placing of young chicks in the sheds and growing the birds to the required size. Following removal of the birds for processing

the sheds are disinfected by spaying the walls and roof with a disinfectant. Approximately 3,000 litres of water is used in the disinfection process which gives a coverage of 1.4 mm in the shed.

The sheds are constructed on a compacted clay base at a grade of 1%. Due to the low grade and water holding capacity of the clay base there will be no runoff from the application of the disinfectant.

6.3 Water Quality Modelling

The impact of the development on water quality has been assessed by using the Australian Water Quality Management Tool (AUSQUAL) using Mode 1, the Gross Annual Model. The site has been modelled as a single catchment of 3.97 hectares.

The water quality component of AUSQUAL is based on assigning export coefficients for unit area loadings of nominated diffuse pollutants. Table 4.1 lists the export coefficients for the five relevant urban land uses, namely shed roofs, rural roads, improved pasture and cultivated ;land. The proportion of lands in these uses are shown in Table 6.2, while the results of the AUSQUAL modelling are summarised in Table 4.3 (Appendix V).

Table 6.1 Export Coefficients for Various Urban Land Uses

Land Use	Suspended Solids (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
Natural Forest	5	0.50	0.04
Shed Roof	220	2.70	0.28
Rural Roads	220	2.70	0.28
Improved Pasture	10	0.60	0.10
Cultivated Land	20	5.00	1.20

Table 6.2 Land Use Areas (%)

Catchment Area	Phase	Natural Forest	Shed Roof	Roads	Improved Pasture	Cultivated Land
3.97 ha	Pre-development	0	0	0	0	3.97
3.97 ha	Post development	0	1.31	1.63	1.03	0

Table 6.3 Summary of Average Annual Pollutant Loads

Catchment Area	Phase	Average Runoff (ML/yr)	Average Annual Export (kg/yr)		
			Suspended Solids	Total Nitrogen	Total Phosphorus
3.97 ha	Pre-development	16.8	336.3	84.1	20.2
3.97 ha	Post development	33.5	6195.8	78.7	8.4

The modelling shows that the construction of the sheds, roads and associated earthworks will decrease the nutrient pollutant loading to Ironbark Creek.

However the sediment loadings will increase and it is proposed to treat this water by the construction of a water quality control pond that will provide a minimum of 14 days storage for annual average runoff.

During the construction stage the water quality control pond will be used as a sediment basin. Further erosion and sediment controls will be employed during the construction phase, and these are described in the *Erosion and Sediment Control Plan* (Appendix XIII). If implemented, these controls will improve loadings from the total site for suspended solids, phosphorus and nitrogen.

On completion of the construction phase Sediment basin 2 will be converted to a Water Quality Control Pond. This structure will contain a littoral zone, a permanent pool and a surcharge pool.

The capacity of the permanent pool is determined by providing 14 days storage for average annual runoff.

The surcharge pool is designed to capture the whole of the first 12.5 mm runoff (to meet EPA requirements for Water Quality Control Ponds) and include an on-site detention facility for the 20-year event (to meet Council requirements). Table 4.4 shows results of the calculations while details are shown in Appendices IX.

Table 6.4 Sediment Basin Capacities (m^3)

	Permanent pool	Surcharge pool			Total recom-mended
	m^3	OSD 20 yr event	12.5 mm runoff	Recom-mended	
Water Quality Pond	1,530	450	500	500	2,030

The Water Quality Control Pond has the following features:

- a permanent pool that will provide residence time for the removal of suspended solids, phosphorus and nitrogen; and
- a surcharge pool that has the capacity to store the first12.5mm of runoff from the site and which will also act as on-site detention basin.

The AUSQUAL modelling indicates that Ironbark Creek will be better off in relation to suspended solids, phosphorus and nitrogen if the development proceeds.

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8 APPENDICES

APPENDICES

APPENDIX I	Methods for Nutrient Erosion and Sedimentation Control
APPENDIX II	NSW Agriculture Poultry Farming Guidelines
APPENDIX III	Department of Urban Affairs and Planning (DUAP) Requirements
APPENDIX IV	Flocculation of Sediments
APPENDIX V	Gosford City Council Requirements
APPENDIX VI	Examples of Sizing Wetlands
APPENDIX VII	The Universal Soil Loss Equation
APPENDIX VIII	Hawkesbury - Nepean Catchment Management Trust Requirements
APPENDIX IX	Sedimentation Basin Calculations
APPENDIX X	IFD Analysis
APPENDIX XI	AUSQUAL Data Files
APPENDIX XII	Storm Flow Calculations
APPENDIX XIII	Erosion and Sediment Control Plan

Swales and Filter Strips

(after Livingston *et. al,* 1994)

Treatment practices that uses terrestrial grasses and other fine herbaceous plants are sometimes called biofiltration. These plants can be installed in a channel in which water flows at some depth–a swale–or on a broad surface area that has sheet flow–a filter strip. Biofilters can also have wetland plants in areas with the hydrology to sustain them.

A vegetated treatment strives for a plant stand that serves as a good filter. Ideal characteristics are dense, uniform growth or fine-stemmed plants tolerant of the area's water and climatological, soils, and pest conditions. Native plants generally combine the best properties. Plants serve mainly as filters; pollutant uptake is not a very important removal mechanism. Therefore, a number of species and mixes appropriate to the area will work equally well.

Sizing Calculations and Expected Performance

The results of a performance investigation of a grass swale, completed in the Puget Sound area of Washington, refined a previously developed design procedure and recommended design features consistent with good performance. The report details the full design procedure, criteria, and guidelines that are expected here.

The swale was relatively effective in capturing solids, oils, and the least soluble metals. The swale was less effective for more soluble metals, especially their dissolved fractions, and less yet for phosphorus. Nitrogen (not shown) exhibited little if any removal; feacal coliform's capture was inconsistent. Therefore biofilters should generally be considered the sole treatment of reduce soils and oil. In fact, they are better choice than oil separators to remove low concentrations of oil and grease from urban runoff. Vegetation can reduce concentrations to even lower levels, while no feasible separator can decrease them below 10 mg/L. The vegetation option is also much cheaper. One theory suggests that biofilters reduce nutrients considerably better if growth is carefully mowed and removed before it dies and releases phosphorus and nitrogen; however, that hypothesis is unproven.

The design procedure uses Manning's equation of open channel flow to obtain a swale width for a given flow and slope and selected water depth. The velocity resulting in this size channel is then compared to a criterion, and the length is calculated using a hydraulic residence time criterion. A key study result is that a residence time of nine minutes to achieve the highest and most reliable performance. Performance began to deteriorate noticeably when residence time fell below five minutes, recommended as the absolute minimum. A filter strip design is handled in the same general

way but with a more shallow flow depth. Steps are as follows:

1. Determine the design flow rate (Q, m/s) by appropriate hydrologic analysis. Use as a basis continuous stimulation with a computer model, a design rainfall event (e.g., six month, 24–hour storm), or a set fraction of total runoff (e.g., first inch).

2. Determine slope (s, m/m) and select vegetation, design vegetation height, and shape if a swale. Normally, swales are parabolic or trapezoidal to avoid erosion in sharp corners of rectangular or V shapes. The trapezoidal shape is easier to construct and will trend to assume a parabolic shape over time.

3. Set design flow depth (y, m). A grass swale's depth could not exceed one-third of the grass height in infrequently mowed swales, or one–half of the grass height in regularly mowed swales, up to a maximum of 75mm. In swales with wetlands vegetation, the depth should be at least 50mm below the height of the shortest species. A filter strip's depth should be no more than 12mm.

4. Solve Manning's equation for the width, using the conditions established in step 1 through 3.

$$Q = 1.49 * A * R^{0.67} * s^{0.5}/n$$

where:
- A = cross sectional area (m^2);
- R = Hydraulic radius (ft) = A/wetted perimeter
- n = Manning's roughness coefficient.

The Puget Sound study used experiments to determine a value of n for flow become the full height of a local common grass mix. The recommended values are, unless other information is available, 50mm for grass biofilters to be mowed regularly and those with herbaceous wetland plants and 60mm for infrequently moved swales.

Solutions of Manning's equation for two configurations follow:

TRAPEZOIDAL SWALE

$$b = Q * (n/1.49) * y^{1.67} * s^{0.5} - Z * y$$

$$T = b + 2 * y * Z$$

FILTER STRIP

$$T = Q * (n/1.49) * y^{1.67} * s^{0.5}$$

where: T = Top width (m);
b = Bottom width (m);
Z = Side slope (m/m; should be no steeper than 3 horizontal to 1 vertical).

The bottom width of a swale should be no less than 600mm if it will be mowed and no more than 2.44m, unless it will be hand finished to get a completely level bottom. If b does not fit into this range, investigate how Q can be reduced by splitting flow, or set b = 2.44 m and proceed with the analysis, or specify hand finishing.

5. Compute A for the configuration:

TRAPEZOIDAL SWALE

$$A = b * y + Z * y^2$$

FILTER STRIP

$$A = T * y$$

6. Find flow velocity (V, ft/s): V = Q/A. I f V is greater than 0.3 m/s, which will knock over most grass and reduce settling or finer particles, investigate how Q can be reduced, or change the width and/or depth.

7. Compute length (L, m):

$$L = V * t * 60s/min$$

where: t = Hydraulic residence time (min); t should be at least nine min, preferably, and no less than five min.

For swales, L should be at least 30m, a length below which flow short circuiting is more likely , if the length in a straight configuration cannot be fit to the site, investigate using a wide-radius covered path, reducing Q or changing the width and/or depth.

8. If flows larger than ! Can enter the biofilter, the grass probably will be knocked over and provide no treatment until it becomes upright again. Therefore, flow regulations upstream or a bypass are recommended. If one of these measures is not provided, the velocity and depth with the largest flow rate must be calculated if the velocity is above a level known to

be erosive, the facility must be enlarged to accommodate it (use 0.3m/s maximum, if other information is lacking). The calculation procedure is standard and covered in open channel discussion in fluid mechanics text, as well as in the previously cited report.

9. If the biofilter is a swale, once the maximum possible depth of flow is established, specify the swale's final depth, it should be at least 150mm deeper than the maximum possible flow depth.

Design Recommendations

The following features maximize the success in establishing biofilters and in their performance:

- Locate the biofilter away from building and tree shadows to avoid poor plant growth from ack of sunlight.
- If the longitudinal slope is less than 2 percent or the water table can reach the root zone of vegetation, plant water-resistant to survive standing water or install an under drain systems to assist drainage. However, underdrains may not be practical with a large filter strip.
- If the longitudinal slope is in the 4 to 6 percent range, provide check dams approximately every 15.24 to 30.48 m to reduce velocity. However, check dams may not be practical on a larger filter strip.
- If the slope on which a swale is installed exceeds 6 percent, place swale to traverse the slope so that no slopes reach more than 4 percent, or 6 percent with check dams.
- Make the lateral slope entirely uniform to avoid any tendency for the flow to channelise.
- Introduce the flow so that entrance velocity is dissipated quickly, flow is disturbed uniformly, and erosion is avoided (e.g., by using a riprap pad or some means of level spreading).

Vegetated Filter Strips

Vegetated filter strips are bands of planted or natural vegetation which can trap and settle out nutrients from storm water which passes through them. Vegetated filter strips include the full range of plant succession including trees, shrubs and grasses along with dense understorey plants.

The purpose of vegetated filter strips is to reduce volumes and peak flow rates through infiltration, interception of runoff and transpiration. The process also results in the interception of sediment. Vegetated filter strips that are planted out with, or contain a good mixture of trees, shrubs and groundcovers, at a high density, have greater pollutant and nutrient removal capability than grassed filter strips. This is due to the fact that they result in a greater interception and uptake of pollutants and provide for the long term retention of the nutrients in the forest biomass.

Vegetated filter strips are best located in or near adjacent waterways or stormwater inlets, and are considered particularly suitable for catchments less than 2 hectares. Scaled down versions of the vegetated filter strips may also be used to pretreat runoff for other stormwater treatment measures (Gosford City Council Environment Program, 1997).

In addition to the stormwater benefits of vegetated filter strips, they may also provide significant wildlife habitat areas, with habitat value increasing with vegetative cover and species diversity. In some circumstances they may also provide wildlife habitat corridors. Other benefits may include landscape, aesthetics, recreation, and increased biodiversity.

Wet Detention Basin

A wet detention basin is essentially a small dam holding a permanent pool of water. In theory, the incoming storm or event displaces the 'old water' and is stored until it is displaced by the next storm or event. The primary pollutant trapping mechanism is sedimentation. Some biological uptake and filtration by pond vegetation may occur and biological processes may, to some extent result in soluble pollutant removal (including nutrients) (Gosford City Council Environment Program, 1997).

The border between a wet detention basin and a constructed wetland is not distinct. However, generally wet detention basins are deeper, can serve smaller catchment areas and have limited macrophyte coverage.

The positive benefits of properly designed wet detention basins, in addition to pollution control, include the creation of wildlife habitat, higher property values, recreation and landscapes amenities.

Constructed Wetland

A constructed wetland is generally shallow water body with a large proportion of its water surface covered by macrophytes. They are designed to remove pollutants from stormwater.

Constructed wetlands may contain both permanent and intermittent flows of water. They contain

various forms of macrophytes and areas of open water and should be designed to retain water for a minimum of 14 days in order to achieve adequate settling of sediment and nutrients (Gosford City Council Environment Program, 1997).

Constructed wetlands rely on proper management to remain effective and efficient in removing nutrient for inflowing runoff. Such management realistically requires regular maintenance of the constructed wetland. Regular maintenance includes the removal of sediment from the pretreatment litter and sediment trap, macrophyte plant harvesting (which involves cutting of aquatic plants and the removal of cuttings - not the complete removal of the plants), and possible mosquito and weed control (Gosford City Council Environment Program, 1997).

Design Factors for Constructed Wetlands (after Gosford City Council Environment Program, 1997).

- Site Constraints

  Constructed wetlands are generally applicable for catchments larger than 8 hectares. They can't be placed on steep unstable sites and generally require a reliable supply of water to stay 'wet' at all times.

  Constructed wetlands can take up quite large areas of land, however, they also suit multi objective designs as they can provide good habitat, recreational and visual amenity, and can be linked to community education programs or stormwater reuse schemes if properly designed.

- Sizing and Capacity

  Where wetlands are proposed for retrofitting, the limiting factor for wetland size is usually the site constraints, e.g. available area, funding, existing services or infrastructure.

  Where wetlands are proposed for greenfield projects, sizing should be designed to facilitate specific water quality objectives. In most situations, phosphorus is the limiting pollutant design and if phosphorus can be removed at the required rates, virtually all other pollutants will also be addressed.

  Wetland sizing can be undertaken using three techniques:

1) Simple Technique: The volume of the wetland's permanent pool can be estimated from the equation:

$$Wv = R_m D/365$$

where
Wv = Wetland volume
R_m = an estimated of mean annual runoff calculated from the average annual runoff
D = theoretical hydraulic retention time in days (minimum of 14)

D is determined by first estimating the required level of treatment in the wetland (e.g. percentage reduction of phosphorus) and then determining the required detention time using Figures 4-6. A minimum detention time of 14 days is required by Council.

Wetland area can be determined by spreading the volume over reed bed zones (max depth 0.5 metres) and open water zones (max depth 2.5 m).

This method does not allow for variability of flow, such as the frequency of storm events and periods of no flow.

2) Time Series Analysis: Time series analysis, usually undertaken by computer modelling, can be used in an iterative manner to finetune the size of the wetland. A water balance can also be undertaken to assess pond behaviour which will enable appropriate macrophytes to be selected.

Time series analysis will taken into account the frequency of occurrences of events, pond conditions at the commencement of events, and the pattern of intervals between events. Time series analysis is the only reliable method to estimate long term performance and can be undertaken for all major greenfield site projects.

3) Event based Analysis: An event-based analysis can be carried out to size structures, such as spillways and outlet mechanisms, and to determine the volume for extended detention.

- Pretreatment

  A litter and sediment trap should be provided before to inlet of the constructed wetland to enhance pollutant removal. The provision of a well being litter and sediment trap will also enhance easy access for sediment and litter removal.

- Configuration

  The configuration of the wetland should be consistent with providing the appropriate area of wetland elements to facilitate the required processes for treatment. For example, trapping of fine dispersive material and dissolved phosphorus is facilitated by biofilms attached to the macrophytes. Optimal removal can be achieved by optimising contact between flow and macrophytes which results in large expansive reed beds. If pollutants are principally to settleable solids, then larger open water sedimentation zones can be included. Other zones to be considered include: littoral zones; inlet and outlet zones; and habitat elements, such as islands.

  Constructed wetlands can be designed to go either on-line or off-line, however, Council prefers constructed wetlands to be located off-line. They should be designed to capture and treat the first flush of stormwater and separate it from any larger volume of stormwater or floodwaters following.

  Pollutant removal is enhanced by minimising short circuiting. This can be achieved by:

  1) designing the pond with a length to width ratio >3:1 and <10:1;
  2 macrophyte beds planted at right angles to flow;
  3 sequential open water areas to aid in mixing flows; and
  4 using islands and beams to direct and elongate flow paths.

  Pond shape should be designed to minimise the areas of potentially stagnant waters as these areas decrease the effective volume of the pond for water quality enhancement, may result in pollutant export and may lead to mosquito breeding and odours.

  Pond edges slopes should be consistent with public health and safety requirements.

The outlet structure can be used to facilitate variable water level control with the reed bed and open water zones. Good water level control is required to:

1) plant macrophytes;
2) optimise macrophyte growth during commissioning;
3) provide weed and mosquito control; and
4) facilitate wetland operation to optimise water quality improvement.

The outlet structure should be accessible for maintenance.

Maximum depths within the wetland are 0.5 m for the reed bed zones and 2.5 m for the open water zones.

Entrant velocities for water flow into the wetland should be <0.4 m/s.

Provision should be made for the possible need to routinely drain the constructed wetland to facilitate the routine cycle of maintenance work if required. This would allow for easier access to sediments, plants and to nurse water quality within the wetland is maintained in order to prevent dangers to public health from a eutrophic or failing constructed wetland.

- Vegetation

The wetland should be planted using a variety of species of macrophytes which can survive both out and wet periods of inundation. Macrophytes should be planted down to 0.5 metres using locally indigenous species as a preferred option.

Growth of aquatic plants (macrophytes) can be enhanced by cutting and harvesting. This process also assists in removing those nutrients collected with the plant tissues and thereby removed from the nutrient cycle associated with the wetland.

The plants to be used are considered to be locally indigenous species which are hardy and suitable for planting in and around constructed wetlands. The use of locally indigenous species is encouraged. They are suited to the local environment and will not become a weed species.

- Other considerations

Other objectives for constructed wetlands, such as habitat and visual amenity, can be addressed by modifying or adding to wetland configuration. Generally, no compromise on water quality components should be made, although additional volume for aesthetic or habitat reasons can be provided. A buffer zone can be provided around the wetland and planted with native riparian vegetation.

Where constructed wetlands are installed to improve water quality of stormwater, residents in the immediate neighbourhood should be made aware of its purpose and functioning and of the need for occasional maintenance sediment removal and aquatic plant (macrophyte) harvesting.

- Maintenance

Little maintenance is required for constructed wetlands if gross pollutant traps/sediment and litter traps are also installed immediately upstream of the wetland to provide an integrated water quality control structure for stormwater runoff management. Rates of situation will vary and depend on the constructive of upstream urban runoff and erosion controls. It is expected that the operation of this Code of Practice in conjunction with Council's Code of Practice for Erosion and Sediment Control will enhance the effective life of any constructed wetland. If constructed wetlands are installed or used during construction and development phases or urban areas, they should be de-silted at the end of such works.

An operation and maintenance plan should be prepared for all constructed wetlands. Maintenance considerations include:

- A higher level of maintenance is required during wetland commissioning
- Weed maintenance will be required, especially during commissioning
- Regular removal of accumulated litter and sediment from pretreatment and sediment trap.

Sediment Fences

A sediment fence located along the downslope boundary(s) of the site would retain sediment on-site and reduce run-off velocities.

Sediment Traps

Appropriate sediment traps shall be located at all points where stormwater leaves the construction site or leaves the gutter and enters the drainage system. In most cases this shall include the drainage inlet(s) immediately downslope of the site (Hawkesbury-Nepean Catchment Management Trust, 1995).

NSW Agriculture Poultry Farming Regulations
(after Communications Unit NSW Agriculture, 1994)

"The environmental impact of a poultry farm is very closely linked to shed design, the materials used in the construction of the sheds and management of the sheds. All new poultry farm developments should incorporate the latest in animal welfare and environmental management technologies wherever economically feasible" (Communications Unit NSW Agriculture, 1994, p8).

Buildings

Table AII - 1. Recommended Separation Distances for Poultry Developments
(Distances in metres from Proposed Poultry Shed)

Situation	Distance (m)
Urban residential zone	500
Settlements of 10 or more dwellings	300
Dwelling on another property	150
Dwelling on the same property	50
Property boundaries	30 to 50
Public Road	100
Other Poultry farms	500
Water Course	50*

* Developments in close proximity (100 m) may be subject to further detailed assessment.

Table AII - 2. Internal Separation Distances Recommended Between Poultry Houses and Other Facilities on the Site.

Situation	Controlled environment sheds	Naturally ventilated (open sided) houses	
	Recommended	Recommended	Preferred Optimum
Parallel broiler, pullet, layer and breeder sheds:	(metres)	(metres)	(metres)
-stepped down a slope	15		5 times house height
-on same level	20		
Parallel high-rise layer sheds:			
-stepped down a slope	20	25	5 times house height
-on same level	25	30	
Between laying and rearing sheds	100	100	200
Laying sheds and egg holding rooms	40	40	40
Areas used for irrigation of poultry waste or poultry abattoir effluent	200	200	300

Flooring of sheds and associated areas should be constructed from compacted, smooth, hard wearing material (including clay soil(s) and gravel) that will permit efficient removal of litter and manure. Effective cleaning and disinfecting of floor areas reduces the risk to the environment and flock health. All sheds should incorporate solid all weather aprons to facilitate movement of vehicles and material into, out of and around sheds.

Walls, side curtains, roofs and gutters need to be kept in good order to maintain effective water drainage, ventilation and appearance of all buildings.

Only biodegradable detergents should be used in the cleaning of sheds.

Keeping grass short near the poultry houses will aid pest and vermin control, improve ventilation, assist in cooling in hot weather and maintain the overall appearance of the property.

The total area of poultry shed roofs can be no more than 8-10% of the total area of the farm.

Waste Water

"It is vitally important to properly plan the management of effluent and runoff" (Communications Unit NSW Agriculture, 1994, p8).

Runoff must be controlled so that it poses minimal risk to local water courses. There are heavy penalties for polluting waterways, whether the pollution is intentional or unintentional. It should be noted that most forms of conventionally housed poultry production do not generate effluents or runoff, apart from roof water, in the normal course of production. However, some runoff may contain sediments, manure, nutrients or chemicals. No matter whether these potential pollutant originate directly from poultry farming or indirectly from general farming practice management of runoff is essential to avoid waterlogging erosion, sedimentation or pollution on site or on adjacent lands or waterways.

Shed roofs, access tracks and hard stands (sealed or compacted) are all runoff areas.

Failure of internal fittings can reduce efficiency and increase the possibility of dust emissions which may lead to water contamination. Faulty plumbing and drinkers will also lead to a loss of efficiency.

Maintaining the overall site, including roads, fences, grass, vegetation, grassed channels, contour, grass, vegetation, grassed channels, contour banks and dams will ensure the continued effectiveness of the design features of the development.

Vegetative Screening

For existing farms, vegetative screen planting can lessen the visual impact of sheds and other buildings. Appropriately arranged species may enhance the environmental amenity of the surrounding area.

Quick-growing trees and shrubs should be planted around sheds, where farms area likely to create a neighbourhood nuisance. Maintenance of natural airflows around sheds is an important consideration when planning a tree or shrub program.

Screen planning should be located at least 12 metres from sheds to allow for adequate air movement.

By-products Management

By-products and wastes from the poultry farms present a range of utilisation opportunities. A wide range of impacts can occur if the wastes are not handled correctly, including pollution of waterways,
contamination of groundwater and land degradation.

Sheds should be designed to allow for litter and manure to be kept reasonably dry at all times. Excessively wet litter or manure causes odours and fly problems. Internal shed environmental problems may affect the health and/or well being of livestock and employees. There is also a greater risk of an adverse impact on the local environment

Care should be taken to avoid spilling manure and litter from vehicles on drives and roads, when this material is being removed from poultry housing. All litter and manure is to be covered when transported from the farm.

The following objectives have been set for the utilisation of manure and litter from poultry operations to:

- Effectively utilise both the nutrient and organic matter components.
- Protect the land resource from degradation, such as soil structural decline and saltation.
- Protect ground water resources from nutrient pollution.
- Protect surface waters from nutrient and particulate pollution.
- Prevent water, wind, insects and vermin affecting the material.
- Recommended methods for utilisation of manure and litter include:
    - Off site removal to commercial processors such as composting/pelleting operations, graziers the nursery industry and market gardens is common in the Sydney Basin and Hunter Region and is preferred.
    - Composting.
    - Direct land application. This requires careful planning and monitoring to avoid environmental degradation. When properly managed, the application of manure, litter

or waste water to land surrounding the poultry farm, can be a reliable method for utilising the nutrients.

If any manure of litter is to be stored on site for land application, it is essential that it is kept dry and secure to maintain nutrient quality, and avoid the potential for nutrient pollution and odour generation.

Structure soil conservation earthworks may be required to control surface runoff and also erosion of areas where poultry manure, litter and other by-products have been applied.

To satisfy the Consent Authorities that the above objectives will be met, it may be necessary to supply the following information.

Site Plan - an accurate map of the site showing the location of:

- the area intended for the application of wastes
- any area of land degradation
- manure and litter collection, treatment, and storage facilities
- areas of existing vegetation and land use
- any dwellings, sheds or structures close to application areas, including these on neighbouring properties
- any water course

Areas for waste application should be separated from waterways and areas of native vegetation by a 20 metre wide vegetated filter strip. This will reduce nutrient losses after heavy rain. These areas should also be regularly monitored for typical indicators such as changes in nutrient status of surface and sub-surface soils. Surface soils should be monitored on an annual basis while sub-surface soils need only be monitored on a three years basis (if surface soil conditions are acceptable). It is vital that farm management respond to the results of monitoring, for example, if the soils are accumulating nutrients, application rates may need to be reduced.

Vermin Management

Dead birds and vermin are to be removed from sheds daily and disposed of immediately by burial, incineration, composting or placed in fly and vermin proof containers or frozen for regular collection. Failure to follow these practices can not only pollute the water system but can also cause disease, vermin, odour problems and human health risks.

If used, disposal pits should be constructed to ensure no leaching of nutrient into ground or surface waters, no access to other animals, be permanently marked and a record kept of the location and number of carcasses buried. Also, the pit should avoid areas subject to water logging, overland water flow, high watertables and drainage lines.

Land and Water Quality Objectives

- Sustainable land management practices and preservation of natural landscape
- To prevent contamination of surface and ground waters.

- To prevent degradation of the land on which the poultry farm is established, and on surrounding lands. Poultry farming should be conducted so that production can be continued indefinitely without degradation of the land or environment. Most conventional intensive poultry farms house the poultry in fully enclosed houses. This contains nearly all wastes, reducing the opportunities for direct pollution of the environment. Free range poultry enterprises and situations where poultry effluent, manure or litter are applied to the site increase the risk of pollution.

Table AII - 3. Recommended Chemical and Bacterial Standards for Poultry Drinking Water (Source: NSW Agriculture)

Mineral	Upper Limit (Mg/litre)
arsenic	0.2
calcium	600
cadmium	0
cobalt	1.0
copper	0.5
iron	2
magnesium	350
sodium	1,000
zinc	25
chlorine	1,500
nitrate	10
sulphate	1,000
pH range	6-9
Total dissolved solids (TDS mg/litre)	3,000
Microbes	Upper limit Organisms/100ml
Coliform organisms	10,000
Faecal coliform	2,000
Desirable Organisms/100ml	
Coliform organisms	100
Faecal coliforms	20

Environmentally sensitive sites, or those close to significant waterways or in major water catchment areas require very careful consideration.

Natural Hazards

Local knowledge about the frequency and intensity of natural hazards such as floods, storms, high winds and bushfires is a valuable aid in site selection. Extremes of temperature and weather will have an impact on the efficient running of any poultry operation.

Catchment Protection

Water volume and drainage patterns should be considered in light of the overall effects on the water catchment. Most Councils require that local drainage patters be maintained and stormwater flows be effectively managed.

Few poultry farms, other than intensive duck operations, produce waste water in sufficient quantities to require the development of a waste water irrigation system.

Drainage and Stormwater

Drainage systems should effectively control water flows and incorporate soil conservation works where necessary.

Stormwater should be managed so that contaminated waters are suitably treated before discharge from the farm.

Sediment retention basins or dams should be used when necessary to separate the sediments from the water. Water containing dissolved nutrients may be applied to land areas where pastures or crops can take up the nutrient for plant growth. Some councils require that natural drainage patterns be maintained and flow control of additional stormwater generated by the development of the farm.
Disease transmission is minimised by:

- An effective drainage design.
- Appropriate by-products and waste management.
- Chlorination of other treatment of surface water supplies.

Under clause 55 of the *Environmental Planning and Assessment Regulation 1994,* the following isues should be considered in the preparation of an EIS:

- consistency of the proposal with Sydney Regional Environmental Plan No. 8 "Central Coast Plateau Areas and Sydney Environmental Plan No. 20 (No. 2-1997) "Hawkesbury Nepean River";
- the potential cumulative effect of the development; and
- potential bushfire hazard issues.

Regular sediment trapping devices are somewhat ineffective with soils with more than 10 per cent dispersible materials and require artificial flocculation to assist in the settling process. Gypsum is a suitable chemical for this purpose and is applied within 24 hours of the conclusion of each storm event as follows:

(i) in larger ponds - mixed into a slurry with water, and then sprayed over the pond surface (figure AIV-1); or

(ii) in smaller ponds and tanks - by simply broadcasting it over the surface by hand.

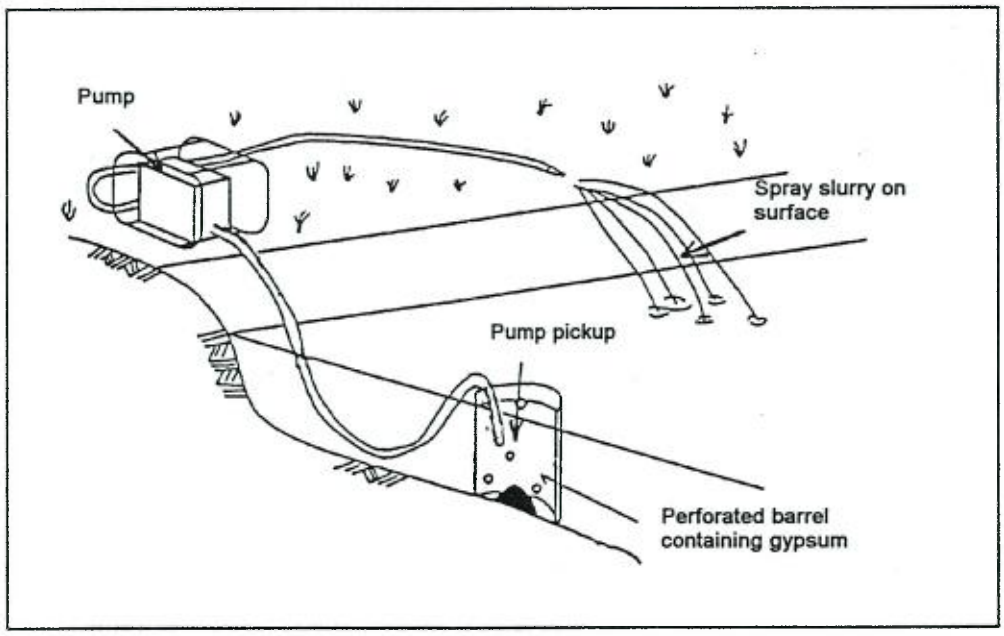


Figure A IV-1 Dosing with gypsum. Ideally, the drum has about a 50 litre capacity and the holes are about 25 mm diameter drilled on a 150 mm grid

Whichever method is chosen, it is essential that the gypsum is spread evenly over the entire pond surface for proper treatment and at a rate of about 32 kg per 100 cubic metres of water unless local experience or other criteria suggest differently - see below.

Normally within about 36 to 48 hours, sufficient of the dispersed materials will have flocculated and settled leaving a suspended solid content of less than about 50 milligrams per litre. A practical field test that approximates this level is to fill a clear plastic or glass soft drink bottle with the water and hold it up to the light. If it is not possible to see clearly through the sample, it is probably above about 50 milligrams per litre and needs further treating.

Notwithstanding the above comments, each pond should be calibrated after the first two storm events to assess the actual flocculant application rate and settling time required. The final application rate should be sufficiently high to permit sediment flocculation and pond discharge within 5 days from the conclusion of each storm event.

The water can be discharged from the basin once the suspended solid load has been lowered to an acceptable level. Achieve discharge with a system that

(i) permits drainage of the pond in about 24 hours; and

(ii) has a floating inlet to prevent flocculated sediments being removed as well - it is essential that materials from the sediment layer are not discharged in the pumping process.

Where rainfall is relatively continuous over a long period and a basin surcharges, it should be treated with a flocculating agent on a regular basis (e.g., daily), with pumping out only undertaken once the weather has cleared.

1. Nutrient Control Plan

2. Erosion/Sedimentation Control Plan

(after Weise, 1998)

Scenario

The wetland is to be located in a **35 hectare catchment** near Sydney and is to be retrofitted to an existing stormwater system. For the construction of the wetland, the **available area is 1 hectare**. The land use types in the catchment vary and the table below shows approximate proportions of land use.

Land use type	**Area (ha)**
Industrial	7
Medium density residential	24.5
Rural residential	3.5

The **mean annual rainfall is 1100 mm** and the wetland is to be designed to achieve **50% removal of dissolved phosphorus**.

The wetland has the primary objective of water quality improvement, with habitat as a secondary objective.

A catchment analysis was undertaken. It revealed:

1. 25% of the soil sample passed 0.05 mm sieve
2. the design storm for the 1 year ARI corresponds to a flow rate of $2m^3/s$.

Preliminary Calculations
Catchment runoff Calculations (refer to chapter 10)
Runoff $_{DA}$ (m^3/day) = Rainfall $_{DA}$ (m^3)/365 (day)

Land use type	**Area (ha)**	**% Yield**	**Runoff $_{DA}$ (m^3/d)**
Industrial	7	80	1100 mm x 7 ha x 80/3650 =169m^3/day
Medium density residential	24.5	45	1100 mm x 24.5 ha x45/3650 = 332m^3 / day
Rural residential	3.5	10	1100 mm x 3.5 ha x 10/3650 = 11 m^3/day
Total runoff $_{MA}$			**=169 + 332 + 11 =512m^3/day**

Average depths

Generic curve method: In the absence of data, use volume ratio of 2:1, therefore d_{AV} from

figure 16-8 is 0.78 m.

Modified mean annual runoff method: From figure 16-6 select ratio of 1:4, therefore d_{AV} from figure 16-9 is **0.62 m**.

System Sizing
Percentage Catchment Area Method
(Available Area /A_C) x 100 >2%
(1 ha/35 ha) x 100 = x%
x = 2.8 > 2%

The area available for the wetland indicates that the site is feasible:

Generic curve method

i. **Determine the % removal rate**
50% of dissolved phosphorus to be removed

ii. **Determine hydraulic residence time**
From figure 16-13, HRT = 15 days
From preliminary calcs, Runoff $_{DA}$ = 512m^3/day

iii.Determine wetland system volume (equation 16-3)

Wetland System Volume	=	**Runoff $_{DA}$ x HRT**
	=	512 x 15
	=	7680 m^3

iv.Determine wetland area

Wetland area	=	**Volume/d_{AV}**
	=	7680/0.78
	=	9,846 m^2
	=	0.98 ha
		Say 1.0 ha

Zone Sizing

Deep water zone:

i. **Determine diameter of particle size to be captured (d)**
From the wet sieve analysis use a design particle size of 0.05 mm.

ii. **Determine the settling velocity (w) and sedimentation efficiency (e_f), of that particle size**
From the Table 16-6 settling velocity, w = 0.0019 m/s, and sedimentation efficiency e_f = 0.76

iii.Determine design flow rate (Q)
Given above as 2m^3/s. This would be estimated from methods outlined in chapter 10.

iv. Calculate surface area required (A_s) (equation 16-5).

$$A_s = \frac{Q}{e_f * w} = 1385\ m^2$$

v. **Calculate pond dimensions (equations 16-6 and 16-7)**
Width $\leq \sqrt{(A_s / 3)} \leq 21.5$ m

Length $\leq 3 * \sqrt{(A_s / 3)} \oplus 64.4$, say 65 m

Check: 21.5 x 65 = 1398 m^2, $\oplus$1385 m^2, $\therefore$ OK

Therefore the deep water zone is **21.5 m wide and 65 m long** with an **area of 1398 m^2 (0.14 ha)**

Macrophyte zone:

i. **Determine the required detention factor**
For 50% dissolved phosphorous removal:
D_f = 1460 / RD_{AV} (equation 16-8)
From table 16-7, Sydney averages 139 rain days
D_f = 1460 / 139 rain days = 10.5

ii. **Calculate the volume of the macrophyte zone**
Volume = **D_f x $Runoff_{DA}$**
= 10.5 x 512
= 5376m^3

Area (m^2) = **Volume (m^3) / d_{AV} (m)** **(equation 16-11)**
= 5376m^3 / 0.62 m
= 8670m^2
= 0.87 ha

Total wetland area = 0.14 + 0.87 = 1.1ha

Method	Wetland Area (ha)
% Catchment Area	0.70
Generic Curve	1.0
Zone Sizing	1.1

Comments on the results:

There seems to be a significant difference between percentage catchment area method and the zone sizing method. The percentage catchment area method is an approximate estimation, but certainly allows the design to gain an idea of overall size.

The generic method and zone sizing method appear to be quite consistent. Although there is more science behind these methods the consistency is still somewhat of a coincidence. There will be cases where the results will differ significantly. The generic curve method doesn't account for peak flows, mineralogy difference between catchments for sizing the deep water zone, nor does it account for different configurations of the macrophyte zone. The accuracy of this method will improve as more curves are developed for different types of catchments and varying configurations of the macrophyte zone (see dialogue box 16-2).

Although this is a hypothetical example, it is not uncommon to find a catchment and site area similar to the abovementioned.

Universal Soil Loss Equation

The USLE is designed to predict the long term, average annual soil loss from sheet and rill erosion at nominated sites under specified management conditions. It is empirically derived. The original application is described by Wishchmeier and Smith (1978), adapted to urban development sites by Goldman *et al* (1986), and modified for Australian conditions in a computer program called SOILOSS (Rosewell & Edwards, 1988). It is represented by:

$$A = RKLSPC$$

where, A = computed soil loss (tonnes/ha/yr)
R = rainfall erosivity factor
K = soil erodibility factor
L = slope length factor
S = slope gradient factor] - considered jointly
P = erosion control practice factor
C = ground cover and management factors.

Table AIV - 1 USLE factors

Constraint	Remarks
R - rainfall erosivity	Rainfall erosivity is a measure of the erosive force and intensity of rain in a normal year. In NSW, it varies from 500 in the far west to 9 500 on the north coast, while at Kulnura it is 3660.
K - soil erodibility	Soil erodibility is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. At the subject site it has been assessed only on the subsoil materials. It can be normally expected to range from 0.005 to 0.02 on soils with low erodibility, from 0.021 to 0.04 to soils with moderate erodibility, and from 0.041 to 0.07 on soils with high erodibility. At the subject site, it ranges from 0.27 to 0.46.
LS - slope length and gradient	Both slope length (metres) and gradient (percent) have major effects on possible soil loss. They should be recorded as typical upper values for the site or unit in question. For the purpose of USLE calculations at urban development sites, it is generally reasonable to assume that *L* is relatively constant because a catch drain or roadway can be constructed so as to limit slope length to a nominated length, e.g. 80 metres. In the USLE, slope and length criteria are normally treated as a single entity, *LS*. The *LS* at this site is 1.68.
P - erosion control practice	The erosion control practice is reflected in the roughening or smoothing of the soil surface by machinery, i.e. those practices that reduce both the velocity of runoff and the tendency of runoff to flow directly downhill. In calculations using the USLE for Urban Residential development sites, it is generally reasonable to assume a constant *P* factor which will often be as high as 1.3.
C - cover	The cover or *C* factor, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from tilled, bare soil and taken as 1.0 - typical of Urban Residential construction sites.

In the urban context, it can be assumed that the computed soil loss derived from the USLE is equal to the sediment flux into a sediment retardation basin located on, or immediately adjacent to, a site. However, not all particles will be trapped. The proportion of suspended particles retained will be largely dependent upon settling conditions and soil dispersibility.

The land capability methodology used in this report draws extensively on the USLE and results in a far more objective appraisal of urban residential lands than that used in NSW in the past. Nevertheless, the USLE has its own limitations, including the fact that it only:

(i) predicts average annual soil loss and not that for a particular storm event (e.g. it does not adequately account for hydrology, especially antecedent moisture conditions affecting peak flow and total runoff);

(ii) predicts sediment entrained in the erosion process and does not predict sediment yield into a particular sediment basin (but at urban residential development sites, sediment trapping devices are usually quite close to areas of erosion, and so this limitation may not apply);

(iii) is effective for sheet and rill erosion and not for concentrated flow (however, at urban residential development sites in NSW, concentrated flows are usually controlled and should not result in significant soil erosion).

Other more suitable models of soil loss estimation are currently being developed and tested but are unlikely to be available for use for several years. These include the WEPP (Water Erosion Prediction Project) which will probably replace the USLE in 5 or 10 years time; AGNPS (Agricultural Non-point Source) pollution model which is currently being modified for use in urban catchments and utilising some of the WEPP technology; and a modified version of the USLE.

Hawkesbury - Nepean Catchment Management Trust Requirements

The Trust's general requirement is that the EIS address the impact of the proposal upon the Hawkesbury-Nepean River and, in this location particularly Ironbark Creek.

Specifically, the EIS should indicate the way in which the following criteria will be achieved:

1. The proposal should satisfy the Trust's policy on water quality and quantity:

   - Any water flow or changes in flow from the site should not alter the downstream natural hydrology (frequency or peaks) for all events up to the one in two year storm event (30 minute event), and should not alter the downstream peak levels for events up to the 1 in 100 year event;
   - Surface runoff should not compromise the ANZEC Guidelines standard for healthy rivers - aquatic ecosystems, water supply for livestock; and NHMRC Guidlines for recreational water quality - visual amenity and primary contact recreation
   - Groundwater should be protected from the impacts of any contaminated surface waters and/or leachate.
   - We therefore recommend that particular regard be given to erosion and sediment controls during both construction and operation; the quality of existing and likely future flows; control of run-off and waste waters; and any potential infiltration into the ground water and effects on water bores.

2 Site management should satisfy the NSW Agriculture's Poultry Farming Guidelines. The cumulative impact of similar uses in the area should be taken into account.

3 Pest control (as discussed on page 35 of NSW Agriculture's Poultry Farming Guidelines) should not adversely affect native fauna.

4 Farm management should avoid soil contamination under and immediately around the sheds and any stockpiles.

5 Drainage from the roofs will also require particular care to prevent concentrated flows causing erosion. The potential for water conservation by using water from the extensive roof areas should be assessed.

The EIS should also address the provisions of Sydney REP No. 20 Hawkesbury-Nepean River (No.2-1997)

I1 - Site Data Sheet

Site Name: Jim Vassiliadis

Site Location: 4410 Kirks Road, Mangrove Mountain

Precinct:

Description of Site: Existing area is all cleared and cultivated. Property is currently used for growing carrots in rotation with other green leaf vegetables. Property all cultivated.

Site/soil/water characteristic	Value								Comments
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	
Catchment Area, ha	3.97								
Disturbed Catchment Area, ha	3.97								

Soil Analysis

% Soil coarser than 0.02mm	40								Limit of fine sand
% of Clay	20								
% of Silt	10								
Dispersion Percentage (Lab)	100.0%								
% of whole soil dispersible	25								
Soil Texture Group	D								> 10% = Type D or F
Soil Loss Class									

5 Day 75 th Percentile Rainfall Event	27								
Rainfall Intensity - 2 year 6hr storm	11.47								

rainfall erosivity (R-factor)	2841								
soil erodibility (K-factor)	0.046								
length (m)	100								
gradient (%)	5								
LS-factor	1.35								Appendix A, Table A1

erosion control practice (P-factor)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3 for Construction sites
ground cover (C-factor)	1	1	1	1	1	1	1	1	1 for Construction sites

Soil Loss t/ha/yr	229								
Soil Loss m^3/ha/yr	180								
Sediment Basin Storage Volume, m^3	130								2 months storage

I2 Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Q_y = 0.00278 \cdot C_{10} \cdot F_Y \cdot I_{y,tc} \cdot A$$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years
  rural runoff coefficients are given ARR Vol 2
  urban runoff coefficients are given in ARR Vol 1, Figure 14.13
  construction coefficients are given in Appendix F of the "Black Book".
- FF_y is a frequency factor for "Y" years
  rural values are given ARR Vol 1, Table 5.1
  urban coefficients are given in ARR Vol 1, Table 15.?
- A is the area of catchment in hectares (ha)
- $I_{y,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a desig

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Chapter 5 of AR&R, 1987)

For urban catchments the Time of Concentration (tc) should be determined by more precise calculations or reduced by a factor of 50 per cent.

Table I2 Peak flow calculations

Site	A	t_c	Rainfall Intensity, I, mm/hr						C_{10}
	ha	mins	$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
Site 1	3.97	13	56	92	104	119	140	155	0.6
Site 2									
Site 3									
Site 4									
Site 5									
Site 6									
Site 7									
Site 8									

Peak Flow Calculations

ARI yrs	Frequency Factor	Site 1 m^3/s	Site 2 m^3/s	Site 3 m^3/s	Site 4 m^3/s	Site 5 m^3/s	Site 6 m^3/s	Site 7 m^3/s	Site 8 m^3/s
$1_{yr,tc}$	0.62	0.23							
$5_{yr,tc}$	0.88	0.54							
$10_{yr,tc}$	1	0.69							
$20_{yr,tc}$	1.12	0.88							
$50_{yr,tc}$	1.2	1.11							
$100_{yr,tc}$	1.3	1.33							

I3 Volume of Sediment Basins: Type C Soils

Basin Volume = Settling Zone Volume + Sediment Storage Volume

Settling Zone Volume

The settling zone volume for Type C Soils is calculated to provide capacity to allow the design particle" (e.g. 0.02mm in size) to settle in the peak flow expected from the design storm. design storm (e.g. 0.25 year ARI). The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle.

Peak flow/discharge for the 0.25-year, ARI storm is given by the Rational Formula:

$$Q_{tc,\,0.25} = 0.25 \times [0.00278 \times C_{10} \times F_1 \times I_{1yr,\,tc} \times A] \quad (m3/sec)$$

where:

$Q_{tc,0.25}$ = flow rate (m^3/sec) for the 0.25 average recurrence interval (ARI) storm event
C_{10} = runoff coefficient (dimension less for ARI of 10 years
F_1 = Frequency factor for 1 year
$I_{1yr,tc}$ = average rainfall intensity (mm/hr) for the 1 year, storm event
A = area of catchment in hectares (ha)

The basin surface area (A) is dependent on the flow rate into the basin (Qtc, 0.25 above) and the settling velocity of the soil particles ($Vel_{settling}$ given in Table 6.2)

Basin Surface Area (A) = $Q_{tc,0.25}$ / $Vel_{settling}$

Particle Settling Velocities Under Ideal Conditions

Particle Size	Settling Velocity
0.100	0.00700
0.050	0.00190
0.020	0.00029

Sediment Basin Volume = Basin Surface Area x depth

The basin settling volume can be calculated using a minimum depth of 0.6 metres.

Sediment Storage Volume = Settling Zone Volume + Sediment Storage Volume

1	2	3	4	5	6	7	8
Site	$Q_{tc,0.25}$ m^3/s	Setting Velocity m/s	Basin urface A m^2	Depth of Settling Zone m	Settling Zone Volume m^3	Sediment Storage Volume m^3	Total Basin Volume m^3
Site 1	0.06	0.00029	200	0.6	130	130	260
Site 2		0.00029		0.6			
Site 3		0.00029		0.6			
Site 4		0.00029		0.6			
Site 5		0.00029		0.6			
Site 6		0.00029		0.6			
Site 7		0.00029		0.6			
Site 8		0.00029		0.6			

I4 Volume of Sediment Basins: Hydrological Calculation, Type C Soils

Basin Volume = Settling Zone Volume + Sediment Storage Zone Volume

The settling zone volume for Type F & D soils is calculated to provide capacity to contain all runoff expected from up to the 75th prcentile rainfall event. The settling zone volume (V) can be determined by the following equation:

$$V = 10 \,.\, C_v \,.\, A \,.\, R_{75th\ IIe,\ 5\ day} \quad (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the 5-day period

R = is the 5-day total rainfall depth (mm) which is not exceeded in 75 percent of rainfall events. (See table in Section 6.3.3)

A = area of catchment in hectares (ha)

Site	C_v	$R_{75th\ IIe,\ 5\ day}$	Catchment Area ha	Settling Zone Volume m^3	Sediment Storage Volume m^3	Total Basin Volume m^3
Site 1	0.50	27	3.97	540	130	670
Site 2	0.50	0	0	10	5	15
Site 3	0.50	0	0	10	5	15
Site 4	0.50	0	0	10	5	15
Site 5	0.50	0	0	10	5	15
Site 6	0.50	0	0	10	5	15
Site 7	0.50	0	0	10	5	15
Site 8	0.50	0	0	10	5	15

		Nitrogen kg/ann	Phosphorus kg/ann
Nutrient Export	Undeveloped	84.08	20.18
	Developed	78.69	8.37
	% reduction required	-6.85%	-141.10%

(i) Permanent Pool

a) Mean Annual Runoff = Fraction Impervious Area * Av. Annual Rain * Area

f = 67.14 %

Av. Annual Runoff = 33480 m3 + 20% for sedimentaion

Av. Annual Runoff = 40180 m3

Av. Rain = 1255 mm

Area = 39726 m2

b) Storage Retention Time (Based on Lawrence, 1986)

etention of Total Phosphorus = 0 %

Hydraulic Residence Time = 0.038 yrs

Permanent Pool = 1530 m3

(ii) Surcharge Pool

(a) Sites < 40-60 ha in area

Surcharge Volume = 1st 12.5 mm of runoff from the area

V = 500 m3

Wetland Volume = Permanent Pool + Surcharge Pool

= 2030 m3

```
Site name          :- Mangrove Mountain
Latitude (South)   :- 33.3467
Longitude (East)   :- 151.1866
Site log-skewness :- 0.020
2 - year ARI, 1  hour intensity = 32.50
              12 hour intensity = 7.65
              72 hour intensity = 2.00
50 - year ARI, 1  hour intensity = 63.00
               12 hour intensity = 16.00
               72 hour intensity = 5.60
F2    4.31 F50  15.87
```

IFD Table for Various ARI's and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
5 min	81.89	105.29	134.75	151.83	174.50	204.16	226.75
6 min	76.73	98.66	126.28	142.29	163.54	191.35	212.53
10 min	62.74	80.68	103.31	116.43	133.84	156.62	173.98
12 min	57.99	74.58	95.51	107.64	123.75	144.83	160.88
15 min	52.41	67.41	86.34	97.32	111.88	130.95	145.48
18 min	48.07	61.82	79.20	89.27	102.65	120.15	133.48
20 min	45.65	58.72	75.23	84.81	97.51	114.14	126.81
25 min	40.79	52.47	67.23	75.80	87.16	102.04	113.38
30 min	37.08	47.70	61.13	68.93	79.27	92.81	103.12
45 min	29.72	38.23	49.01	55.28	63.58	74.45	82.74
1.0 hr	25.23	32.46	41.63	46.95	54.01	63.26	70.30
1.5 hr	20.01	25.79	33.24	37.59	43.34	50.88	56.64
2.0 hr	16.92	21.84	28.24	32.00	36.95	43.46	48.43
3.0 hr	13.32	17.22	22.39	25.44	29.44	34.71	38.75
4.5 hr	10.47	13.57	17.73	20.20	23.43	27.69	30.97
6.0 hr	8.83	11.46	15.03	17.15	19.93	23.60	26.42
9.0 hr	6.95	9.04	11.92	13.64	15.87	18.85	21.13
12.0 hr	5.87	7.64	10.11	11.59	13.51	16.07	18.04
18.0 hr	4.37	5.74	7.80	9.06	10.68	12.86	14.56
24.0 hr	3.54	4.68	6.47	7.59	9.02	10.96	12.48
30.0 hr	2.99	3.98	5.58	6.60	7.89	9.65	11.05
36.0 hr	2.60	3.48	4.93	5.87	7.06	8.69	9.98
48.0 hr	2.07	2.79	4.03	4.85	5.88	7.31	8.45
72.0 hr	1.47	2.00	2.98	3.64	4.47	5.63	6.58

IFD Polynomial: $\ln I = a + b*\ln(D) + c*\ln(D)^{**2} + d*\ln(D)^{**3} + e*\ln(d)^{**4} + f*\ln(D)^{**5} + g*\ln(D)^{**6}$
where duration D is in Hrs and average intensity I is in mm/hr

ARI	a	b	c	d	e	f	g	Max % error
1	3.2261414	-0.5732947	-0.0127390	0.0113751	-0.0027451	-0.0007931	0.0001645	1.32
2	3.4794299	-0.5701508	-0.0125720	0.0107504	-0.0025051	-0.0006958	0.0001428	1.12
5	3.7315065	-0.5617395	-0.0122345	0.0090380	-0.0018355	-0.0004292	0.0000830	0.57
10	3.8536209	-0.5573231	-0.0120573	0.0081388	-0.0014839	-0.0002892	0.0000516	0.45
20	3.9951105	-0.5536669	-0.0119106	0.0073945	-0.0011929	-0.0001734	0.0000256	0.59
50	4.1547284	-0.5495422	-0.0117451	0.0065547	-0.0008646	-0.0000426	-0.0000037	0.75
100	4.2614068	-0.5467855	-0.0116345	0.0059935	-0.0006451	0.0000448	-0.0000233	0.86

Overland Flow Travel Time Aid
Table of t*I**0.4
Where t = time in min and I = intensity in mm/hr

Duration	1	2	5	10	20	50	100
5 min	29.14	32.22	35.54	37.27	39.40	41.95	43.74
6 min	34.03	37.63	41.56	43.60	46.11	49.11	51.22
7 min	38.78	42.90	47.38	49.72	52.59	56.02	58.43
8 min	43.42	48.02	53.05	55.66	58.87	62.71	65.41
9 min	47.94	53.02	58.56	61.44	64.98	69.21	72.20
10 min	52.36	57.91	63.94	67.09	70.94	75.56	78.81
12 min	60.91	67.36	74.36	78.00	82.47	87.82	91.59
14 min	69.14	76.45	84.38	88.50	93.56	99.62	103.89
16 min	77.09	85.24	94.06	98.64	104.28	111.03	115.78
18 min	84.80	93.76	103.45	108.49	114.69	122.10	127.32
20 min	92.29	102.04	112.59	118.07	124.82	132.89	138.57
22 min	99.60	110.12	121.51	127.43	134.71	143.42	149.55
25 min	110.24	121.89	134.52	141.08	149.15	158.80	165.60
26 min	113.72	125.74	138.77	145.54	153.87	163.83	170.85
28 min	120.56	133.31	147.14	154.34	163.17	173.75	181.20
30 min	127.29	140.75	155.38	162.98	172.32	183.51	191.38
40 min	159.36	176.26	194.71	204.32	216.10	230.20	240.13

MORSE McVEY & ASSOCIATESlicense No. 3155
----------TITLES----------
SCENARIO 1 - DEVELOPED P1
BASED ON DEVELOPED SITE
STANDARD 5 LANDUSES 4 POLLUTANTS

		Susp.Smg/L	T.Nitrmg/L	T.Phosmg/L	F.ColiF.C./L
NF	= NATURAL F	5.00	0.50	0.04	500.00
SR	= SHED ROOF	220.00	2.70	0.28	1500.00
RR	= RURAL ROA	220.00	2.70	0.28	3000.00
IP	= IMPROVED	10.00	0.60	0.10	1500.00
CL	= CULTIVATE	20.00	5.00	1.20	2000.00

WEIGHTED RUNOFF COEFFICIENTS FOR EACH LAND-USE

NF	SR	RR	IP	CL
0.23	0.95	0.76	0.47	0.38

ANNUAL SUB-SUB-AREA STATISTICS

sub-area..TOTAL SITE 3.97 ha, diffuse factor = 1 geo factor = .9

LAND USE	RELATIVE AREAS %	RUNOFF ML/yr	Susp.S kg/ann	T.Nitr kg/ann	T.Phos kg/ann	F.Coli 1e7 FC
NF	0	0.00	0.00	0.00	0.00	0.00
SR	33	13.97	3073.95	37.73	3.91	20.96
RR	41	13.94	3066.45	37.63	3.90	41.82
IP	26	5.54	55.43	3.33	0.55	8.31
CL	0	0.00	0.00	0.00	0.00	0.00
non-pointsource kg/yr.			6195.83	78.69	8.37	71.09
pointsource kg/yr.			0.000	0.000	0.000	0.000
sum	100%	33.45	6195.83	78.69	8.37	71.09
weighted/ha		8.43	1560.66	19.82	2.11	17.91
volumetric runoff coeff.			67.1%			

----------S U M M A R Y----------
| SCENARIO 1 - DEVELOPED P1
| BASED ON DEVELOPED SITE
| STANDARD 5 LANDUSES 4 POLLUTANTS
|---
| TOTAL CATCHMENT 3.97 ha
| TOTAL AREAS FOR THE DIFFERENT LAND-USES IN ha

NATURAL F	SHED ROOF	RURAL ROA	IMPROVED	CULTIVATE
0.0	1.3	1.6	1.0	0.0
0.0%	32.8%	40.9%	26.3%	0.0%

RAINFALL.....	1255 mm
TOTAL RUNOFF	33.45374 ML
VOLUMETRIC RUNOFF COEFF..	67.14 %
TOTAL EXPORT Susp.S.....	6195.8 kg/ann
TOTAL EXPORT T.Nitr.....	78.7 kg/ann
TOTAL EXPORT T.Phos.....	8.4 kg/ann
TOTAL EXPORT F.Coli.....	71.1 1e7 FC

```
MORSE McVEY & ASSOCIATESlicense No. 3155
-------------TITLES---------------
SCENARIO 1 - UNDEVELOPED P1
BASED ON STATUS QUO
STANDARD 5 LANDUSES 4 POLLUTANTS

                      Susp.Smg/L    T.Nitrmg/L    T.Phosmg/L    F.ColiF.C./L
NF    = NATURAL F         5.00          0.50          0.04          500.00
SR    = SHED ROOF       220.00          2.70          0.28         1500.00
RR    = RURAL ROA       220.00          2.70          0.28         3000.00
IP    = IMPROVED         10.00          0.60          0.10         1500.00
CL    = CULTIVATE        20.00          5.00          1.20         2000.00

WEIGHTED RUNOFF COEFFICIENTS FOR EACH LAND-USE
      NF        SR        RR        IP        CL
    0.23      0.95      0.76      0.47      0.38

  ANNUAL SUB-SUB-AREA STATISTICS
-----------------------------------

sub-area..TOTAL SITE        3.97 ha, diffuse factor = 1 geo factor = .9
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
LAND    RELATIVE    RUNOFF    Susp.S        T.Nitr        T.Phos        F.Coli
USE     AREAS %     ML/yr     kg/ann        kg/ann        kg/ann        1e7 FC
-----+---------+---------+-----------+-----------+-----------+-------------
NF          0        0.00         0.00          0.00          0.00          0.00
SR          0        0.00         0.00          0.00          0.00          0.00
RR          0        0.00         0.00          0.00          0.00          0.00
IP          0        0.00         0.00          0.00          0.00          0.00
CL        100       16.82       336.31         84.08         20.18         33.63
.....................................................................................
non-pointsource kg/yr.          336.31         84.08         20.18         33.63
pointsource     kg/yr.           0.000          0.000         0.000         0.000
sum       100%       16.82       336.31         84.08         20.18         33.63
weighted/ha           4.24        84.71         21.18          5.08          8.47
volumetric runoff coeff.          33.8%


 ----------------------S U M M A R Y----------------------------
| SCENARIO 1 - UNDEVELOPED P1
| BASED ON STATUS QUO
| STANDARD 5 LANDUSES 4 POLLUTANTS
|-------------------------------------------------------------------
| TOTAL CATCHMENT       3.97 ha
| TOTAL AREAS FOR THE DIFFERENT LAND-USES IN ha
|    NATURAL F    SHED ROOF    RURAL ROA    IMPROVED     CULTIVATE
|           0.0           0.0          0.0          0.0          4.0
|          0.0%          0.0%         0.0%         0.0%       100.0%
| RAINFALL.................        1255 mm
| TOTAL RUNOFF ............     16.81543 ML
| VOLUMETRIC RUNOFF COEFF..       33.75 %
| TOTAL EXPORT Susp.S.......      336.3 kg/ann
| TOTAL EXPORT T.Nitr.......       84.1 kg/ann
| TOTAL EXPORT T.Phos.......       20.2 kg/ann
| TOTAL EXPORT F.Coli.......       33.6 1e7 FC
|
 -------------------------------------------------------------------
```

NAME: J. VASSILIADIS
ADDRESS: RMB 4410 KIRKS ROAD MANGROVE MOUNTAIN
REFERENCE: PROPOSED POULTRY SHEDS
JOB No: 981723

Runoff Q = C Fy I A
where:
C10 = 0.9 x f + 0.7 * (1- f) where f is fraction impervious
f = 100 %
C10 = 0.90 F100 = 1.2
C100 = 1.08
I = 227 mm/hr

100 year ARI storm flows

CATCHMENT		RUN OFF					COMMENTS
COMPONENT	SURFACE	I mm/hr	A m2	C	Q m3/s	TOTAL Q m3/s	
R1/1	ROOF	227	1086.8	1.080	0.0740	0.0740	
G1	GRASS	227	499	0.840	0.0264	0.1004	
A1	ROAD	227	855	0.984	0.0530	0.1534	
R1/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G2	GRASS	227	1672	0.840	0.0886	0.1626	
A2	ROAD	227	842	0.984	0.0522	0.2148	
R2/1	ROOF	227	1086.8	1.080	0.0740	0.2888	
R2/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G3	GRASS	227	1672	0.840	0.0886	0.1626	
A3	ROAD	227	842	0.984	0.0522	0.2148	
R3/1	ROOF	227	1086.8	1.080	0.0740	0.2888	
R3/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G4	GRASS	227	1672	0.840	0.0886	0.1626	
A4	ROAD	227	842	0.984	0.0522	0.2148	
R4/1	ROOF	227	1086.8	1.080	0.0740	0.2888	
R4/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G5	GRASS	227	1672	0.840	0.0886	0.1626	
A5	ROAD	227	842	0.984	0.0522	0.2148	
R5/1	ROOF	227	1086.8	1.080	0.0740	0.2888	
R5/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G6	GRASS	227	1672	0.840	0.0886	0.1626	
A6	ROAD	227	754	0.984	0.0468	0.2094	
R6/1	ROOF	227	1086.8	1.080	0.0740	0.2834	
R6/2	ROOF	227	1086.8	1.080	0.0740	0.0740	
G7	GRASS	227	1092	0.840	0.0578	0.1318	
				TOTAL		1.7238	

NAME: J. VASSILIADIS
ADDRESS: RMB 4410 KIRKS ROAD MANGROVE MOUNTAIN
REFERENCE: PROPOSED POULTRY SHEDS
JOB No: 981723

Runoff Q = C Fy I A
where:
C10 = 0.9 x f + 0.7 * (1- f) where f is fraction impervious
f = 100 %
C10 = 0.90 F5 = 0.95
C5 = 0.855
I = 135 mm/hr

5 year ARI Storm Flows

CATCHMENT		RUN OFF					COMMENTS
COMPONENT	SURFACE	I mm/hr	A m2	C	Q m3/s	TOTAL Q m3/s	
R1/1	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G1	GRASS	135	499	0.6650	0.0124	0.04720	
A1	ROAD	135	855	0.7790	0.0250	0.07220	
R1/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G2	GRASS	135	1672	0.6650	0.0417	0.07650	
A2	ROAD	135	842	0.7790	0.0246	0.10110	
R2/1	ROOF	135	1086.8	0.8550	0.0348	0.13590	
R2/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G3	GRASS	135	1672	0.6650	0.0417	0.07650	
A3	ROAD	135	842	0.7790	0.0246	0.10110	
R3/1	ROOF	135	1086.8	0.8550	0.0348	0.13590	
R3/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G4	GRASS	135	1672	0.6650	0.0417	0.07650	
A4	ROAD	135	842	0.7790	0.0246	0.10110	
R4/1	ROOF	135	1086.8	0.8550	0.0348	0.13590	
R4/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G5	GRASS	135	1672	0.6650	0.0417	0.07650	
A5	ROAD	135	842	0.7790	0.0246	0.10110	
R5/1	ROOF	135	1086.8	0.8550	0.0348	0.13590	
R5/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G6	GRASS	135	1672	0.6650	0.0417	0.07650	
A6	ROAD	135	754	0.7790	0.0220	0.09850	
R6/1	ROOF	135	1086.8	0.8550	0.0348	0.13330	
R6/2	ROOF	135	1086.8	0.8550	0.0348	0.03480	
G7	GRASS	135	1092	0.6650	0.0272	0.06200	
				TOTAL		0.81110	

EROSION & SEDIMENT

CONTROL PLAN

&

SPECIFICATION

RMB 4410 KIRKS ROAD

MANGROVE MOUNTAIN

Prepared by:

Morse McVey & Associates Pty Ltd
Suite 3, 390 princes Highway, Bomaderry
Phone (02) 4423 2822

c81202 AXIII.wpd

November 1998

BACKGROUND

1. Extreme site/soil constraints are identified in Table 1.

Table 1 Site/soil constraints

Site	Restrictions
Roads < 5% grade	There are no extreme constraints to construction other than: * retain all vegetation on site except for area for road works, works yard and site office.
Roads > 5% grade	Delay commencement of work on road to as late as possible prior to stripping of earth works. Ensure works are completed in as short a time as possible. Rehabilitate land within 10 working days from completion of work by: * topsoiling table drains * fertilising and seeding in accordance with Clause 16, 17 & 18 ; and * placing "Jutemaster T.M.", "Fibre Mulch" or kikuyu turf ;
Roads > 10% grade	In addition to the above restrictions construct temporary diversion banks at 30 metre intervals at the finish of work daily and when rain occurs. Diversion banks may be constructed from shale or sand bags and placed across the road diverting runoff to sediment traps.
Culverts	Outlet to be stabilised with rock rip rap for 2 metres past the end of the pipe.
Disturbed Areas	Within 10 working days of completion of road construction all disturbed areas must be topsoiled, seeded and fertilised.

2. The soil landscape at this site is ***Somersby***. The likely soil loss at this site is 300 tonnes per hectare per year – calculated with the Universal Soil Loss Equation (USLE). The various USLE values are in Table 2.

Table 2 USLE values

Site/soil/water characteristic	Units
rainfall erosivity (*R* factor)	2 841
soil erodibility (*K* factor)	0.046
slope length (m)	100
slope gradient (%)	5
LS factor	1.35
erosion control practice (*P* factor)	1.3
ground cover (*C* factor)	1.0

GENERAL INSTRUCTIONS

3. This plan is to be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued and relating to development at the subject site.

4. The site superintendent will ensure that all soil and water management works are located as instructed in this specification.

5. All contractors and sub-contractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to downslope lands and waterways.

LAND DISTURBANCE

6. Where practical, the soil erosion hazard on the site will be kept as low as possible. To this end, works should be undertaken in the following sequence:

(i) install any necessary security fences for the site;

(ii) construct "silt" fencing as shown on the soil and water management plan (figure 1);

(iii) construct diversion banks above cut batters;

(iv) strip topsoil and stockpile on the top side of road works, forming a earth bund along the contour. Water collected in the diversion bank shall be discharged via a spreader bank to well grassed drainage lines;

(v) undertake site development works in accordance with the engineering plans ensuring "silt" fence sediment traps are installed at all drainage inlet pits (figure 2) and downstream of tail out drains.

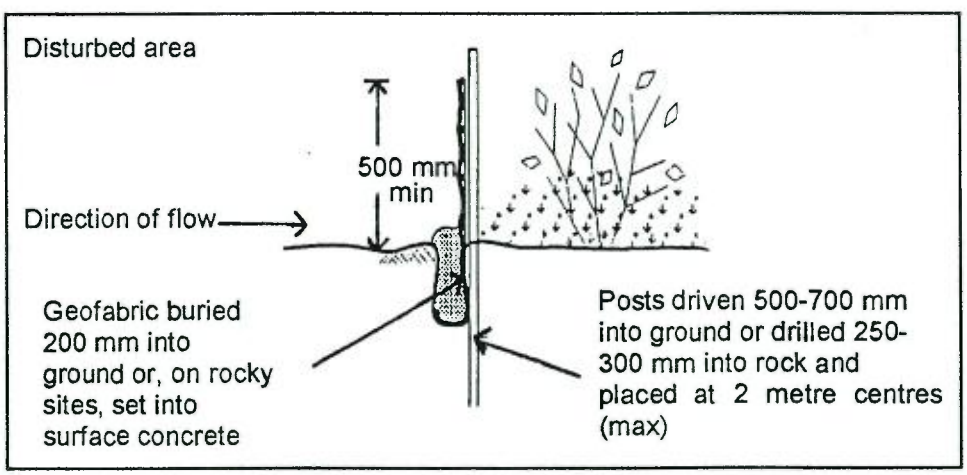


Figure 1 Construction of a geofabric lined "silt" fence

EROSION CONTROL

7. Where practicable, foot and vehicular traffic should be kept away from areas not included in the road works and away from any rehabilitated areas. No land shall be disturbed downstream of fill batters.

8. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control.

9. Final site landscaping will be undertaken as soon as possible and within 20 working days from completion of construction activities.

10. During construction the maximum length of road surface between diversion bank shall be:
    - 30 metres on slopes greater than 10%; and
    - 50 metres on slopes from 5% to 10%.

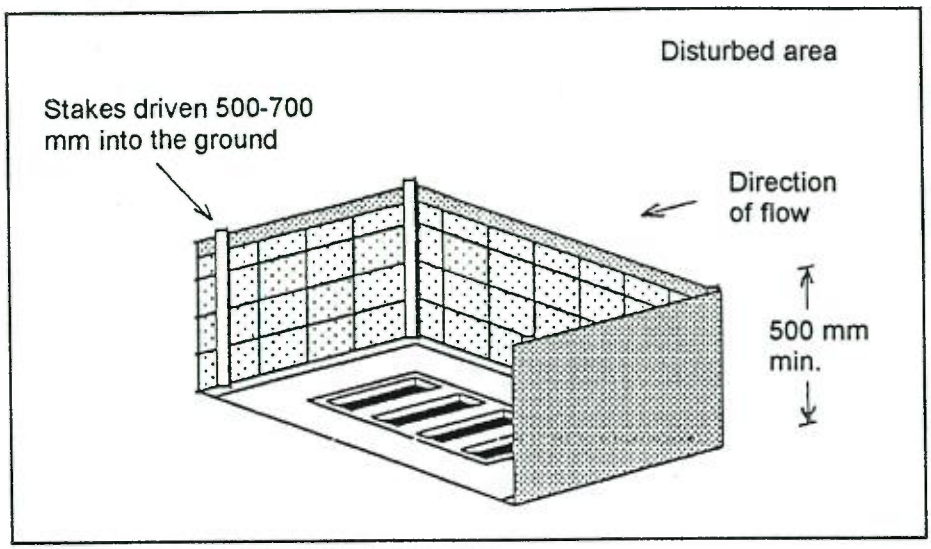


Figure 2 A geofabric sediment barrier

SEDIMENT CONTROL

11. Sediment barriers ("silt fences") will be installed on the downslope of fill batters. Barriers will be located as shown on plan and may be constructed from straw bales or woven fabric material.

12. Woven Fabric Sediment Traps shall be constructed downstream of each tail out drain or temporary diversion bank. Sediment traps shall discharge to existing grassed areas.

13. Stockpiles will not be located within 2 metres of hazard areas, including likely areas of concentrated or high velocity flows such as waterways, diversion banks and tailout drains. Where they are between 2 and 5 metres from such areas, special sediment control measures will be taken to minimise possible pollution to downslope waters, e.g., through installation of "silt" fencing.

14. Water will be prevented from entering the permanent drainage system unless it is relatively sediment free, i.e. the catchment area has been permanently landscaped and/or any likely sediment has been filtered through an approved sediment trap or grassed buffer area.

15. Temporary soil and water management structures will be removed only after the lands they are protecting are rehabilitated.

REHABILITATION

16. All lands will be properly topsoiled, seeded and mulched within 10 working days from completion of works. Prior to addition of topsoil, the ground surface will be tyned, chained, or similar to ensure effective keying of the two materials.

    A recommended listing of plant species is:

Spring/Summer sowings:	
Couch, hulled	8 kg/ha
Couch, unhulled	7 kg/ha
Kangaroo Valley Ryegrass	8 kg/ha
Japanese Millet	20 kg/ha
Carpet Grass	8 kg/ha
Haifa White Clover	5 kg/ha
Red Clover	5 kg/ha

Autumn/Winter sowings:	
Couch, hulled	8 kg/ha
Couch, unhulled	7 kg/ha
Kangaroo Valley Ryegrass	8 kg/ha
Ryecorn/Oats	20 kg/ha
Demeter Fescue	3 kg/ha
Haifa White Clover	5 kg/h

17. Temporary rehabilitation shall be undertaken on disturbed areas where works have stopped and soils are expected to remain exposed for more than two months before either works continue or permanent rehabilitation is undertaken. For vegetative rehabilitation, the following species mix is recommended:

Autumn/Winter sowing -	oats/ryecorn @ 20 kg/ha Japanese millet @ 10 kg/ha
Spring/Summer sowing -	Japanese millet @ 20 kg/ha oats/ryecorn @ 10 kg/ha

18. Fertilisers should include:

(i) Grower 11, Multigrow (or equivalent) at 250 kilograms per hectare and trace elements according to manufacturers instructions at sowing, and

(ii) Nitram (or equivalent) at 100 kilograms per hectare in the following Spring

17. The following work will be carried out on cut and fill batters:

SITE	SOIL TYPE	SLOPE	REHABILITATION
Cut Batter and Fill Batter	Clay/shale	2 : 1 Max Slope length is 5m	Rehabilitation to be carried out within 10 working days of completion of work. Place 75 mm topsoil on the batter by track machine working up and down the slope. Seed & fertilise in accordance with 15, 16 & 17 above.
		length > 5m & < 10m	In addition to the above place a layer of "Jutemaster T.M." or "Fibre Mulch" over the seed and fertiliser and staple to the slope. Alternatively lay and staple kikuyu turf.
		10m +	Construct berm and limit slope length to 10m.
Table Drains	Clay/Shale	< 5%	Place 75 mm topsoil on the bed of drain by track machine working up and down the slope. Seed & fertilise in accordance with 16, 17 & 18 above.
		>5% to <12%	In addition to the above place a layer of "Jutemaster T.M." or "Fibre Mulch" over the seed and fertiliser and staple to the bed. Alternatively use kikuyu turf and staple to bed.

OTHER MATTERS

19. Acceptable receptors will be provided for concrete and mortar slurries, paints, acid washings, light-weight waste materials and litter.

SITE INSPECTION & MAINTENANCE

20. Receptors for concrete and mortar slurries, paints, acid washings, light-weight waste materials and litter are to be emptied as necessary. Disposal of waste shall be in a manner approved by the site superintendent.

21. At least weekly, the contractor will inspect the site, providing particular attention to the following matters.

    (a) Ensure drains operate effectively and initiate repair or maintenance as required.

    (b) Remove spilled sand (or other materials) from hazard areas, including lands closer than 2 metres from likely areas of concentrated or high velocity flows such as waterways, gutters, paved areas and driveways;

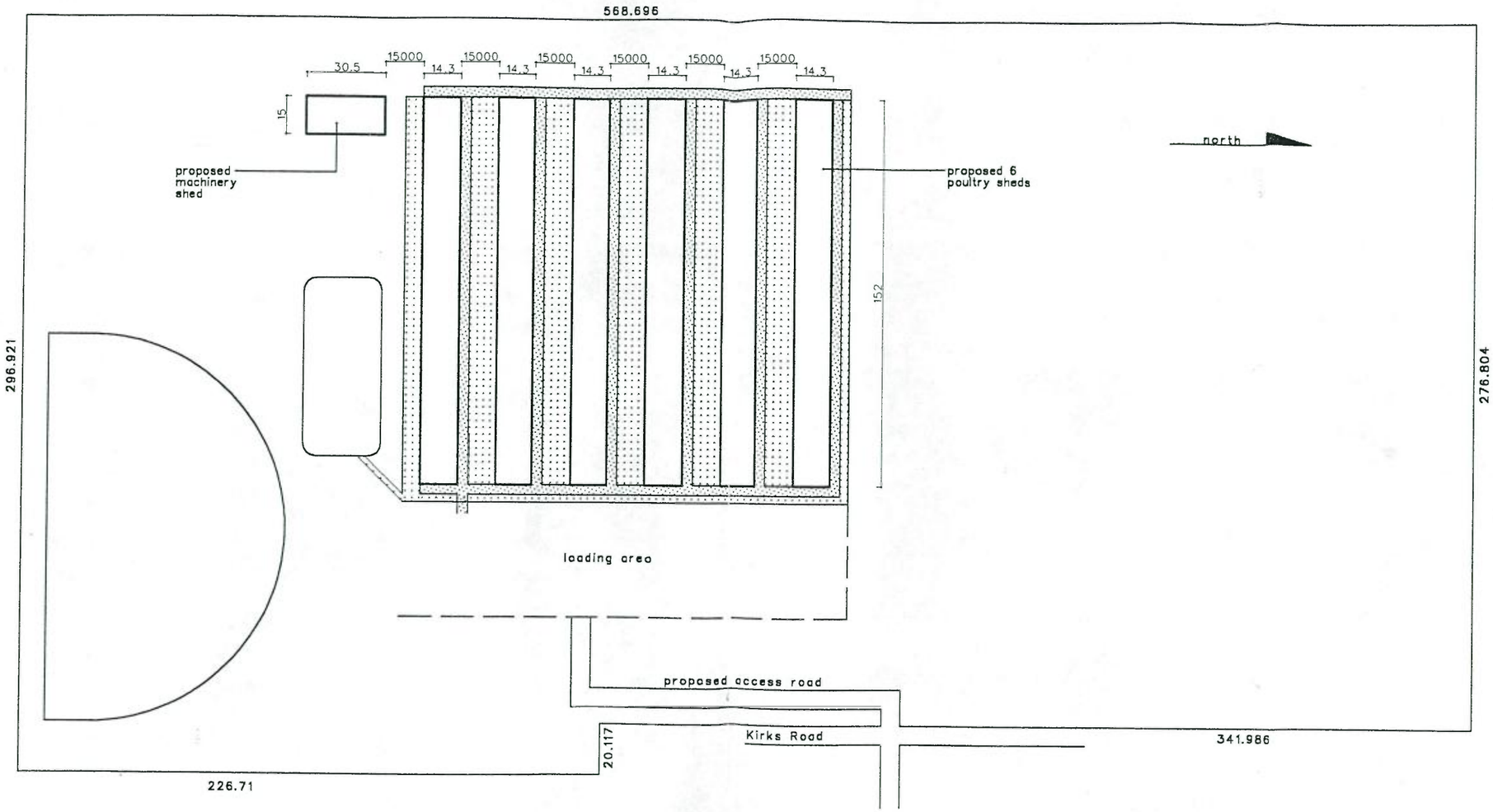
    (c) Remove sediment from traps whenever less than the design capacity remains. Ensure any collected sediment is disposed in areas where further pollution to downslope lands and waterways is unlikely;

    (d) Ensure rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate;

    (e) Construct additional erosion and/or sediment control works as might become necessary to ensure the desired protection is given to downslope lands and waterways, i.e., make ongoing changes to the *Soil & Water Management Plan.*

    (f) Maintain erosion and sediment control measures in a functioning condition until all earthwork activities are completed and the site rehabilitated.

    (g) Remove temporary soil conservation structures as a last activity.



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Facsimile: (02) 4677 1709
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PLAN
SITE PLAN

PROJECT
PROPOSED POULTRY SHEDS
J. VASSILIADIS

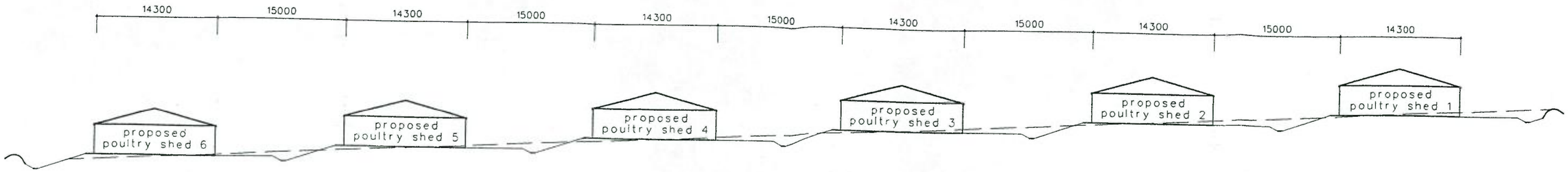
LOCATION
RMB 4410 KIRKS RD.
MANGROVE MOUNTAIN

SCALE: 1:2000
DRAWN: A.McVey
CHECKED: G. McVey
DATE: June 1998

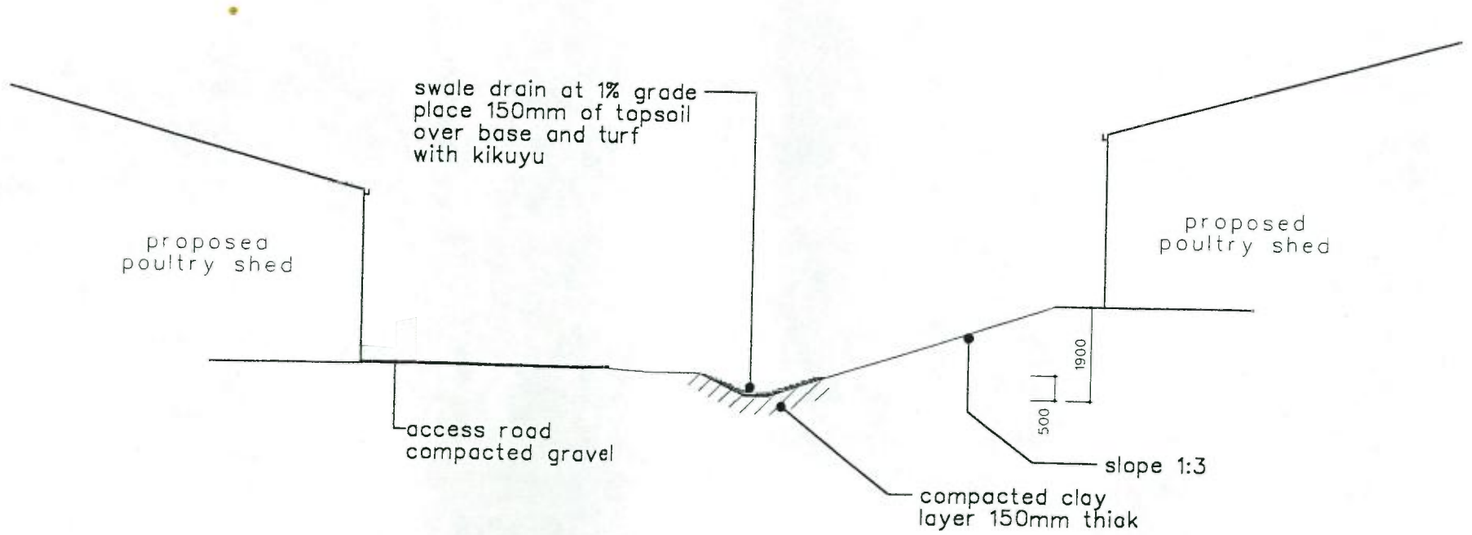
Confirm all dimensions on site prior to start of construction. Use figured dimensions in preference to scaling.

All dimensions in millimetres unless stated otherwise.

PLAN NUMBER:
981723-01



average fall of site 5 %



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PLAN
SECTION
PROJECT
PROPOSED POULTRY SHEDS
J. VASSILIADIS
LOCATION
RMB 4410 KIRKS ROAD
MANGROVE MOUNTAIN

SCALE: 500
DRAWN: A. McVey
CHECKED: G. McVey
DATE: December 1998

Confirm all dimensions on site prior to start of construction. Use figured dimensions in preference to scaling.

All dimensions in millimetres unless stated otherwise.

PLAN NUMBER:
981723 02

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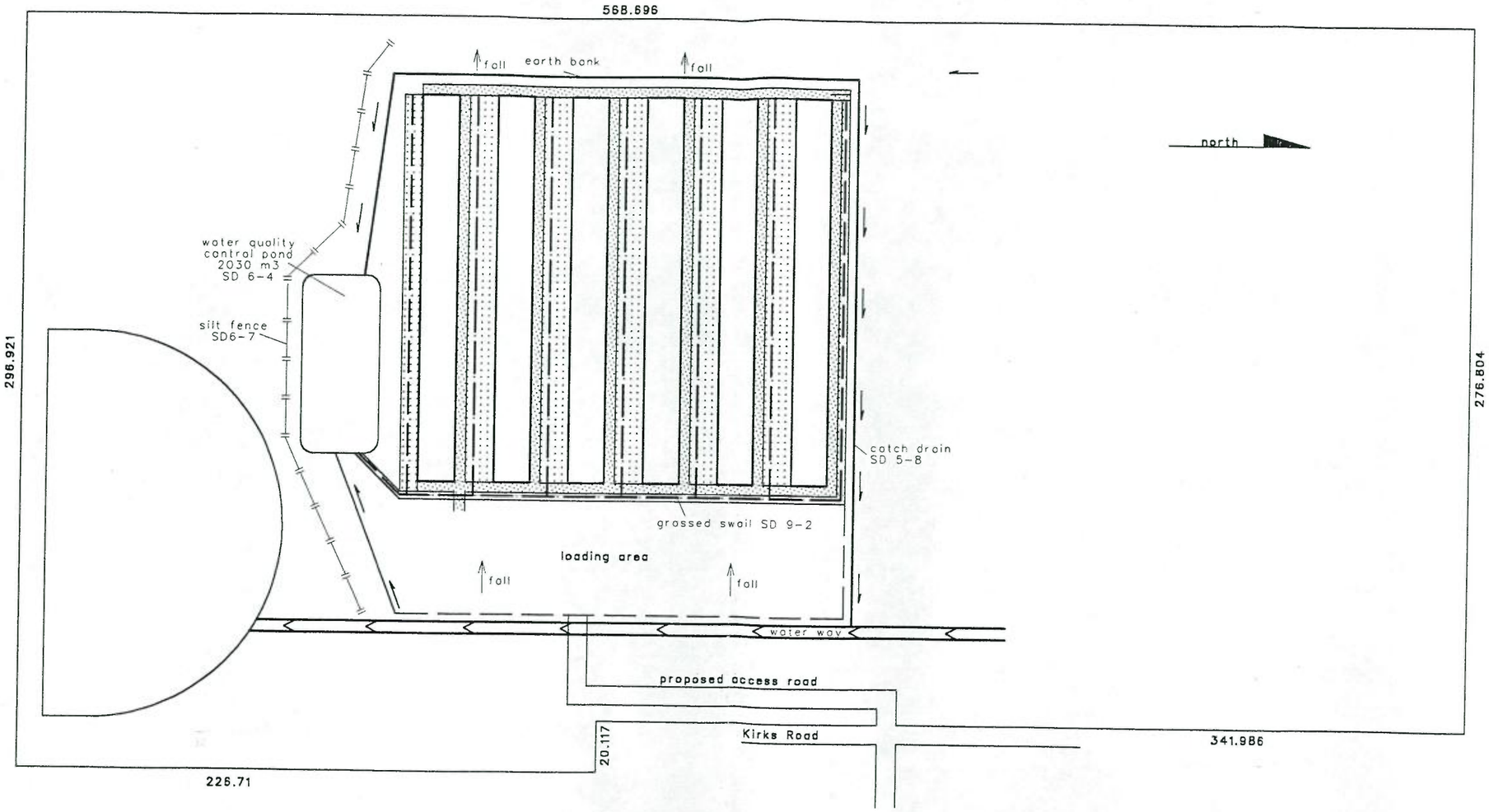

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PLAN
EROSION & SEDIMENT CONTROL PLAN

PROJECT
PROPOSED POULTRY SHEDS
J. VASSILIADIS

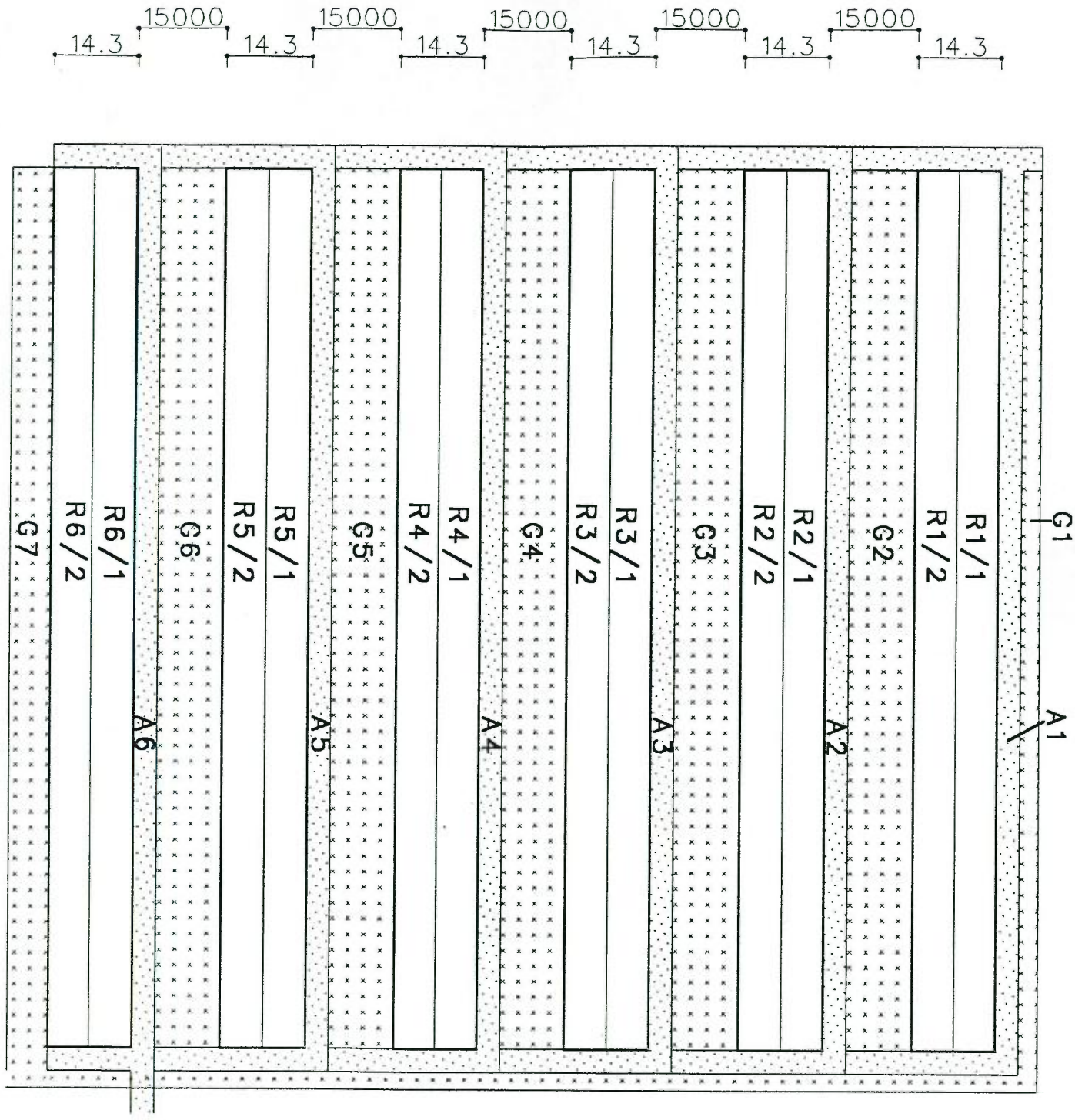
LOCATION
RMB 4410 KIRKS RD.
MANGROVE MOUNTAIN

SCALE: 1:2000
DRAWN: A.McVey
CHECKED: G. McVey
DATE: June 1998

Confirm all dimensions on site prior to start of construction. Use figured dimensions in preference to scaling.

All dimensions in millimetres unless stated otherwise.

PLAN NUMBER:
981723-03



Morse McVey

& Associates Pty Ltd

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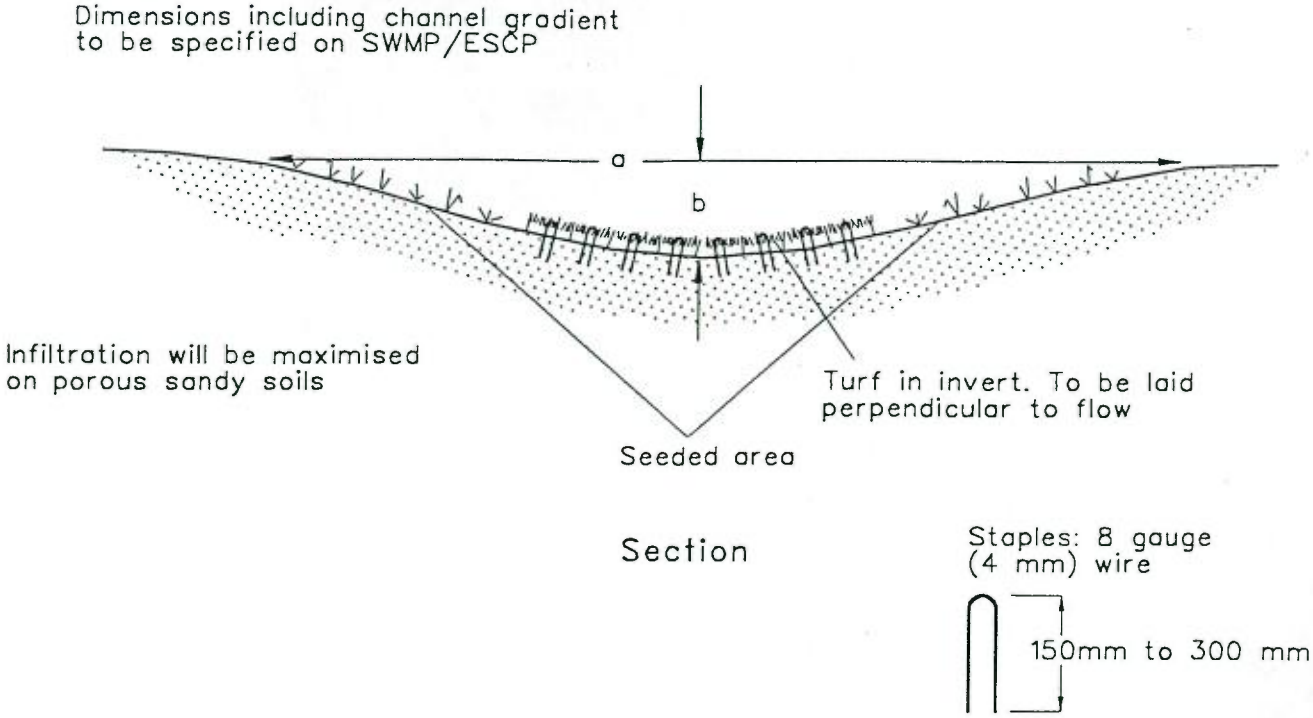
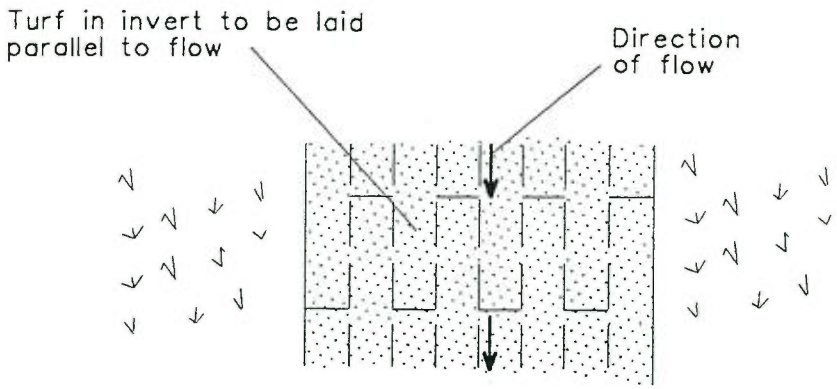
PLAN
AREA LAYOUT
PROJECT
PROPOSEDPOULTRY SHEDS
J. VASSILIADIS
LOCATION
RMB 4410 KIRKS RD.
MANGROVE MOUNTAIN

SCALE: 1:1000 PLAN NUMBER: 981723-0/



Section

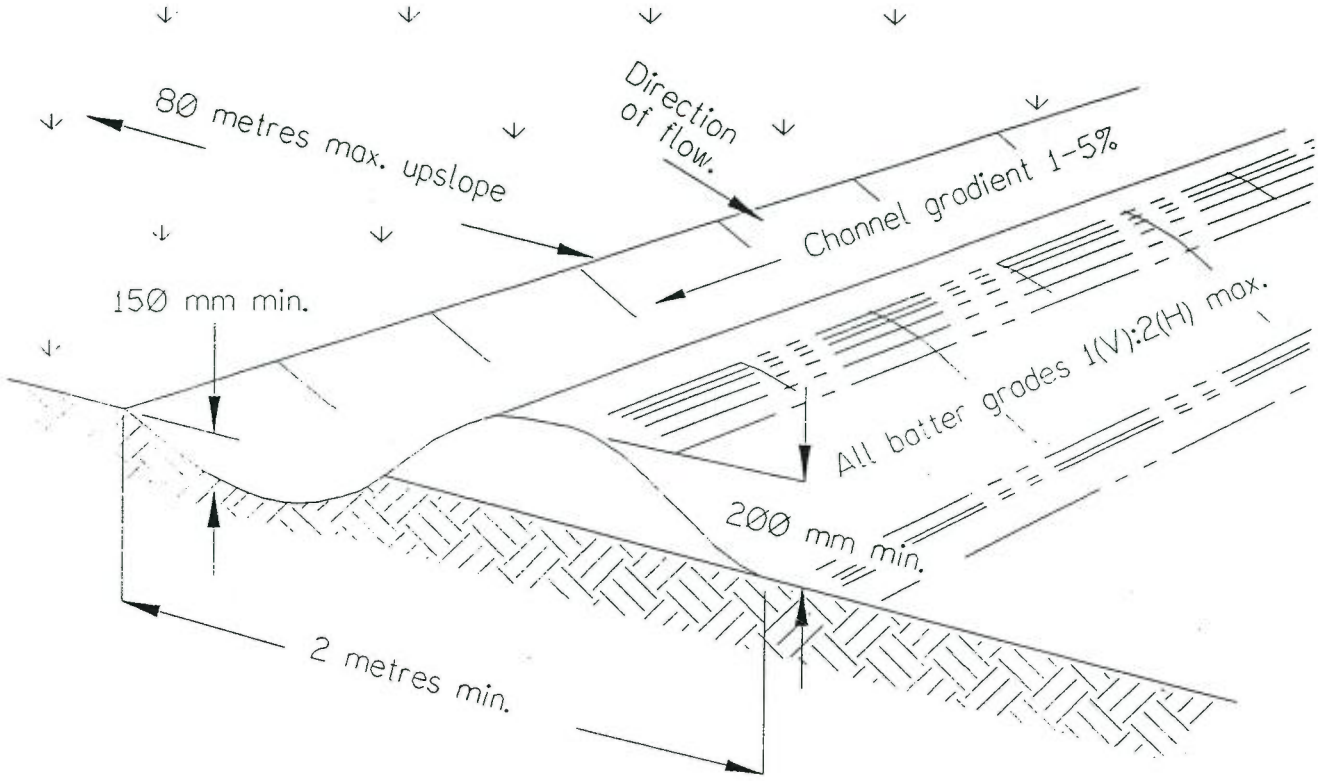


Plan

NOTE: This practice can only be used to treat runoff free of sediment.

Construction Notes

1. Ensure that sufficient upstream site work practices are in place to ensure that sediment is unlikely to reach the swale.
2. Remove topsoil and stockpile outside swale area.
3. Form a shallow depression as shown on the SWMP/ESCP ensuring that its grade does not exceed 5 per cent and sideslopes do not exceed 30 per cent.
4. Prepare seedbed and sow seed in accordance with Standard Drawing 4-3.
5. Turf the invert as specified in the SWMP/ESCP.
6. Pin turf through topsoil to natural ground at 1 pin per square metre.
7. Fertilise and irrigate frequently for two months to establish vigorous ground cover.

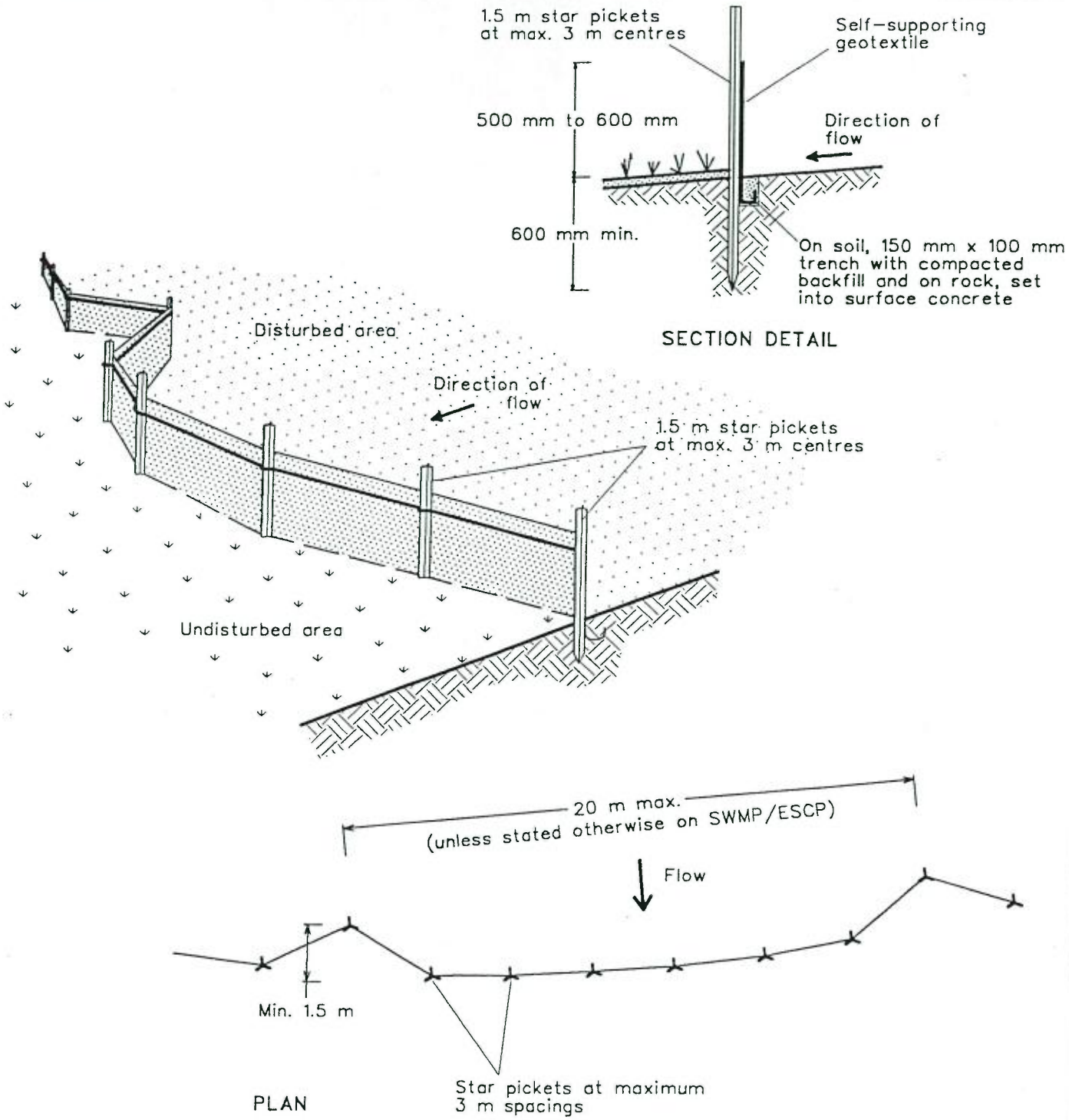


NOTE: Only to be used as temporary bank where max. upslope length is 80 metres.

Construction Notes

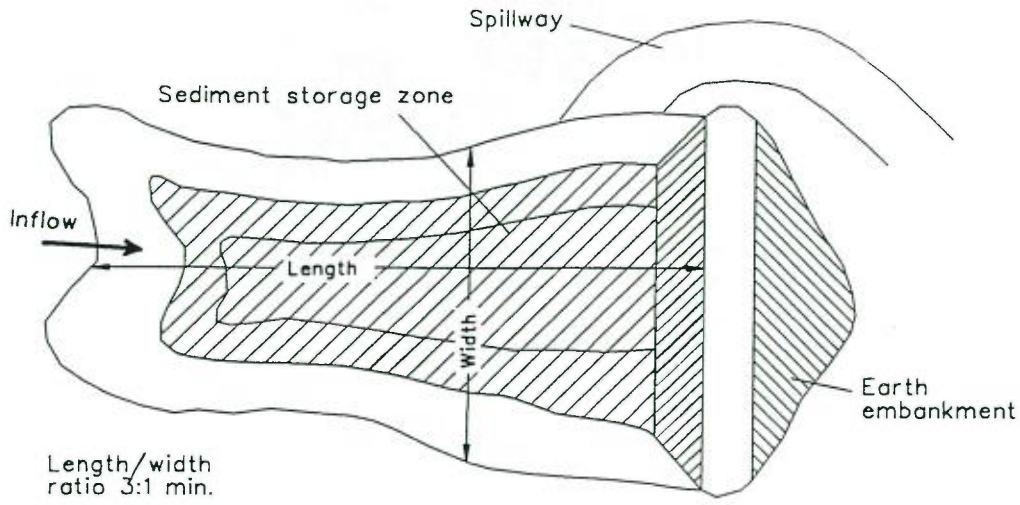
1. Construct along gradient as specified.
2. Maximum spacing between banks shall be 80 metres.
3. Drains to be of parabolic or trapezoidal cross section not V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Construction is of a temporary nature and shall be completed at the end a days work or immediately prior to rain.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.

CATCH DRAINS SD 5-8

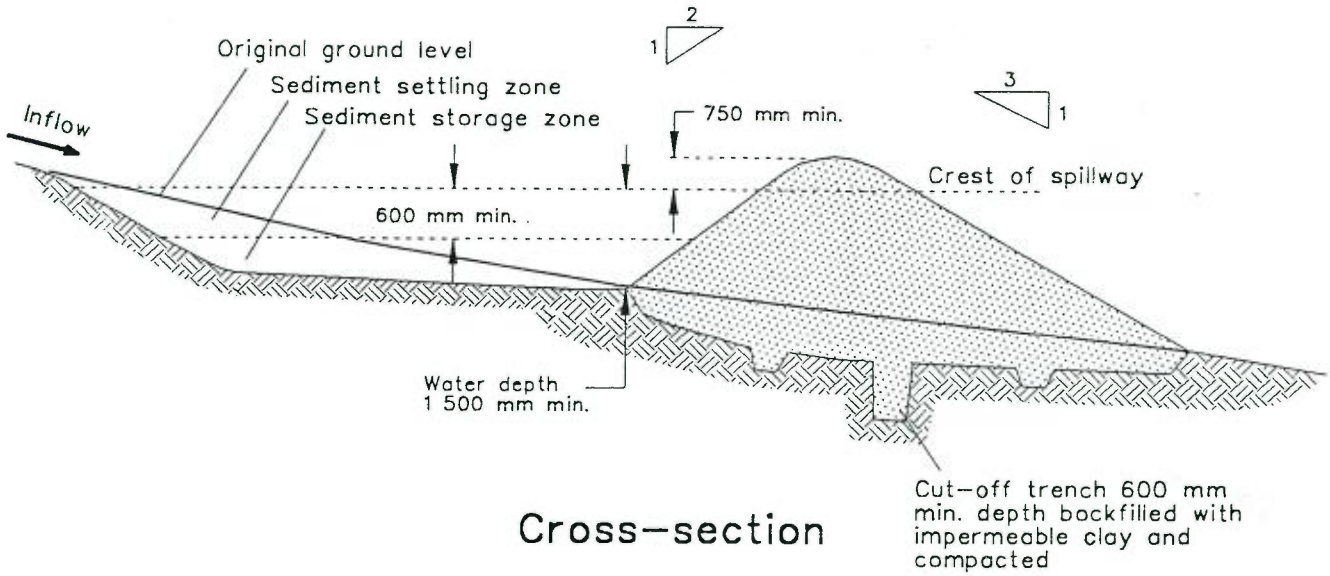


Construction Notes

1. Construct sediment fence as close as possible to parallel to the contours of the site.
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150 mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
4. Backfill trench over base of fabric.
5. Fix self-supporting geotextile to upslope side of posts with wire ties or as recommended by geotextile manufacturer.
6. Join sections of fabric at a support post with a 150 mm overlap.



Plan View



Cross-section

Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1 200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill according to the directions of the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping at least 100 mm deep to help bond compacted fill to existing substrate.
6. Spread fill in 100 mm to 150 mm layers and compact at optimum moisture content in accordance with the SWMP.
7. Construct emergency spillway.
8. Rehabilitate structure in accordance with the SWMP.
9. Place a "Full of Sediment" marker to show when less than design capacity occurs and sediment removal is required.

EARTH BASIN - WET

(APPLIES TO *TYPE D* AND *TYPE F* SOILS ONLY)

SD 6-4

APPENDIX 4

POTENTIAL IMPACTS ON GROUNDWATER ASSESSMENT SYDNEY GROUNDWATER COMPANY

SYDNEY GROUNDWATER COMPANY

ENVIRONMENTAL ASSESSMENTS & MANAGEMENT OF CONTAMINATED SITES

Your Ref:
Our Ref: E147.2
Date: 23/12/98

The Manager
Conacher Travers
70 Hills Street
GOSFORD NSW 2250

ATTENTION: MR PHIL CONACHER

Dear Sir,

RE: EIS FOR THE DEVELOPMENT OF THE PROPOSED POULTRY SHEDS AT LOT 146 DP 795253 KIRKS ROAD, MANGROVE MOUNTAIN, NSW

1.0 Introduction

We are pleased to provide our groundwater impact assessment for the above proposed development. Our comments are based on a review of the following information:

- the Kulnura - Mangrove Mountain Policy for Groundwater Resource Management prepared by the Department of Land and Water Conservation (DLWC);
- topographic survey and proposed development plans of the site;
- Mangrove Sheet 9131-3-N, 2nd Edn., topographic map 1:25,000 scale, published by NSW Department of Lands (1982);
- Sydney Sheet S1 56 - 5 geological map 1:250,000 scale, published by the Geological Survey of NSW (1961);
- groundwater bore data provided by the DLWC for registered water supply bores within a 1km and 2km radius of the site; and
- technical details of chemicals proposed for use on the site.

It is understood that a Stormwater and Nutrient Management Plan is currently being prepared for the proposed development and that this will be presented as part of the Environmental Impact Statement.

2.0 Regional Hydrogeology and Site Groundwater Conditions

Groundwater in the Mangrove Mountain area occurs within the fractured bedrock aquifer of the Hawkesbury Sandstone Formation. A review of DLWC groundwater data for registered

Sydney Groundwater Company Pty. Ltd.
A.C.N. 082 966 943
P.O. Box 75 Kogarah NSW 1485 ◆ 3 Fairway Avenue Kogarah NSW 2217 AUSTRALIA
Tel (02) 9553-1434 Fax (02) 9587-7810 Mobile 0419-875 252 E-mail sydgro@zip.com.au

water supply bores within 2km of the site showed that local bores have intersected water bearing zones at depths ranging between 14.3m and 81m below ground level (BGL) resulting in standing groundwater levels between 6m to 26m BGL.

Bore summaries for all bores within a 2km radius of the site are presented in Appendix A and bore locations are illustrated on Figure 1.

The two nearest bores to the site (Bore Nos. GW046765 and GW064503) are registered for stock and domestic use and are located approximately 375m north and 300m northeast of the proposed poultry sheds, respectively. According to the DLWC database, these bores intersected groundwater in fractured sandstone at 32m and at 14m BGL respectively.

Groundwater salinity for bores drilled in this area is described as 'good' to 'fresh' suggesting low salinities of less than 500mg/L total dissolved salts (TDS), which would account for the fact that many local bores are registered for domestic use.

Well yields range from as low as 0.33 L/sec to as high as 4.17 L/sec; however, yields of less than 1 L/sec are generally obtained in this area, which is typical of fractured bedrock aquifer conditions.

Groundwater recharge is by infiltration of rainfall or irrigation waters through the sandy topsoil, or directly through near-surface or outcropping sandstone bedrock. Groundwater discharge mechanisms include spring flow (as is likely to be occurring in nearby groundwater fed dams), base flow to creeks and groundwater pumping from water supply bores.

Local groundwater flow directions have not been confirmed, but are expected to reflect ground topography, which slopes gently (around 4% gradient) south toward a small creek, which begins at the southern end of the site. A retention pond is proposed for runoff disposal purposes at this part of the site and this will be discussed in more detail in Section 4.0.

3.0 Groundwater Usage

The DLWC bore data search indicated 18 registered water supply bores within 2km of the site, 8 of which are within a 1km radius. Bore records show that 14 out of the 18 bores are authorised (or intended) for domestic use, bore GW038351 is authorised for stock watering and farming use, while bores GW066452, GW066453 and GW066454, are undefined with regards to their purpose.

The site is located within Sub-Zone 2 of Groundwater Management Area (GWMA) 603/1 as designated by the DLWC (Ref. DLWC 1996) and is therefore subject to groundwater usage restrictions. It is understood that the total site area is approximately 16.2 hectares and the proposed development will occupy approximately 3.4 hectares (21% of the site) as illustrated in Figure 2. Under the GWMA plan, the total groundwater usage from all water supply bores drilled on the site will be allocated a ceiling of 8.1ML/yr, applying the new allocation factor of 0.5ML/Ha/yr to the total site area.

4.0 Groundwater Impacts and Proposed Protection Measures

The main potential sources of groundwater impact from the proposed development are:

- sediment and nutrients released due to site disturbance during the construction phase and subsequent stormwater flows;
- chemicals used to disinfect the sheds during normal operations;
- chemicals that may be contained in the stock feed; and
- animal wastes.

The construction phase may involve cutting into the slope to produce a level surface for the shed; however, the exposed surface will be lined with clay to form a low permeability base to the poultry sheds. The shed floors will be further stabilised and sealed with the use of a recognised industrial stabilizer *(Weslig 120)* which is designed to bind the clay floor to produce a hard, tight surface.

Disinfection of the shed floors during commercial operations will involve spraying with mixtures of *Farm Clean* (a liquid detergent composed of alkaline salts) and Glutaplus (a broad spectrum liquid sanitiser, which contains glutaraldehyde and quaternary ammonium compounds, and is biodegradable).

To avoid overwetting of shed floors and runoff production, shed disinfection will be by means of a low volume, high pressure spray system that produces a damp floor condition.

It is understood that a comprehensive drainage, sediment and nutrient control strategy for the site is detailed in separate Appendix to the EIS. It is also understood that animal wastes will be removed from the site by an authorised contractor to avoid stockpiling on-site. Dead birds will be placed in a sealed and weatherproof chicken composter.

A retention pond is proposed for runoff disposal purposes at the southern part of the site prior to the stream, design details for which are covered under the proposed Stormwater and Nutrient Management Plan. As groundwater quality in the area is known to be relatively good with a significant proportion of local bores utilising this resource for domestic purposes, it is proposed that the runoff disposal area and associated drainage trenches be lined with a minimum of 100mm to 150mm of clay, in order to minimise downward infiltration.

5.0 Conclusions and Recommendations

It is concluded that the proposed design and operation of the sheds will provide adequate protection from downward infiltration of chemicals. Given the relatively high quality of the groundwater resource in the area, however, it is recommended that drainage and runoff disposal areas be lined with a minimum of 100mm to 150mm of clay in order to minimise downward infiltration.

Assuming that the groundwater withdrawals from any additional water supply bores does not exceed the allocation set by the DLWC, then no adverse impacts on local water supply bores are expected from the proposed development.

If you require further information or clarification regarding any aspect of this report, please contact Ben Kendon or the undersigned.

For and behalf of
SYDNEY GROUND WATER COMPANY PTY LTD

Nik Kontos
Principal Environmental Hydrogeologist

Attach.

Figure 1. Water Bore Location Plan
Figure 2. Topographic Site Plan (Proposed Development)
Appendix A. DLWC Bore Data for Registered Bores within 2km of the Site

REFERENCES

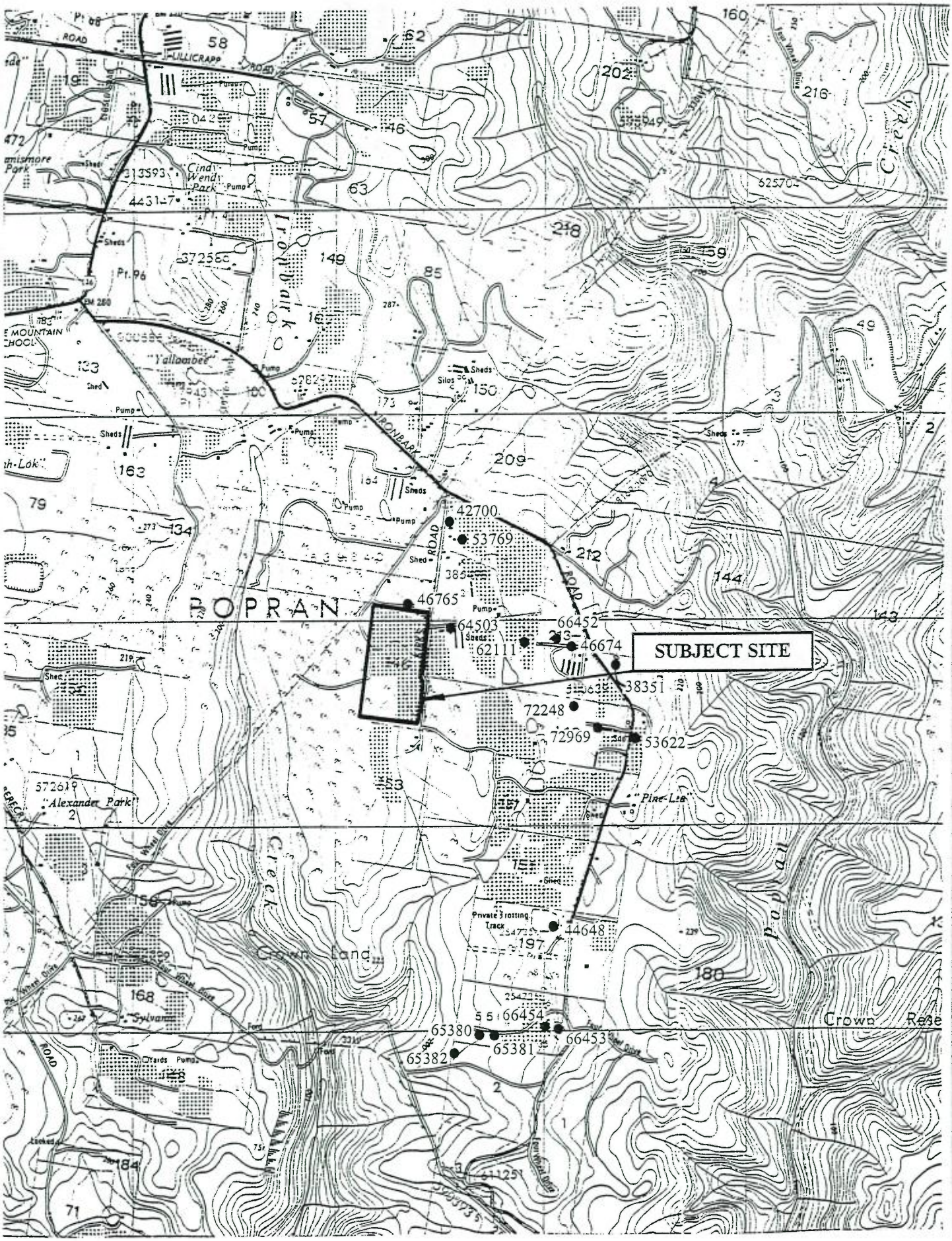
DLWC (1996) Managing the Groundwater Resources of the Hawkesbury Sandstone, Kulnura-Mangrove Mountain - Licensing Policy, Department of Land and Water Conservation, TS 95.067.

Bryan, J.H. (1965) *1:250,000 Geological Series Map, Sydney Sheet SI 56 - 5,* published by the Geological Survey of NSW, Department of Mines.

Land and Information Center (1982*) 1:25,000 Topographic Map, Mangrove Sheet 9131-3-N,* 2nd Edn., NSW Department of Lands.

FIGURE 1

GROUNDWATER SUPPLY BORE LOCATION PLAN
(From DLWC Boremaster Database)



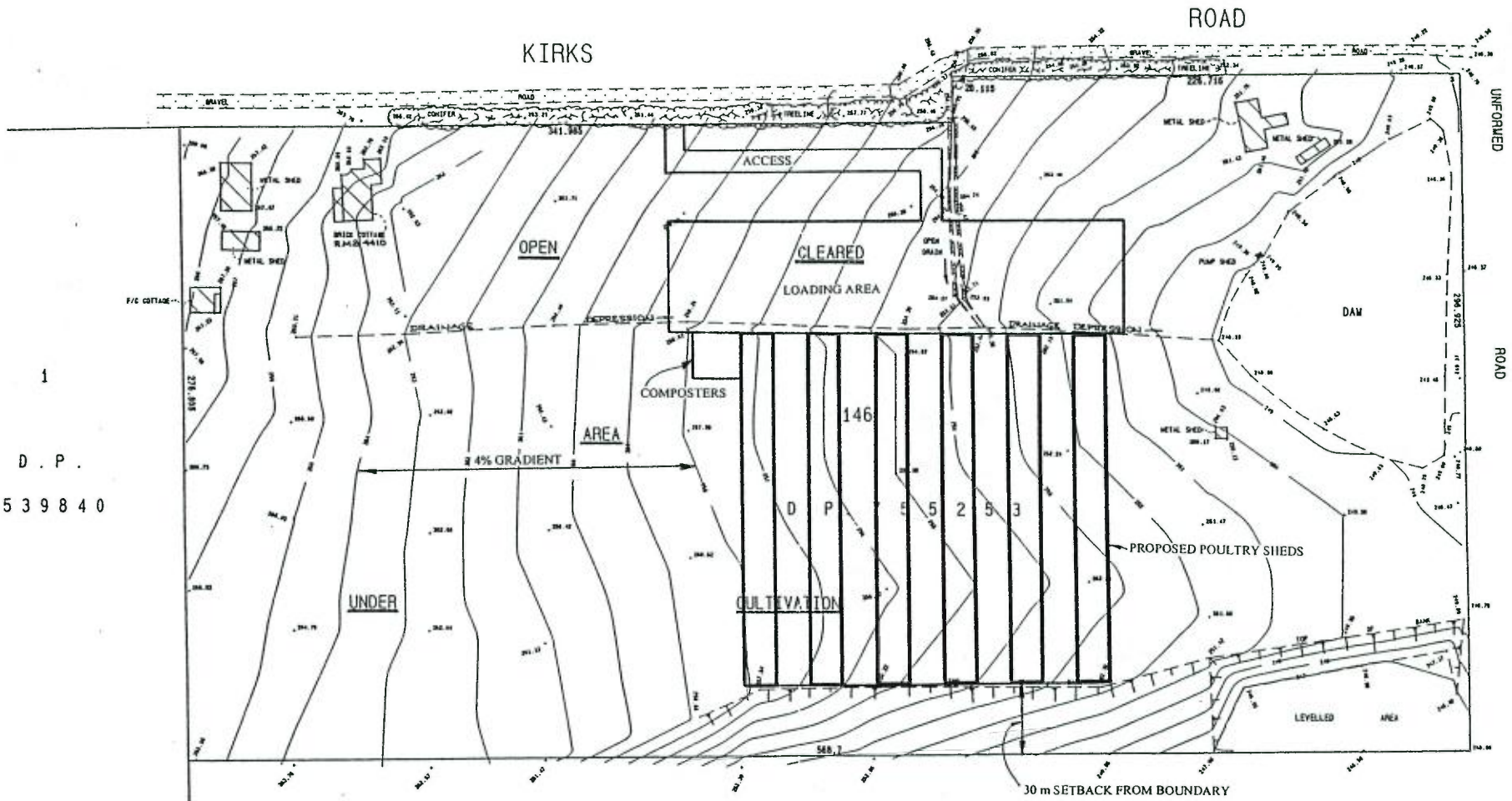
N

SCALE 1:25,000
CONTOUR INTERVAL 10 METRES

Figure 1
Water Bore Location Plan

FIGURE 2

TOPOGRAPHIC SITE PLAN
(Proposed Development)



NOTE : RELATIONSHIP OF IMPROVEMENTS TO BOUNDARIES IS APPROXIMATE ONLY.

NOTE : A.H.D. SCALED FROM CMA MAP - MANGROVE 9131-3-N.

0 50
m

Figure 2
Topographic Site Plan

STEPHEN THORNE & ASSOCIATES PTY.LTD
REGISTERED SURVEYORS

SUITE 8 No. 42 MANN STREET, GOSFORD 2250
TELEPHONE (02) 4323 1255 FAX (02) 4324 2226

SITE DETAIL PLAN
LOT 146 IN D.P. 755253
RMB 4410 KIRKS ROAD, MANGROVE MOUNTAIN

DATE	SCALE	LEVEL DATUM	DRAWING No.
DEC. 98		SCALED A.H.D.	3348

APPENDIX A

DLWC BORE DATA FOR REGISTERED BORES WITHIN 2km OF THE SITE

Date/Time: 04-Jan-1999 12:29 PM
User: SYDNEY
Report: RMGW001D.QRP
Executable: S:\G5\PROD\GROUND.EXE
Exe Date: 09-Oct-1998
System: Groundwater
Database: S_coast

LAND & WATER CONSERVATION

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW038351

Converted From HYDSYS

License : 10BL100024

	Authorised Purpose(s)	Intended Purpose(s)
	STOCK	FARMING

Work Type : Bore open thru rock
Work Status: (Unknown)
Construct. Method: Rotary Air
Owner Type : Private

Commenced Date :
Completion Date : 01-May-1974
Final Depth : 60.90 m
Drilled Depth : 61.00 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	DP510639 (154)
Licensed:	NORTHUMBERLAND	POPRAN	DP510639 (154)

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6308740
Easting : 332420
Latitude (S) : 33° 20' 51"
Longitude (E) : 151° 11' 57"

GS Map : 0055A2
AMG Zone: 56
Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	9.70	127			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
16.70	16.70	0.00	Consolidated	8.20		0.08			(Unknown)
22.50	22.50	0.00	Consolidated	7.90		0.23			(Unknown)
36.20	36.20	0.00	Consolidated	14.90		0.38			(Unknown)
45.10	45.10	0.00	Consolidated	14.90		0.91			(Unknown)

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.21	1.21	Soil Clay	Soil	
0.00	1.21	1.21	Ironstone Floater	Ironstone	
1.21	4.57	3.36	Sandstone	Sandstone	
4.57	5.79	1.22	Clay	Clay	
5.79	21.33	15.54	Sandstone Water Supply	Sandstone	
21.33	21.94	0.61	Ironstone	Ironstone	
21.94	58.52	36.58	Sandstone Water Supply	Sandstone	
58.52	59.43	0.91	Shale	Shale	
59.43	60.96	1.53	Sandstone	Sandstone	

Remarks

***** End of GW038351 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW042700 *Converted From HYDSYS*

License : 10BL141824

	Authorised Purpose(s)	Intended Purpose(s)
	DOMESTIC	IRRIGATION

Work Type : Bore open thru rock
Work Status: (Unknown)
Construct. Method: Rotary
Owner Type : Private

Commenced Date :
Completion Date : 01-Jul-1976
Final Depth : 52.00 m
Drilled Depth : 52.00 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA
Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	80
Licensed:	NORTHUMBERLAND	POPRAN	PT80

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:
CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)
Northing : 6309424
Easting : 331594
Latitude (S) : 33° 20' 28"
Longitude (E) : 151° 11' 25"

GS Map : 0055A2 **AMG Zone:** 56
Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	9.70	139			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
24.00	24.30	0.30	Consolidated	9.60		2.02			Good
36.00	36.30	0.30	Consolidated	9.60		3.16			Good
39.90	39.90	0.00	Consolidated	9.60		4.17			Good

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.50	4.50	Soil Clay	Soil	
0.00	4.50	4.50	Floater Ironstone Water Supply	Floater	
4.50	7.60	3.10	Sandstone Soft	Sandstone	
7.60	52.00	44.40	Sandstone	Sandstone	

Remarks

*** End of GW042700 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW044648 *Converted From HYDSYS*

License : 10BL108820

Work Type : Bore open thru rock
Work Status: (Unknown)
Construct. Method: Rotary Air
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	DOMESTIC
IRRIGATION	STOCK
STOCK	

Commenced Date :
Completion Date : 01-Jan-1976
Final Depth : 77.70 m
Drilled Depth : 77.70 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	197
Licensed:	NORTHUMBERLAND	POPRAN	197

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6307475
Easting : 332035

Latitude (S) : 33° 21' 31"
Longitude (E) : 151° 11' 41"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Concrete	0.00	0.40	141			(Unknown)
1	1	Casing	P.V.C.	0.00	6.00	141			Cemented

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.00	35.20	0.20	(Unknown)			0.08			Good
42.00	42.10	0.10	(Unknown)	15.70		0.25			Good
53.30	53.70	0.40	(Unknown)	15.70		0.38			Good

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Clay Stones	Clay	
1.00	64.00	63.00	Sandstone Water Supply	Sandstone	
64.00	65.30	1.30	Shale	Shale	
65.30	77.70	12.40	Sandstone	Sandstone	

Remarks

***** End of GW044648 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW046674 *Converted From HYDSYS*

License : 10BL105965

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	FARMING
Work Status: (Unknown)	STOCK	
Construct. Method: Rotary Air		
Owner Type : Private		

Commenced Date : **Final Depth :** 47.20 m
Completion Date : 01-Feb-1977 **Drilled Depth :** 47.20 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	154
Licensed:	NORTHUMBERLAND	POPRAN	LOT1 DP510639

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6308818 **Latitude (S) :** 33° 20' 48"
Easting : 332192 **Longitude (E) :** 151° 11' 48"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	6.00	140			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.90	23.00	0.10	Consolidated	10.90		0.37			Good
32.00	41.00	9.00	Consolidated	10.90		0.75			(Unknown)

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.82	1.82	Soil Clay	Soil	
0.00	1.82	1.82	Ironstone Floater	Ironstone	
1.82	3.20	1.38	Sandstone Soft	Sandstone	
3.20	4.00	0.80	Clay	Clay	
4.00	47.20	43.20	Sandstone Water Supply	Sandstone	

Remarks

*** End of GW046674 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW046765 *Converted From HYDSYS*

License : 10BL105925

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	DOMESTIC
Work Status: (Unknown)	STOCK	
Construct. Method: Rotary Air		
Owner Type : Private		

Commenced Date : **Final Depth :** 60.40 m
Completion Date : 01-Jul-1977 **Drilled Depth :** 60.40 m

Contractor Name :
Driller :

Property : **Standing Water Level :**
GWMA : 603 - SYDNEY BASIN **Salinity :** Good
GW Zone : 001 - MANGROVE MT.-KULNURA **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	146
Licensed:	NORTHUMBERLAND	POPRAN	146

Region: 10 - SYDNEY SOUTH COAST **CMA Map :** 9131-3N MANGROVE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District:

Elevation : **Northing :** 6309008 **Latitude (S) :** 33° 20' 41"
Elevation Source: (Unknown) **Easting :** 331378 **Longitude (E) :** 151° 11' 17"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	19.80	137			Cemented at Shoe

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
32.00	32.10	0.10	(Unknown)			0.25			(Unknown)
51.80	51.90	0.10	(Unknown)			0.70			(Unknown)

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	Soil	Soil	
3.00	17.00	14.00	Clay Soft Sandstone Interlayere	Clay	
17.00	60.40	43.40	Sandstone Shale Interlayere Water Supply	Sandstone	

Remarks

***** End of GW046765 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW047009 *Converted From HYDSYS*

License : 10BL158337

Work Type : Bore open thru rock
Work Status: (Unknown)
Construct. Method: Rotary Air
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	IRRIGATION
STOCK	

Commenced Date :
Completion Date : 01-Dec-1977
Final Depth : 91.50 m
Drilled Depth : 91.50 m

Contractor Name :
Driller :

Property : - N/A
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	148
Licensed:	NORTHUMBERLAND	POPRAN	148

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6306965
Easting : 329876

Latitude (S) : 33° 21' 47"
Longitude (E) : 151° 10' 17"

GS Map : 0055A2 **AMG Zone:** 56

Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	6.00	137			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
27.00	28.00	1.00	(Unknown)	14.00		0.08			Good
61.00	62.00	1.00	(Unknown)	14.00		0.25			Good
69.00	70.00	1.00	(Unknown)	14.00		0.33			Good

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.60	0.60	Soil	Soil	
0.60	27.00	26.40	Sandstone Layer	Sandstone	
27.00	28.00	1.00	Water Supply	(Unknown)	
28.00	61.00	33.00	Sandstone Shale Interlayere	Sandstone	
61.00	91.50	30.50	Water Supply	(Unknown)	

Remarks

License No. 106899 has now been cancelled, replaced by 10bl158337

***** End of GW047009 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW053622 *Converted From HYDSYS*

License : 10BL121183

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	IRRIGATION
Work Status: (Unknown)	IRRIGATION	
Construct. Method: Rotary Air	STOCK	
Owner Type : Private		

Commenced Date : **Final Depth :** 84.00 m
Completion Date : 01-Aug-1981 **Drilled Depth :** 84.00 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	L2 DP510639 (154)
Licensed:	NORTHUMBERLAND	POPRAN	NOT AVAILABLE

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6308495 **Latitude (S) :** 33° 20' 59"
Easting : 332460 **Longitude (E) :** 151° 11' 58"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;DD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	6.00	150			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
30.00	31.00	1.00	Consolidated	23.00		0.13			Good
60.00	61.00	1.00	Consolidated	23.00		0.13			Good
80.00	81.00	1.00	Consolidated	23.00		0.06			Good

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Soil	Soil	
1.00	3.00	2.00	Clay	Clay	
3.00	57.00	54.00	Sandstone Water Supply	Sandstone	
57.00	60.00	3.00	Shale	Shale	
60.00	84.00	24.00	Sandstone Water Supply	Sandstone	

Remarks

***** End of GW053622 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW053769 *Converted From HYDSYS*

License : 10BL138325

	Authorised Purpose(s)	Intended Purpose(s)
	DOMESTIC	IRRIGATION

Work Type : Bore open thru rock
Work Status: (Unknown)
Construct. Method: Rotary Air
Owner Type : Private

Commenced Date :
Completion Date : 01-Oct-1981
Final Depth : 114.00 m
Drilled Depth : 114.00 m

Contractor Name :
Driller :

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	80
Licensed:	NORTHUMBERLAND	POPRAN	PT80

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6309435
Easting : 331615

Latitude (S) : 33° 20' 28"
Longitude (E) : 151° 11' 26"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	15.00	150			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
36.00	38.00	2.00	Consolidated			0.32			(Unknown)
60.00	80.00	20.00	(Unknown)			0.44			(Unknown)

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Soil	Soil	
2.00	42.00	40.00	Sandstone Water Supply	Sandstone	
42.00	44.00	2.00	Shale	Shale	
44.00	60.00	16.00	Sandstone	Sandstone	
60.00	114.00	54.00	Shale Sandstone Interlayere Water Supply	Shale	

Remarks

*** End of GW053769 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW062711 *Converted From HYDSYS*

License : 10BL134589

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	DOMESTIC
Work Status: (Unknown)	STOCK	STOCK
Construct. Method: Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 46.00 m
Completion Date : 01-Jun-1986 **Drilled Depth :** 46.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans

Property :
GWMA : - SYDNEY BASIN **Standing Water Level :**
GW Zone : - MANGROVE MT.-KULNURA **Salinity :** Fresh
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	L154 DP510639 (154)
Licensed:	NORTHUMBERLAND	POPRAN	154

Region: 10 - SYDNEY SOUTH COAST **CMA Map :** 9131-3N MANGROVE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District:

Elevation : **Northing :** 6308838 **Latitude (S) :** 33° 20' 47"
Elevation Source: (Unknown) **Easting :** 331988 **Longitude (E) :** 151° 11' 40"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Welded Steel	-0.20	4.60	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.80	23.30	0.50	Consolidated			0.10			Fresh
29.10	29.40	0.30	Consolidated			0.30			Fresh
40.50	41.10	0.60	Consolidated	6.00		1.10			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.20	1.20	Soil Sandy	Soil	
1.20	1.80	0.60	Gravel	Gravel	
1.80	2.70	0.90	Shale Some Clay	Shale	
2.70	4.30	1.60	Sandstone Yellow Silty	Sandstone	
4.30	16.50	12.20	Sandstone Yellow	Sandstone	
16.50	23.30	6.80	Sandstone Grey Water Supply	Sandstone	
23.30	46.00	22.70	Sandstone Black Yellow	Sandstone	

Remarks

***** End of GW062711 *****

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW064503 *Converted From HYDSYS*

License : 10BL136716

	Authorised Purpose(s)	Intended Purpose(s)
	DOMESTIC	DOMESTIC
	STOCK	STOCK

Work Type : Bore
Work Status: (Unknown)
Construct. Method: Cable Tool
Owner Type : Private

Commenced Date :
Completion Date : 01-Sep-1987
Final Depth : 42.00 m
Drilled Depth : 42.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans

Property :
GWMA : 603 - SYDNEY BASIN
GW Zone : 001 - MANGROVE MT.-KULNURA

Standing Water Level :
Salinity : Fresh
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	L3 (80)
Licensed:	NORTHUMBERLAND	POPRAN	LT3 PT80

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source: (Unknown)

Northing : 6308930
Easting : 331580

Latitude (S) : 33° 20' 44"
Longitude (E) : 151° 11' 24"

GS Map : 0055A2 **AMG Zone:** 56

Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Steel	-0.30	10.70	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.50	14.70	0.20	Consolidated	6.00		0.10			Fresh
28.10	28.90	0.80	Consolidated	6.00		0.30			Fresh
33.80	34.20	0.40	Consolidated	8.00		0.60			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.80	0.80	Topsoil	Topsoil	
0.80	2.70	1.90	Sand Gravel	Sand	
2.70	9.10	6.40	Sandstone Yellow Silty	Sandstone	
9.10	14.50	5.40	Sandstone Yellow	Sandstone	
14.50	14.70	0.20	Sandstone Yellow Water Bearing Water Supply	Sandstone	
14.70	28.10	13.40	Sandstone Yellow	Sandstone	
28.10	28.90	0.80	Sandstone Water Bearing Water Supply	Sandstone	
28.90	33.80	4.90	Sandstone Yellow	Sandstone	
33.80	34.20	0.40	Sandstone Yellow Water Bearing Water Supply	Sandstone	
34.20	38.50	4.30	Sandstone Yellow	Sandstone	
38.50	39.80	1.30	Clay Shale	Clay	
39.80	40.50	0.70	Sandstone	Sandstone	
40.50	42.00	1.50	Sandstone Yellow	Sandstone	

Remarks

*** End of GW064503 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW065380 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock		DOMESTIC
Work Status:		STOCK
Construct. Method: Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 47.00 m
Completion Date : 18-Aug-1988 **Drilled Depth :** 0.00

Contractor Name :
Driller : 1435 ISELT, John Hans

Property : **Standing Water Level :**
GWMA : **Salinity :** Fresh
GW Zone : **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A:	NORTHUMBERLAND	POPRAN	198
Licensed:			

Region: 10 - SYDNEY SOUTH COAST **CMA Map :** 9131-3N MANGROVE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District:

Elevation : 0.00 **Northing :** 6306962 **Latitude (S) :** 33° 21' 48"
Elevation Source: **Easting :** 331740 **Longitude (E) :** 151° 11' 29"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Steel	-0.30	6.20	152			Driven into Hole
1	1	Casing	Pressure Cemented Casing	0.00	6.20	168			Cemented

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.60	18.80	0.20	Consolidated	16.00		0.10			Fresh
32.40	32.90	0.50	Consolidated	16.00		0.30			Fresh
42.30	43.20	0.90	Consolidated	16.00		0.60			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW065380 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW065381 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock		DOMESTIC
Work Status:		STOCK
Construct. Method: Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 70.00 m
Completion Date : 13-Aug-1988 **Drilled Depth :** 0.00

Contractor Name :
Driller : 1435 ISELT, John Hans

Property : **Standing Water Level :**
GWMA : **Salinity :** Fresh
GW Zone : **Yield :**

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	198
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST **CMA Map :** 9131-3N MANGROVE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District:

Elevation : 0.00 **Northing :** 6306950 **Latitude (S) :** 33° 21' 48"
Elevation Source: **Easting :** 331826 **Longitude (E) :** 151° 11' 33"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Pressure Cemented Casing	0.00	6.20	168			Cemented
1	1	Casing	Steel	0.30	6.80	152			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
16.10	16.90	0.80	Consolidated	6.00		0.20			Fresh
58.30	59.30	1.00	Consolidated	26.00		0.50			Fresh
66.40	66.70	0.30	Consolidated	26.00		0.70			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW065381 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW065382 *Converted From HYDSYS*

License :

		Authorised Purpose(s)	Intended Purpose(s)
Work Type :	Bore open thru rock		DOMESTIC
Work Status:			STOCK
Construct. Method:	Cable Tool		
Owner Type :	Private		

Commenced Date : **Final Depth :** 74.00 m
Completion Date : 09-Aug-1988 **Drilled Depth :** 0.00

Contractor Name :
Driller : 1435 ISELT, John Hans

Property :
GWMA :
GW Zone :

Standing Water Level :
Salinity : Fresh
Yield :

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	198
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation : 0.00
Elevation Source:

Northing : 6306816 **Latitude (S) :** 33° 21' 53"
Easting : 331650 **Longitude (E) :** 151° 11' 26"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Steel	-0.30	6.20	152			Driven into Hole
1	1	Casing	Pressure Cemented Casing	0.00	6.20	168			Cemented

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.30	15.10	0.80	Consolidated	14.00		0.20			Fresh
61.50	62.80	1.30	Consolidated	14.00		0.60			Fresh
70.10	70.40	0.30	Consolidated	14.00		0.80			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW065382 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW066452 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
Work Type :		
Work Status:		
Construct. Method:		
Owner Type :		

Commenced Date : Final Depth :
Completion Date : Drilled Depth :

Contractor Name :
Driller :

Property : Standing Water Level :
GWMA : Salinity :
GW Zone : Yield :

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	212
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map :
Grid Zone : Scale :

Elevation : 280.00 m (A.H.D.)
Elevation Source: Est. Contour 8-15M.

Northing : 6308930
Easting : 332105

Latitude (S) : 33° 20' 44"
Longitude (E) : 151° 11' 45"

GS Map : 005512 AMG Zone: 56

Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	42.70	168			Driven into Hole
1	1	Casing	Poured Concrete	0.00	3.00	0			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.50	18.80	0.30	Consolidated	14.00		0.10			Fresh
41.80	42.10	0.30	Consolidated	14.00		0.25			Fresh
51.90	52.20	0.30	Consolidated	14.00		0.40			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW066452 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW066453 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
Work Type :		
Work Status:		
Construct. Method:		
Owner Type :		

Commenced Date : **Final Depth :**
Completion Date : **Drilled Depth :**

Contractor Name :
Driller :

Property : **Standing Water Level :**
GWMA : **Salinity :**
GW Zone : **Yield :**

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	198
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** **Scale :**
Area / District:

Elevation : 160.00 m (A.H.D.) **Northing :** 6307070 **Latitude (S) :** 33° 21' 45"
Elevation Source: Est. Contour 8-15M. **Easting :** 332085 **Longitude (E) :** 151° 11' 43"

GS Map : 0055A2 **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	4.00	168			Driven into Hole
1	1	Casing	Poured Concrete	0.00	4.00	0			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.10	18.40	0.30	Consolidated	14.00		0.10			Fresh
32.10	32.50	0.40	Consolidated	14.00		0.40			Fresh
41.90	42.50	0.60	Consolidated	14.00		0.70			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW066453 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW066454 *Converted From HYDSYS*

License :

Authorised Purpose(s) | Intended Purpose(s)

Work Type :
Work Status:
Construct. Method:
Owner Type :

Commenced Date : Final Depth :
Completion Date : Drilled Depth :

Contractor Name :
Driller :

Property : Standing Water Level :
GWMA : Salinity :
GW Zone : Yield :

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	198
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map :
Grid Zone : Scale :

Elevation : 245.00 m (A.H.D.)
Elevation Source: Est. Contour 8-15M.

Northing : 6307000
Easting : 332060

Latitude (S) : 33° 21' 47"
Longitude (E) : 151° 11' 42"

GS Map : 0055A2 AMG Zone: 56

Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	5.70	168			Driven into Hole
1	1	Casing	Poured Concrete	0.00	5.70	0			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.80	15.10	0.30	Consolidated	14.00		0.10			Fresh
40.50	41.20	0.70	Consolidated	14.00		0.37			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

*** End of GW066454 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW072248 *Converted From HYDSYS*

License :

		Authorised Purpose(s)	Intended Purpose(s)
Work Type :	Bore		DOMESTIC
Work Status:			FARMING
Construct. Method:	Cable Tool		STOCK
Owner Type :	Private		

Commenced Date : **Final Depth :** 43.00 m
Completion Date : 31-Mar-1994 **Drilled Depth :** 43.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans

Property : **Standing Water Level :**
GWMA : **Salinity :** Fresh
GW Zone : **Yield :**

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	L1 DP510639
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST **CMA Map :** 9131-3N MANGROVE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District:

Elevation : 0.00 **Northing :** 6308668.5 **Latitude (S) :** 33° 20' 53"
Elevation Source: **Easting :** 332208.9 **Longitude (E) :** 151° 11' 49"

GS Map : **AMG Zone:** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.40	5.60	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.80	19.00	0.20	Consolidated	18.00		0.10			Fresh
40.30	40.70	0.40	Consolidated	14.00		0.40			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.40	0.40		Topsoil	
0.40	1.60	1.20	Sandy Clay & Gravel	Clay	
1.60	2.80	1.20		Shale	
2.80	4.50	1.70	Yellow Sandstone	Sandstone	
4.50	18.80	14.30	Brown Sandstone	Sandstone	
18.80	19.00	0.20	Yellow Sandstone W.b	Sandstone	
19.00	39.70	20.70	Yellow Sandstone	Sandstone	
39.70	40.30	0.60		Clay	
40.30	40.70	0.40	Yellow Sandstone W.b	Sandstone	
40.70	43.00	2.30	Yellow Sandstone	Sandstone	

Remarks

ACC = 7

*** End of GW072248 ***

DEPARTMENT OF LAND & WATER CONSERVATION
Work Summary

GW072969 *Converted From HYDSYS*

License :

	Authorised Purpose(s)	Intended Purpose(s)
		DOMESTIC

Work Type : Bore open thru rock
Work Status:
Construct. Method: Cable Tool
Owner Type : Private

Commenced Date : **Final Depth :** 50.00 m
Completion Date : 13-Mar-1995 **Drilled Depth :** 50.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans

Property :
GWMA :
GW Zone :

Standing Water Level :
Salinity : Fresh
Yield :

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
	Form A:	NORTHUMBERLAND	POPRAN	L140 DP755253
	Licensed:			

Region: 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District:

CMA Map : 9131-3N MANGROVE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation : 0.00
Elevation Source:

Northing : 6308529.6 **Latitude (S) :** 33° 20' 57"
Easting : 332340.5 **Longitude (E) :** 151° 11' 54"

GS Map : **AMG Zone:** 56 **Coordinate Source :** GD.,ACC.GIS

Construction

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.30	12.00	160			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
16.50	16.70	0.20	Consolidated	16.00		0.10			Fresh
38.60	38.90	0.30	Consolidated	16.00		0.20			Fresh
44.20	44.50	0.30	Consolidated	14.00		0.35			Fresh

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.40	0.40		Topsoil	
0.40	4.80	4.40	Sandy Loam And Clay	Loam	
4.80	10.60	5.80	Yellow Silty Sandstone	Sandstone	
10.60	16.50	5.90	Yellow Sandstone	Sandstone	
16.50	16.70	0.20	Yellow Sandstone W.b.	Sandstone	
16.70	32.10	15.40	Yellow Sandstone	Sandstone	
32.10	38.60	6.50	Brown Sandstone	Sandstone	
38.60	38.90	0.30	Brown Sandstone W.b.	Sandstone	
38.90	44.20	5.30	Brown Sandstone	Sandstone	
44.20	44.50	0.30	Yellow Sandstone W.b	Sandstone	
44.50	50.00	5.50	Yellow Sandstone	Sandstone	

Remarks

*** End of GW072969 ***

*** End of Report ***

APPENDIX 5

NOISE AND ODOUR EMISSIONS ASSESSMENT
PETER STEPHENSON AND ASSOCIATES PTY LTD

Stephenson

INDUSTRIAL POLLUTION & ENVIRONMENTAL CONTROL

Peter W Stephenson & Associates Pty Ltd
ACN 002 600 528 (Incorporated In NSW)

45 Chandos Street
St Leonards NSW 2065 Australia
Tel: (02) 9438 4399
Fax: (02) 9438 4311

ASSESSMENT OF BOUNDARY NOISE AND ODOUR EMISSIONS EXISTING AND PROPOSED POULTRY FARM SITES MANGROVE MOUNTAIN NSW

PROJECT NO.: 2454/98

DATE: DECEMBER 1998

P. W. STEPHENSON

M. E. KIMBER

K. CHAMPION

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Stephenson and Associates Pty. Limited was requested by Conacher Travers Pty. Limited to assess the sound pressure levels and the odour emissions from an existing poultry farm at Mangrove Mountain referred to in this assessment as Jack Sandy's property and a proposed poultry farm site at 4410 Kirks Road, Mangrove Mountain. This assessment forms part of a Development Application (DA) for the proposed poultry farm.

The objective of this survey was to assess sound pressure and odour emission levels from an existing poultry farm facility and a proposed poultry farm site and subsequently determine compliance with the Noise Control Act 1975 and the Clean Air Act 1961.

The sound pressure level exceeded for 90% of the measurement time ($L_{A90,T}$) was used to represent the background sound pressure level. The EPA currently consider the $L_{A90,T}$ to be the best description of background sound.

As per the EPA approval condition, the sound pressure level exceeded for 10% of the measurement time ($L_{A10,T}$) was used to assess the noise emanating from the existing chicken sheds and their ancillary equipment.

The Site work was conducted on 23 March 1995 for a previous DA at the same site for the proposed poultry farm. (Environmental Impact Statement, Proposed Poultry Sheds Lot 146 DP 755253 Kirks Road Mangrove Mountain, April 1995.)

1.1 DESCRIPTION OF SITE

The location of the test points and the proposed poultry farm are presented in Figure 4.1 and the layout of the proposed poultry farm is presented in 4.2 respectively of section 4.0 of this report.

The sites considered in this survey are located in a rural area. The existing facility is surrounded mainly by other poultry farms and the proposed site is surrounded by rural neighbours.

The nearest residential neighbour to the proposed poultry farm is approximately 200 metres away from the southwest corner of the nearest of the proposed poultry sheds.

The existing poultry farm consists of eight (90 m x 12.2 m) chicken sheds and the proposed poultry farm will have six (15.2 m x 111 m) chicken sheds.

1.0 INTRODUCTION

Stephenson and Associates Pty. Limited was requested by Conacher Travers Pty. Limited to assess the sound pressure levels and the odour emissions from an existing poultry farm at Mangrove Mountain referred to in this assessment as Jack Sandy's property and a proposed poultry farm site at 4410 Kirks Road, Mangrove Mountain. This assessment forms part of a Development Application (DA) for the proposed poultry farm.

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The sound pressure level exceeded for 90% of the measurement time ($L_{A90,T}$) was used to represent the background sound pressure level. The EPA currently consider the $L_{A90,T}$ to be the best description of background sound.

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The sites considered in this survey are located in a rural area. The existing facility is surrounded mainly by other poultry farms and the proposed site is surrounded by rural neighbours.

The nearest residential neighbour to the proposed poultry farm is approximately 220 metres away from the southeast corner of the closest proposed poultry sheds. Other residences are 260 metres away from the northeast corner of the proposed sheds and 280 metres to east of the proposed sheds.

The existing poultry farm consists of eight (90 m x 12.2 m) chicken sheds and the proposed poultry farm will have six (15.2 m x 111 m) chicken sheds.

2.0 NOISE MEASUREMENT PROCEDURES

2.1 INTRODUCTION

Measurements were performed during daylight hours on 23 March 1995 between 0930 - 1300 hours. The maximum ambient temperature during the measurement period was 27°C for daylight hours. Wind was calm at 0900 hour and easterly at 19 km/hr at 1500 hour. Sound pressure level measurements were conducted at several locations, as described in Figure 4.1 and Figure 4.2.

2.2 METHODS AND STANDARDS

Sound pressure level measurements were conducted in accordance with Australian Standard 1055 - 1984, "Acoustic Description and Measurement of Environmental Noise".

Measurements were made 1.2 metres (m) above ground, and at least 3.5 m from any reflecting surface, eg. wall, building.

Statistical analyses were determined from 6,000 samples of 0.1 second duration conducted over ten minute periods.

2.3 INSTRUMENTATION

Statistical Noise Level Analyser Type 4426 Bruel and Kjaer conforming to ISO and DIN requirements was used to measure sound pressure levels. Calibration was effected by Bruel and Kjaer Sound Level Calibrator type 4230. Periodic checks on analyser results were made with precision Sound Level Meter Type 2203 and Octave Filter Set type 1613.

The Sound Level Meter Type 2203 meets the requirements of Australian Standard 1259 - Part 2 - 1976 and Octave Filter Set meets Australian Standard Z41-1969.

2.4 TERMINOLOGY

The following terminology is defined with reference to the statistical analyses of measured sound pressure levels:-

$L_{Aeq,T}$ That sound level in dB(A) which, if present for eight hours per day, produces the same composite noise exposure index as that obtained from the summation of the partial noise doses over one day.

$L_{A1,T}$ The level exceeded 1% of the measurement time.

$L_{A10,T}$ The level exceeded 10% of the measurement time - L_{A10} is considered a fair description of traffic noise and was used as the indicator of the peak feed and water distribution equipment noise.

$L_{A50,T}$ The level exceeded 50% of the measurement time.

$L_{A90,T}$ The level exceeded 90% of the measurement time - L_{A90} is considered the best description of background sound by NSW Environment Protection Authority.

$L_{A99,T}$ The level exceeded 99% of the measurement time.

3.0 TEST METHODS

3.1 ODOUR MEASUREMENT/DYNAMIC OLFACTOMETRY

Odour emissions are measured as numbers of dilutions to threshold or odour detection units (odu.). The number of dilutions refers to the number of times the odorous gas must be diluted to reach the threshold of detection of the average human nose.

Odour emissions are measured as a number of dilutions to threshold or odour detection units (odu.). The number of dilutions refers to the number of times the odorous gas must be diluted to reach the threshold of detection of the average human nose. This dilution to detection threshold is referred to as a guessing response whilst odour concentrations where the odour assessment panellists consider they are certain of their responses when they have detected an odour are now referenced within the range 20 - 80 ppb 1-Butanol and are termed certainty odour detection units (OU/m^3). In NSW, certainly odour units are currently considered the most appropriate unit for reporting odour concentrations.

3.2 METHODS AND STANDARDS

Ambient air was drawn through a Teflon hose connected to a Tedlar or Nalophane sampling bag. The sampling pump was connected to the airtight plastic container to provide a sample gas flowrate of approximately 0.5 - 1.5 lpm. After the required volume was sampled, the pump was stopped and the bag sealed with a stainless steel plug. Two samples were collected from each sampling point.

Using a series of valve controlled calibrated flow-meters, the Tedlar or Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air, and passed through one of two mixing chambers.

The diluted sample was then presented to a panel of eight screened panellists via one of two sampling ports. The panellists then recorded if they could detect any odour and from which port. The other port was discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists response at the point of detection, not recognition, of the odour is electronically indicated.

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the exhaust gas.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with EPA Draft Guideline Method for Olfactometry (July 1994) and the Committee European de Normalisation (CEN) Standard 064 titled "Odour Concentration measurement by dynamic olfactometry. This CEN standard is currently the subject of review by Standards Australia Technical Committee for adoption within modification for local content as an Australian Standard.

3.3 ODOUR PANEL SELECTION

The odour panellists were initially selected using the Source Emission Measurement Standard Analytical Procedure B1 - Choice of Panellists - December, 1985 adopted by the Technical Services Section of the Air Quality Branch of the Environment Protection Authority (Victoria).

The suitability of a person is initially determined by a standard triangle testing procedure. In this test the panellist is presented with six (6) solutions of vanillin or methyl salicylate in benzyl benzoate and chooses the odd odourant in each group.

People are classified in groups according to their sensitivity as observers thus:-

GROUP	CLASSIFICATION	CORRECT
1	Sensitive Observers	6
2	Good Observers	5
3	Satisfactory Observers	4
4	Poor Observers	3

An odour panel of eight persons is selected from Group 2 or a combination of groups 1 and 2 or 2 and 3.

Screened panellists can then be further classified by their response to a selection of odorous gases, for example, ammonia, hydrogen sulfide or butanol. For this study, the panel was referenced against 1-butanol with an overall panel response of 35 parts per billion.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the hour preceding the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

3.4 ODOUR TERMINOLOGY

The odour level is expressed in odour detection units and is analogous to concentration. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour detection units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just not be detectable to the average human nose, that is, at the odour detection threshold.

4.0 ASSESSMENT CRITERIA

4.1 EPA NOISE EMISSION CRITERIA

Recommended outdoor background noise levels for rural zones are given in Table 4.1. For a rural/residential area daytime recommended background noise level $L_{A90,T}$ is 45 dB(A) and the night time $L_{A90,T}$ is 35 dB(A).

4.2 EPA ODOUR EMISSION CRITERIA

Section 15A of the New South Wales Clean Air Act (NSW CAA), 1961 states that an odour shall not traverse the boundary of the site from which it was generated. Section 15A, however, is currently being reviewed by the EPA NSW.

Depending on the rate and height of the discharge of odour, the distance to the site boundary and the prevailing wind speed and direction, the EPA NSW will determine whether the odour would be detectable at the site boundary. This determination would be achieved by a combination of odour measurement (dynamic olfactometry) and dispersion modelling.

The EPA NSW are currently reviewing their position on odour criteria. From an interim standpoint, the EPA NSW require that the odour beyond the boundary of the site must not exceed an ambient criterion of one odour unit recognition, for more than one percent of the time based on:

- the detection threshold (certainty) from dynamic olfactometry testing of point or area sources; and
- predictive modelling and 99.0 percentile concentrations for three minute averages. In essence the odour emission monitoring concentration summarised in Table 5.2 ranged from 628 to 835 OU/m^3 which translates to a range of average mass odour emission rates which will be determined by the surface areas of the source OU/m^3. The highest odour emission rates were detected adjacent to the downwind side of the chicken sheds.

TABLE 4.1 RECOMMENDED OUTDOOR BACKGROUND NOISE LEVELS

ROW	ZONING OF NOISE RECEIVER AREA	PREDOMINANT LAND-USE OF RECEIVER AREA	TIME PERIOD	LA_{90} BACKGROUND NOISE LEVEL DB(A) ACCEPTABLE LIMIT	EXTREME
(a)	Rural (approx R1 AS1055)	Residential, church, hospital	Day Night	45 35	50 40
(b)	Residential area	Residential, church, hospital, school	Day Night	45 35	50 40
(c)	(approx 1-R2 (AS1055)	Shop or commercial office	Day Night	50 40	55 45
(d)		Light industry	Day Night	55 45	60 50
(e)	Residential area on	Residential, church, hospital, school	Day Night	50 40	55 45
(f)	a busy road or near an industrial area	Shop or commercial office	Day Night	55 45	60 50
(g)	or commercial area (approx R2-R3 AS1055)	Light industry	Day Night	60 50	65 55
(h)	Industrial area	Residential, church, hospital, school	Day Night	55 45	60 50
(i)	(approx R4-R6 AS1055)	Shop or commercial office	Day Night	60 50	65 55
(j)		Factory office or factory	Day Night	65 65	70 70
(k)	Passive recreation area	Picnic grounds, public beaches, bush walks, public gardens, etc	Day Night	40 40	50 50

SOURCE: *SPCC Environmental Noise Control Manual*
Note:

From Monday to Saturday, daytime is defined as 7.00 am to 10.00 pm and night time is 10.00 pm to 7.00 am. On Sundays and Public Holidays daytime is 8.00 am to 10.00 pm and night time is 10.00 pm to 8.00 am. Levels applicable to commercial offices in the schedule would also apply to such premises as hotels, motels, clubs, dance halls and theatres.

FIGURE 4.1 LOCATION OF TEST POINTS - EXISTING SHEDS AND OF PROPOSED POULTRY FARM

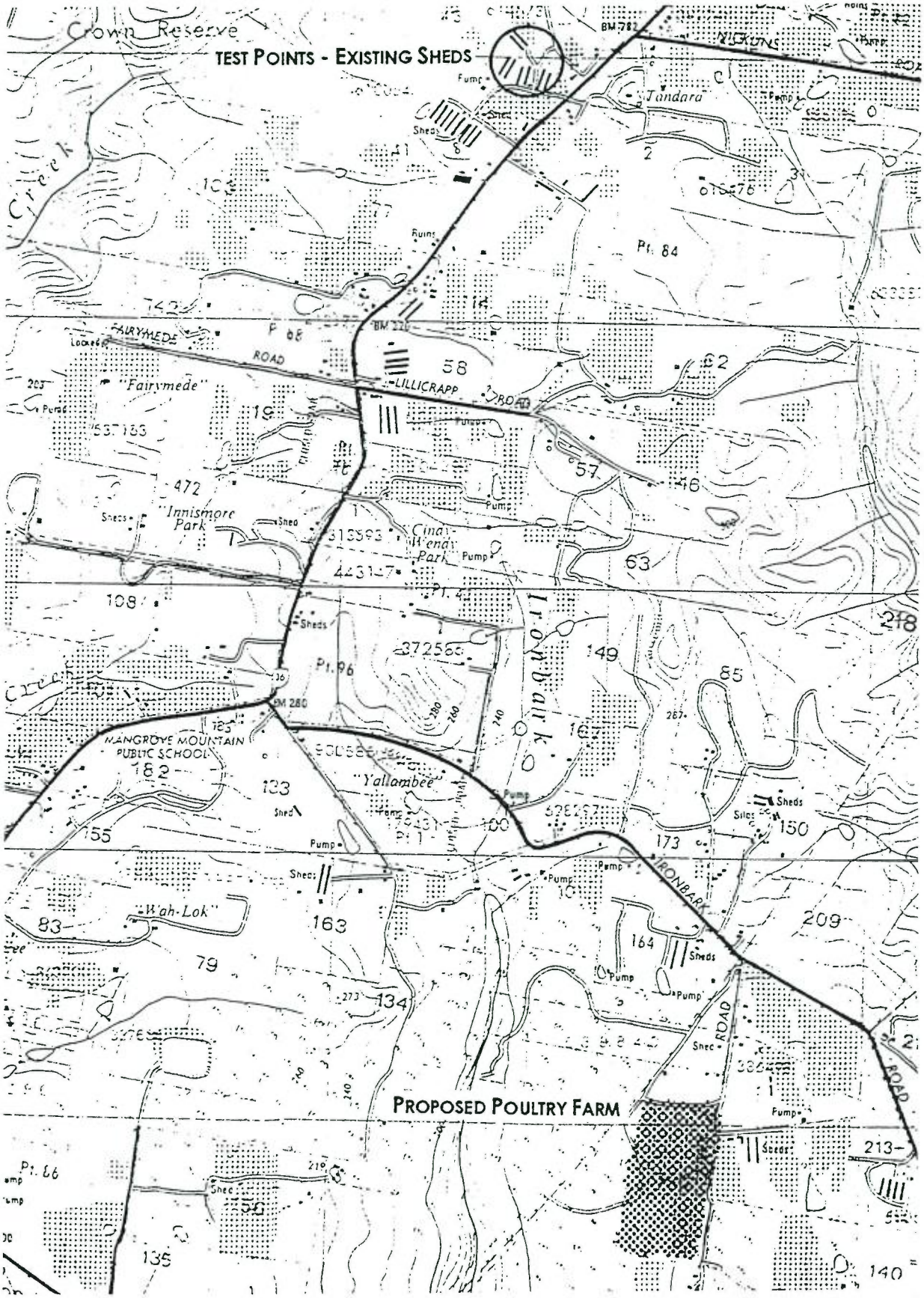
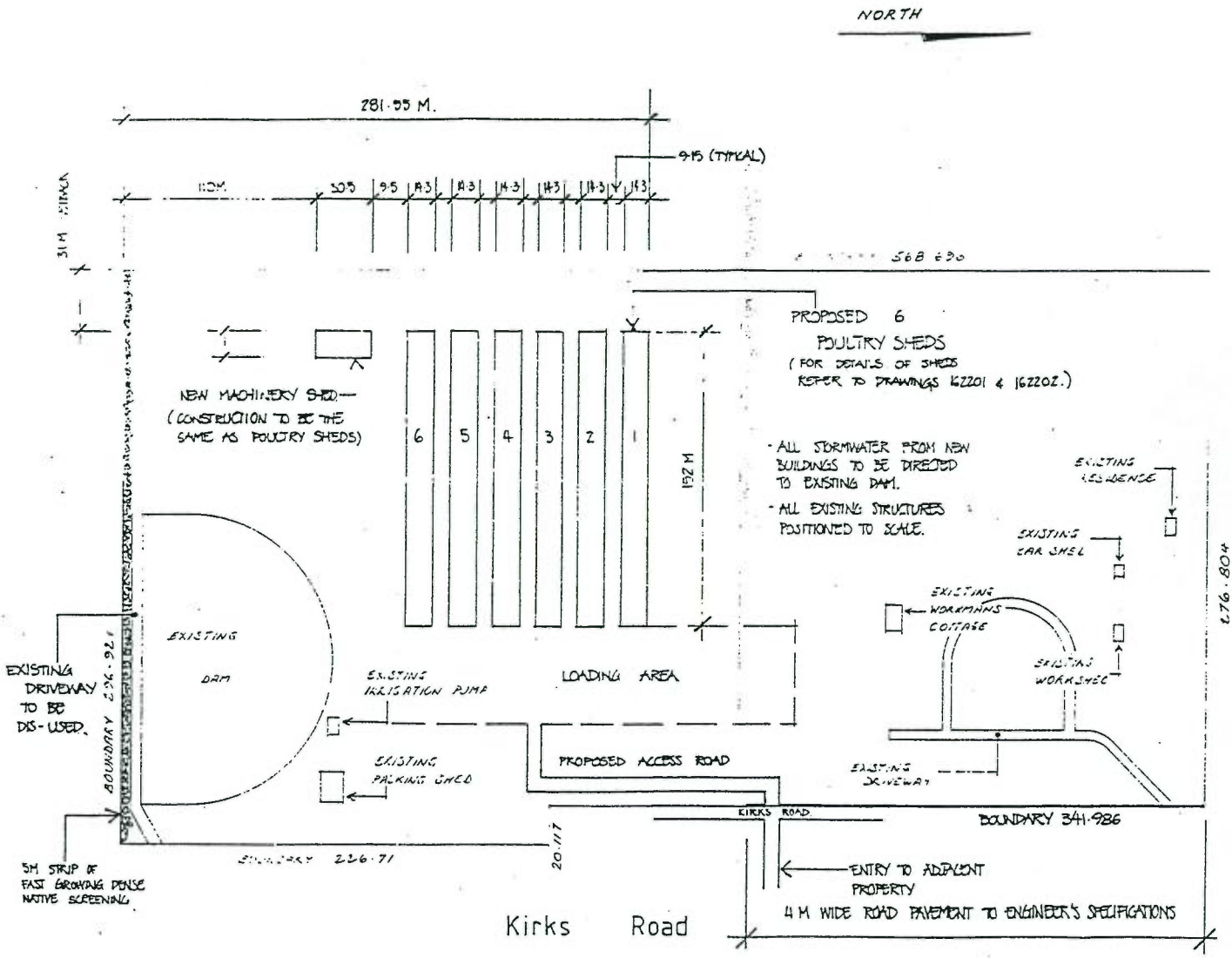


FIGURE 4.2 LAYOUT OF THE PROPOSED POULTRY FARM SITE RMB 4410 KIRKS ROAD, MANGROVE MOUNTAIN



5.0 MEASUREMENT RESULTS AND DISCUSSION

5.1 NOISE MEASUREMENT RESULTS

Sound pressure level measurements are presented in Tables A.1 and A.2 of Appendix A and the summarised results are presented in Table 4.1 of this section.

Measurements were performed at the locations indicated in Figure 4.1 and Figure 4.2 of this section.

The locations of these measurements were:-

A_1 Between sheds 5 and 6 of Jack Sanday's property shed operating - 4 conditions tested (refer Table 5.1)

A_2 Between sheds 5 and 6 of Jack Sanday's property further West from point A_1, shed operating 2 conditions tested (refer Table 5.1)

A_3 Feed Silo West end of shed 3 - 5 m North West of source, Jack Sanday's property (refer Table 5.1)

B_1 Adjacent to the boundary of the nearest neighbour to the proposed poultry sheds, 4410 Kirks Road, Mangrove Mountain (refer Table 5.1)

Measurements were conducted approximately four metres from the source during a daytime period between 0935 and 1300 hours on 23 March 1995.

The sound pressure levels generated from the existing chicken sheds for 10% of measurement time ($L_{A10,T}$), with the exception of the feed delivery truck, ranged from 57.3 dB(A) to 65.5 dB(A) at four metres distance. Similarly, the sound pressure levels generated for 90% of measurement time ($L_{A10,T}$) ranged from 44.5 dB(A) to 58.3 dB(A). These measurements were taken during normal daily operation of the sheds approximately four metres from the emission source.

TABLE 5.1 SUMMARY OF NOISE MEASUREMENT RESULTS - 23/2/95

JACK SANDAY'S POULTRY FARM, MANGROVE MOUNTAIN

SAMPLING LOCATION	SAMPLING CONDITIONS	TIME (HRS)	NOISE LEVEL $L_{A10,T}$ dB(A)	BACKGROUND NOISE LEVEL $L_{A90,T}$ dB(A)
A1	Between sheds 5 & 6 with feed running in shed 5 and then shed 6. Water pump turned on during sampling - started @ 2200 of 6000 samples.	0935	58.5	49.3
A1	Between sheds 5 & 6 with feed running in shed 5 and then shed 6. Water feed on, solid feed off; water off 0949; constant twitter of chickens	0948	60.3	44.5
A1	Cooling fans on in sheds 5 & 6 - one rattling out of balance adjacent to sampling point.	1120	62.3	55.3
A1	Cooling fans on in sheds 5 & 6 - no rattling fan for part of time, only chattering of birds - then rattling recommenced as well as feed and water distribution.. **Worst Case noise sources.**	1135	65.5	54.5
A2	Relocate sample site away from rattling (out of balance) fan to area between sheds 5 & 6 farther to west.	1149	61.5	58.3
A2	Fans and chickens - no feed - feed truck tipping in distance - shed 4.	1205	57.3	54.8
A3	Feed truck loading silo west end of shed 3 - 5m NW of noise source.	1220	87.5	86.3
B1	**4410 Kirks Road:** adj. to nearest neighbour to proposed poultry sheds. Very quiet. Birds/insects in distance. One aircraft overhead in latter third of test.	1300	43.3	26.8

NOTE: All noise measurements were taken approximately 4 metres away from source

$L_{A10,T}$ The level exceeded 10% of the measurement time. $L_{A10,T}$ is considered a fair description of traffic or intermittent noise.

dB(A) Decibels on (A) weighted scale - (A) weighted scale is the best indicator of the response of the human ear.

The readings were scaled to a distance of 150 m away from the source. A conservative reduction factor of 4.0 dB(A) was chosen for every doubling of the distance from the source. Thus, the $L_{A10,T}$ range at 150 m away from the source was estimated to be between 37.3 dB(A) to 45.5 dB(A). A range of 22.5 - 38.3 dB(A) was estimated for $L_{A90,T}$ in a similar manner.

The highest noise level measured was at Jack Sanday's existing chicken sheds during the unloading of the feed truck. $L_{A10,T}$ was 87.5 dB(A) and background noise level $L_{A90,T}$ was 86.3 dB(A). On this specific site, typically, the feed truck delivers feed to the silos twice a week and the unloading process on average takes about 15 - 30 minutes in total.

The sound pressure level generated at the proposed site for chicken sheds for 10% of measurement time ($L_{A10,T}$), was 43.3 dB(A) and the sound pressure level generated for 90% of measurement time ($L_{A10,T}$) was 26.8 dB(A).

5.2 ODOUR MEASUREMENT RESULTS

The odour levels obtained from the existing chicken sheds and the proposed site for new chicken sheds are presented in summary Table 5.2 of this section and the details are given in Tables A.3 to A.7 of Appendix A.

The odour emission concentrations obtained from the *existing chicken sheds* measured at the source ranged from 628 OU/m^3 to 835 OU/m^3. The odour emission concentration obtained from the site of the *proposed chicken sheds* measured near the existing Dam was 1114 OU/m^3, the high level measured was attributed to algal growth around the edges of the Dam caused by a long period of drought in the area.

TABLE 5.2 SUMMARY OF ODOUR EMISSION TEST RESULTS - JACK SANDAY'S POULTRY FARM MANGROVE MOUNTAIN, NSW - 23 MARCH 1995

Test Location	Odour Concentration (Certainty) (OU/m³)	Moisture Content (%)
Shed 6 - Side Wall near Shed 5 downwind	835	2.0
	835	2.0
North Side of Shed 6	628	2.0
	628	2.0
Shed 5 - Side Wall near Shed 6	835	2.0
	628	2.0
Front Door of Shed 5	628	2.0
	718	2.0
Proposed Site for New Sheds - Adjacent to the Dam Southern Corner of Property.	1114	2.2

KEY

ou/m³ = odour units (certainty) referenced to 20-80 ppb Butanol
% = percentage

6.0 CONCLUSION

The following conclusions have been drawn regarding the noise and odour assessments carried out on Jack Sanday's existing poultry farm and the proposed site for a poultry farm at 4410 Kirks Road, Mangrove Mountain.

- Day time sound pressure levels (SPL's) associated with the normal operation of the chicken sheds, that is, chicken noise plus all the ancillary equipment such as feed pumps, water pumps and cooling fans were at the worst case $L_{A10,T}$ of 45.5 dB(A) and $L_{A90,T}$ of 38.3 dB(A) 150 m away from the source. These results do not exceed the recommended background noise levels given in Table 5.1.

- The highest SPL was recorded during unloading of a feed delivery truck. $L_{A10,T}$ and $L_{A90,T}$ were 67.5 dB(A) and 66.3 dB(A) respectively 150 m away from the source. However, the feed truck generally delivers feed twice a week and it takes on average 15 minutes to unload during daylight hours.

- The SPLs recorded on the proposed site for chicken sheds were 43.3 dB(A) for $L_{A10,T}$ and 26.8 dB(A) for $L_{A90,T}$. The EPA guidelines as presented in Table 5.1 of this report indicate a minimum $L_{A90,T}$ SPL of 45 dB(A) day and 85 dB(A) night for rural areas.

- It is recommended that the feed silos should be situated on the north end of the chicken sheds. This arrangement will give a distance of more than 300 m from the last shed (shed 6) to the nearest residential house; it will also locate the sheds between the feed silos and the nearest house which will act as a barrier to further attenuate the noise generated during the unloading of feed.

- The odour levels measured at the sheds are within the recommended limits and should generally disperse well before the boundary of the site. Chicken shed related odours were not detected at the boundary of Jack Sanday's property and hence would not be expected at the boundary of 4410 Kirks Road. An existing odour level of 1114 OU/m^3 was measured near the Dam at the proposed site near the boundary of the nearest residence. This high level was attributed to algal growth around the edges of the Dam caused by a long period of drought. The odour emitted at the boundary is indicative of the range of odour emissions that can be expected in a multifunctional rural environment.

APPENDICES

APPENDIX A

TABLES

Stephenson
Industrial Pollution & Environmental Control
Phone: (02) 411 2114
Fax: (02) 411 8183

PROJECT NUMBER 1924/95

INTEGRATED SITE PLANNING & MANAGEMENT
JACK SANDAY PROPERTY
MANGROVE MOUNTAIN

23/03/95

Sheet A TABLE A1

Field Book No.:

Refer to Sheet:

Refer to Drawing No.:

Samples No.: 6000

Range: 26 - 90

Sample Period: 0.15

RMS Detector: Fast/Inst

	A1	A1	A1	A1	A2	A2	A3		
L_{10}	58.5	60.3	62.3	65.5	61.5	57.3	87.5		
L_{50}	51.5	47.0	56.5	60.3	60.5	56.0	86.8		
L_{90}	49.3	44.5	55.3	54.5	58.3	54.8	86.3		
L_1	59.5	62.8	64.5	67.0	63.8	59.3	88.0		
L_{99}	48.0	43.3	54.8	53.8	55.0	54.3	85.8		
L_{eq}	54.3	54.3	58.6	61.7	60.2	55.9	86.5		
Hours	0935	0948	1120	1135	1149	1205	1220		
26									
28									
30									
32									
34									
36									
38									
40									
42		4.8							
44		33.0							
46	0.9	19.3							
48	28.4	4.9							
50	26.1	6.2							
52	7.6	8.8		2.2		0.6			
54	10.4	3.3	39.0	42.1	5.6	54.1			
56	13.8	3.8	26.0	3.7	3.8	42.5			
58	12.1	4.5	10.4	1.2	30.6	2.0			
60	0	7.8	13.8	6.2	54.6	0.2			
62		2.2	8.4	18.1	4.0	0			
64		0.1	2.0	19.6	0.4				
66		0.1		6.2	0.2				
68		0							
70									

72									
74									
76									
78									
80									
82									
84								4.9	
86								94.9	
88									
90									
92									
94									
96									
98									
100									
102									
104									
106									
108									
110									
112									
114									
116									
118									
120									
122									
124									
126									
128									
130									

COMMENTS: Meteorological Data: calm @ 9.00 a.m., easterly wind @ 19 km @ 3.00 p.m.
Relative humidity 89-94% and Maximum Temperature 27°C

A1	0935	Between sheds 5 & 6 with feed running shed 5 and then shed 6. Water pump turned on during sampling - started @ 2200 samples
A1	0948	Same location as above. Water feed on; solid feed off; water off 0949; constant twitter of chickens
A1	1120	Cooling fans on in sheds 5 & 6 - one rattling out of balance adjacent to A1
A1	1135	Cooling fans on in sheds 5 & 6 - no rattling fan for part of time, only chattering birds; then rattling recommenced & so did feed & water - worst case.
A2	1149	Relocate sample site away from rattling (out of balance) fan to area between Sheds 5 & 6 farther to west Fans still on; water feed shed 5; light aircraft overhead
A2	1205	Fans & chickens - no feed - feed truck tipping in distance - shed 4
A3	1220	Feed truck loading silo west end of shed 3 - 5m NW of source

form no. T 70

INSTRUMENT: NOISE LEVEL ANALYSER, B & K, TYPE 4426

Calibrated Start:	Calibrated Stop:	Measured:	Approved:
93.5		PWS/AM	A.M.

Stephenson
Industrial Pollution & Environmental Control
Phone: (02) 411 2114
Fax: (02) 411 8183

PROJECT NUMBER 1924/9

INTEGRATED SITE PLANNING & MANAGEMENT
JIM GATT'S PROPERTY 23/03/95
MANGROVE MOUNTAIN (proposed site for new sheds)

Sheet A TABLE A2

Field Book No.: | Refer to Sheet: | Refer to Drawing No.:

Samples No.: 6000 | Range: 26 - 90 | Sample Period: 0.15 | RMS Detector: Fast/Inst

	B1																		
L_{10}	43.3									72									
L_{50}	28.8									74									
L_{90}	26.8									76									
L_1	50.8									78									
L_{99}	26.3									80									
L_{eq}	39.1									82									
Hours	1300									84									
26	41.0									86									
28	18.5									88									
30	9.0									90									
32	6.9									92									
34	3.4									94									
36	2.4									96									
38	2.1									98									
40	2.9									100									
42	2.9									102									
44	3.4									104									
46	2.1									106									
48	1.6									108									
50	0.9									110									
52	0.4									112									
54	0.1									114									
56	0									116									
58										118									
60										120									
62										122									
64										124									
66										126									
68										128									
70										130									

COMMENTS:

B1 1300 Jim Gatt's property 4410 Kirks Road

- adjacent to nearest neighbour to proposed poultry sheds
- very quiet, birds and insects - grasshoppers - in distance
- 1 aircraft overhead in latter third of test

INSTRUMENT: NOISE LEVEL ANALYSER, B & K, TYPE 4426

Calibrated Start: 93.5 | Calibrated Stop: | Measured: PWS/AM | Approved: A. [illegible]

form no. T 70

TABLE NO A3
SUMMARY OF ODOUR ANALYSIS

PROJECT NO. 2454/98
SITE: MANGROVE MOUNTAIN - SANDAY'S PROPERTY
EXISTING SHEDS
DATE: 23 MARCH 1995
DISCHARGE POINT: SHED 6 - SIDE NEAREST TO SHED 5

	Run 1	Run 2
Time Start:	1025	1032
Time Stop:	1030	1037
Volume dilution air (ℓ)	0	0
Meter reading initial (ℓ)	465	476
Meter reading final (ℓ)	476	488
Volume sampled: (ℓ)	11.5	11.5
Dilution factor	1	1
Odour concentration (certainty) OU/m³	835	835

Note: Breeze diagonally across the shed - samples taken downwind at the side wall near shed 5.

STACK EXHAUST GAS DATA

Stack discharge temperature (°C)

- Dry bulb (°C) 25
- Wet Bulb (°C) 21
- Humidity (% moisture) 2

SUBJECTIVE DESCRIPTION

pungent, irritant, chicken bodies, ammonia, flesh, chicken meal

TABLE NO 4
SUMMARY OF ODOUR ANALYSIS

PROJECT NO. 2454/98
SITE: MANGROVE MOUNTAIN - SANDAY'S PROPERTY EXISTING SHEDS
DATE: 23 MARCH 1998
DISCHARGE POINT: SHED 6 - NORTH SIDE OF SHED 6

	Run 1	Run 2
Time Start:	1058	1103
Time Stop:	1102	1108
Volume dilution air (ℓ)	0	0
Meter reading initial (ℓ)	510	522
Meter reading final (ℓ)	522	533
Volume sampled: (ℓ)	11.5	11.2
Temp Meter (°C)	26	26
Dilution factor	1	1
Odour concentration (certainty) OU/m³	628	628

STACK EXHAUST GAS DATA

Stack discharge temperature (°C)

- Dry bulb (°C) 25
- Wet Bulb (°C) 21
- Humidity (% moisture) 2

SUBJECTIVE DESCRIPTION

pungent, irritant, eggs, livestock, ammonia, flesh, chicken meal

TABLE NO A5
SUMMARY OF ODOUR ANALYSIS

PROJECT NO. 2454/98
SITE: MANGROVE MOUNTAIN - SANDAY'S PROPERTY
EXISTING SHEDS
DATE: 23 MARCH 1995
DISCHARGE POINT: EXISTING SHEDS - SHED 5: THE SIDE NEAR SHED 6

	Run 1	Run 2
Time Start:	1041	1048
Time Stop:	1046	1052
Volume dilution air (ℓ)	0	0
Meter reading initial (ℓ)	488	499
Meter reading final (ℓ)	499	510
Volume sampled: (ℓ)	11.0	11.5
Temp Meter °C	25	25
Dilution factor	1	1
Odour concentration (certainty) OU/m³	835	628

STACK EXHAUST GAS DATA

Stack discharge temperature (°C)

- Dry bulb (°C) 25
- Wet Bulb (°C) 21
- Humidity (% moisture) 2

SUBJECTIVE DESCRIPTION

pungent, irritant, chicken meal, livestock cereal meal, feathers, ammonia

TABLE NO A6
SUMMARY OF ODOUR ANALYSIS

PROJECT NO. 2454/98
SITE: MANGROVE MOUNTAIN - SANDAY'S PROPERTY EXISTING SHEDS
DATE: 23 MARCH 1995
DISCHARGE POINT: EXISTING SHEDS - SHED 5 : FRONT DOOR

	Run 1	Run 2
Time Start:	1138	1152
Time Stop:	1143	1157
Volume dilution air (ℓ)	0	0
Meter reading initial (ℓ)	544	556
Meter reading final (ℓ)	556	568
Volume sampled: (ℓ)	11.5	11.5
Temp Meter °C	27	27
Dilution factor	1	1
Odour concentration (certainty) OU/m³	628	718

STACK EXHAUST GAS DATA

Stack discharge temperature (°C)

- Dry bulb (°C) 25
- Wet Bulb (°C) 21
- Humidity (% moisture) 2

SUBJECTIVE DESCRIPTION

irritant, sweet, feather, dusty, stockfeed (meal)

TABLE NO A7
SUMMARY OF ODOUR ANALYSIS

PROJECT NO. 2454/98
SITE: MANGROVE MOUNTAIN - KIRKS ROAD PROPERTY
DATE: 23 MARCH 1995
DISCHARGE POINT: PROPOSED SITE FOR SHEDS 4410 KIRKS ROAD
SOUTHERN CORNER OF DAM

Time Start:	1332
Time Stop:	1336
Volume dilution air (ℓ)	0
Meter reading initial (ℓ)	567.4
Meter reading final (ℓ)	578.9
Volume sampled: (ℓ)	11.5
Temp Meter °C	27
Dilution factor	1
Odour concentration (certainty) OU/m³	1114

STACK EXHAUST GAS DATA

Stack discharge temperature (°C)

- Dry bulb (°C) 25
- Wet Bulb (°C) 21
- Humidity (% moisture) 2

SUBJECTIVE DESCRIPTION

stagnant water, wet soil, sludge, pungent

APPENDIX 6
TECHNICAL DATA FOR CHEMICALS USED

WESCO TECHNOLOGIES AUSTRALIA

A DIVISION OF
SPECIAL MINING SERVICES PTY LTD
ACN 002 010 933

Telephone (049) 307 363
Facsimile (049) 307 603
PO Box 16 Lochinvar 2321
Australia

"WINDCREST"
BEACON HILL ROAD
LOCHINVAR
NSW
AUSTRALIA

WESLIG 120

Weslig 120 has the ability to stabilise earth floors, to a strength of 35 mpa in stress loading, providing a floor stronger than most concrete. However, the success of the stabilisation will depend on a number of critical factors: please refer to information sheet "**Weslig 120** – application techniques for stabilisation".

Where the floor is used for poultry, machinery, grain sheds and similar, it is important that adequate drainage is provided and weather prevented from entering the shed.

Weslig 120 can be used for open areas such as car parks, walking trails, storage lots, haulage terminals, roadways, airport runways, etc. After compaction the surface will be unaffected by light rain, but continual heavy rain may soften the surface and, although remaining stable and usable , it may be marked and a little damp. On drying, the pavement will resume its hard surface. Due to traffic wear and tear and weathering the surface will require a spray maintenance treatment with **Weslig 120** (dissolved in water) from time to time. Stabilised pavements may be sealed with bitumen or asphalt.

The Northern Daily Leader, Saturday, May 24, 1997 – 11

Reprinted by courtesy of Gerry Bolla - December 1995 Issue.

New Product for stabilising floors

Weslig 120, a product new to the poultry industry is showing promise as a durable cost effective earth floor stabilizer.

The product comes in powdered form ready to mix with any reasonable gravel base material suitable for shed flooring. Weslig 120 has been used for many years as an organic binder for preparing road base under bitumen or unsealed roads.

It has stood the test of time in the mining industry where it is used for treating roads extensively used by heavy vehicles weighing up to 400 tonnes.

The powder is a natural organic product derived from timber as tar or pitch. It is claimed to be non-corrosive, non-toxic and non-inflammable and used in zoos for the manufacture of large animal cages e.g. elephant, bison and bear.

The main feature of the product is that it gradually sets to a rock-hard consistency and can only be cut with a concrete saw when fully cured- which may take up to three years.

To use the product it must be mixed in with the base material (suitable sand, soil or gravel) using a front end loader or large capacity cement mixer. Minimal amounts of water are added to gain a stiff consistency - unlike the wet slurry mix used for concreting.

The material must be thoroughly mixed to gain a good consistency before being spread over the shed floor.

It is important that existing floors are properly filled and levelled to avoid wasting the mix which should be laid to an even 100 mm (4") thickness.

The product does not set quickly like concrete, so there is no urgency in levelling.

This is best done using a laser leveller fitted to a grader or tractor blade. The finished floor is then compacted using a small ride-on vibrating roller.

Although the material sets slowly, it can be used within days. It eventually finishes up with a bond strength of 35 mpa which is nearly twice the strength of standard concrete.

The surface is virtually impervious which is desirable for shed hygiene and should be easily cleaned.

Mr. Ken Charlton of Wesco Technologies Australia claims the finished floor should last the life of the shed. Damaged floors are easily repaired using the same mix, as the material readily bonds to itself, greatly simplifying maintenance.

Costs

The Weslig 120 powder ingredient costs approximately $1.70/m² of finished surface area. To this has to be added the cost of plant, labour plus a reasonable gravel base. The final cost is around $5/m² or $6,000 per shed.

Jack Roberts, a Steggles grower in the Lower Hunter has used the product in his three new sheds. Mr. Roberts claims he is quite satisfied with the product at this early stage (after one batch) and noted that the floors were much easier and quicker to clean and sweep.

Mr. Charlton's company, Wesco Technologies Australia, is the sole supplier of the product and is keen for this technology to be used in the poultry industry.

As a consequence they are quite willing to train contractors free of charge in how to use the product, or alternatively, growers may be able to do the job themselves.

For further information contact Mr. Ken Charlton Ph (049) 307363, fax (049) 307603 ⌂

INDUSTRIAL & AGRICULTURAL BUILDINGS

Preparation Instructions

DAY 1

Step 1

(a) Using concrete agitator (DRY MIX) place 5 cubic metres of gravel in the concrete agitator and 4 bags (100kg) WESLIG 120 powder.

Mix dry without addition of water.

(b) Using front end loader only (DRY MIX) -
(this is an alternative to (a) above)

Using a front end loader with a one cubic metre bucket or larger, place 10 cubic metres in a heap and add 8 x 25kg bags WESLIG 120 to the centre of the heap.

Mix dry, turning over with the front end loader until thoroughly mixed. Then follow Steps 2 & 3 using the front end loader. If the loader has a half cubic metre bucket, use 5 cubic metre heaps with 4 x 25kg bags WESLIG 120.

(c) Under certain limited circumstances, a grader may be used to lay the material out in a row to the depth of the tines, spread the WESLIG 120 on the row and then rotary hoe or blade mix. This procedure is done outside the building.

Step 2 - CONTROL MOISTURE TO OPTIMUM

Take a handful of mixture and test for moisture content by the hand squeeze method. If the mix is at optimum it is ready to use. If less than optimum, very slowly add water, constantly checking until optimum moisture is achieved.

Step 3 -

Use a two tonne tipper truck or similar to place the mix in small heaps appropriately and as evenly as possible over the floor.

REPEAT STEPS 1, 2 & 3 until sufficient mixed material at optimum moisture is placed in position on the floor so that, when spread, the layer will be 100mm (4 inches) deep.

Step 4 -

Use grader or tractor fitted with laser leveller blade and shape the floor.

Step 5 -

Fully compact floor with smooth drum vibrating ride-on roller (with maximum vibration). Use hand-held Wacker Packer in corners and on sides.

Roll in both directions - along the length of the floor as well as across. Trim and adjust with grader or tractor (with blade) during compaction.

Step 6 -

Dampen the floor evenly with water and leave overnight.

DAY 2

Step 7 -

Repeat compaction at least once or twice longitudinally and once transverse, and also edges and corners.

Step 8 -

Dampen floor again, and either slurry with roller or leave to dry.

A SUPER HIGH QUALITY SMOOTH FINISH MAY BE ACHIEVED USING A CONCRETE FINISHING HELICOPTE

Floor is ready for use on DAY 3.

Exercise care when using plant and machinery for the first three to four days.

If any bags of WESLIG 120 powder remain when the job is finished these may be stored for long periods under cover in a well ventilated location.. They may be used in another floor, or for roadways, paths, etc.

These procedures and timing in days are a nominal guide only, and may vary for each job. For example, a day as nominated may stretch to two or more if small plant is used for a large job.

If you wish to vary the techniques, please check with one of our engineers before doing do - we are only a phone call away...

1800 025930

REMEMBER -

MATERIALS
MIXING
MOISTURE
COMPACTION

WILL GIVE YOU A LONG LASTING, HARD WEARING BUILDING FLOOR!

WESCO TECHNOLOGIES AUSTRALIA
A DIVISION OF
SPECIAL MINING SERVICES PTY LTD
ACN 002 010 933

Telephone (049) 307 363
Facsimile (049) 307 603
PO Box 16 Lochinvar 2321
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"WINDCREST"
BEACON HILL ROAD
LOCHINVAR
NSW
AUSTRALIA

WESLIG 120 - APPLICATION TECHNIQUES FOR STABILISATION

INDUSTRIAL & AGRICULTURAL BUILDINGS

A WESLIG 120 stabilised floor is an alternative to a concrete floor for buildings. It is generally a better alternative as it is impervious, hard-wearing, and normally does not crack. The cost is usually about 10% or less of the cost of a concrete floor.

Application methods are simple and safe, and very easy to carry out.

The normal procedure is to apply a 100mm (4 inches) stabilised and compacted clay gravel overlay over an existing floor, or for a new building, over a shaped and compacted floor sub-base material.

REQUIREMENTS AND PROCEDURES

A. Materials

(i) WESLIG 120 stabiliser (available in one tonne lots - 40 x 25kg bags per tonne)

(ii) Gravel - a suitable clay gravel should contain 20% or more minus 0.075mm sieve fines, plus other size gravels and sands up to, say, 10-14mm (half inch) top size. The gravel may contain a small quantity of stone up to 19-25mm (one inch) top size, but the larger the quantity above 14mm, the harder the work necessary to achieve a quality finish to the surface. Blended material may be used.

B. Mixing Equipment

One front end loader, approximately one cubic metre bucket or larger, although mixing should be practical with a bucket of half a cubic metre.

All mixing may be achieved with the loader, but a quicker and more efficient method is to use the loader in conjunction with a mobile concrete agitator and loading hopper.

The use of a rotary hoe set at maximum revolutions is also an option, under certain limited circumstances.

THOROUGH MIXING IS ESSENTIAL - WESLIG 120 IS NOT A FILLER AS IS CEMENT: IT IS IMPORTANT THAT EVERY PARTICLE HAS A COVERING OF WESLIG 120.

C. Distribution of Stabilised Material

The loader can be used to transport the mixed material into the shed. For larger sheds use a two tonne tip truck or similar to place the material in the building.

D. Floor Shaping

A 20 h.p. or larger tractor with an automatically controlled laser levelling scoop blade. A laser scoop levelling trailer may be used as an alternative. If the building is accessible by a loader or grader, and the operator can "work levels", this method can be used. This would be restricted to very skilled and experienced operators.

BOBCAT OR SIMILAR UNITS ARE NOT SUITABLE.

E. Compaction

A small ride-on vibrating smooth drum roller is recommended (available from most hire services).

Also, a hand-held petrol (Wacker-Packer) vibrating compacter is useful for compacting edges and corners not accessible by the roller.

F. Water Supply

Normal domestic water supply from a hand-held garden hose.

G. Preparation of Existing Floor

At least one day before the new floor is laid, it is necessary for the existing surface to be prepared by removing all non-soil debris.

Fill all holes and depressions in the floor with soil or gravel and try to achieve a surface as close as possible to the final profile planned for the new overlaid stabilised floor.

Dampen the surface.

H. Stabilising Procedure

For 100mm (4 inches) depth stabilisation, the rate of application is 2kg of WESLIG 120 powder per square metre. As an example, a 1500 square metre floor will require three tonnes WESLIG 120, a 1000 square metre floor will require two tonnes.

Mixing rate in gravel is 20kg of powder per compacted cubic metre.

../2

FARM CLEAN

Heavy Duty Detergent (DS1042/6) — Poultry Industry

GENERAL DESCRIPTION

Farm Clean is a heavy duty liquid detergent. It is specifically designed to be compatible with quat-based disinfectants, which are widely used in the poultry industry.

Farm Clean will penetrate and lift the toughest soils, while also preventing their re-deposition.

FEATURES AND BENEFITS

- **Farm Clean** contains powerful surfactants for excellent detergency.
- **Farm Clean** has non-caustic alkalinity.
- **Farm Clean** is concentrated, allowing economical use rates.
- **Farm Clean** will not interfere with the disinfectant action of quaternary ammonium compounds.
- **Farm Clean** is non corrosive to most metal surfaces including aluminium, galvanised iron and stainless steel.

PRODUCT PROPERTIES

Physical Form:	Clear, green, mobile liquid
Odour:	Nil
pH (neat):	>13
pH (0.5% v/v):	10.7
Specific Gravity:	1.11
Foaming tendency:	Moderate

PACKAGING

5 L Bottle	For Trial Purposes.
25 L	P/C 17638
200 L	P/C 17640

DIRECTIONS FOR USE

Dilute **Farm Clean** at a rate of 0.1-0.5% v/v (10 mL - 50 mL per 10 L of water). **Farm Clean** can be used with hot or cold water.

Apply **Farm Clean** using high or low pressure spray equipment, foaming equipment or manually.

SAFETY INFORMATION

Refer to Material Safety Data Sheet.

TECHSHEET

Brisbane Office
61 Campbell Street
Bowen Hills Q 4006
Telephone (07) 3213 6111

Sydney Office
144 Gilba Road
Girraween NSW 2145
Telephone (02) 631 [illegible]

Melbourne Office
23-25 Church Street
Hawthorn Vic 3122
Telephone (03) 9853 0211

Adelaide Office
90 Bedford Street
Gilman SA 5013
Telephone (08) 47 [illegible]

Perth Office
31 Dennirup Way
Malaga WA 6062
Telephone (09) 249 2988

Issue No: f02a-1.doc
Date: 1/11/9[illegible]

MATERIAL SAFETY DATA SHEET

C

Campbell Brothers Limited
A.C.N. 009 657 489
Campbell Street, Bowen Hills, Qld 4006, Australia
Emergency Telephone Number: 1800 628 724

Date: 30 SEPTEMBER 1996
Issue No: 1

IDENTIFICATION

PRODUCT NAME: **FARM CLEAN**

OTHER NAMES: NONE.

UN NUMBER: NONE.
D.G CLASS: NONE.
SUBSIDIARY RISK: NONE
HAZCHEM CODE: NONE.
PACKAGING GROUP: NONE.
POISONS SCHEDULE: 5

HAZARDOUS ACCORDING TO CRITERIA OF WORKSAFE AUSTRALIA
PRODUCT CODE/S: (17638) 25L.
(17640) 200L.

RECOMMENDED USE: AS A HEAVY DUTY DETERGENT FOR MOST HARD SURFACES.

PRODUCT DESCRIPTION / PROPERTIES

APPEARANCE:	CLEAR, GREEN, MOBILE LIQUID WITH A MILD ODOUR.
BOILING POINT/MELTING POINT:	NO INFORMATION AVAILABLE.
VAPOUR PRESSURE:	17.5mm Hg AT 20.0°C.
PERCENT VOLATILES:	73.0% AT 100.0°C.
SPECIFIC GRAVITY/BULK DENSITY:	S.G. 1.10
FLASH POINT:	NO KNOWN FIRE HAZARD.
PH NEAT:	>13
FLAMMABILITY LIMITS:	-
AUTOIGNITION TEMPERATURE:	-

INGREDIENTS:

ALKALINE SALTS	<10.0%
Ingredients not considered hazardous by definition	to 100.0%

HEALTH HAZARD INFORMATION

HEALTH EFFECTS

SWALLOWED: Likely to cause burns upon ingestion.

EYE: Can severely irritate the eyes.

SKIN: The product may cause irritation with long and repeated contact.

INHALED: Mists and sprays are capable of causing irritation if deliberately inhaled.

FIRST AID

SWALLOWED: Immediately remove product from the mouth, DO NOT INDUCE VOMITING, give a glass of water to effectively dilute the product. Seek immediate medical assistance.

EYE: Irrigate with copious quantities of water for at least 15 minutes and seek IMMEDIATE medical attention.
** SHOW THIS SAFETY DATA SHEET TO A DOCTOR **

SKIN: Wash skin thoroughly with water.

INHALED: Remove from source to fresh air. Seek medical assistance if effects persist.

ADVICE TO DOCTOR: Treat symptomatically.

PRODUCT NAME: FARM CLEAN

PRECAUTIONS FOR USE

EXPOSURE LIMITS:	No data found.
VENTILATION:	Ensure adequate ventilation.
PERSONAL PROTECTION:	As the product can cause eye irritation, safety glasses or goggles must be worn. The use of rubber gloves is recommended.
FLAMMABILITY:	The product poses no flammability hazard.

SAFE HANDLING INFORMATION

STORAGE and TRANSPORT:	Store in a cool dry place, away from foodstuffs. No special transport precautions are needed.
SPILLS and DISPOSAL:	Absorb with dry earth, sand or a similar material, shovel up and dispose of in an area approved by local authority by-laws. Small spillages may be safely mopped up or flushed to drain with water, if permitted. Incineration of disposed material is not recommended as it is unlikely to adequately burn.
FIRE/EXPLOSION HAZARD:	The product is non-combustible, however, the packaging material may burn to emit noxious fumes. Fire fighters should wear self-contained breathing apparatus to minimise risk of exposure to vapour or products of combustion. Extinguish fires with water spray, foam, carbon dioxide or dry chemical powder.
OTHER INFORMATION:	The product is fully miscible with water. It is a moderately strong alkali; the pH neat is >13 use good industrial hygiene.

The information contained in this MSDS is specific to the product when handled and used neat. This product when diluted may be classified as non hazardous and may not require the same control measures as the neat product. Check with your technical representative if in doubt.

KEEP OUT OF REACH OF CHILDREN

CONTACT POINTS:	Customer Service	1800 077 240
10 SEPTEMBER 1996	Emergency Contact	1800 628 724

LAST ISSUE DATE: N/A

GLUTAPLUS

Sanitiser • *Poultry Industry*

GENERAL DESCRIPTION

GLUTAPLUS is a broad spectrum liquid sanitiser designed for use in poultry sheds and on farm equipment.

GLUTAPLUS is a concentrated combination of glutaraldehyde and quaternary ammonium compounds providing powerful disinfectant activity.

FEATURES AND BENEFITS

- Contains two broad spectrum biocides: glutaraldehyde and quaternary ammonium compounds.
- Provides activity against gram positive and gram negative bacteria, fungi, viruses and bacterial spores.
- Provides high tolerance to proteinaceous soils.
- Biodegradable.
- Provides residual biocidal activity to prevent recontamination.

PRODUCT PROPERTIES

Physical Form:	Clear, mobile liquid
Colour:	Colourless to pale liquid
Odour:	Pungent, aldehydic
pH (use dilution):	4.2
Surfactant System:	Non-ionic

DIRECTIONS FOR USE

Glutaraldehyde is a severe irritant. Please read the Material Safety Data Sheet before using this product.

1. Remove all animals or birds.
2. Remove all portable equipment.
3. Remove litter and manure from floors and other surfaces.
4. Empty all water and feed containers.
5. Saturate all surfaces with **GLUTAPLUS** diluted at a rate of 0.5-1.0% v/v (i.e. 50 to 100mL per 10 litres of water.
6. Allow solution to dry for at least five minutes.
7. Ventilate area thoroughly before re-use.
8. Thoroughly clean waterers before re-use. Avoid residue in feeders.

PACKAGING

25 litre Polyethylene drum	P/C 17418
200 litre Polyethylene drum	P/C 17420

SAFETY INFORMATION

Refer to Material Safety Data Sheet.

Brisbane Office
61 Campbell Street
Bowen Hills Q 4006
Telephone (07) 3253 6111

Sydney Office
144 Gilba Road
Girraween NSW 2145
Telephone (02) 631 8077

Melbourne Office
23-25 Church Street
Hawthorn Vic 3122
Telephone (03) 9853 0211

Adelaide Office
80 Bedford Street
Gilman SA 5013
Telephone (08) 47 8600

Perth Office
31 Dennirup Way
Malaga WA 6062
Telephone (09) 249 2988

Issue No: g01a-1.doc
Date: 16.10.96

MATERIAL SAFETY DATA SHEET

Campbell Brothers Limited
A.C.N. 009 657 489

Campbell Street, Bowen Hills, Qld 4006, Australia

Emergency Telephone Number: 1800 628 724

Date: 3 OCTOBER 1996
Issue No: 2

IDENTIFICATION

PRODUCT NAME: **GLUTAPLUS**

OTHER NAMES: POISONOUS LIQUID, N.O.S. (CONTAINS GLUTARALDEHYDE AND QUATERNARY AMMONIUM COMPOUND).

U.N. NUMBER: 2810

DANGEROUS GOODS CLASS: 6.1(b)
SUBSIDIARY RISK: None.
HAZCHEM CODE: 2Z
PACKAGING GROUP: III
POISONS SCHEDULE: 5

HAZARDOUS ACCORDING TO CRITERIA OF WORKSAFE AUSTRALIA
PRODUCT CODE/S: (17418) 25 L Drum.
(17420) 200 L Drum.

RECOMMENDED USE: As a sanitiser for the poultry industry.

PRODUCT DESCRIPTION / PROPERTIES

APPEARANCE:	Clear, colourless, mobile liquid with an aldehydic odour.
BOILING POINT/MELTING POINT:	No information available.
VAPOUR PRESSURE:	No information available.
PERCENT VOLATILES:	No information available.
SPECIFIC GRAVITY/BULK DENSITY:	S.G. 1.03
FLASH POINT:	Not applicable.
FLAMMABILITY LIMITS:	Not applicable.
pH:	4.2

INGREDIENTS:

Glutaraldehyde	[111-30-8]	15%
Quaternary Ammonium Compound	[8001-54-5]	10%
Water		to 100.0%

HEALTH HAZARD INFORMATION

HEALTH EFFECTS

SWALLOWED: Harmful if swallowed.

EYE: Corrosive to eyes; may cause severe and permanent damage.

SKIN: The product is a known skin sensitiser, and may cause irritation with long and repeated contact.

INHALED: Vapours are pungent and corrosive; can cause tissue damage to respiratory tract. Effects may include nausea, an increased rate of respiration, possible bleeding from the nose, and headaches.

FIRST AID

SWALLOWED: IMMEDIATELY REMOVE PRODUCT FROM MOUTH, DO NOT INDUCE VOMITING, GIVE A GLASS OF WATER OR MILK, THEN A RAW EGG.
Contact a Doctor or Poisons Information Centre in your capital city for further advice.
** *SHOW THIS SAFETY DATA SHEET TO A DOCTOR* **

EYE: IRRIGATE WITH GENEROUS QUANTITIES OF WATER FOR 15 MINUTES AND SEEK IMMEDIATE MEDICAL ASSISTANCE.
** *SHOW THIS SAFETY DATA SHEET TO A DOCTOR* **

SKIN: Remove contaminated clothing and wash skin thoroughly with water. Seek medical assistance if the effects persist.

INHALED: Remove from source of vapour to fresh air.
** *SHOW THIS SAFETY DATA SHEET TO A DOCTOR* **

ADVICE TO DOCTOR: Treat symptomatically.

PRECAUTIONS FOR USE

EXPOSURE LIMITS: T.W.A. for Glutaraldehyde = 0.2 ppm.

VENTILATION: Use in a well ventilated area.

PERSONAL PROTECTION: As the product can cause eye and skin irritations, safety goggles and rubber or PVC gloves should be worn. Respiratory Protection is required for high vapour concentration areas.

FLAMMABILITY: The product poses no flammability hazard.

SAFE HANDLING INFORMATION

STORAGE and TRANSPORT: Store away from foodstuffs.
The product is a poisonous liquid, Class 6.1(b)
(Transportation of Dangerous Goods Code)

SPILLS and DISPOSAL: ENSURE ADEQUATE VENTILATION.
Absorb with dry earth, sand or a similar material, shovel up and dispose of in an area approved by local authority by-laws. Small spillages may be safely mopped up or flushed to drain with water, if permitted. Incineration of disposed material is not recommended as it is unlikely to adequately burn.

FIRE/EXPLOSION HAZARD: The product is non-combustible, however, the packaging material may burn to emit noxious fumes.
Fire fighters should wear self-contained breathing apparatus to minimise risk of exposure to vapour or products of combustion.
Extinguish fires with water spray, foam, carbon dioxide or dry chemical powder.

OTHER INFORMATION: The product is water based and is fully soluble in water.

Safe for use with all common metals.

The information contained in this MSDS is specific to the product when handled and used neat. This product when diluted may be classified as non hazardous and may not require the same control measures as the neat product. Check with your technical representative if in doubt.

KEEP OUT OF REACH OF CHILDREN

CONTACT POINTS:	Customer Service	1800 077 240
3 OCTOBER 1996	Emergency Number	1800 628 724

THIS ISSUE REPLACES ALL PREVIOUS ISSUES

APPENDIX 7
CLIMATIC DATA

Monthly Data for PEATS RIDGE (WARATAH ROAD)

Site Number 061351 Latitude 33°18'42"S Longitude 151°14'32"E Elevation 280 metres Opened Oct 1981 Still Open

Total Monthly Precipitation (mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1981										251.6	244.4	70.8	
1982	147.8	60.8	337.9	4.8	4.8	48.2	48.1	4.1	160.6	70.2	18.4	23.8	929.5
1983	40.4	64.6	215.0	163.8	161.2	76.0	28.8	46.8	59.4	181.4	53.0	136.0	1226.4
1984	164.4	135.6	187.0	107.0	85.2	60.8	161.8	15.4	39.8	77.0	283.8	71.2	1389.0
1985	6.2	84.8	37.8	181.0	131.8	74.2	73.4	36.0	64.4	385.2	151.0	91.6	1317.4
1986	260.6	68.8	29.2	42.0	57.0	36.8	22.8	285.8	133.5	45.4	257.6	9.2	1248.7
1987	58.4	89.2	132.4	56.2	71.4	77.4	46.0	339.0	13.2	196.0	143.4	129.2	1351.8
1988	210.8	188.7	70.4	526.0	102.6	74.6	210.0	58.6	185.2	1.2	124.8		
1989	233.2	129.4	176.8	346.2	136.2	302.4	44.0	16.4	3.9	15.1	79.6	147.0	1630.2
1990	101.0	620.0	282.8	346.8	164.4	68.6	103.8	229.4	139.2	57.6	28.4	44.0	2186.0
1991	98.6	38.2	33.6	8.7	83.4	181.6	74.4	8.6	12.6	30.6	50.8	225.0	846.1
1992	94.4	109.2	172.6	177.4	45.8	54.0	8.2	35.0	25.6	33.0	145.8	205.8	1106.8
1993	78.6	82.2	115.6	51.6	20.0	62.4	79.2	77.6	54.6	58.6	98.2	71.2	849.8
1994	105.2	109.2	120.6	190.4	32.4	48.4	26.0	15.4	10.4	52.2	39.2	126.2	875.6
1995	210.8	99.0	274.4	17.8	156.4	58.0	1.2	0.8	165.0	23.0	120.4	87.6	1214.4
1996	165.4	71.8	74.6	19.2	141.4	92.0	40.6	219.2	107.8	39.2	114.2	79.8	1165.2
1997	138.8	198.6	43.8	18.0	103.8	58.6	79.6	11.8	87.0	89.2			

Summary of Total Monthly Precipitation using available data between 1981 and 1997

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	132.2	134.4	144.0	141.1	93.6	85.9	65.5	87.5	78.9	94.5	122.1	101.2	1238.4
Median	122.0	94.1	126.5	81.6	93.9	65.5	47.1	35.5	61.9	57.6	117.3	87.6	1220.4
Highest	260.6	620.0	337.9	526.0	164.4	302.4	210.0	339.0	185.2	385.2	283.8	225.0	2186.0
Lowest	6.2	38.2	29.2	4.8	4.8	36.8	1.2	0.8	3.9	1.2	18.4	9.2	846.1
Number	16	16	16	16	16	16	16	16	16	17	16	15	14

Climatological Summary for PEATS RIDGE (WARATAH ROAD)

e Number 061351 Latitude 33°18'42"S Longitude 151°14'32"E Elevation 280 metres Opened Oct 1981 Still Open All available data have been used

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years of Record
Mean Daily Maximum Temp (°C)	26.5	26.0	24.2	21.9	19.1	16.2	15.7	17.4	20.0	22.6	23.9	25.5	21.6	16
Highest Temperature (°C)	40.1	39.1	38.9	34.7	26.9	23.6	23.7	28.9	31.1	38.6	40.7	40.8	40.8	16
Lowest Maximum Temperature (°C)	15.6	17.2	15.6	13.4	10.2	9.6	9.0	9.3	12.9	11.8	11.3	15.4	9.0	16
Mean Number of days over 30°C	7.3	4.9	2.2	0.1	nil	nil	nil	nil	0.1	2.2	3.9	5.9	26.6	16
Mean Number of days over 35°C	1.4	1.4	0.2	nil	nil	nil	nil	nil	nil	0.2	0.5	1.1	4.9	16
Mean Daily Minimum Temp (°C)	16.0	16.1	14.3	12.0	10.0	7.2	6.0	6.6	8.2	10.8	12.5	14.7	11.2	15
Lowest Temperature (°C)	7.9	8.4	6.2	3.7	2.2	0.0	-0.1	-0.1	0.0	1.4	5.3	6.9	-0.1	16
Highest Minimum Temperature (°C)	27.0	24.7	21.8	18.9	17.1	15.1	14.1	16.8	18.8	21.8	23.5	24.7	27.0	15
Mean Number of Days below 2.2°C	nil	nil	nil	nil	0.1	0.9	1.7	1.9	0.3	0.1	nil	nil	5.0	16
Mean Number of Days below 0°C	nil	nil	nil	nil	nil	0.1	0.1	0.1	0.1	nil	nil	nil	0.3	16
Mean Daily Terrestrial Minimum (°C)	15.1	15.0	13.0	10.3	8.1	5.2	3.6	4.0	5.9	8.6	11.1	13.3	9.4	15
Lowest Daily Terrestrial Minimum (°C)	5.7	5.3	4.3	1.2	-1.3	-2.7	-4.4	-4.1	-2.4	-0.8	2.8	4.8	-4.4	15
umber of Days Terrestrial below -0.9°C	nil	nil	nil	nil	0.1	0.8	2.7	2.5	0.5	nil	nil	nil	6.5	15
Mean 9am Temperature (°C)	20.9	20.3	19.2	17.3	14.4	11.3	10.5	12.1	14.9	17.7	18.3	20.1	16.4	16
Mean 3pm Temperature (°C)	24.4	24.4	22.4	20.2	17.3	14.7	14.2	16.1	18.2	20.2	21.9	23.3	19.8	15
Mean 9am Relative Humidity (%)	75	79	79	75	78	76	72	65	60	60	68	70	71.4	16
Mean 3pm Relative Humidity (%)	61	63	65	62	67	64	57	50	48	52	56	59	58.8	15
Mean 9am Cloud Cover (oktas)	5.1	5.1	4.6	4.3	4.3	3.9	3.5	2.8	3.3	4.2	4.8	4.9	4.3	16
Mean 3pm Cloud Cover (oktas)	4.5	4.8	4.5	4.3	4.6	4.1	3.9	3.4	4.0	4.3	4.8	4.6	4.2	15
Maximum Wind Gust (km/h)														0
Mean Daily Wind Run (km)														0
Mean Number of Days of Strong Wind	nil	0.1	0.1	0.1	nil	0.1	0.1	0.1	0.1	0.1	0.1	nil	0.7	16
Mean Number of Days of Gales	nil	nil	nil	nil	nil	nil	0.1	0.1	nil	0.1	nil	nil	0.2	16
Mean Daily Pan Evaporation (mm)	4.7	4.3	3.5	2.7	1.9	1.6	1.8	2.6	3.5	4.2	4.6	4.9	3.4	15
Mean Daily Sunshine (hours)														0
Mean Number of Days with Hail	0.1	nil	0.1	nil	nil	nil	nil	0.1	0.1	0.1	0.1	0.1	0.6	16
Mean Number of Days with Snow	nil	nil	nil	nil	nil	nil	0.1	nil	nil	nil	nil	nil	0.1	16
Mean Number of Days with Frost	nil	nil	nil	nil	nil	0.4	1.8	1.5	0.7	nil	nil	nil	4.3	16
Mean Number of Days with Fog	0.3	0.6	0.6	0.1	1.7	2.1	0.5	0.3	0.3	0.1	0.1	0.1	6.8	16
Mean Number of Days with Thunder	2.6	2.2	1.2	0.7	0.5	0.1	0.4	0.5	1.2	1.3	2.4	2.3	15.4	16
Mean Number of Clear Days	6.3	5.9	7.8	8.3	7.2	9.3	10.2	12.9	10.7	7.8	6.0	4.9	97.3	16
Mean Number of Cloudy Days	12.4	12.4	11.2	8.9	10.7	7.9	7.2	6.3	6.0	9.3	10.9	10.7	113.9	16
Mean Monthly Rainfall (mm)	132.2	134.4	144.0	141.1	92.4	87.7	64.6	92.5	78.3	94.8	122.1	101.2	1285.3	16
Highest Monthly Rainfall (mm)	260.6	620.0	337.9	526.0	164.4	302.4	210.0	339.0	185.2	385.2	283.8	225.0		16
Lowest Monthly Rainfall (mm)	6.2	38.2	29.2	4.8	4.8	36.8	1.2	0.8	3.9	1.2	18.4	9.2		16
Mean number of Rain days	13.7	14.3	14.5	10.4	12.6	10.1	9.1	8.5	8.5	10.3	12.1	11.9	135.9	16
Highest number of Rain days	20	20	22	22	19	18	13	16	14	16	18	20		16
Lowest number of Rain days	6	10	8	3	3	3	2	2	3	1	5	5		16

Prepared by Climate and Consultancy Section in the New South Wales Regional Office of the Bureau of Meteorology
Contact us by phone on (02) 9296 1555, by fax on (02) 9296 1567, or by email on reqnsw@bom.gov.au

FIRST YEAR : 1981 LAST YEAR : 1993 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 14.11 %

STATION : 061351 PEATS RIDGE (WARATAH ROAD) 33 19 S, 151 15 E 280.0 M ELEV

JANUARY 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	4	1	*					6
NE	16	4			*			21
E	4	1						6
SE	10	2						12
S	11	2						13
SW	17	3	*					20
W	6	*	1					6
NW	11	5	1					17
ALL	78	19	2		*			

NO. OF OBS. 366

FEBRUARY 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	4	*						5
NE	15	4	*					19
E	10	1						11
SE	10	1		*				12
S	11	3						14
SW	19	2	*					22
W	6	1						7
NW	9	2	*					11
ALL	84	15	1	*				

NO. OF OBS. 336

MARCH 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	4	1	*					4
NE	14	5	*					19
E	4	1	*					6
SE	9	2	1					12
S	10	2	*					12
SW	20	7	1					28
W	4	2	*					6
NW	8	4	1					12
ALL	73	24	3					

NO. OF OBS. 364

APRIL 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	2	1						3
NE	12	*	1					13
E	4	*						4
SE	6	1						8
S	8	3						10
SW	23	7	*	*	*			31
W	12	4	*			*		17
NW	9	5	1					15
ALL	76	21	2	*	*	*		

NO. OF OBS. 353

JANUARY 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	3	*	*					3
NE	16	13	2					31
E	10	9	2					21
SE	11	7	1					19
S	6	2	*					8
SW	2	1	1					4
W	3	2	*					6
NW	3	4	1					8
ALL	55	39	7					

NO. OF OBS. 321

FEBRUARY 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	1	1	*					2
NE	14	10	2					25
E	11	10	*	*				22
SE	14	8	2				*	25
S	5	4		*				9
SW	4	2	*					6
W	2	1	*					3
NW	5	1	1					7
ALL	57	36	6	1			*	

NO. OF OBS. 317

MARCH 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	2	*						2
NE	15	11	1					28
E	10	7	1	*	*			19
SE	16	6	1					22
S	7	3	*					11
SW	5	3	1					8
W	3	1	1					4
NW	4	*	1					5
ALL	61	32	5	*	*			

NO. OF OBS. 322

APRIL 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	2	1						4
NE	15	7						22
E	8	3						11
SE	14	5	1					20
S	9	3	*	*				12
SW	10	2	1		*			13
W	3	2	1					5
NW	7	3	1		*			12
ALL	69	27	3	*	1			

NO. OF OBS. 289

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 30/ 3/94

[redacted] TEL: ([redacted]69 4[redacted] FA[redacted]) 66[redacted]5

BUREAU OF METEOROLOGY - SURFACE WIND ANALYSIS

PERCENTAGE OCCURRENCE OF SPEED VERSUS DIRECTION BASED ON 13 YEARS OF RECORDS

FIRST YEAR : 1981 LAST YEAR : 1993 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 14.11 %

STATION : 061351 PEATS RIDGE (WARATAH ROAD)

33 19 S, 151 15 E 280.0 M ELEV

MAY 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	2	1						3
NE	5	*						5
E	2	1						3
SE	3	*		*				4
S	7	2						9
SW	27	5	2					34
W	17	6	2	*				25
NW	12	4	2					18
ALL	75	20	5	1				

NO. OF OBS. 365

JUNE 0900 HOURS LST

CALM	SPEED (KM/HR)							
*	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	1	*						1
NE	2	1						3
E	1							1
SE	1							1
S	3	1	1					5
SW	25	8	1	1				35
W	19	7	2					29
NW	13	10	2					25
ALL	65	28	6	1				

NO. OF OBS. 354

JULY 0900 HOURS LST

CALM	SPEED (KM/HR)							
1	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	2	1						3
NE	3	*						3
E	1		*					1
SE	1	*	*					1
S	1	*	*					2
SW	20	10	4					34
W	15	8	2	*				25
NW	16	11	3					30
ALL	59	31	9	*				

NO. OF OBS. 366

AUGUST 0900 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	3	3	*					6
NE	5	1	*					6
E	2	*						2
SE	2	*			*			3
S	3	1						4
SW	16	7	2	*			*	25
W	16	7	2	*	*			25
NW	14	12	4		*			29
ALL	61	30	8	1	1		*	

NO. OF OBS. 367

MAY 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	6	1	*					7
NE	14	1						15
E	5	1						6
SE	10	*	*					10
S	14	2	*					16
SW	16	4	1					21
W	7	2	1					10
NW	10	2		*	*			13
ALL	82	13	3	*	*			

NO. OF OBS. 302

JUNE 1500 HOURS LST

CALM	SPEED (KM/HR)							
1	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	6	2	*					8
NE	3	1						4
E	3	1						4
SE	8	*						8
S	9	2				*		11
SW	24	6	2					31
W	10	3	2					15
NW	11	4	2	*				17
ALL	73	19	6	*		*		

NO. OF OBS. 293

JULY 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	6	1	*					7
NE	4	1						5
E	2	*						2
SE	5	2	1					8
S	9	1	1	*				11
SW	16	6	4	*				26
W	7	3	2		*			13
NW	15	8	3				*	27
ALL	65	23	11	1	*		*	

NO. OF OBS. 302

AUGUST 1500 HOURS LST

CALM	SPEED (KM/HR)							
	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
DIRN								
N	5	1	*					6
NE	7	4	1					13
E	6	2						8
SE	5	1	1					7
S	7	2	*					9
SW	12	6	4					23
W	7	3	1					11
NW	13	6	4	*				23
ALL	61	27	12	*				

NO. OF OBS. 312

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 30/ 3/94

BUREAU OF METEOROLOGY - SURFACE WIND ANALYSIS

PERCENTAGE OCCURRENCE OF SPEED VERSUS DIRECTION BASED ON 13 YEARS OF RECORDS

FIRST YEAR : 1981 LAST YEAR : 1993 NUMBER OF MISSING OBSERVATIONS (AS PERCENTAGE OF MAXIMUM POSSIBLE) : 14.11 %

STATION : 061351 PEATS RIDGE (WARATAH ROAD) 33 19 S, 151 15 E 280.0 M ELEV

SEPTEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		5	1	*					7
NE		4	2	1					7
E		3	*						3
SE		1		*					1
S		6	2						8
SW		18	8	1	*				28
W		12	7	1	*				20
NW		14	8	3					25
ALL		63	29	7	1				

NO. OF OBS. 357

OCTOBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		5	2					*	7
NE		10	3	*					14
E		4	1	*					5
SE		6	1	1	*				8
S		5	5	1					11
SW		14	8	1					23
W		7	4	2					12
NW		11	8	2				*	21
ALL		62	32	6	*			*	

NO. OF OBS. 400

NOVEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		4	1						5
NE		15	5	1					20
E		4	2	*					6
SE		7	2	*					9
S		9	3	*					13
SW		16	5	2					22
W		8	2	*	*				10
NW		8	6	1					15
ALL		70	24	5	*				

NO. OF OBS. 385

DECEMBER 0900 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	*	4	1	*					5
NE		15	5	*					20
E		6	1						7
SE		10	2	*					12
S		10	1	*					10
SW		15	4		*				19
W		4	3						7
NW		11	7	1					19
ALL		74	24	1	*				

NO. OF OBS. 389

SEPTEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		3	2	*					5
NE		10	7	1					18
E		7	5	*					12
SE		5	3	*				*	9
S		6	3					*	9
SW		8	7	1	*				16
W		6	5	2					13
NW		8	8	2					17
ALL		54	38	6	*			*	

NO. OF OBS. 297

OCTOBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		3	1	*					5
NE		12	12	1					25
E		9	9	2	*				20
SE		8	2	1	1				11
S		4	2	1					7
SW		5	5	2					11
W		4	4	1					9
NW		7	4	1	*				12
ALL		52	39	8	1				

NO. OF OBS. 341

NOVEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N	*	1	1	*					2
NE		13	16	2	1	*			32
E		10	8	1	*		*		19
SE		8	6	1					14
S		5	3	1					8
SW		5	4	1					10
W		3	1	*					4
NW		7	2	1					10
ALL		51	40	7	1	*	*		

NO. OF OBS. 336

DECEMBER 1500 HOURS LST

DIRN	CALM	1 TO 5	6 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 & UP	ALL
N		3	1						4
NE		13	16	2					31
E		10	9	1	1				20
SE		10	8	1					19
S		4	3						7
SW		3	4	*	*				7
W		1	2						4
NW		5	2	1					8
ALL		49	45	5	1				

NO. OF OBS. 322

* OCCURRED BUT LESS THAN 0.5 PERCENT

PRODUCED BY M.I.S.S. 30/ 3/94

APPENDIX 8
PEST CONTROL PLAN
AND
WASTE MANAGEMENT DETAILS

PEST CONTROL

Flies, wild birds and vermin have the potential to affect activities on the poultry farm and on neighbouring properties. Although this potential exists, control measures will be implemented to minimise or mitigate any impacts. In accordance with previous Conditions of Development Consent for poultry sheds set by Gosford City Council and the NSW Agriculture Poultry Farming Guidelines, the following measures will be adopted to control vermin in and around the proposed development.

- Buildings and surrounds will be kept clear of rubbish and excessive vegetation through regular slashing of grass and general landscape maintenance. This will prevent the establishment of nesting and habitat areas for pest species.

- All feed storage silos will be suitably sealed to prevent access by wet weather and vermin and to prevent spillage of feed. This also applies to any bagged material, feed additives and other material.

- Any spilled feed stuffs will be removed immediately to prevent the attraction of pest animals and native fauna.

- All feed storage and handling equipment and tools will be maintained regularly and kept in good condition. Feed delivery systems will be waterproofed or covered to prevent feed becoming wet. Wet foodstuffs can become breeding sites for flies and other vermin.

- Any stockpiles of feed, manure or rubbish will be kept to a minimum and removed regularly to avoid the attraction of pest species.

- There will be regular removal of dead birds, and wet and dry manure from the sheds to prevent breeding grounds for flies.

- Dead birds will be removed daily and disposed of into a proprietary brand chicken composter which is vermin proof and fully protected against wet weather.

- Access by pests to the poultry sheds, feed and water will be prevented through regular building maintenance and preventative measures including seals on doors and containers, and closure of doors and gates when not in use.

- Rat and mice traps will be regularly set to control any influxes of pests. Traps will be placed around food storage areas and within buildings to capture any pests and will be checked daily to avoid a build-up of dead pest species. Poison baits will not be used thereby reducing adverse impacts on native carnivores from consuming poisoned vermin.

- Predatory animals such as foxes, cats and rodents will be controlled in a manner which will not adversely affect native fauna. Appropriate fencing will

be installed to prevent access to buildings and grounds by pest species, and in doing so will prevent access by native mammals.

As with any form of agriculture, pest control is greatly improved with good farm management. The poultry farm will be maintained to the best possible standards in order to function efficiently and as a result, pest control will be greatly enhanced. With appropriate vermin control potential adverse impacts of rodents on adjoining areas of woodland will be controlled.

WASTE MANAGEMENT

A variety of measures and procedures will be implemented to manage the on-going generation of solid and liquid wastes generated by the proposed development. Details on the procedures to be implemented are provided below:

Shed Waste:
Floor litter and manure is cleaned out by contractors at the end of each growing cycle when the sheds are cleaned out. Floor litter is scooped up by a front-end loader or Bobcat style machine and directly loaded onto waiting dump trucks. It is then directly transported to a recycling facility where it is converted to fertiliser or other horticultural products.

Dead Birds:
Dead birds are placed in enclosed chicken composters where they are composted for removal with the shed floor litter at the time of shed cleanout.

Runoff from Roof Water:
Roof water is collected by the gutter/pipe system for collection to the detention basin/nutrient pond where it goes through a natural process of settling and biological action provided by the plants established in these ponds to utilise nutrients within the runoff water.

Surface Water Runoff
Surface water is collected by a series of banks and drains and diverted to the detention/nutrient control pond.

Internal Shed Runoff
No internal shed runoff is anticipated as the shed is sealed from outside runoff and rain. Washdown water from standard cleans between growing cycles is used in quantities of approximately 4,000 litres per shed. This quantity of washdown water is not sufficient to generate internal runoff as the top layer of the shed floor retains the water which is later evaporated into the air within the sheds. The exhaust fans can be utilised to increase the evaporation rate and speed up the drying process.

To provide for emergency collection of any contaminated internal washdown water a 2,000 litre concrete collection tank has been incorporated into the shed design. The shed floor is to be graded with a centrefall of 1-2% to a central collection sump (covered with a metal plate while the shed houses chickens)

where runoff can drain by gravity to a pipe system draining into the collection tank. This collection tank is a concrete tank excavated into the ground which can be pumped out by a contractor with the liquid waste transported to an approved waste disposal depot.

COMPOST-A-BIRD by POOLED RESOURCES / OEC (NSW)

An environmentally friendly, economic and convenient method for disposing of normal mortalities resulting from chicken production without the foul odours, flies, vermin, energy costs, inconvenience and pollution risks associated with burning, on-site burial or other methods of waste disposal.

The result? ....a friable, relatively odour free high grade fertiliser of considerable value to horticultural applications.

Managing the *COMPOST-A-BIRD* Unit For Best Results:

All natural systems work best when subject to regular inputs and outputs proportionate to the size of bacterial populations present in a chamber of the barrel. This means that the unit needs to be actively managed so that the ingredients of the composting "mull"; namely moisture, carbon, nitrogen, oxygen, bacteria, and heat, are kept as constant as possible. For purposes of explanation, the essential ingredients (for thorough aerobic fermentation, - that is, breakdown by bugs in the presence of air) can be considered just like those necessary to successfully make a cake or bread!

To explain how it all works, lets take a moment to look at the ingredients of our "mull":-

• **MOISTURE:** Fresh animal tissues are made up mainly of water. Young chicks contain up to 86% water , while adult birds make around 68%. A certain amount of water is required by our composters' microbes(bacteria) to function but for our purposes the amount of water we are adding (by way of the dead birds we throw in our composter), far exceeds the amount we require. Too much moisture (too many birds suddenly added at once, too little dry carbon material or the use of a wet carbon source) causes too little air in the "mull" causing anaerobic (meaning: "no air") fermentation which is extremely smelly.

• **CARBON:** This is usually added as fresh, dry sawdust or dry, spent litter, or any other form of carbon such as dry shredded straw or corn husks - usually added in roughly equal quantity as the dead birds you are adding to your composter. The purpose of such material is to soak up any excess moisture resulting from the break down of dead birds so that our "mull" stays light and friable, allowing air to penetrate whenever the composter is turned (usually once per day). Carbon is the base on which our bacteria reside and for normal levels of aerobic fermentation to occur a ratio of 70 or 80 carbon to one nitrogen is usually quoted as necessary. For our purposes you do not need to worry too much about this as the appearance of the "mull" will normally tell you what corrections need to be made to keep things working properly. An excessive smell of ammonia will also indicate more carbon should be added.

• **BACTERIA:** While dead birds themselves will usually provide the right types of bacteria to commence composting, this process usually starts slowly. You can get things happening quickly by obtaining seed bacteria from a previous batch of compost, or, better still, by obtaining a bag of active "hot" compost from another composter currently in use. This applies also to your own composter chambers, where a quantity of active material from a hot chamber can be added to dead birds in another to get things rolling.

.../2

The more you can provide the better, and if a large number of birds is likely to need composting in the short term, the quicker you can produce more bacteria by getting 2 or more chambers operating at the same time, the better your composting unit will handle these quantities of birds. It's a bit like adding enough yeast to dough for a loaf of bread - you must have enough bacteria to spread around the quantity of dead birds you want to compost.

• **NITROGEN:** The protein chains that form animal tissues are made up mainly of nitrogen. Nitrogen is used by bacteria to provide energy and building blocks so that they can multiply. It is during this process that protein is converted to simpler nitrogen in a less volatile (more usable) form. For bacteria to effectively break down animal tissues requires, not only large quantities of bacteria, but also large surface areas for them to work on. For this reason, very large birds (over 2.4 kgs) such as big meat chickens or turkeys need to be broken down into at least 2, or preferably 4 or more pieces to aid rapid composting and avoid odours.

• **OXYGEN:** Oxygen is added in air which enters our "mull" when the composter is rotated. Oxygen enters the unit through the air vents at either end of the barrel as heat escapes the unit. Air is critical in preventing our "mull" going anaerobic and producing foul odours. The contents of your composter are tumbled to ensure a thorough mixing of air through them.Too much air (through overventilation) can cause the composting material to lose too much heat and wind the composting process down. For these reasons, one complete rotation, once daily after adding birds is all that is recommended. To ensure adequate oxygen is provided and humidity is allowed to escape, the wire vents of the composter must be kept unblocked. If the contents become too moist the wire insect excluders can block and must be opened with a stiff bristle brush to enable an exchange with the outside air.

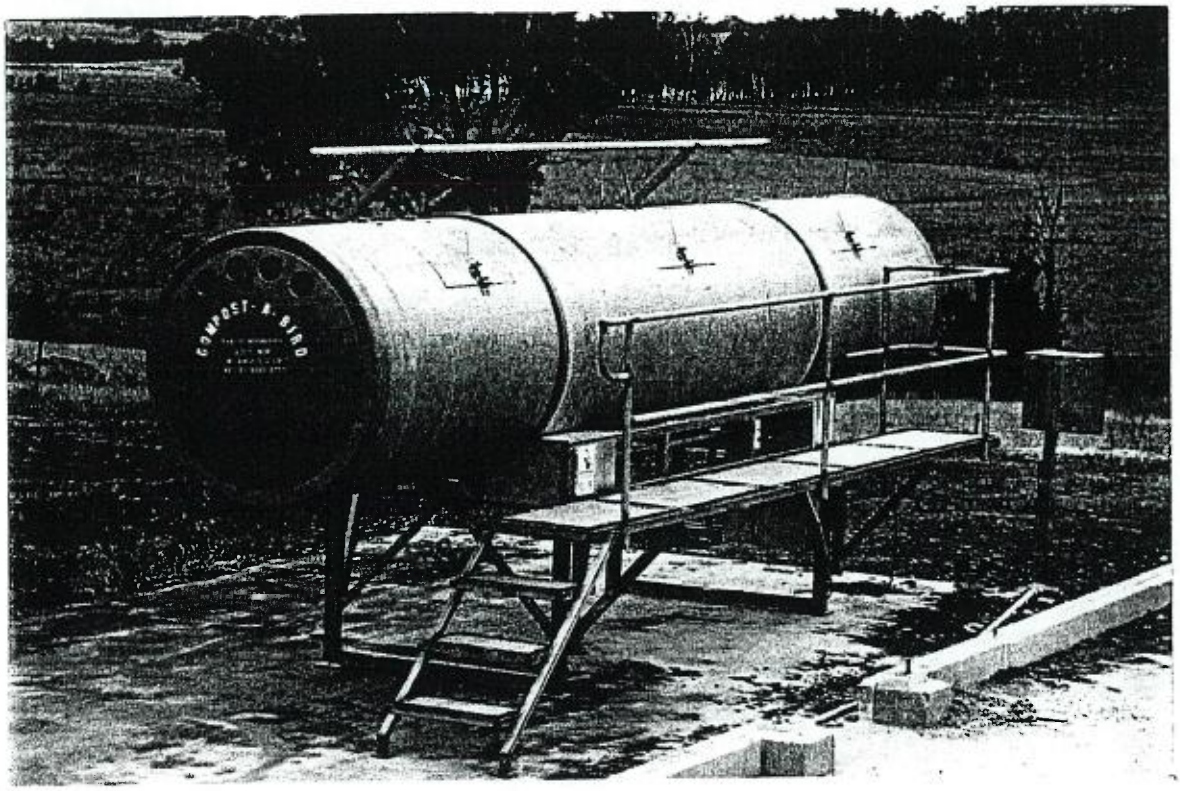
• **HEAT:** To build tissue in living animals requires energy. This energy is released as heat during the break down of the protein chains in tissues and at levels below 70 to 80 degrees celcius, serves to encourage further bacterial breakdown (provided the other ingredients do not limit the process). A fine balance between providing enough ventilation, yet conserving enough heat to keep the composting process at a high level, needs to be maintained. Overventilation (particularly in winter) or too big a compartment relative to the amount of material to be composted, can prevent the material retaining enough heat to compost effectively. For this reason it pays to leave a residue of material in a compartment when emptying it if initial volumes of wastes to be composted are expected to be low. In our case you can consider your composter as 2 or 3 ovens (depending on model) used to contain the heat for bacterial baking of our "cake". Not only does the temperature have to be right, but by now you should have realised that just the right amount of each ingredient needs to be present, not only to minimise the time taken for complete composting (usually around 22 days from last dead bird deposit), but also to avoid any significant odour generation.

And that is the process! While understanding it may appear a little complicated, and while many of you may feel a little bit bewildered about how you are going to control all these variables, rest assured right now that, with a little trial and error (experience!), you will get the hang of it relatively quickly and be efficiently disposing of your "dead-uns" in next to no time at all!

Greg Poole *(Ph.0414 273199)*

COMPOST-A-BIRD POULTRY COMPOSTERS

by POOLED RESOURCES / OEC (NSW)



SPECIFICATIONS:

-Description: A range of 4 to 5.2 cubic metre, heavy duty tubular composters (as pictured) designed for the efficient conversion of dead poultry carcasses into high grade fertiliser with minimal site impacts, enabling complete exclusion of rodents, insects and feral animals.

-Construction: Hobass pipe barrel made of sand, resin and fibreglass matt combination (min. wall thickness 20 mm), resembling fine sandstone in texture and colour, with moulded heavy duty fibreglass end caps and doors coloured forest green. All barrel fittings and insect meshing made of stainless steel. Braced H.D.galv. steel support structure, designed to rest on reinforced concrete base nom. 150mm thick, and supporting the barrell approx. 1m. above ground level. Quad reduction drive consisting of 1HP 240volt motor/worm drive, HD chain and sprocket (2 pr), rotating two HD cast iron, tyred, drive wheels, with barrell supported by another two free-wheeling cast iron wheels.

-Operation: As per instruction sheets; mortalities are deposited into a compartment and the barrell rotated once dailly. Composted material is removed 22 days after the last bird is deposited into a compartment.

-Sizing: With normal levels of bird mortality (5 to 6%) 1 cubic metre of composter capacity will provide disposal for approx 15 thousand birds (layers or meat chickens). A minimum of 3 composter compartments are generally required for management flexibility. Most modern day farms generally are of a size requiring at least 2 composters.

-Available from: POOLED RESOURCES / OEC (NSW)
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