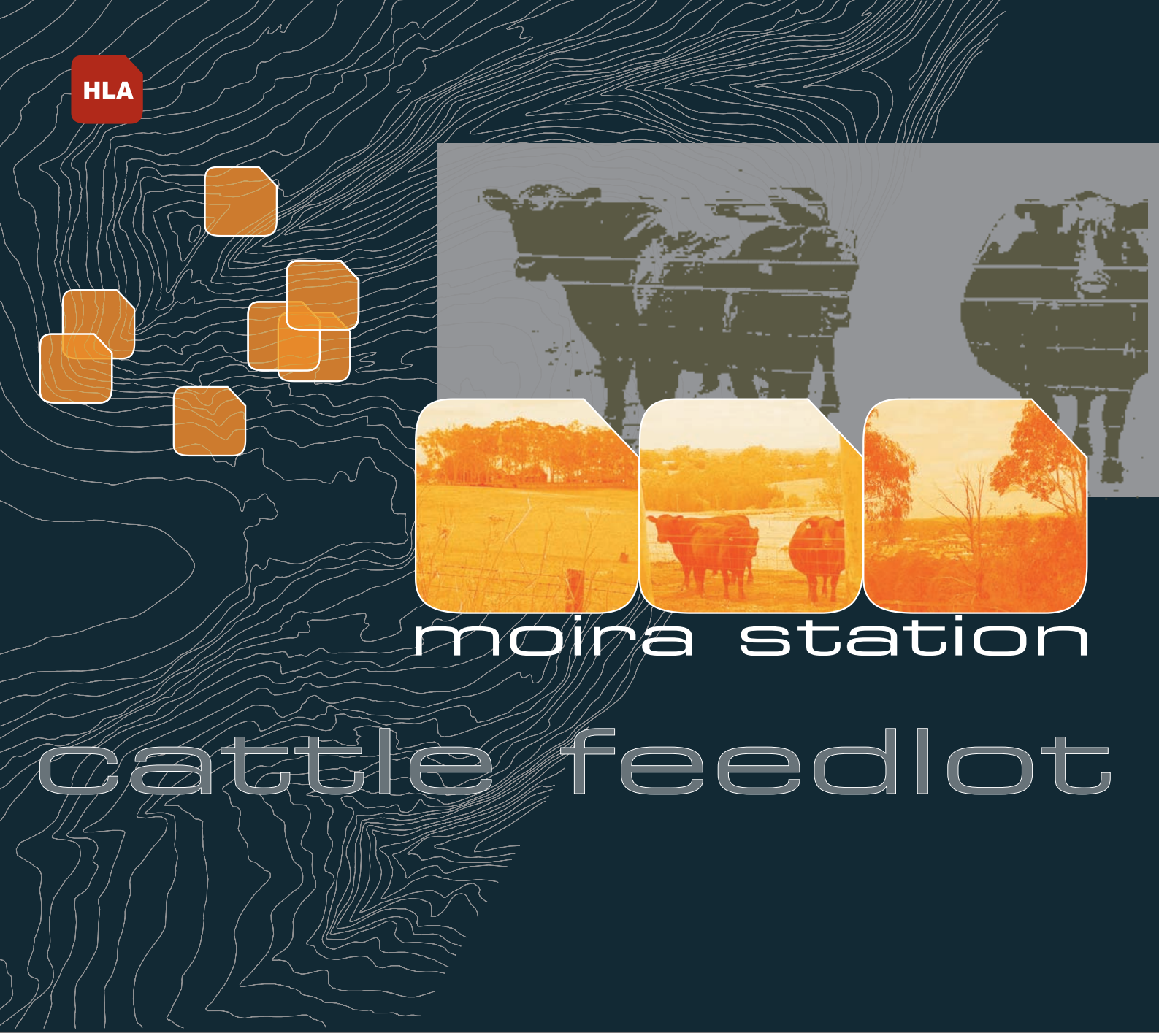

Moira Station Cattle Feedlot Environmental Assessment

Volume 1

December 2005

Prepared for:

Agricultural Equity Investments Pty Ltd

CERTIFICATION

Submission of Environmental Assessment (EA)
prepared under the Environmental Planning and Assessment Act 1979 Section 75F

EA prepared by name qualifications	Duncan Peake Bachelor of Science (Hons) Environmental Planner	Michael England Bachelor of Arts (Regional and Urban Planning Senior Principal, National Practice Leader Environmental Planning
address	HLA Level 5, 828 Pacific Highway Gordon NSW 2072	HLA Level 5, 828 Pacific Highway Gordon NSW 2072
in respect of	*The construction and operation of a cattle feedlot at Moira Station, NSW. The feedlot would comprise 80,000 head of cattle, feed pens, access road, sedimentation ponds, holding pond, freshwater storage, effluent storage, receivals area, feed mill, commodities area, amenities and irrigation area.*	
project application applicant name applicant address	HLA Level 5, 828 Pacific Highway Gordon NSW 2072 Agricultural Equity Investments Pty Ltd	
land to be developed lot no., DP/MPS, vol/fol etc proposed project	The proposed project is to be carried out on land shown on the maps included in the EA. The land is owned by Noel Griffen and is leased by AEI. ☐ Map(s) attached	
Environmental Assessment	☐ an Environmental Assessment (EA) is attached	
Certification	I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.	
	Signature Name: Duncan Peake Date 30/11/05	Signature Name: Michael England Date 30/11/05

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ACKNOWLEDGEMENTS AND NOTES ON THE TEXT

The study team wishes to thank members of the Moira community and the Moama and Cummeragunja Local Aboriginal Land Councils who greatly contributed to the preparation of the Environmental Assessment as well as the individuals, organisations and government bodies who generously provided their assistance.

Would/Will

As a determination on the project will only be made after the Environmental Assessment (EA) has been on public display and submissions considered, the future conditional tense is used throughout this EA and Statement of Commitments when describing the project, alternatives and assessing impacts. 'Would' is therefore, used throughout the text in preference to 'Will'.

If approval is given for the project to proceed under the NSW environmental planning legislation, all 'would' preferences should be interpreted as 'will'.

GUIDELINES FOR MAKING A SUBMISSION

How does your submission fit into the Environmental Impact Assessment process?

Submissions from members of the public, government agencies and interest groups are invited and sought in response to this Environmental Assessment.

Why write a submission?

A submission is a way to provide input into the environmental assessment process for the project.

Submissions can provide information, comment on the project and findings, or suggest improvements.

What should you include in a submission?

It is particularly useful if you can indicate:

- Your interest in the project.
- Your opinion of the project (or particular aspects of it).
- What measures you consider would be appropriate to improve the project.
- Any errors or omissions in the information presented in the Environmental Assessment.
- Any further factual information you have (and its source).

Your comments may also cover related facts or topics that you believe should be considered. All submissions will be treated as public documents unless otherwise stated.

What should you keep in mind?

You will make it easier for your submission to be analysed if you:

- Attempt to list points, so that the issues raised are clear.
- Refer each point to the appropriate sections in the Environmental Assessment.
- Include your name, address and the date.
- Ensure that your submission is as legible as possible.
- Provide sketches and/or diagrams if they assist in clarifying your submission.

Where to send submissions?

Submissions should be addressed to:

Moira Station Cattle Feedlot EA
Department of Planning
GPO Box 39
SYDNEY NSW 2001

LIST OF ABBREVIATIONS

AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
ACS	Animal Care Statement
AEI	Agricultural Equity Investments
AHC Act	Australian Heritage Commission Act 1975
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management Systems
AS	Australian Standard
BOD	Biochemical Oxygen Demand
BoM	Bureau of Meteorology
C	Carbon
CEC	Cation Exchange Capacity
CEMP	Construction Environmental Management Plan
CFC	Chloro-flurocarbon
Cl	Chloride
cm	Centimetre
DA	Development Application
dB_a	Decibels
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage
DIPNR	Department of Infrastructure, Planning and Natural Resources
DLWC	Department of Land and Water Conservation
DNR	Department of Natural Resources
DoP	Department of Planning
DPI	Department of Primary Industries
DSRD	Department of State and Regional Development
EAT	Emerson Aggregate Test
EC	Electrical Conductivity
e.g.	Example
EA	Environmental Assessment
EMMP	Environmental Management and Monitoring Plan
EMP	Environmental Management Plan
EMS	Environmental Management System
ENCM	Environmental Noise Control Manual

EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	NSW Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
Etc	Etcetera
FM Act	Fisheries Management Act 1994
GHD	Gutteridge Haskins and Davey Pty Ltd
GHG	Greenhouse Gases
GPO	General Post Office
GTA	General Terms of Approval
H	Horizontal
Ha	Hectares
HASP	Health and Safety Plan
HLA	HLA Envirosciences Pty Ltd
H:V	Horizontal Units in Proportion to Vertical Units
i.e.	That is
IGAE	Intergovernmental Agreement on the Environment 1992
INP	Industrial Noise Policy
K	Potassium
Kg	Kilogram
kg/ha	Kilogram per hectare
Km	Kilometre
Km/h	Kilometres per hour
kV	Kilo-volt
L	Litre
LEP	Local Environment Plan
LGA	Local Government Area
Ltd	Limited
m	Metre
m^2	Square metres
m^3	Cubic metres
mg/L	Milligrams per litre
mg/m^3	Milligrams per cubic litre
ML/ day	Mega litres per day
ML/mm	Mega litres per millimetre

ML	Mega litre
MLH	Meat and Livestock Holdings Australia
mm	Millimetres
MPID	Moira Private Irrigation District
MR	Main Road
N	Nitrogen
Na	Sodium
NES	National Environmental Significance
NLWRA	National Land and Water Resources Audit
NP&W Act	National Parks and Wildlife Act 1974
NSW	New South Wales
NVC Act	Native Vegetation Conservation Act 1997
OEMP	Operational Environmental Management Plan
OH&S	Occupational Health and Safety
P	Phosphorus
PET	Potential Evapotranspiration
PFM	Planning Focus Meeting
pH	Measure of the acidity or alkalinity of a solution
PHA	Preliminary Hazard Analysis
PGI	Preliminary Geotechnical Investigation
POEO Act	Protection of the Environment Operations Act 1997
Pty	Proprietary
QDPI	Queensland Department of Primary Industries
REP	Regional Environmental Plan
RFI Act	Rivers and Foreshores Improvement Act 1948
RNE	Register of the National Estate
RTA	NSW Roads and Traffic Authority
RVMP	Regional Vegetation Management Plan
SAR	Sodium adsorption ratio
SCU	Standard Cattle Unit
SH21	State Highway 21
t	Tonnes
TAPM	The Air Pollution Model
Tpa	Tonnes per annum
TSC Act	Threatened Species Conservation Act 1995
WA	Wildlife Atlas
WSP	Water Sharing Plan
°C	Degrees Celsius
µg	Micrograms

µL	Micro litres

GLOSSARY OF TERMS

Aboriginal archaeological site (Aboriginal site)	A place where physical remains or modification of the natural environment indicate past and "traditional" activities by Aboriginal people. Site types include artefact scatters, isolated artefacts, burials, shell middens, scarred trees, quarries and contact site.
Aerobic	Associated with the presence of free oxygen.
Alluvium	Sediment deposited by a stream, consisting of unconsolidated material such as gravel, sand, silt and clay.
Ambient	Surrounding environment.
Ameliorative	To make better, improve.
Anaerobic	A condition in which no free oxygen nitrates are present.
Annual Environmental Management Report	A report providing an annual summary of mining operations, consultation and environmental performance of the mine.
Applicant	The body proposing the project. In the case of this EA, Agricultural Equity Investments is the applicant.
Aquifer	Geological formation, group of formations, or part of a formulation capable of transmitting and yielding significant quantities of water.
Artefact	An item of human manufacture, normally applied only to the products of previous culture. Examples are bone or stone tools, engraving, paintings.
Australian Height Datum	The standard reference level used to express the relative elevation of various features. A height given in metres AHD is essentially the height above sea level.
Biochemical Oxygen Demand (BOD_5)	The decrease in oxygen content in mg/L of a sample of water in the dark at a certain temperature over a certain period of time, which is caused by the bacterial breakdown of organic matter. The oxygen demand is measured after 5 days (BOD_5) at which time 70% of the final value has usually been reached.
Biodiversity	First coined in 1988 as a contraction of biological diversity; traditionally referring to species richness and species abundance. Biodiversity has been defined subsequently as encompassing biological variety at genetic, species and ecosystem scales (DASETT 1992). The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority, and is protected by the International Convention on Biological Diversity 1992.

Bunds	An earthwork or wall to contain and control spillages, normally associated with tank farms, fuelling and chemical storage facilities.
Burial Site	Usually a subsurface pit containing human remains and sometimes associated artefacts.
CALPUFF	A computer-based dispersion model used to predict impacts to air.
Catchment	The area in which water collects to form the supply of a river stream or drainage area.
Cation exchange capacity	The capacity of soil to hold and exchange cations. Expressed as centimoles of positive charge per kilo of soil (cmol(+)/kg).
Cation	A positively charged ion.
Conservation	The management of natural resources in a way that will benefit both present and future generations.
Construction Environmental Management Plan	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Contaminants	Polluting substances.
Crop Factor (Kc)	The proportion of potential evapotranspiration (PET) actually transpired by a crop.
Cumulative effect	Refers to the accumulation of effects over time.
dB(A)	The most common measurement of environmental noise – measured using a simple sound level meter having an A-weighting filter to simulate the subjective response of the human ear.
Diversity	The abundance in numbers of species in a given location.
Ecologically Sustainable Development	Development that aims to meet the needs of the present generation without compromising the ecological processes on which life depends for the benefit of future generations.
Ecosystem	An interdependent system of interacting plants, animals and other organisms together with the non-living (physical and chemical) components of their surroundings.

Effluent	Effluent means: (a) wastewater from sewage collection or treatment plants; or (b) wastewater from collection or treatment systems that are ancillary to processing industries involving livestock, agriculture, wood, paper or food, being wastewater that is conveyed from the place of generation by means of a pipe canal or other conventional method used in irrigation (but not by means of tanker or truck); or (c) wastewater from collection or treatment systems that are ancillary to intensive livestock, aquaculture or agricultural industries, being wastewater that is released by means of a pipe, canal or other conventional method used in irrigation as part of day-to-day farming operations.
Electrical Conductivity	A measure of the conduction of electricity through water or a water extract (1 part soil to 5 parts water) of soil. Used to determine the soluble salts content.
Emergency response	The reaction by emergency services such as Fire, Police, Ambulance, Industrial Fire Brigades, etc, to an emergency.
Emission	The release of constituents into the atmosphere (e.g. gas, steam or noise).
Endangered species	Those plants and animal species likely to become extinct unless action is taken to remove or control the factors that threaten their survival.
Environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
Environmental Impact Assessment	The orderly and systematic evaluation of a proposal, including alternatives and objectives, and its effects on the environment, including the mitigation and management of those effects.
Environmental Assessment	A document providing a formal description of a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and economic justification of the project. The EA is used as a vehicle to facilitate public comment and as the basis for analysing the project prior to determining the project under relevant legislation.
Environmental management	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy.

Environment Protection Licence	A licence to undertake an activity listed on Schedule 1 of the Protection of Environment Operations Act 1997. In the case of the feedlot, the licence would be issued by DEC.
Feed Bunk	A long trough for feeding cattle.
Feed Road	Road used to access feed bunk.
Feedlot Class	There are four feedlot classes defined within the draft policy *Assessment and Management of Odour from Stationary Sources in NSW*: Class One: This represents the highest standard of design, operation, maintenance, pad management and cleaning frequency. Class Two: This is the generally accepted standard for a well-designed, constructed and maintained feedlot, which has a high standard of operation. This is the reference standard for all classes. Class Three: Well designed, well constructed and operated with higher standards than Class Four for pad preparation and maintenance and pen cleaning. Well removed from impact locations. Class Four: Generally a small feedlot in an isolated situation with basic management and development standards, well separated from any residential situations and having fewer than 1000 head of cattle.
Floristic composition	The plant species present in a particular community, sub-community or site.
Geotechnical	Relating to the form, arrangement and structure of the geology.
Greenhouse Effect	Predicted global climatic change (e.g. global warming) associated with the build up of certain gases (such as water vapour, carbon dioxide, methane, chlorofluorocarbons, ozone, nitrous oxide, etc) within the atmospheric environment of the earth.
Greenhouse Gas	Gases such as methane, carbon dioxide, CFC which contribute to global warming by trapping heat between the earth and the atmosphere.
Groundwater	Subsurface water contained within the saturated zone.
Habitat	The particular local environment occupied by an organism.
Heritage (cultural heritage)	A term which encompasses Aboriginal and post-contact archaeological sites and material remains (cultural resources).

Hydrogeology	The study of subsurface water in its geological context.
Hydrology	Surface water and groundwater and their interaction with earth materials.
Impervious	A material that does not allow another substance to pass through or penetrate it.
Integrated Development	Development that requires development consent and one or more of the approvals listed within section 91 of the Environmental Planning and Assessment Act 1979.
Infiltration	The process of surface water soaking into the soil.
Inter-generational equity	The principle 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.
Katabatic Drift	Katabatic drainage flow (or valley drainage flow) occurs under light winds and stable meteorological conditions. Air, as it cools at night, falls and tends to move down hill in areas of significant topographic relief. As this air moves it tends to create a bulk movement of air, which can cause winds to blow in areas influenced strongly by topography.
$L_{A3,\ T}$	The A-weighted noise level exceeded for 1% of a time interval, T.
$L_{a10,\ T}$	The A-weighted noise level exceeded for 10% of a time interval, T. This is commonly referred to as the average maximum noise level.
$L_{A90,\ T}$	The A-weighted noise level exceeded for 90% of a time interval, T. This is commonly referred to as background noise level.
$L_{aeq,\ T}$	The equivalent continuous sound level in dB(A). The energy average A-weighted noise level over a time interval, T.
Mitigation	Reduce the severity of impact.
National Estate	Those parts of Australia's natural, Aboriginal or historic environment which are identified of worth for present and future generations.
Native vegetation	A broad term for vegetation comprised of plant species which occur naturally in Australia (but which are not necessarily indigenous).

Neutral Atmospheric Conditions	An atmosphere that is at a temperature of approximately 23^{o}C from ground level to an altitude of 200m or more. There are no fluctuations in density or water vapour content and no wind. Such conditions rarely occur, as temperature will usually vary with altitude and there is always movement in various directions in different layers of the atmosphere.
Nutrients	Chemical elements that are essential for plant and animals growth; the major nutrients essential for plant growth are nitrogen, phosphorus and potassium. In excess quantities, nitrogen and phosphorus may encourage nuisance growths of algae and aquatic plants in water, and in the case of nitrate, pose a human health risk.
Odour unit	The assessment of odours involves the exposure of a selected panel of observers to varying concentrations of an odour in a controlled sequence to determine then point at which only half the panel can successfully detect the odour. This point is called the odour threshold or one odour unit (ou). The number of odour units is the concentration of a sample divided by the odour threshold. There are several odour thresholds that can be determined.
Operational Environmental Management Plan	The control, training and monitoring measures to be implemented during the operation phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts (being socio-economic, cultural, physical, biological) identified during environmental assessments.
Particulates	These include any solid material suspended in the atmosphere.
Pathogen	An organism capable of eliciting disease symptoms in another organism.
Percentiles	The first value in a sample set which exceeds exactly x% of the population expressed in x%ile (e.g. 95 percentile – 95%ile). The 50 percentile is called the median.
Permeability	The property or capacity of a porous rock, sediment, clay or soil to transmit a fluid.
PM_{10}	Particulate matter less than 10µm in size, the respirable fraction.
Precautionary principle	The principle that if there are threats of serious or irreversible environmental damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
Rating Background Level (RBL)	The RBL (L90) is defined as the overall single figure background level representing each assessment period (i.e. day/evening/night).
Recycling	The return of waste materials to the production system so that the need for raw materials is reduced.

Register of the National Estate	A list of the National Estate developed under the provisions of the Commonwealth's Australian Heritage Commission Act 1975. The Register of the National Estate now falls under the provisions of the Environment Protection and Biodiversity Conservation Act.
Rehabilitation	The return of previously mined land to a stable land surface capable of useful purposes.
Relic	Any item greater than 50 years of age.
Revegetation	The process of re-establishing a vegetative cover.
Riparian zone	The vegetated corridor along streams and rivers.
Risk	Likelihood of a specific undesirable event occurring within specified period or in specified circumstances. Listed as frequency or probability.
Risk assessment	A process used to determine whether people and the environment are at risk (e.g. health and safety) from exposure to hazardous substances used or produced (mainly in an industrial or work place) so that appropriate control measures or management practices can be introduced to prevent or minimise the risk.
Salinity	The concentration of water soluble salts, mainly sodium, calcium and magnesium, which may be chlorides, sulphates or carbonates. Measured as conductivity in dS/m, or as dissolved solids in mg/L.
Scarred tree	Scars are caused on trees by the removal of bark by Aborigines for the manufacture of utensils, canoes or for shelter. A toehold tree or possum tree also falls under this category as it is a tree which has had small patches of bark chopped out to provide hand and foot holds for climbers after possums or vantage.
Sorption	General term for the interaction (binding or association) of a solute ion or molecule with a solid. E.g. Subsurface drain - A shallow drain installed in an irrigated field to intercept the rising ground-water level and maintain the water table at an acceptable depth below the land surface.
Sound Power Level	The amount of acoustic energy (per second) emitted by a noise source. Sound Power Level is expressed in decibels (dB) and cannot be directly measured.
Sound Pressure Level (SPL)	The "Noise Level", in decibels (dB), heard by our ears and/or measured with a sound level meter. The sound pressure level generally decreases with increasing distance from a source. Noise levels are often written as dB(A) rather than dB. The "A-weighting" is a correction applied to the measured noise signal to account for the ear's ability to hear sound differently at different frequencies.

Standard Cattle Unit (SCU)	A standard cattle unit is defined as an animal of 600 kg liveweight at the time of exit (turnoff) from the feedlot.
Statutory authority	An authority set up as a requirement of legislation.
Sustainable use	Use of an organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
Tailwater	Wastewater runoff leaving the downslope end of an effluent irrigation area.
Temperature inversion	An atmospheric state in which the air temperature increases with altitude.
Terrestrial	Of or pertaining to the land as distinct from the water.
Threatened species	Animals and plants that are in danger of extinction or may now be considered extinct, but have been seen in the wild in the last 50 years.
Visibility	Measure of extent to which particular components of a project may be visible from surrounding areas.
Visual absorption capacity	An estimation of the capacity of the landscape to visually absorb a project without creating a significant change in visual character or producing a reduction in scenic quality.
Vulnerable species	Those species that may soon become endangered unless action is taken.
Wastewater	Water which is collected and transported to a treatment area. Wastewater normally includes water from both domestic and industrial use.
Wet weather storage (storage)	A facility for storing effluent generated when the use of effluent for irrigation is not possible, such as when it is raining, or when evaporation is very low.
Wind climate	A description of the meteorological conditions created by the wind involving measurements of wind speed, direction and frequency of gusts for average, seasonal and annual conditions.

executive summary

EXECUTIVE SUMMARY

BACKGROUND

Agricultural Equity Investments (AEI) Pty Limited proposes to develop a cattle feedlot at Moira Station in the Riverina Region of southern New South Wales (NSW). The Project site is approximately 1,200 hectares (ha) in size and is located near the border of NSW and Victoria, approximately 250km north of Melbourne. The proposal will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), under which it is defined as a major project. As required under Part 3A of the EP&A Act, an Environmental Assessment (EA) has been prepared for the proposed development.

The site has previously been used for agricultural purposes and contains an extensive network of irrigation channels, which are fed by the main Moira Irrigation Channel. The proposed feedlot would accommodate approximately 80,000 cattle, which would arrive at the feedlot weighing approximately 300kg and be fed and watered until an average weight of approximately 529kg is reached. The purpose of the proposed feedlot is to produce grain fed beef graded and cut to compete with the US product in the global market, particularly Asia, where there is considered to be high demand for consistent quality beef products.

Regional Description

The feedlot site is located within Murray Shire in the Murray Darling Basin. The major industries in this region comprise agriculture, food processing, manufacturing, forestry and wood processing, transport and logistics, education and research and public sector institutions. The nearest towns in the vicinity of the Project site are Mathoura, Echuca-Moama and Barmah.

Alternatives Considered

Following an extensive search for potential development sites throughout central and southern NSW, four Shires were selected for the proposed development. These were:

- Jerilderie Shire;
- Deniliquin Shire;
- Conargo Shire; and
- Murray Shire.

The factors which precluded these areas from being selected included the presence of threatened species, the presence of groundwater at shallow depths, inadequate soils and being located within a flood zone.

The site within the Murray Shire was selected as it satisfied the selection criteria, which included factors such as having an adequate area, compatible surrounding landuses, access to transport, access to a local workforce, and an available water and power supply.

PROJECT DESCRIPTION

The proposed development is for an 80,000 head cattle feedlot located at Moira Station. Cattle weighing 300kg would be transported to the feedlot and housed in pens. The cattle would be fed rations which will include specific quantities of grain until they reach a designated weight (an average of 529kg) whereby they would be transported from the site to an abattoir.

The Moira feedlot would be classified as a Class One feedlot (DEC, 2001), which has the highest standard of design, operation, maintenance, pad management and cleaning frequency. The proposed feedlot would occupy a footprint of approximately 600ha and elements of the project include:

- Feed pens;
- Internal roadways;
- Ancillary buildings;
- Effluent storage;
- Receivals area;
- Commodities and feed preparation area;
- Freshwater storage;
- Sedimentation and holding ponds;
- Irrigation area; and
- Diversion of Moira Irrigation Channel.

Construction

Preparation of Moira Station to allow for the construction of the proposed development would consist of the following activities:

- Clearance of trees in the pen area;
- Clearance of trees along the proposed access road; and
- Construction of a temporary access road adjacent to the proposed operational access road.

Following site preparation, the topsoil within the pens would be stripped to an approximate depth of 100mm and the feed bunks would be constructed with an in-situ 4m concrete apron with steel pipes and cable fencing.

The construction of feed roads and cattle lanes would include an upper layer of spray seal and would slope away from the pens at a grade of approximately 3% to allow for adequate drainage. The roads and lanes would be approximately 8m wide to allow the movement of vehicles.

The sedimentation basins, holding pond and storage areas would be constructed by stripping the topsoil in the area and then excavating to the required depth. Clay lining would be used in compacted layers to achieve a density of approximately 95% of the standard maximum dry density.

A new permanent access road would be constructed to a width of approximately 10m, which includes two lanes of 4m width and 1m hard shoulders. The road would be sealed and provide access between the Cobb Highway and the receivals area.

The site currently has existing service infrastructure in the form of electricity, water and communications. The proposed development would require some extension of these services. Construction would be undertaken over a period of approximately 6 months. All traffic associated with construction would utilise the Cobb Highway.

Operation

The feedlot is designed to house a maximum of 80,000 head of cattle at any one time. It is expected that cattle would be supplied from south eastern Australia. These areas include The Riverina, the south and central western slopes and plains, the central and southern tablelands of NSW and central, northern and eastern Victoria, South Australia and Tasmania.

Cattle would enter the feedlot at around 9 to 12 months of age and an average of 300kg liveweight. The cattle would be fed for approximately 182 days to achieve an average weight of 529kg liveweight. All cattle would be transported into the feedlot by road. Feed for the cattle would be transported to the site from south eastern Australia. Locally grown produce, in particular, grains would be used, together with smaller quantities of protein meals, trace mineral and vitamin premixes, salt, limestone, urea and other registered stock feeds and additives.

The operation and practices for the proposed feedlot at Moira Station would comply with the nationally recognised Australian Model Code of Practice for the Welfare of Animals (SCARM, 2004) and Australian Model Code of Practice for the Welfare of Animals: Land Transport of cattle (SCARM, 2000). In addition, AEI would prepare an Animal Care Statement (ACS) prior to stocking the feedlot.

APPROVALS

Local Planning Matters

The primary local planning instrument applicable to the subject land is the Murray Local Environmental Plan (LEP) 1989. Under this LEP, the land is zoned 1(a) General Rural and the proposed development falls within the definition of 'intensive livestock keeping establishment'. The proposed feedlot meets the objectives associated with this definition and the LEP zoning.

State Planning Matters

Consent is required for the proposed development under Part 3A of the EP&A Act, and the proposed development is a major project under the Act. The Minister for Planning is the consent authority for the proposed feedlot.

State Environmental Planning Policies (SEPP)

The SEPPs applicable to the proposed development are:

- SEPP No. 11 – Traffic Generating Developments;
- SEPP No. 30 – Intensive Agriculture; and
- SEPP 2005 – Major Projects.

Regional Environmental Planning Policy

The regional planning policy applicable to the proposed development is:

- Murray Regional Environmental Plan No. 2 – Riverine Land.

State Legislation

- *Protection of the Environment Operations Act 1997* (POEO Act): Under section 48 of the POEO Act, the proposed development requires an Environment Protection Licence (EPL) as it is a scheduled activity;

- *Roads Act 1993:* The proposed development involves the connection of a private road to a classified road, therefore the proposal requires assessment from the RTA under section 138 of the Roads Act 1993. The assessment from the RTA must be consistent with the assessment undertaken by the Department of Planning as required under 75(V) of the EP&A Act; and
- *Threatened Species Conservation Act 1995:* The TSC Act provides a framework to ensure that the impact of any action affecting threatened species is assessed. Schedule 1 of the TSC Act lists endangered species, populations and ecological communities, Schedule 2 lists vulnerable species and Schedule 3 lists key threatening processes. Part 3 of the TSC Act defines critical habitat. The EA includes eight part tests on identified threatened species.

Commonwealth Matters

- *Environment Protection and Biodiversity Conservation Act 1999:* The proposed feedlot is not expected to impact on matters of NES, and as a consequence the EPBC Act is not triggered and referral to, and approval from, the Commonwealth Minister for Environment and Heritage is not required.

CONSULTATION WITH STAKEHOLDERS

Statutory and non-statutory authority consultation

As part of the environmental impact assessment process, consultation was undertaken with the following authorities:

- Department of Planning (formerly DIPNR);
- Roads and Traffic Authority (RTA);
- Department of Environment and Conservation (DEC);
- Commonwealth Department of Environment and Heritage (DEH);
- Moira Private Irrigation District (MPID);
- Greater Murray Area Health Service (Department of Health);
- Department of State and Regional Development (DSRD);
- Department of Primary Industries (DPI); and
- Murray Shire Council;

A Planning Focus Meeting (PFM) was held on 17 June 2004 and comments were subsequently provided in the Director General's Requirements.

Community Consultation

Consultation was also undertaken with representatives from the Moama and Cummeragunja Local Aboriginal Land Councils and the local community. The overall objective of the community consultation program was to inform the community about the proposed development and to ensure clear, transparent, two-way communication by listening, recording and responding to the issues as they arose.

A letter and project information DVD was distributed to residents living within 10km of the Project site. The community was encouraged through the letter to make submissions on the proposal and several took up the opportunity to comment. As a result, a number of responses

from the community were received and these were returned with face to face meetings or further correspondence containing information pertaining to the issues raised in the respective enquiries.

Each of the issues raised by members of the community related to the proposal has been addressed within this EA.

Issues Identification

The key issues arising from the consultation process are outlined in the table below.

Table ES-0-1: Issue Identification

Aspect	Issue
Environment	Flora and Fauna Irrigation Management Odour Traffic Waste Management
Social	Amenity Consultation Employment Hazards and Risk Traffic and transport
Project/EA Process and Findings	Strategic Objectives
Project	Sourcing of materials

The issues listed in **Table ES-0-1** identified as a result of consultation with statutory authorities and the community have been addressed within this EA and are summarised in **ES5** below.

ENVIRONMENTAL IMPACT ASSESSMENT

Air Quality

Odour

The Odour Impact Assessment used a computer-based dispersion model, CALPUFF, to predict off-site odour levels due to the operation of the feedlot. To assess the potential impacts that odour emissions could have on existing air quality, the dispersion model predictions were compared to relevant regulatory air quality criteria.

There are two primary methods for assessing odour impacts from cattle feedlots. The two methods are:

1. Generic calculations (known as a Level 1 assessment), and
2. Odour dispersion modelling (Level 2 or 3 assessment).

Both these approaches were undertaken in the odour assessment for the proposed feedlot at Moira Station.

A number of residential properties are located within about ten kilometres of the feedlot site. Although some of the modelled results show that odour levels are predicted to be slightly below the odour criteria, it would be difficult to say that odours from the feedlot would not be detectable on occasions at these locations. Residences located further away from the feedlot site would be expected to observe lower odour levels and lower frequency of odour events than residences closer to the site.

The results of the dispersion modelling indicate that some residences are predicted to experience odour levels which are higher than those considered to be acceptable by DEC. The predicted odour levels in the towns of Barmah, Mathoura and Moama are within acceptable criteria and limits.

The proponent is currently in negotiations with affected property owners in order to reach a mutually acceptable solution should this project application be approved by the Minister.

Dust

The site is likely to be influenced by agricultural activities and emissions from vehicles and trains. Observations of other feedlots have found that dust problems can particularly develop during the late afternoon and dusk, when temperatures drop and cattle become more active (Department of Primary Industries and Fisheries Queensland). However, it is considered that the potential for dust can be minimised by the implementation of appropriate mitigation measures during construction and operation of the feedlot.

Greenhouse Gases

Methane is 23 times more potent in its global warming potential than carbon dioxide. In cattle, methane is produced naturally as a by-product of digestion. The cattle at the feedlot would generate approximately 9,600 tonnes of methane a year.

Research into methane production in cattle has found that the amount of methane produced by cattle varies depending on the diet they are fed on. The diet proposed for cattle at the Moira feedlot would be a high quality grain based diet, which would minimise the amount of methane produced by the cattle.

Combustion emissions associated with the proposed feedlot may include exhaust emissions from construction equipment (eg. excavator, bulldozers etc) and vehicles used to transport cattle and feed. The vehicle emissions associated with the proposal are not considered to significantly impact upon the air quality of the local area.

Land Capability for Irrigation

The proposed development would produce effluent during its operation and would require licensing approvals for effluent irrigation as part of waste management at the site. An Environment Protection Licence (EPL) would be provided by the NSW Department of Environment and Conservation (DEC) as part of the project approval.

Preliminary investigations at the site concluded that the soil, groundwater and climate conditions existing at the site make it suitable for irrigation of liquid effluent. Calculations were then undertaken in order to determine the required sizes of holding ponds, sedimentation basins and effluent storage. The controlled drainage area of the site was determined to be 201ha and the amount of runoff predicted was 1,043ML in a 90th percentile year.

As a result, the size of each sedimentation pond would be 5ML, the holding pond would be 130ML and the effluent storage area would be 500ML.

The amount of wastewater and its nutrient content on site determined the amount of land required to sustainably irrigate the wastewater generated from the proposed development. The assessment also concluded that the amount of land to be irrigated at Moira Station (approximately 380ha) was sustainable.

Treated wastewater from the effluent storage would be used as an irrigant for the surrounding land within the Moira Station property. Irrigation design considerations took account of soils, water balance, organic balance, salt loading and nutrient balance.

The land at Moira Station is suitable for irrigation and various controls would be implemented to ensure the irrigation system does not cause environmental pollution or public health risks including;

- The presence of an irrigation manager;
- Scheduling of irrigation so that it only occurs during suitable times and at suitable locations;
- The implementation of an Effluent Irrigation Management Plan (EIMP); and
- Monitoring of effluent wastewater, soil and crops.

Surface Water

Existing Environment

The main features of the surface water environment in the surrounding area are the Murray River located approximately 9km to the east and also the Moira Lake and wetland system, located approximately 5km to the east of the site. Irrigation channels for the Moira Private Irrigation District (MPID) traverse the northern portion of the Project site. Water is supplied to the area by the Moira Irrigation Channel which pumps water from the Murray River and channels it to the surrounding properties.

The site is not subject to flooding and there are no permanent natural drainage lines occurring within the site. There are some drainage depressions located in the northern part of the site and vegetation is typically located in these areas. Precipitation at the site is generally low (average annual rainfall 443mm) and evaporation is high, typically resulting in a deficit of water on the site. Therefore, runoff generally infiltrates into the soil, or is lost by evaporation.

Assessment of Impacts

Site preparation and construction would require significant earthworks involving clearing of trees, cut and fill, pond construction and road construction with the potential for soil erosion and soil loss during rainfall events.

As part of the site preparation works, it is proposed that the channel of the Moira Irrigation Channel which cross the site would be re-directed around the footprint of the proposed development and away from the controlled drainage area. Four sedimentation basins would be constructed to the west of the feed pens. During construction these basins would be utilised to capture runoff from disturbed areas during rain events.

During operation of the feedlot, contaminated runoff from the feed pens and receivals area would drain to the west into the sedimentation ponds. Runoff and wastewater would be stored, treated and disposed of on site by irrigation.

Groundwater at the Project site, which was located at a depth of 22m, is not expected to be adversely impacted from the proposed development.

Mitigation Measures

It is expected that the proposed development would not create any impacts upon the local surface water and groundwater environment. A Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP) and Effluent Irrigation Management Plan (EIMP) would be prepared for the feedlot operations, which would detail the management and monitoring requirements for water management at the Project site.

Landform, Geology and Soils

Existing Environment

The study area consists of farm infrastructure in the form of ruins and a shearing shed in the north-eastern portion of the site and shed silos and yards in the southern portion of the site. There are also irrigation channels and graded tracks on-site.

The geology of the study area is underlain by Quaternary Alluvium comprising sand, silt, clay and gravel. The site contains the following soil strata:

- Surface topsoil/ disturbed layer;
- Alluvial clayey soils;
- Alluvial sandy soils; and
- Alluvial silty soils.

Assessment of Impacts

Geotechnical investigations were undertaken across the Project site and concluded that a number of potential minor geotechnical issues needed to be managed to allow for the construction of the proposed feedlot. These issues included:

- Treatment of dispersive soils;
- Variable subsurface conditions (clayey and sandy soils) and potentially undetected “Stream Traces” within the subsurface profile;
- Clay soil plasticity and cracking potential;
- Soil permeability;
- Stability of compacted earthworks embankments for water retaining structures;
- Stability of excavated slopes within water retaining structures; and
- Compaction and moisture content requirements for bulk earthworks.

Mitigation Measures

Management measures would be implemented during the construction of the feedlot in order to mitigate potential impacts. These measures include:

- placed earthworks would be tested by a NATA registered soil laboratory and all water retaining structures would be constructed under the full-time presence of a geotechnical engineer/ geotechnician on site;
- Inspection and approval of stripped areas prepared by the earthworks contractor for the placement or fill;

- Confirmation that the earthworks construction techniques are in accordance with specification;
- Inspection of the reservoir area excavations for sand layers and bands;
- The addition of an appropriate percentage of gypsum (calcium sulphate) to the clay soil during construction;
- Stipulation of an appropriate construction specification for bulk earthworks with respect to both compaction and moisture content;
- Controls and verification during construction to ensure the adopted construction specification and design is followed; and
- The implementation of a clay liner (or appropriate alternative) at the base of the reservoir at the holding pond.

Traffic and Transport

The construction and operation of the proposed feedlot would result in an increase in traffic volumes in the area. Traffic generated from the operation of the feedlot would include transport of cattle to and from the feedlot, transport of feed and other supplies, employee movements and the transportation of waste.

The site would be accessed from the Cobb Highway, which currently benefits from low traffic volumes and above average sight distance. A new site access will be constructed to accommodate the increase in traffic volumes. It would be able to accommodate B-double vehicles and would include a deceleration lane on the Cobb Highway.

During both construction and operation, it is predicted that the AADT of the Cobb Highway would increase by a maximum of approximately 4%. The Cobb Highway has sufficient capacity to accommodate the traffic generated during the construction and operation of the proposed feedlot. It is expected that traffic generated would not adversely impact the operation of the local road network.

Ecology

HLA undertook an Ecological Assessment of the site in March 2005 to identify the flora and fauna issues associated with the proposed feedlot.

During the field survey, 69 vascular plant species were recorded, including 29 introduced species. There are four vegetation communities present at the site:

- River Red Gum (*Eucalyptus camaldulensis*) Community;
- Black Box (*Eucalyptus largiflorens*) Community;
- Box Community with Exotic Understorey; and
- cropped.

Fifty-six fauna species were recorded at the site, including three threatened birds: the Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), the Brown Tree Creeper (*Climacteris picumnus)* and the Blue-billed Duck (*Oxyura australis)*. The remains of a Major Mitchell's Cockatoo (*Cacatua leadbeateri*) were also found, which is listed as Vulnerable under the TSC Act.

The investigations concluded that habitat is present at the site for 17 threatened species. As required under the TSC Act, eight part tests were undertaken for these identified threatened

species. The eight part tests concluded that the proposed development is unlikely to adversely impact upon the threatened species identified within the study area.

Overall, the proposed development is not expected to create any significant ecological impacts. However, management measures would be implemented and include scheduling and managing the location and extent of stocking in sensitive areas to the north of the development footprint and enhancing existing habitats to the north of the footprint.

Cultural Heritage

An Aboriginal Heritage Assessment was undertaken to identify any Aboriginal heritage issues associated with the proposed feedlot. The archaeological survey and assessment defined the survey area into areas of low, moderate or high archaeological sensitivity.

There is a low to nil potential for archaeological material to occur in the areas currently affected by previous laser levelling, ploughing, irrigation services, and/or roads. This encompasses the vast majority of the study area.

Only one area has been assigned as moderate sensitivity due to its 'relatively' (in comparison with the remaining areas) undisturbed condition. It is located within the north eastern section of the study area and is outside the area of impact.

Three Aboriginal sites were identified within this north eastern section of the Project site: a scarred tree (MF1), a potential oven mound (MF2) and a glass bottle base reused as a core (MF3). All three locations have been identified as high sensitivity due to the presence of Aboriginal objects protected under the NPW Act 1974 (as amended).

The proposed development is not expected to create any significant heritage impacts. However, measures that would be implemented to ensure the protection of heritage include:

- Ceasing all works should any Aboriginal objects or archaeological deposits be identified during the course of site works and contacting the DEC;
- Should suspected skeletal material be uncovered during the course of site works, all works must cease and the DEC, the NSW Police and the NSW Coroners office contacted immediately, regardless of any existing DEC permits for the proposed development;
- Inviting the Moama LALC to undertake targeted monitoring of the excavations on site;
- Geotechnical personnel and Moama LALC working within the study area should be provided brief instruction by a qualified geoarchaeologist in identifying significant soil sequences and buried archaeological deposits; and
- Raising the awareness of all personnel associated with the site as to their responsibilities with regards to cultural heritage.

Visual Amenity

The topography of the surrounding landscape is flat, as much of the area has been cleared with cultivated and uncultivated paddocks and irrigation channels. There are areas with remnant vegetation. The surrounding area contains no significant spot heights with the area at a relief of approximately 100m AHD. The landscape changes in nature as one moves east towards Lake Moira and it's associated the wetland system and the Murray River.

The land to the east of the site consists of dense vegetation and becomes more sparse and remnant toward the west.

In some areas there is a clear line of sight across the central portion of the property from the Cobb Highway to the Moama Deniliquin Railway line in the west. In general the land is covered with low grasses with little evidence of a shrub understorey due to grazing. There are few residential properties within five kilometres of the Project site.

Numerous irrigation channels cross the site, these channels connect with the Moira Irrigation Channel to the north of the site. The shearing sheds and ruins located on the site date to the 19th century and provide evidence of the historic landuses of the site. These buildings are in a dilapidated state and are located outside the footprint of the proposed development.

A visual assessment was undertaken which identified sensitive viewpoints in the surrounding area. It was considered that the majority of residential properties located within the viewshed of the proposed development would not have direct views to the proposed feedlot and would not be impacted as a result of the proposal. It is considered that the amount of vegetation in the area of the proposal and the distance between receptors and the proposed development reduced the potential for a visual impact to residential receivers in the local area.

Noise

Due to the rural nature of the area and the considerable distance between the proposed development and any sensitive receivers, background noise monitoring was not undertaken to establish existing background noise levels associated with the site. As such, the noise assessment has undertaken the following assumptions:

- There are no significant existing noise sources in the locality; and
- Existing background levels would be comparable to those of a typical rural environment. The minimum limit of 30dB(A) (DEC, 2000) was used for this assessment.

Noise impacts could arise from the following activities:

- Construction noise;
- Operation of the feedlot; and
- Road traffic noise from the operation of the feedlot.

There are very few residential (sensitive) receptors in the vicinity of the noise sources of the proposed development. There are expected to be some temporary noise impacts to R1, R2 and R3 during the construction period. However, due to the temporary and infrequent nature of the activities it is considered that the noise impacts would be relatively minor.

The operation of the feedlot would be consistent with the existing agricultural activities of the region and due to the significant distance to the nearest receptor, the noise generated from the proposed development is not expected to create a significant impact to the surrounding environment.

Appropriate management measures would be implemented during the construction and operation of the feedlot. These measures include maintaining all plant and equipment and installing noise attenuation apparatus, and appropriately managing the cattle so they remain quiet and unstressed.

Hazards and Risks

Hazards and risks associated with the proposal include:

- Risks to human health and safety;

- Risks to animal health; and
- Other risks to the biophysical environment.

The primary human risk is the potential for Q-fever, which is mainly acquired by workers in the livestock, agriculture, veterinary and meat industries as these people are more likely to come into contact with airborne particles created from tissue, waste and dust from infected animals. The preparation and implementation of an Occupational Health and Safety (OH&S) Management Plan for the operations at the feedlot would manage the OH&S risks for employees such as general safety for working with machinery and cattle, including methods of managing the potential to acquire Q-fever.

The proposed cattle feedlot also has the potential to impact upon the health of the animals through heat stress created from the climatic conditions. An Animal Care Statement (ACS) would be prepared prior to stocking the feedlot. The ACS would outline management measures aimed at preserving the welfare of the animals within the feedlot.

The biophysical environment would also be potentially impacted from the proposal, in particular odour and wastewater. Appropriate mitigation measures have been developed to address these issues.

The proposed cattle feedlot is not expected to create any significant hazards or risks to humans, animals or the biophysical environment provided the mitigation measures are implemented.

Social and Community

The social impacts were assessed by investigating the social characteristics of the area, by reviewing statistical data and by qualitative assessment of how people may experience impacts from the feedlot. Both positive and negative social impacts and the significance of these were assessed, and the requirement for measures to mitigate any impacts was also considered.

During construction, proposed impacts that may negatively affect people were considered to be environmental and amenity related, such as the increased incidence of dust, traffic and noise. The creation of employment opportunities for local workers and businesses would be the primary social benefit of the construction phase of the feedlot. Approximately 80 jobs would be created in areas such as earthmoving, transportation, road construction, concrete batching and site management.

The primary social benefit of the operation of the feedlot would be the creation of approximately 86 new jobs, 80 people would be employed for the feedlot operation and 6 people would be employed for other activities on the property. The generation of employment opportunities from the surrounding area and towns such as Mathoura and Moama would result in positive social and economic benefits for the families of those employed and the community as a whole.

The design, construction and operational management of the feedlot are not expected to adversely impact on people, and their social environment.

Land Uses

Landuses in the vicinity of the site include:

- Agricultural activities;
- Rural residential;
- Transport;

- Infrastructure; and
- Recreation.

The proposed feedlot development would continue, but intensify, the existing rural land uses of the site. The proposal would also require associated administrative land uses, such as office buildings to manage the feedlot and irrigation system.

It is considered that the proposed development is consistent with the surrounding landuses of the area. The construction and operation of the proposed feedlot are not expected to create any significant impacts to the surrounding landuses. Notwithstanding this, management measures would be implemented that would minimise the potential for the proposal to adversely affect the surrounding land uses.

Economics

Traditionally the economic base of the Murray Shire has been founded upon agriculture. However in recent years, tourism and viticulture have grown to be large economic sectors in the region.

Economic impacts during the construction phase are likely to have a positive effect upon the region due to the 80 direct employment opportunities that the project would create, and also the indirect effects upon suppliers and businesses associated with the project. The total set-up cost for the feedlot is estimated to be in the order of $80 million, including acquisition of land and construction costs. Employees utilised during the construction period would be sourced, where possible, from within the local area, as would the major types of goods and services used.

The operation of the feedlot is considered to have a beneficial impact upon the local and regional economy, primarily as a result of employment generation. The feedlot would directly employ approximately 86 people in a variety of positions including administration, cattle management and feedlot maintenance. The feedlot would also have positive indirect effects on the local economy, with the creation of jobs associated with the production of feed and the transportation of feed and cattle. Generation of employment would have multiplier effects from local income expenditure, as local businesses benefit from providing goods and services to the feedlot and its employees. It is also expected that grain for the feed of the cattle would be sourced from local suppliers.

Energy

The construction and operation of the proposed cattle feedlot would result in the consumption of energy in the form of electricity and fuel. However, the impacts of the proposal relating to the consumption of non-renewable energy are considered to be negligible. Measures to limit the use of non-renewable energy sources include:

- Use of modern and well maintained equipment;
- Reducing idling times on equipment/vehicles by switching off when not operational;
- Switching off truck and construction equipment engines when waiting to enter or exit a site or during loading or unloading; and
- Switching off lighting and office equipment when not in use.

Cumulative Impact

There are no known proposed developments in the locality immediately surrounding the proposed cattle feedlot site. However, there are two smaller cattle feedlots located within the

Shire. Each of these feedlots has development consent for 5,000 cattle and are located a significant distance from the proposed cattle feedlot at Moira Station. A cumulative impact assessment of these feedlots and the interaction with Moira Station focussed upon the primary external environmental impacts associated with feedlots; odour and traffic. The impact of these individual environmental factors are minimal, therefore, no significant cumulative impact is anticipated from the proposed development due to the safeguards to be implemented. The cumulative impact of the project with other known projects currently operating or proposed for the area is considered to be minimal.

STATEMENT OF COMMITMENTS

Environmental Management

AEI commit to the preparation and implementation of environmental management of the site and its activities during construction and operation. Environmental management at the site would be administered through an Environmental Management Plan (EMP) and regular environmental reporting and auditing. The EMP would be applicable to both the construction and operation phases of the project and would contain details of:

- Objectives of the plan;
- Statutory requirements and integration with other plans;
- Environmental management procedures;
- Monitoring requirements; and
- Emergency response.

A Construction Environmental Management Plan (CEMP) and an Operational Environmental Management Plan (OEMP) would form an integral part of the EMP for the project. To ensure that relevant authorities are appropriately informed of how AEI is managing its environmental performance, periodic reports would be prepared by the contractor during the construction phase and AEI during the operational phase, in accordance with each party's Quality System. Environmental audits would be undertaken during the construction and operational phases of the project.

PROJECT JUSTIFICATION

The assessment of the proposal undertaken in the development of this EA has incorporated biophysical, economic and social considerations. The potential biophysical impacts associated with the proposed development include examination of the following impacts:

- Terrestrial ecology;
- Landform, geology and soils (primarily for suitability for irrigation purposes);
- Hydrology, hydrogeology and water quality; and
- Wastewater treatment.

The assessment of the impact of the proposed development on each of the biophysical elements of the environment has concluded that providing management measures and monitoring systems are implemented to mitigate potential impacts, the proposed development would not have a significant impact and is therefore justifiable on environmental grounds.

The economic impact assessment demonstrates that the proposed development would provide both direct and indirect economic benefits to the local, regional and state economies. Given these benefits, the proposed development is justifiable on economic grounds.

The potential social impacts of the proposed development include consideration of the following key issues:

- Odour;
- Traffic and transportation;
- Amenity; and
- Landscape character and visual impact.

Other social or cultural issues assessed as part of the EA include hazard and risk, Aboriginal heritage, social and economic environments, energy, waste and cumulative impacts of the development on the environment. The assessments of each of these factors have shown that the project would not have a significant impact provided mitigation measures are implemented, and that the project is justifiable on social grounds.

part a
project background

1 BACKGROUND TO THE PROJECT

1.1 Background to the Project

Moira Station is located in southern New South Wales (NSW) and forms the project site, which has an approximate area of some 1,200 hectares (ha). It is situated on the western side of the Cobb Highway, some 42km south of Deniliquin and around 13km south of Mathoura and is bounded on the west by the Deniliquin-Bendigo railway and on the east by the Cobb Highway/Moira Marshes.

The property is currently used for irrigation and grazing, and has a 1,125ML water licence from the river and a bore licence of 5,114ML.

1.2 Project Outline

The proposed project at Moira Station involves a cattle feedlot with the following components:

- Feed pens including troughs;
- Access road (approximately 2.2km in length);
- Freshwater storage dam (approximately 1,000ML);
- Effluent storage area (approximately 500ML);
- Sedimentation ponds and holding pond (approximately 130ML);
- Irrigated area (approximately 380ha);
- Manure stockpiling area;
- Commodities and feed preparation area;
- Receivals area; and
- Ancillary buildings.

It is envisaged that the cattle feedlot will comprise some 80,000 cattle. The cattle will be delivered to Moira Station at a weight of approximately 300 kilograms (kg). The cattle will then be housed in pens approximately 12.7m^2 per head of cattle where they will be fed and watered to a weight of approximately 529kg.

It is expected that the construction of the feedlot will require a workforce of around 80 people with an operational workforce of some 86 people.

1.3 The Applicant

The applicant for the proposed cattle feedlot project is Agricultural Equity Investments (AEI) Pty Limited. AEI is an investment firm which facilitates funding for the construction and operation of cattle feedlots throughout NSW. AEI has previous experience in the design and management of cattle feedlots in NSW having designed, constructed and operated the feedlot approximately 75km west of Hay, NSW on a property known as Ravensworth.

1.4 Environmental Impact Assessment Process

The *Environmental Planning and Assessment* (EP&A) *Act 1979* and the *EP&A Regulation 2000* provide a framework for environmental planning in NSW.

Prior to any decision to proceed with a proposal that may have an impact on the environment, a detailed assessment of the likely impacts of the project must be undertaken. Part 3A of the EP&A Act establishes the processes and matters for consideration by approval authorities when determining the impact of a project and whether the project should be approved. The proposed project is defined as a major project under the provisions of the EP&A Act and State Environmental Planning Policy (Major Projects) 2005.

1.4.1 Major Projects

Section 75B(2) of the EP&A Act makes provision for 'major projects' to be identified through various means, including by way of declaration in State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005), or by notice in the Gazette.

Schedule 1 of SEPP 2005 identifies classes of development which are major projects. This includes certain intensive livestock industries such as those that employ 20 or more people for the purpose of feedlots, piggeries, poultry egg or meat production or dairies.

The proposed project is an 80,000 head of cattle feedlot and is expected to employ approximately 80 people and is therefore classified as a 'major project' under SEPP 2005 and the Minister for Planning is the approval authority.

1.4.2 Impact Assessment Requirements

Under section 75F of the EP&A Act, an Environmental Assessment (EA) must be prepared in accordance with the requirements of the Director General of the Department of Planning (DoP). A request for these requirements was made in June 2004.

The Director General's Requirements, which also include the requirements of the Commonwealth Department of Environment and Heritage (DEH), were issued on 25 August 2004 under Part 4 of the EP&A Act and were confirmed as applicable under Part 3A of the EP&A Act on 5 September 2005. A copy is enclosed as **Appendix A** to this EA.

1.4.3 Planning Focus Meeting

A Planning Focus Meeting (PFM) was held at Moira on 17 June 2004, and was attended by all relevant Federal and State statutory authorities. The PFM provided a forum for discussion and consideration of issues to be included in the Director General's Requirements issued by Department of Planning (DoP), which set out the requirements for the form and content of the EA. These issues are outlined in **Section 8** of this EA.

1.4.4 EA Exhibition

This EA has been prepared under Part 3A of the EP&A Act which specifically lists the matters to be addressed in an EA. Issues raised by Department of Environment and Heritage (DEH) have also been addressed within this EA.

The EP&A Act requires that the EA be placed on exhibition for public review for a minimum period of 30 days.

1.5 Document Structure

This EA has been prepared in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000*. It has also been prepared in accordance with the Director General's

requirements, issues raised by relevant government agencies and non-government organisations, and issues raised by the community.

The EA comprises two volumes incorporating the main text of the EA within Volume 1 and specialist technical studies in Volume 2. Volume 1 is divided into ten parts, as follows:

- *Part A – Project Background*

Part A of the EA briefly outlines the environmental assessment process, describes the background to the project and provides an outline of the proposed project.

- *Part B – Location and Context*

Part B describes the study area, site history and land use context of the project site.

- *Part C – Project Needs and Alternatives*

Part C describes the needs and objectives of the project.

- *Part D – Project and Its Management*

Part D of the EA provides a detailed description of the project, the relevant controlling Commonwealth and State legislation, and nominates the various licences required to enable the proposed project to proceed.

- *Part E – Issues Identification*

Part E of the EA summarises the issues raised during the consultation with the statutory and other relevant authorities, and the local community. The issues raised during the consultation process are then prioritised for the following sections of the EA.

- *Part F –Assessment of Effects*

Part F of the EA provides an overview of the existing environment, an assessment of the likely effects of the project and the identification of the appropriate mitigation measures to safeguard the environment. This part addresses the biophysical environment which examines impacts on surface water and groundwater quality, terrestrial ecology, air quality, landform; and the socio-cultural environment including hazards and risks, cultural heritage, noise, traffic, planning, land use, socio-economics, energy, the visual environment and waste management. The cumulative impacts of the project and a summary of key planning issues are also addressed.

- *Part G – Statement of Commitments*

Part G of the EA provides a Statement of Commitments which details AEI's commitment to environmental management and ongoing monitoring of the site and activities associated with the proposed project. The Statement of Commitments is intended to be considered as a stand-alone document to be attached to conditions of approval should the project be granted approval by the Minister.

- *Part H – Project Justification*

Part H addresses the principles of Ecologically Sustainable Development (ESD) and provides justification for the proposal.

- *Part I – EA Findings*

Part I summarises the findings of the EA.

- *Part J – References*

Part J provides a list of materials referenced during preparation of the EA.

part b
location & context

2 REGIONAL AND LOCAL CONTEXT

2.1 Overview of the Riverina Region

The Murray Shire is located within the southern part of the Riverina Region in the south west of NSW, as shown in **Figure 2.1**. The Riverina Region stretches some 500km east to west from the Kosciuzsko National Park across the sheep-wheat belt of the South West Slopes and the riverine plains and irrigation areas, to the semi-arid plains surrounding Hay.

The region has an industry base which includes agriculture, food processing, manufacturing, forestry and wood processing, transport and logistics, education and research and public sector institutions. The Riverina has a large and dynamic food and wine production and processing sector, the gross regional product is in excess of AUD$4.5 billion and primary production is valued at over AUD$1 billion per annum. The greater Riverina Region is home to approximately 175,000 people.

2.2 Overview of Moira

As shown in **Figure 2.1**, the Moira area is located on the border of NSW and Victoria on the Murray River floodplain. The general landscape setting of the area is relatively flat riverine plains dominated by agricultural landuses. The area contains significant ecological and world heritage value in the form of the Barmah-Millewa Forest which incorporates the Moira Lake wetland system, the Barmah State Forest and the Moira State Park which are situated along the Murray and Edward Rivers. The Barmah-Millewa Forest forms the largest contiguous stand of River Red Gum (*Eucalyptus camaldulensis*) forest in the world. The 70,000 hectare forest contains a diverse range of wetland environments, including:

- Ramsar wetlands;
- swamps and marshes (Moira Marshes);
- rushlands;
- grasslands;
- lakes and billabongs;
- streams; and
- Red Gum forest.

The main towns in the area are Mathoura and Moama located in the Murray Shire LGA (NSW) and Echuca and Barmah in Moira Shire Council (Victoria). Echuca-Moama was once the largest inland port in Australia as it was the closest point on the Murray to Melbourne. Echuca-Moama now has a population of approximately 16,000.

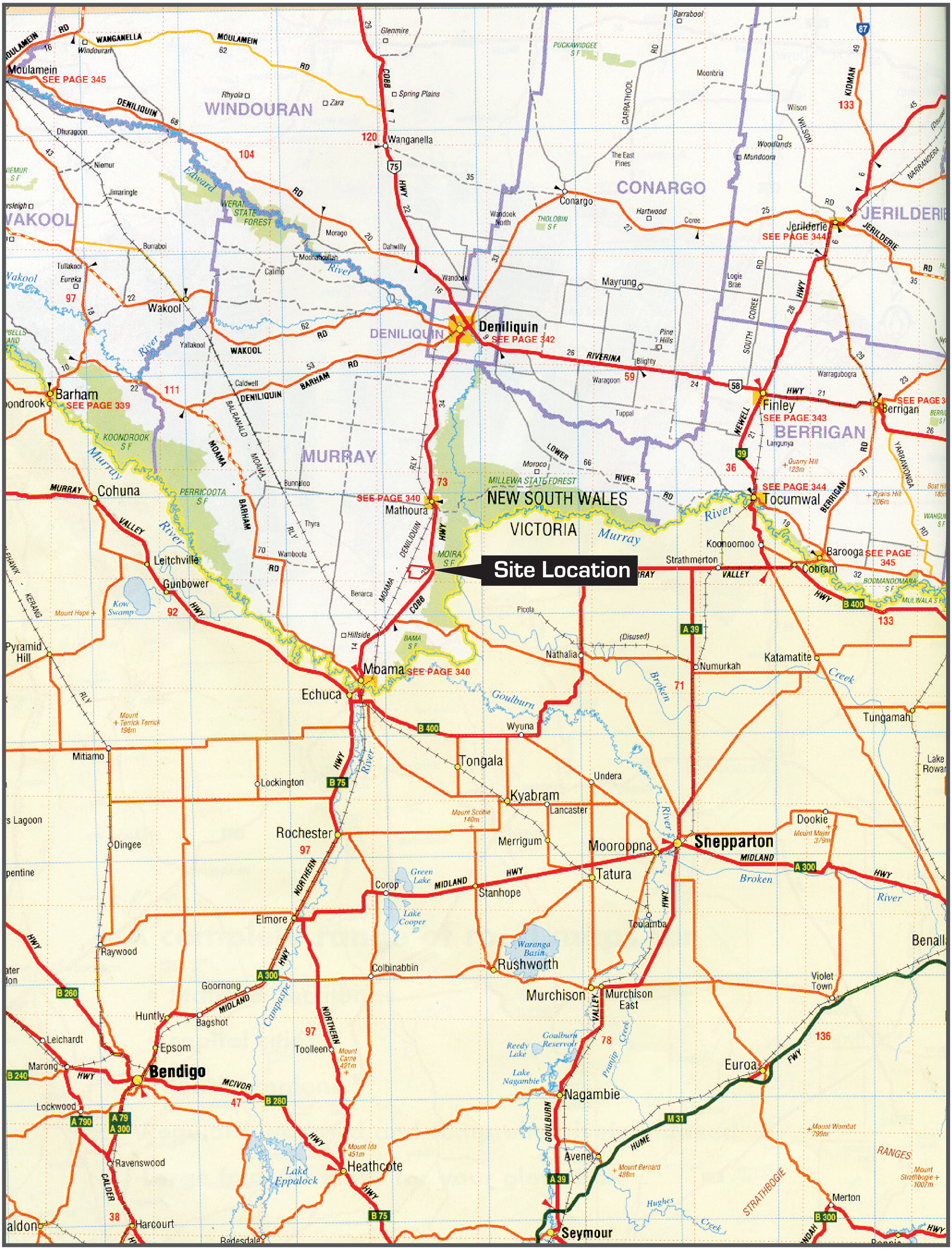
Irrigation channels for the Moira Private Irrigation District (MPID) traverse the area. The start of the Moira Channel and associated pumps are located to the east of the Cobb Highway and the project site, which is approximately 13km south of Mathoura.

2.3 Land Use Context

The project site is shown in **Figure 2.2** and is situated south of the township of Mathoura, which is an old timber town. The site is located within a rural area where land is predominantly used for grazing and agricultural purposes and for the management of the Moira State Forest and the water resources of Moira Lake, Barmah Lake, associated wetlands and the River Murray.

The project site is located within a rural area, characterised by large agricultural properties with grazing on native pastures and some irrigated cropping, with few neighbouring residential properties.

The water resources of Moira Lake, Barmah Lake, associated wetlands and the River Murray are such that the area is affected by water sharing and management plans. There is a network of irrigation channels in the area for the MIPD.

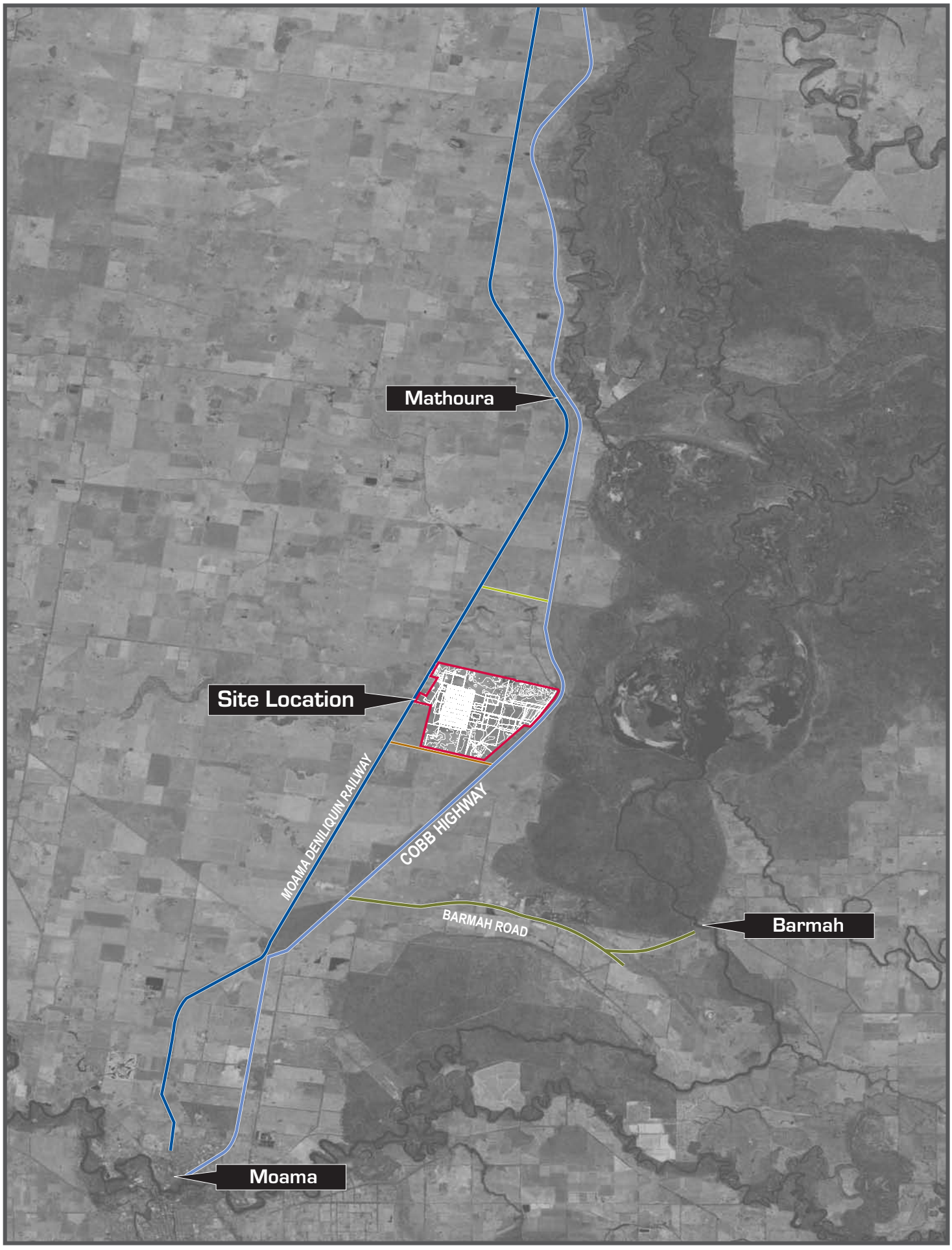


Regional Context
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

0 20
Kilometres

FIGURE
2.1

PROJECT-FILE NAME **S60133** DATE **26 September 2005** DRAWN **TO** APPROVED



HLA

Site Location
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Stud Farm Lane
Cotswold Lane

N

0 4
Kilometres

FIGURE
2.2

PROJECT-FILE NAME **S60133** DATE **26 September 2005** DRAWN **TO** APPROVED

3 SITE LOCATION AND HISTORY

3.1 Site Location and Description

The project site is approximately 800km from Sydney and 250km north of Melbourne and is located on the Cobb Highway between Moama-Echuca and Hay, some 13km south of Mathoura and approximately 20km north of Moama (see **Figure 2.2**). The project site falls within the catchment of the Murray-Darling Basin, more specifically the Riverine Plain, and is limited to an extensive alluvial floodplain with a very slight rise in the north eastern section.

The project site is bounded on the west by the Deniliquin-Bendigo railway, to the east by the Cobb Highway, to the south by Stud Farm Lane and the Moira Channel to the north. Other agricultural and small rural landholdings are located to the west. The land consists of some 1200ha and is irregular in shape. Road access to the project site is from the Cobb Highway, an arterial road.

The project site has been historically used for agriculture involving flood irrigation, cropping, cattle and sheep grazing and is located in a rural area which encourages agricultural uses. The project site currently supports farm infrastructure in the form of ruins and a shearing shed in the north eastern portion of the site and shed silos and yards in the southern portion of the site. There are also irrigation channels and graded tracks on site.

The project site has been extensively cleared for agricultural uses, and has been impacted to varying degrees by weed invasion and overgrazing by stock and feral species. Weeds dominate the areas that are presently irrigated. Adjacent agricultural land has been substantially cleared and the remaining woodlands within the project site generally have a disturbed understorey due to past livestock and rabbit grazing.

There is an extensive network of irrigation channels throughout the project site, fed by the main Moira Irrigation Channel.

3.2 Ownership

The property is owned by Mr Noel Griffen. The property is currently used for irrigation and grazing and has a 1,125ML water licence from the river and a bore licence of 5,114ML.

3.3 Site History

The Murray Shire region was developed in the 1840s by squatters following the route of the overlanders as they drove cattle from Sydney to Adelaide in the late 1830s. From the 1860s onwards, the selectors, mainly from Victoria, moved onto the squatters' land. The settlements of Moama and Mathoura survived over the years as centres for the movement of agriculture produce and the growth of the timber industry. The Cadell Tilt, which changed the course of the Murray River about 30,000 years ago traverses the area from north to south.

The project site has been used for sheep grazing and shearing in the past.

3.4 Current Land Use

The project site is also presently used for cropping, with a significant portion irrigated. Fallow cropped areas and paddocks in the north of the site are presently utilised for grazing.

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project needs & alternatives

4 OBJECTIVES AND PROJECT DEMAND

4.1 Project Objectives

The primary objective of the proposed project is to supply customers with grain-fed beef, graded and cut to compete with the US product on a global market, with a particular focus on the Asian market.

Agricultural Equity Investments (AEI) has formed a strategic alliance with organisations which have considerable experience in the industry providing an integrated production and processing system for grain fed beef. As a result, the project has a number of objectives which are listed below and are focussed on providing sustainable environmental, social and economic outcomes.

- To produce consistent quality grain fed beef for the domestic and export market using best practice and sustainable management systems;
- To provide a comprehensive trace back system that provides food safety through a documented history of the animals in the program;
- To provide dedicated feeding programs for cattle to meet specific customer needs;
- To provide a source of employment in the local area;
- To provide a local market for grain as the feedlot would aim to source grain from local producers;
- To implement procedures, practices and processes that ensure compliance with the relevant industry standards and legislative, policy and planning requirements; and
- To sustainably dispose of treated wastewater on cropping areas on Moira through irrigation.

4.2 Project Demand

Industry research has shown that demand for beef from Asia has grown consistently over recent years and demand is considered to be in excess of supply. Additional cattle feedlots are therefore necessary to meet the market demand for the beef products currently being supplied to the Asian market.

The proposed project is aimed at providing products to well established markets in Japan, China and Korea. Japan, in particular, is considered to be the premium beef market in the world and has an expectation of high quality beef for consumption. In recent years, the various Asian beef markets have indicated that high quality beef products are increasing in demand due to previous quality related problems involving Bovine Spongiform Encephalopathy (BSE or Mad Cow Disease) in September 2001, where the demand for beef products experienced a downturn.

The potential for exporting beef into the Japanese market represents an ideal opportunity for the Australian beef industry. As stated in **Section 4.1**, a key objective of the proposed project is to provide a consistent quality product. The proposed cattle feedlot would implement high standards of management practice to ensure that the project produces consistent quality and safe beef. As a result, it is envisaged that the operation of the proposed cattle feedlot at Moira Station would be able to provide consistent quality beef to satisfy the demand requirements of the Asian beef market.

5 ALTERNATIVES CONSIDERED

5.1 Site Selection Criteria

The selection of a site for the proposed project was undertaken over a period of several months. Central and southern New South Wales were searched for a suitable and affordable site to accommodate an 80,000 head of cattle feedlot.

The selection criteria for the proposed site included the following characteristics:

- An area of a minimum of 120ha;
- A surrounding area with minimal close neighbouring properties in order to minimise potential impacts from the proposed project;
- Access for transport to enable smooth delivery and distribution of cattle and grain;
- Available water supply, preferably river and bore water;
- Existing power supply;
- Comprise a suitable soil type for a feedlot;
- Access to suitable feeder cattle numbers in south eastern Australia;
- Access to suitable grain and feed components; and
- Access to a local workforce for the operation of the feedlot.

5.2 Alternative Site Locations

Following an extensive search for potential project sites, four areas were selected for further consideration. These candidate areas were:

- Jerilderie Shire;
- Deniliquin Shire;
- Conargo Shire; and
- Murray Shire.

5.2.1 Jerilderie Shire

Following more detailed consideration, the sites within Jerilderie Shire were deemed unsuitable as they had been extensively farmed and the soils were not of a sufficient quality to accommodate the proposed feedlot, particularly sedimentation and holding ponds. Additionally, a search of the Department of Environment and Conservation Wildlife Atlas (DEC WA) database revealed that the majority of unfarmed areas within Jerilderie Shire were considered to be areas of habitat for the Plains Wanderer (*Pedionomus torquatus*). The Plains Wanderer is a threatened species and is listed as endangered under the NSW *Threatened Species Conservation Act 1995* and as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* The potential presence of this threatened species and likely restrictions on the levels of vegetation clearance made the use of sites within this area unfeasible.

5.2.2 Deniliquin Shire

Two suitable sites were located within Deniliquin Shire. However, further investigation of these sites revealed that both of these sites contained groundwater close to the surface. Groundwater

was located between 1.5m and 3m below the surface, which would have been significantly impacted due to the required excavation depth for the holding pond and irrigation requirements. These sites were deemed to be unsuitable for the proposed project.

5.2.3 Conargo Shire

A property was identified in Conargo Shire which satisfied the majority of the criteria outlined in **Section 5.1**. However, the proposed site was located within a 1 in 100 year flood zone. Under Clause 16 of the *Conargo Local Environment Plan 1987*, the proposed project is prohibited. This site location was therefore deemed unsuitable for the proposed cattle feedlot.

5.2.4 Murray Shire

A property was identified within the Murray Shire which satisfied all of the relevant site selection criteria. This site was then taken forward as the preferred site location and is discussed in **Section 5.3**.

5.3 Preferred Site Location

The preferred location of the proposed cattle feedlot on Moira Station within Murray Shire was chosen due to the fact that the site satisfied the selection criteria with the following characteristics:

- An area of a minimum of 120ha – Moira Station has an area of some 1,200 hectares;
- A surrounding area with minimal close neighbouring properties in order to minimise potential impacts from proposed development - Moira State Forest is adjacent to the eastern boundary of the site and large agricultural blocks are situated to the north, west and south of the site. Therefore, there were relatively large separation distances to towns, such as Deniliquin (42km), Moama (20km), Shepparton (80km);
- Access for transport to enable smooth delivery and distribution of cattle and grain - direct access to the Cobb Highway for road transport. Direct rail access to the Deniliquin-Bendigo railway should it be required to bring in cattle and grain by rail;
- Available water supply, preferably river and bore water - the site has an available water supply, with both a river and bore licence. Additionally, the site is located at the start of the Moira Channel which allows the opportunity to bring in additional water in consultation and agreement with MPID, should the need arise;
- Existing power supply to the site – the site has an existing power supply available;
- Comprise a suitable soil type for a feedlot - the site consists of a clay based soil which is a suitable soil type for a feedlot;
- Access to suitable grain and feed components – rural properties in the Riverina Region produce suitable grain and feed components;
- Access to suitable feeder cattle numbers in south eastern Australia – the Riverina Region is located in south eastern Australia and provides direct access to suitable feeder cattle markets; and
- Access to a local workforce for the operation of the feedlot - a suitable and available workforce is located in Moama-Echuca and the surrounding area.

The above characteristics of the Moira Station site indicate the suitability of the Project site for the proposed cattle feedlot project.

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project & its management

6 PROJECT DESCRIPTION

6.1 Project Outline

The proposed project is an 80,000 head of cattle feedlot located at Moira Station, which is approximately 13km south of Mathoura in south western NSW. The proposed feedlot would occupy a footprint of approximately 600 hectares (ha), which includes feed pens, sedimentation basins, effluent storage and irrigation areas.

Cattle weighing 300kg would be transported to the feedlot and housed in pens. The cattle would be fed rations which will include specific quantities of grain until they reach a designated weight (an average of 529kg) when they would be transported from the site to an abattoir.

The Moira feedlot would be classified as a Class One feedlot, which has the highest standard of design, operation, maintenance, pad management and cleaning frequency. A Class One feedlot is defined in **Section 6.1.2**.

6.1.1 Project Elements

The project, as shown in **Figure 6.1**, comprises the following elements:

Feed pens

Ninety six (96) pens measuring some 61m by 168m would be established to contain the cattle on site. The feed pens would slope from east to west. The relative levels of the pens have been designed to provide an approximate balance of cut and fill on the site. Material excavated from the holding pond would be used as fill under the pens.

Clay material for an approximately 300mm thick layer under the pens would be utilised. The highest point on the pen area would be around 1.35m above existing ground level. The feedlot pens would have a slope of generally 3% which falls to lateral drains with a slope of some 0.2%. The lateral drains would run between the cattle alleyways.

Four lateral move irrigators would be installed and used during the summer months. These irrigators would extract water from a concrete channel east and west of the pens and be used for cooling, dust control and maintaining pad moisture.

Internal roadways

Feed and cattle lanes would be established between each of the pens. These roads would be approximately 8m wide to enable vehicles to deliver feed to the feed bunks of the pens. Additionally, an approximately 8m wide roadway between the site receivals area and the Cobb Highway would be established. This roadway would be sealed and cater for vehicles, including B-Doubles, delivering and transporting feed, cattle and compost. Pavement material for an approximately 300mm thick layer under the roads would be extracted from a separate borrow pit off site.

Ancillary buildings

Ancillary buildings for the purpose of feedlot administration would be established. This includes a workshop measuring some 36m by 22m, two offices measuring around 36m by 18m, and an amenities block measuring about 19m by 11m. Diesel storage would be provided to fuel feed trucks and other on-site equipment.

Effluent storage

Water from the holding pond would be pumped up into the irrigation storage, and freshwater supplied to the storage via the freshwater storage located on the eastern section of the site. Water from the effluent storage, consisting of a mixture of freshwater, runoff, and wastewater would be directed into irrigation channels to flood irrigate the fields adjacent to the feed pens. The storage would be capable of holding all wastewater and runoff during the wet winter months when irrigation would not be taking place. The storage area would have a capacity of some 500ML.

Commodities and feed preparation area

Feed and supplements would be delivered to the commodities area where they would be stored. A feed mill and a hay processor would also be located in this area.

Receivals area

Cattle would be delivered to the receivals area, via a weighbridge and an internal access road which would be connected to the Cobb Highway. The pens within the receivals area would each measure approximately 27m by 17m.

Freshwater storage

A freshwater storage of around 1,000ML capacity would be constructed in the north eastern corner of the site.

Sedimentation and holding ponds;

Runoff from the feedlot would be directed into two sets of twin sedimentation ponds. Each sedimentation pond would measure some 95m by 46m at the floor and have depths from around 0.37m to 1m. A channel with an approximate slope of 7% would connect the sedimentation basins to a holding basin, via concrete box culverts measuring 1,500mm x 900mm and 16m in length. The holding basin would measure approximately 870m by 181m at the top with design side slopes of 1V:3H. The floor would be some 6.2m below ground level and water depths in the sedimentation and holding ponds would not exceed 1.5m and 3m respectively. Material excavated from the holding pond would be used as fill under the pens.

Irrigation area

The irrigated area would cover approximately 380ha, comprising some 300ha of liquid waste irrigated crop and the remainder made up of drains, roads and channels.

Diversion of Moira Irrigation Channel.

Some existing channels of the Moira Irrigation Channel would be re-directed around the footprint of the proposed project.

6.1.2 Design Philosophy

The design of the proposed cattle feedlot has incorporated the findings of environmental studies and prescribed mitigation measures following detailed environmental investigations. This approach enables the proposal to integrate sustainability into the design and operation of the feedlot.

The design of the feedlot is consistent with environmental standards and relevant guidelines. Within the draft policy *Assessment and Management of Odour from Stationary Sources in NSW* (DEC, 2001), DEC outlines objectives for proposed feedlots to meet. A key feature is the categorisation of feedlot classes which reflect improved odour performances achieved through a sustainable design process. There are four feedlot classes defined within the policy:

Class One: This represents the highest standard of design, operation, maintenance, pad management and cleaning frequency.

Class Two: This is the generally accepted standard for a well-designed, constructed and maintained feedlot, which has a high standard of operation. This is the reference standard for all classes.

Class Three: Well designed, well constructed and operated with higher standards than Class Four for pad preparation and maintenance and pen cleaning. Well removed from impact locations.

Class Four: Generally a small feedlot in an isolated situation with basic management and development standards, well separated from any residential situations and having fewer than 1000 head of cattle.

It is proposed that the Moira feedlot would be designed, constructed and maintained as a Class One feedlot.

6.1.3 Design Capacity

The feedlot would operate as follows:

- Approximate weight in 300 kg
- Approximate average weight out (turnout) 529 kg
- Maximum stocking density 12.7m^2 per head of cattle

The stocking density is generally defined as the average feedlot pen area allocated to each beast. It has important implications for the environmental management of feedlots as it affects the moisture content of the pad and therefore, its potential to produce odour and dust.

In order to quantify the stocking density areas for feedlots, reference is made to Standard Cattle Units. A Standard Cattle Unit (SCU) is defined as an animal of 600kg liveweight, at the time of exit (turnoff) from the feedlot (QCFAC, 2000). The use of this term enables the stocking capacity of feedlots to be expressed in accordance with the weight of the cattle turned off from the facility, rather than the number of head. This concept is based on the understanding that manure production increases with cattle liveweight.

Moira Station cattle at turnout are equivalent to 0.882 SCU with an average weight of 529kg. The stocking density for cattle on site at turnout would be equivalent to 14.4m^2 per SCU, giving a stocking density of 12.7m^2 per head of cattle (at 529kg) at Moira Station.

6.2 Site Preparation

Preparation of Moira Station to allow for the construction of the proposed project would consist of the following activities:

- Clearance of trees in the pen area;
- Clearance of trees along the proposed access road; and

- Construction of a new access road adjacent to the proposed operational access road.

These activities would be undertaken and completed prior to commencement of the main construction program.

6.3 Provision of Service Infrastructure

The project site currently has existing service infrastructure in the form of electricity, water and communications. The proposed project would require the extension of electricity services from the existing buildings to service the lighting structures surrounding the pens and also the receivals area, weighbridge, mill, pump sites and ancillary buildings. Extensions to existing water and communications services to the proposed ancillary buildings would also be required.

6.4 Construction

6.4.1 Construction Program

The construction of the proposed project would be undertaken over a period of approximately 6 months.

The construction access road would be adjacent to the main entry road from the Cobb Highway. Earthworks would commence with topsoil stripping of work areas for the simultaneous construction of feed pens, roads, building pads and water storages as well as upgrading the irrigation areas.

Drainage pipelines, pits and structures would be integrated with earthworks to enable the completion of sections for the erection of pens, cattle alleys, feed bunks and roads.

Materials required would include concrete, pipes, pits, gravel, sand, cement, road base, steel pipe and cable for pens, road sealing material, power and communication cables and building materials.

6.4.2 Hours of Construction

It is expected that the construction of the proposed project would occur within the hours specified by the Department of Environment and Conservation (DEC) and Murray Shire Council. These hours would be between 7am and 6pm for Monday to Friday and between 7am and 12pm on Saturdays with no construction activities undertaken on Sundays and Public Holidays.

6.4.3 Construction of Project Elements

Pen Foundation Preparation and Construction

The area for the pens would be cleared of trees and stumps with roots of trees grubbed to some 300mm below the surface. Topsoil would be stripped to a minimum depth of around 100mm with the stripped material to be stockpiled for spreading on areas marked for revegetation upon completion of construction.

Feed Bunk Foundations

The feed bunks would be in-situ concrete with an approximate 4m concrete apron. The feed bunks also consist of steel pipe and cable fencing. The feed bunks would be constructed with steel forms over a gravel base (approximately 100mm in thickness). The forms would be moved by small cranes.

Water Troughs

The water troughs would consist of pre-cast concrete with a 2.5m apron. This would be sited approximately 20m from the feed bunks. Drains would be constructed to allow wash water to be discharged outside the pens.

Feed Roads

The feed roads would consist of the following:

- An upper layer of spray seal;
- Slope away from feed bunk with a cross fall generally of 3% to allow for adequate drainage; and
- A width of least 4m to allow movement of trucks.

Other roads within the site would also comprise similar features. Scrapers, graders, water trucks and rollers would construct the roads.

Cattle Lanes

It is expected that the construction of cattle lanes and associated drainage would commence during the earthworks stage and be completed with a compacted gravel layer to allow all weather access for cattle and machinery.

Sedimentation Basins

There would be two twin sets of sedimentation ponds. Each sedimentation pond would have a capacity of some 5,100m^3 with floor dimensions of approximately 95m long by 46m wide.

Topsoil in the areas of the proposed sedimentation ponds would be stripped and stockpiled for later re-spreading over pond embankment batters and disturbed areas.

Excavation of the ponds would be performed to a depth of approximately 4.7m below natural surface. Any unsuitable materials for pond lining that are excavated (i.e. gravel and sand) would be removed from the site. Clay lining would be used in compacted layers, typically 150mm, and compacted to achieve a density of no less than 95% of the standard maximum dry density.

Excavation would be undertaken utilising self loading scrapers which would move material to the feed pens and roads. Compactors, rollers, water carts and graders would be involved to achieve the required compaction.

Holding Pond

The holding pond would be situated downslope of the sedimentation ponds. The holding pond is expected to have a nominal capacity of 130ML. Excavation of the holding pond would be undertaken in a similar manner to that of the sedimentation ponds. Material would be excavated by self loading scrapers and then moved to feed pens and roads. Compactors, rollers, water carts and graders would be involved to achieve the required compaction.

Effluent Storage

Excess effluent from the holding pond would be pumped to the effluent storage area, which would have a capacity of some 500ML. Excavation of the effluent storage area would be

undertaken in a similar manner to that of the sedimentation ponds and holding pond. Material would be excavated by self loading scrapers and then moved to feed pens and roads. Compactors, rollers, water carts and graders would be involved to achieve the required compaction.

Access Road

The proposed project involves the construction of an access road connecting to the Cobb Highway (SH21). This internal road access would be some 10m wide, with two lanes of around 4m wide plus approximately 1m hard shoulders. The total length of the access road is expected to be about 2,200m. The access from the Cobb Highway would also include a decelerating lane on the southern approach. This area would be sealed to allow trucks approaching the site from the south to comfortably enter the site whilst allowing traffic to continue along the Cobb Highway with minimal interruption. A weighbridge would be constructed along this access road.

Diversion of Moira Channel

Following consultation and agreement with the Moira Private Irrigation Board (MPID), the newly constructed channel would be connected to the existing Channel at a time of year when the Channel contains no water. This would minimise potential impact to local water quality during construction. Scrapers, water carts and graders would used to construct the channel to the agreed specification.

Dust and Climate Control

Four lateral move irrigators would be constructed to be used during the summer months for cooling, dust control and maintaining manure pad moisture. The irrigators would extract water from a concrete channel on the east and west of the pens. Each irrigator would cover an area of approximately 672m by 450m.

6.4.4 Traffic and Access Arrangements

All traffic associated with the construction of the proposal would utilise the Cobb Highway. The Cobb Highway would provide direct access into the proposed feedlot. A separate access from the Cobb Highway would be constructed for activities during the construction period.

Estimated traffic movements associated with the proposal are described and assessed in **Section 15** of this EA, however **Table 6-1** summarises the number of movements expected for each activity during construction and operation.

Table 6-1: Summary of Expected Traffic Movements

Activity	Vehicle Type	Movements per day
Construction Phase		
Earthworks	Self-loading scrapers; Excavators; Water carts; Rollers; and Graders	60
Cattle Pens and laneways	Cranes; and Concrete trucks.	60

Activity	Vehicle Type	Movements per day
Road sealing	Spray seal trucks; Gravel trucks; Rollers; and Sweepers	60
Employees	Light vehicles	80
Operational Phase		
Cattle Input and Output	B-Double	20
Grain Delivery	Single and B-Double	36
Compost Export	Single	4
Employees	Light vehicles	60
Maintenance vehicles	Light vehicles and utility vehicles	Infrequent

6.4.5 Fencing, Security and Lighting

The boundary of the feedlot would be fenced with standard farm fencing with the site containing minimal lighting for the proposed structures.

6.4.6 Waste Minimisation and Management

As discussed in **Section 6.1.1**, liquid waste from the proposed project would drain into the sedimentation and holding ponds and then be pumped into the effluent storage area. The wastewater in the effluent storage area would be flood irrigated on the surrounding land within Moira Station. For details of waste water management, please refer to **Section 12** of this EA.

6.5 Construction Vehicles and Equipment

The anticipated construction vehicles and equipment required for the proposed feedlot are shown in the table below.

Table 6-2: Construction Equipment

Activity	Equipment
Earthworks	Self loading Scrapers
	Excavators
	Grader
	Roller
	Water cart
Pen and drain construction	Concrete Batch Plant/Mixer trucks
	Cranes
	Truck
	Boring Equipment
	Pipe Cutting and Welding Equipment
Road sealing	Spray Seal Trucks
	Gravel Trucks
	Rollers

Activity	Equipment
	Sweepers

6.6 Construction Workforce

At this stage it is anticipated that construction of the feedlot may involve a construction workforce of up to 80 people.

6.7 Construction Environmental Management and Monitoring

In accordance with the requirements under Part 3A of the EP&A Act, AEI commit to the environmental management and monitoring of the construction of the proposed project. The proposed site preparation and construction works would commence only after all relevant licenses, permits and approvals have been received and a Construction Environmental Management Plan (CEMP), and a Health and Safety Plan (HASP), have been prepared by the nominated contractor.

The CEMP would provide information on the methods and safeguards that would be used for carrying out the construction of the proposed works. The methods adopted and the implemented safeguards would be aimed at ensuring that workers, the local community and the environment are protected.

The CEMP would also contain certain details on the monitoring programs and reporting procedures associated with the implemented environmental safeguards. Monitoring requires an on-going commitment and continual maintenance of records, both prior to (baseline) and during the proposed works. Should routine monitoring and/or external parties identify a potential issue relating to the proposed works, the potential issue would be logged, validated, and as appropriate, management programs would be rectified.

The CEMP is described in further detail in **Section 28** of this EA.

6.8 Operation

6.8.1 Description of Operations

Cattle Management Plan

The feedlot is designed to house a maximum of 80,000 head of cattle at any one time. The majority of cattle would be steers of British breed origin. Breed mixes would change over time as market signals develop. It is expected that cattle would be supplied from south eastern Australia. These areas include the Riverina, the south and central western slopes and plains, the central and southern tablelands and central, northern and eastern Victoria.

Cattle would enter the feedlot at around 9 to 12 months of age and an average of some 300kg liveweight. The cattle would be fed for approximately 182 days to achieve an average of 529kg liveweight. Total cattle throughput would be approximately 160,000 head of cattle annually.

All cattle would be transported into the feedlot by road, via the Cobb Highway. On arrival, the cattle would be given unlimited access to high quality hay and freshwater prior to processing. The feed would contain additional electrolytes and protein to aid recovery from the stress of transport. Sick and injured cattle would be removed and treated according to veterinary advice. Hospital pens with easy access to facilities for daily treatment would be available at strategic locations throughout the lot and in the immediate vicinity of the receivals area.

While in the receivals area, cattle would have access to shade and shelter. Night lighting would be provided at the receivals area to allow loading and unloading at night which would reduce the effect on cattle from daytime arrival during summer.

The feedlot pens would provide a minimum area of 12.7m^2 per head (includes receivals, dispatch and hospital pens) during the total period on feed.

One standard pen size would be used which would be approximately 61m deep with a width of around 168m. The feedlot design incorporates 96 pens, as shown in **Figure 6.1**.

When cattle reach their selected market weights they would be transported by truck to export abattoirs. Transport operators would adhere to the *Model Code of Practice for the Welfare of Animals Part 3: Land Transport of Cattle* (SCARM, 2000).

Feed Management Plan

The majority of feed for the feedlot would be transported to the project site from sites located within south eastern Australia. Locally grown produce, and in particular grains, would be used together with smaller quantities of protein meals or grains, trace mineral and vitamin premixes, salt, limestone, urea and other registered stock feeds and additives.

The approximate amounts of these feeds and ingredients required for the proposed project are listed in **Table 6-3**.

Table 6-3: Annual Feed Requirements for Project

Feed/Ingredient	Requirements tonnes dry matter	Total Tonnes
Roughage	17,552	22,818
Grain	187,361	206,097
Meal	3,520	3,872
Mineral Supplement	10,970	12,067
Total	**219,403**	**244,854**

All feed would be processed on site through a feed mill. It would consist of storage silos to store grain and the mill would use cold processing or rolling. The mill would be sized to enable the processing of the annual requirements for full capacity of the feedlot. The mill would be powered by electricity supply.

Hay would be processed on site by use of a grinder or similar equipment. Silage pits would also be established in this area. Feed would be loaded into feed trucks from overhead storage bins or by front end loader from ground level storage bays. The feed trucks have on-board mixing equipment. Feed would then be loaded into the in-situ feed bunks from the feed trucks using the feed roads.

Water use for the cattle would be as follows:

- Allow an average of 50L/day per head of cattle; and
- Allow full feedlot of 80,000 cattle.

The annual drinking water required for the cattle at Moira Station would be 1,460ML. Water use for the overhead irrigators would be as follows:

- Allow an application of 3mm per day;
- Allow 100 days per year in use; and
- Allow 100ha for application area (feed pens).

The annual water for application on the pens would be 330ML and therefore, the total annual water requirement would be 1,790ML.

Manure Stockpiling, Composting and Spreading

The manure collected from the feed pens would be stored adjacent to the feed pens and the holding pond, as shown in **Figure 6-1**. This location was chosen as it is within the controlled drainage area, collecting all the surface runoff from the pens and therefore, runoff from the stockpile would be prevented from entering any nearby channel (NSW Department of Agriculture, 2003).

Manure from the pens would be removed frequently and placed directly onto the available land, as shown in **Figure 6-1**, where possible and favourable weather conditions permitting, which would reduce the risk of odours. The stockpiled manure would be placed in windrows, approximately 1 to 1.5m in height, with base widths ranging from 3 to 5m. Windrow composting relies on natural convection and diffusion for distributing oxygen and heat through the stockpile. Warm air from the centre of the stockpile rises from the top of the stockpile while cool air is drawn in to the stockpile near the base. Further aeration would be achieved by regularly turning the windrows using equipment or machinery (QCFAC, 2000).

Aerobically composting allows the manure to be stored or spread with little odour or fly breeding potential and eliminates most of the weed seeds and pathogens within the manure. Composting the manure stockpiles would reduce moisture content, odour and anaerobic metabolites (NSW Department of Agriculture, 2003).

Following the aerobic composting, the manure would undergo a screening process which would remove the accumulated solids and very large particles (including slabs of dry feedlot manure) prior to spreading.

The spreading of manure on the Moira Station property would include an area of land to the east of the Cobb Highway. In accordance with the NSW Draft Feedlot Manual (NSW Department of Agriculture, 2003), the practice of spreading manure would involve the following.

- Annual application rates would be based on annual soil tests and would not exceed fertiliser recommendations for a particular crop and yield goal;
- Application of manure would occur after harvest but before initial land preparation begins for planting; and
- Incorporation of the manure into the soil would occur within 48 hours of application with a minimum 50m buffer zone between the application area and the irrigation channel.

Management practices for manure stockpiling, composting and spreading are outlined in **Section 11.6** and also within the Statement of Commitments in Part G of this EA.

Drainage

Runoff from the feedlot would drain through the sedimentation ponds to the holding pond. It would then be pumped to the effluent storage area. The sizing of retention and holding basins to contain these flows is discussed in **Section 12**.

Wastewater Disposal

Wastewater generated during the operation of the proposed feedlot would be used to irrigate the surrounding land within Moira Station. The amount of land to be irrigated is approximately 380ha. The details of the irrigation system are discussed in **Section 12** of this EA.

6.8.2 Hours of Operation

The feedlot would operate for 12 hours each day from 7am to 7pm and be operational 7 days per week. Staff would be present 24 hours a day, 7 days a week.

6.8.3 Operational Workforce Requirements

The proposed feedlot would provide employment for approximately 86 people. 80 people would be involved in the feedlot operation and 6 people would be involved in the remaining activities on the property.

6.9 Operational Environmental Management and Monitoring

In accordance with the requirements under Part 3A of the EP&A Act AEI commit to the environmental management and monitoring of the operation of the proposed project. An outline of an environmental management plan (EMP) has been developed for the construction and operation of the proposed feedlot at Moira, as shown in **Section 28**.

It is proposed to develop an environmental monitoring program for Moira Station as part of the EMP. The areas of monitoring would include:

- Soil monitoring; and
- Wastewater monitoring.

6.9.1 Soil Monitoring

Soil sampling would be carried out prior to any solid waste application or waste water irrigation at the site. The prior condition of the soil must be established as clearly as possible so it can be used as a benchmark against which any future changes can be measured. A waste/crop/soil nutrient balance would be established.

6.9.2 Wastewater Monitoring

Wastewater would be analysed for pH, sodium (Na), phosphorus (P), nitrogen (N), chloride (Cl) and electrical conductivity (EC) to determine application rates and method. With liquid waste, dilution rates would need to be calculated on the basis of the amount of dissolved salts and EC.

6.10 Animal Care Statement

The operation and practices for the proposed cattle feedlot at Moira Station will comply with the nationally recognised *Australian Model Code of Practice for the Welfare of Animals: Cattle* (SCARM, 2004) and *Australian Model Code of Practice for the Welfare of Animals: Land Transport of Cattle* (SCARM, 2000). In addition, AEI will prepare an Animal Care Statement (ACS) prior to stocking the feedlot.

The ACS would outline procedures and policies required for disease control and veterinary care. It would also detail the means of mass disposal of carcasses should a large death count occur at the facility.

Site boundary
Drainage pipeline
Moira channel relocation

TOTAL AREA 1200Ha (Approx)
IRRIGATION AREA 380Ha (Approx)
All areas and volumes are nominal

Source: Frank Rennick & Company Pty Limited

PROJECT-FILE NAME	**S60133**
DATE	**27 September 2005**
DRAWN	**TO**
APPROVED	

Proposed Site Layout
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

HLA

Scale 1:20000

FIGURE
6.1

7 STATUTORY PLANNING

The project application and associated EA for the proposed Moira Station cattle feedlot will be assessed in accordance with the framework established by the EP&A Act and the EP&A Regulation 2000.

As part of the assessment, a number of local and State planning instruments and policies are required to be addressed, together with relevant Commonwealth and NSW legislation.

This section provides an outline of the environmental planning framework and assesses the proposed project in the context of that framework.

7.1 Local Planning Matters

7.1.1 Murray Local Environmental Plan 1989

General Objectives

The primary local planning instrument applying to the Project site is the Murray Local Environmental Plan (LEP) 1989. The objectives of LEP 1989 include:

> *To encourage the proper management, development and conservation of natural and man-made resources within the Shire of Murray by protecting, enhancing or conserving:*
>
> *(i) prime crop and pasture land,*
>
> *(ii) timber, minerals, soil, water and other natural resources,*
>
> *(iii) areas of significance for nature conservation,*
>
> *(iv) areas of high scenic or recreational value,*
>
> *(v) places and buildings or archaeological or heritage significance, including aboriginal relics and places,*
>
> *(vi) the bed and banks of the Edward, Murray and Wakool Rivers, and*
>
> *(vii) the waterways and associated wetlands for their fish and fish habitat values.*

The proposal for a cattle feedlot retains the existing agricultural use of the land and has been carefully assessed through this EA in terms of its potential effect on soils, water, heritage, waterways, flora and fauna and surrounding ecosystems. Provided that the management and mitigation measures recommended in this EA are implemented on the site the effect of the proposal upon these valuable resources would be properly managed and, the proposed project to be consistent with the general objectives of Murray LEP 1989.

Zoning

The project site is zoned 1(a) General Rural under Murray LEP 1989. The proposal is being a cattle feedlot which is described as an intensive livestock keeping establishment, which is defined in clause 5 of LEP 1989 as being:

> *a building or place in which or on which cattle, sheep, goats, dogs, cats, poultry or other livestock are held for the purposes of breeding, boarding or nurturing by a feeding method other than natural grazing and, without limiting the generality of the foregoing, includes:*
>
> *(a) feed lots,*

(b) piggeries,

(c) poultry farms, and

(d) fish farming (including crustaceans and oysters).

Intensive livestock keeping establishments are permissible with consent in the 1(a) General Rural zone. The objectives of this zone are to promote the proper management and utilisation of resources by:

(a) protecting, enhancing and conserving:

(i) agricultural land in a manner which sustains its efficient and effective agricultural production potential,

(ii) soil stability by controlling and locating development in accordance with soil capability,

(iii) forests of existing and potential commercial value for timber production,

(iv) valuable deposits of minerals, coal, petroleum, and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,

(v) trees and other vegetation in environmentally sensitive areas where the conservation of the vegetation is significant to scenic amenity, recreation or natural wildlife habitat or is likely to control land degradation,

(vi) water resources for use in the public interest,

(vii) areas of significance for nature conservation, including areas with rare plants, wetlands and significant habitat, and

(viii) places and buildings or archaeological or heritage significance, including the protection of aboriginal relics and places,

(b) preventing the unjustified development of prime crop and pasture land for purposes other than agriculture,

(c) facilitating farm adjustments,

(d) minimising the cost to the community of:

(i) fragmented and isolated development of rural land, and

(ii) providing, extending and maintaining public amenities and services, and

(e) providing land for future urban development for rural-residential development and for development for other non-agricultural purposes in accordance with the need for that development.

The proposed project would result in the efficient, effective and productive use of agricultural land on the site. An investigation of land capability, including soil types, water resources, vegetation and other physical attributes indicates that the land is suitable for the proposed cattle feedlot and the proposed irrigation for on site effluent disposal.

The proposed feedlot has been assessed in terms of its potential environmental effects and the management and mitigation measures recommended in this EA have been developed to properly manage potential effects to an acceptable level.

The proposal will include the sustainable use of water resources in line with the requirements of the *Water Management Act 2000* and avoids environmentally sensitive areas such that these would be protected and preserved in accordance with relevant LEP and zone objectives.

The proposed project is consistent with the objectives of the 1(a) General Rural zone.

Considerations for development in rural zones

Clause 10 of Murray LEP 1989 sets out general considerations for development in rural zones and states that the Council shall not consent to an application to carry out development on land within Zone 1(a) or 1(c) unless it has taken into consideration, if relevant, the effect of the development on:

(a) the present use of the land, the potential use of the land for the purposes of agriculture and the potential of any land which is prime crop and pasture land for sustained agricultural production,

(b) vegetation, timber production, land capability (including soil resources and soil stability) and water resources (including the quality and stability of watercourse and ground water storage and riparian rights),

(c) the future recovery of known or prospective areas of valuable deposits of minerals, coal, petroleum, sand, gravel or other extractive materials,

(d) the protection of areas of significance for nature conservation or of high scenic or recreational value, and places and buildings or archaeological or heritage significance, including Aboriginal relics and places,

(e) the cost of providing, extending and maintaining public amenities and services to the development,

(f) future expansion of settlements in the locality, and

(g) where the land is within Zone No 1(a) and within 400 metres of the bank of the Murray River, the effect of the development on the riparian lands of that river.

Clause 10 goes on to say that the Council must also take into consideration the relationship of the development to development on adjoining land or on other land in the locality.

The subject land is currently used for the purposes of irrigation and grazing and would remain in agricultural use under the proposed project. The land has been assessed and is considered to be suitable for the proposed use in terms of soil types, water resources and land capability. The site does not hold any potential for the recovery of valuable mineral deposits and does not constitute or form part of an area of significance for nature conservation or high scenic or recreational value.

The site does not lie within 400m of the bank of the Murray River therefore impacts upon riparian lands as a result of the proposal would be negligible. A detailed assessment of the potential effects of the proposal upon surrounding environmental assets including flora and fauna, waterways and systems (including the Murray River and the Moira Marshes), Aboriginal and European heritage has been undertaken through this EA. A series of environmental management and mitigation measures have been recommended in this EA to properly manage to an acceptable level the potential effecs of the proposal on these assets.

Surrounding development and land use is largely agricultural holdings with the nearest town – Mathoura, being some 13km north of the site. The proposal would not adversely impact upon adjoining or surrounding development and the location is considered to be suitable for the

proposed use in terms of zoning, access and transport, land capability and surrounding land use.

Development along arterial roads and access

Clause 20 of Murray LEP 1989 deals with development of land which has frontage to an arterial road and states that the Council shall not grant consent to such development unless:

> *(a) access to that land is provided by a road other than the arterial road, wherever practicable, and*
>
> *(b) in the opinion of Council, the safety and efficiency of the arterial road will not be adversely affected by:*
>
> *(i) the design of the access to the proposed development,*
>
> *(ii) the emission of smoke or dust from the proposed development, or*
>
> *(iii) the nature, volume or frequency of vehicles using the arterial road to gain access to the proposed development.*

Further, Clause 29 provides that:

> *A person, other than the Council, shall not construct a road which has access to a public road except with the consent of the Council.*

The site has frontage to the Cobb Highway, an arterial road and therefore Clause 20 applies to the assessment of the proposed project.

Access to the proposed feedlot is to be provided by way of a new private access road connected to the Cobb Highway in accordance with the requirements of Clause 20(a). It is not anticipated that this arrangement would result in an adverse impact on the safety or efficiency of the highway as discussed in **Section 15**.

In accordance with the *Roads Act 1993*, the proposal must be referred to the Roads and Traffic Authority (RTA) for consent to connect this new private access road to the Cobb Highway (being a classified road). The RTA has been consulted regarding the proposed access arrangements and has provided their requirements for assessment which are included in **Appendix A.**

7.1.2 Development Control Plans

There are no development control plans of relevance to the proposal.

7.2 State Planning Matters

7.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and provide opportunity for public involvement.

As outlined in **Section 1** of this EA, approval is required for the proposed project under Part 3A of the EP&A Act, and the proposed project is a major project under the Act. The Minister for Planning is the consent authority for the proposed feedlot.

This section of the EA also addresses the State planning policies created under the EP&A Act that are relevant to the project.

Major Projects

Section 75B(2) of the EP&A Act defines the kinds of development to which Part 3A applies:

> *(a) Major infrastructure or other development that, in the opinion of the Minister, is of State or regional environmental planning significance.*

At the time Director General's requirements were requested for this project, development defined under SEPP 34 – Major Employment Generating Industrial Development was deemed to be State significant development.

On 25 May 2005 State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005) was gazetted and replaced SEPP 34. Schedule 1 of SEPP 2005 identifies the classes of development which are 'major projects', and includes certain intensive livestock industries which employ greater than 20 people for the purpose of feedlots, piggeries, poultry egg or meat production or dairies. The proposed project involves a cattle feedlot employing some 80 people and in accordance with the provisions of SEPP 2005, the Minister would be the approval authority.

7.2.2 State Environmental Planning Policies

State Environmental Planning Policy No. 11 - Traffic Generating Developments

State Environmental Planning Policy No.11 – Traffic Generating Developments (SEPP 11) aims to ensure that the traffic management authority is provided with the opportunity to make representations on certain traffic generating developments, prior to the consent authority determining the application. SEPP 11 establishes the Road and Traffic Authority (RTA) as the traffic management authority to be consulted.

Schedule 2 of the policy includes development for the purposes of industry which has a gross floor area of 5,000m² or more which has direct access to an arterial road, or a road connecting with an arterial road if that access is within 90m of the alignment of an arterial road.

The proposed feedlot project has a gross floor area greater than 5,000m² and has private access road linking it to the Cobb Highway (an arterial road) within 90m of this junction. The proposal will therefore be referred to the Roads and Traffic Authority for comment in accordance with the requirements of SEPP 11.

State Environmental Planning Policy No. 30 – Intensive Agriculture

State Environmental Planning Policy No. 30 – Intensive Agriculture (SEPP 30) aims to require development consent for cattle feedlots and piggeries over a certain size and to ensure that the consent authority takes into account certain criteria such as the potential for odour, water pollution and soil degradation in determining applications for such development.

Clause 6 of SEPP 30 states that a person must not carry out development for the purpose of a cattle feedlot with the capacity to accommodate 50 or more head of cattle without development consent.

Clause 7 of the policy also sets out the factors for consideration in the assessment of applications for such development including:

(a) the adequacy of the information provided in the statement of environmental effects or environmental impact statement accompanying the development application, and

(b) the potential for odours to adversely impact on the amenity of residences or other land uses within the vicinity of the site, and

(c) the potential for the pollution of surface water and ground water, and

(d) the potential for the degradation of soils, and

(e) the measures proposed to mitigate any potential adverse impacts, and

(f) the suitability of the site in the circumstances, and

(g) whether the applicant has indicated an intention to comply with relevant industry codes of practice for the health and welfare of animals, and

(h) the consistency of the proposal with, and any reasons for departing from, the environmental planning and assessment aspects of any guidelines for the establishment and operation of cattle feedlots or piggeries published, and made available to the consent authority, by the Department of Agriculture and approved by the Director of Planning.

The proposed project comprises a cattle feedlot accommodating up to 80,000 head of cattle. SEPP 30 came into force prior to the introduction of Part 3A of the EP&A Act. While it therefore deals with proposals which would previously have been assessed under Part 4 of the EP&A Act, the factors for consideration set out in clause 7 of SEPP 30 remain relevant for this EA. In accordance with Clause 6 of the SEPP, this EA accompanies a development application made to the Minister seeking approval for the establishment and operation of the feedlot.

This EA has been prepared in accordance with the requirements of the EP&A Act and Regulation and provides a detailed description and environmental assessment of the proposed feedlot including potential impacts in terms of odour, surface and groundwater and soils and recommends mitigation and management measures to minimise potential adverse impacts. These issues are addressed in **Sections 12, 13** and **14** of the EA.

State Environmental Planning Policy No. 44 - Koala Habitat Protection

State Environmental Planning Policy No.44 – Koala Habitat Protection (SEPP 44) applies to Murray LGA. The aim of SEPP 44 is:

To encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline by:

- *requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat;*
- *encouraging identification of core koala habitat area; and*
- *encouraging the inclusion of core koala habitat areas in environment protection zones.*

SEPP 44 requires the consent authority to consider whether land subject to a DA is potential koala habitat or core koala habitat, as defined in the Policy. Consideration of whether the subject land includes potential and core koala habitat is included in **Section 16** and **Appendix G** of the EA. The assessment concluded that the project site and lands within the vicinity of the Moira feedlot do not contain potential or core koala habitat, and therefore the provisions of SEPP 44 are not applicable to the project.

State Environmental Planning Policy No.55 - Remediation of Land

State Environmental Planning Policy No.55 – Remediation of Land (SEPP 55) aims to provide a Statewide planning approach to the remediation of contaminated land, and in particular, promotes the remediation of contaminated land for the purpose of reducing risk of harm to human health or any other aspect of the environment.

Clause 7 of SEPP 55 requires a consent authority to consider whether the land to which a Development Application (DA) relates is contaminated and if the land is contaminated, to be satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation), prior to granting consent. While this EA has been prepared to accompany a project application under Part 3A of the EP&A Act, the matters for consideration nominated in clause 7 of SEPP 55 remain relevant for this EA.

The subject site has been used in the past for irrigation and grazing and the proposed project would retain and intensify the agricultural use on the site. Given the nature of the past and proposed uses of the site, the land is not expected to contain contamination from past activities, which would impact on the proposed use.

State Environmental Planning Policy (Major Projects) 2005

State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005) was gazetted on 25 May 2005 and replaced all existing provisions related to previously defined state significant development contained in some 85 separate planning instruments, directions and declarations. Proposed projects that are listed under SEPP 2005 are known as 'major projects'.

The primary aim of SEPP 2005 is:

> *To identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development.*

Schedule 1 of SEPP 2005 identifies classes of development which are major projects. This includes certain intensive livestock industries such as those that employ 20 or more people for the purpose of feedlots, piggeries, poultry egg or meat production or dairies.

The proposed project is an 80,000 head of cattle feedlot and is expected to employ approximately 80 people. It therefore meets the criteria for classification as a major project under SEPP 2005 and the Minister is the approval authority.

7.3 Regional Planning Policies and Studies

Murray Regional Environmental Plan No. 2 – Riverine Land

Murray Regional Environmental Plan 2 (REP2) applies to all riverine land of the River Murray (being the river and its floodplain) within the City of Albury and the areas of Balranald, Berrigan, Conargo, Corowa, Deniliquin, Hume, Murray, Wakool, Wentworth and Windouran, including the subject site.

The objectives of the plan are:

> *(a) to ensure that appropriate consideration is given to development with the potential to adversely affect the riverine environment of the River Murray, and*

(b to establish a consistent and co-ordinated approach to environmental planning and assessment along the River Murray, and

(c) to conserve and promote the better management of the natural and cultural heritage values of the riverine environment of the River Murray.

Part 2 of the REP provides general and specific planning principles to guide Councils in the preparation of Local Environmental Plans and for consideration when assessing development applications.

The REP requires that the following be taken into account when a consent authority determines a development application:

(a) the aims, objectives and planning principles of this plan,

(b) any relevant River Management Plan,

(c) any likely effect of the proposed plan or development on adjacent and downstream local government areas,

(d) the cumulative impact of the proposed development on the River Murray.

The following specific principles are of relevance to the proposed project:

- ***Land degradation*** *- Development should seek to avoid land degradation processes such as erosion, native vegetation decline, pollution of ground or surface water, groundwater accession, salination and soil acidity, and adverse effects on the quality of terrestrial and aquatic habitats.*
- ***Water quality*** *- All decisions affecting the use or management of riverine land should seek to reduce pollution caused by salts and nutrients entering the River Murray and otherwise improve the quality of water in the River Murray.*
- ***Wetlands*** *- Wetlands are a natural resource which have ecological, recreational, economic, flood storage and nutrient and pollutant filtering values.*
  Land use and management decisions affecting wetlands should:
  (a) provide for a hydrological regime appropriate for the maintenance or restoration of the productive capacity of the wetland,
  (b) consider the potential impact of surrounding land uses and incorporate measures such as a vegetated buffer which mitigate against any adverse effects,
  (c) control human and animal access, and
  (d) conserve native plants and animals.

This EA addresses the above points including the cumulative impact of the proposal on the River Murray, land degradation, water quality and wetlands in **Sections 13** and **16.** The environmental assessment concludes that the environmental impact of the proposed feedlot would be reduced to an acceptable level with the implementation of management and mitigation measures as outlined in **Section 28** of the EA.

Part 3 of the REP details consultation requirements for development proposals requiring consent. The REP sets out specific planning controls and consultation for certain kinds of development, including intensive livestock keeping establishments. In respect of this type of development the plan provides that:

- It is prohibited on flood liable land.

- Elsewhere, Council consent is required.
- The development is 'advertised'
- Consultation with NSW Department of Conservation and Land Management (now Department of Natural Resources), NSW Department of Planning, NSW Department of Water Resources (now DNR), Environment Protection Authority (now DEC), the Murray-Darling Basin Commission and NSW Agriculture (now DPI) is required.

The subject land is not flood prone, therefore the proposed project is permissible under the REP. As the proposed project is a major project, the project application will be determined by the Minister for Planning and consultation with the DEC, the Murray-Darling Basin Commission and the DPI will be undertaken in accordance with the requirements of the REP.

The REP also requires that generally:

(a) Where development is contrary to the aims, objectives or principles of this plan and may have a significant environmental effect along the Murray River— P&D (Vic), C&NR** (Vic) and the adjacent local Council in Victoria must be consulted.*

(b) Where development is within or may adversely affect land dedicated or reserved under the National Parks and Wildlife Act 1974 —the NPWS must be consulted.

(c) Where development may adversely affect endangered fauna within the meaning of the National Parks and Wildlife Act 1974, the NPWS must be consulted.

(d) Where development may affect an Aboriginal site or any other place that is generally recognised as a place of cultural significance to the Aboriginal community—the NPWS must be consulted.

(e) Where development is within or may adversely affect a State Forest—the Forestry Commission must be consulted.

*(f) Where development may affect boating safety—the MSB*** must be consulted.*

** P&D (Vic) : Victorian Department Planning and Development*
*** C&NR : Victorian Department of Conservation and Natural Resources*
**** MSB : NSW Maritime Services Board*

The proposed project is not contrary to the aims or principles of the Murray REP and ecological assessments conducted as part of this EA indicate that the proposed feedlot would not have a significant environmental effect on the Murray River. The proposal would not impact upon land within a National Park or a State Forest and is not expected to adversely affect endangered fauna (**Section 16**). Aboriginal archaeological assessments have been undertaken on the site and conclude that the proposal would not have an adverse impact upon place of cultural significance to the Aboriginal community. It is therefore concluded that the consultation requirements of the REP do not apply to the proposal.

Water Sharing Plan - NSW Murray and Lower Darling Regulated Rivers

Water Sharing Plans (WSPs) were introduced under the *Water Management Act 2000*, with most coming into effect between December 2002 and February 2003. Thirty-five WSPs are currently in place in rural areas of NSW. Areas where a WSP applies are governed by the provisions of the *Water Management Act 2000*, whilst the remainder of NSW falls under the provisions of the *Water Act 1912.*

WSPs set visions and strategies for the area to which they apply and contain guidelines for comprehensive water management within that area including provisions related to environmental water, water access licences, water use approvals, extraction limits, available water determination and access licence dealings.

The subject site benefits from a water access licence issued under the *Water Management Act 2000* with an allocation of 1,125ML from the river source and a 5,114ML bore licence and does not propose the use of additional water above these quotas.

7.4 State Legislation

7.4.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) was assented to on 19 December 1997 and repealed a number of environmental legislative Acts existing at that time, including the *Clean Waters Act 1970* and the *Clean Air Act 1961*, the *Noise Control Act 1975*, the *Pollution Control Act 1970* and the *Environmental Offences and Penalties Act 1989*. The Act also amended the *Environmentally Hazardous Chemicals Act 1985*, the *Ozone Protection Act 1989*, the *Protection of the Environment Administration Act 1991* and the *Waste Minimisation and Management Act 1995*.

The objects of the POEO Act are as follows:

(a) to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development,

(b) to provide increased opportunities for public involvement and participation in environment protection,

(c) to ensure that the community has access to relevant and meaningful information about pollution,

(d) to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following:

- *(i) pollution prevention and cleaner production,*
- *(ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment,*
- *(iii) the elimination of harmful wastes,*
- *(iv) the reduction in the use of materials and the re-use or recycling of materials,*
- *(v) the making of progressive environmental improvements, including the reduction of pollution at source,*
- *(vi) the monitoring and reporting of environmental quality on a regular basis,*

(e) to rationalise, simplify and strengthen the regulatory framework for environment protection,

(f) to improve the efficiency of administration of the environment protection legislation,

(g) to assist in the achievement of the objectives of the Waste Avoidance and Resource Recovery Act 2001.

The POEO Act prohibits any person from causing pollution of waters or air, and provides penalties for pollution offences relating to water, air and noise.

The POEO Act provides a regulatory framework for the licensing of all activities listed in Schedule 1 to the Act that have the potential to impact on the environment. Livestock intensive industries are included in Schedule 1 of the POEO Act, the definition of which includes:

> *feedlots that are intended to accommodate in a confinement area and rear or fatten (wholly or substantially) on prepared or manufactured feed more than 1,000 head of cattle, 4,000 sheep or 400 horses (excluding facilities for drought or similar emergency relief)*

Pursuant to Section 48 of the POEO Act, an Environment Protection Licence (EPL) is required for all scheduled activities and would be issued to a specific premises or activity.

The proposed Moira feedlot falls within the Schedule 1 definition, given it involves a cattle feedlot accommodating some 80,000 head of cattle.

The proposed project would therefore require an EPL under the POEO Act.

7.4.2 Roads Act 1993

The *Roads Act 1993* regulates the carrying out of certain activities on public roads, provides a classification of roads, and establishes procedures for opening and closing public roads.

Section 138 of the *Roads Act 1993* requires the consent of the appropriate roads authority for the following works:

- erecting a structure or carrying out a work in, on or over a public road, or
- digging up or disturbing the surface of a public road, or
- removing or interfering with a structure, work or tree on a public road, or
- pumping water into a public road from any land adjoining the road, or
- connecting a road (whether public or private) to a classified road.

The proposed project involves the connection of a private access road to a classified road – the Cobb Highway (SH21). The project would be referred to the RTA in conjunction with the assessment of the EA by the Department of Planning in accordance with section 75(V) of the EP&A Act.

7.4.3 Water Act 1912

The *Water Act 1912* regulates works which impact on water resources and is to be repealed in the future by the *Water Management Act 2000*. At this stage, the *Water Management Act 2000* only applies to areas affected by WSPs.

The subject site is covered by the NSW Murray and Lower Darling Water Sharing Plan, therefore the proposed project is regulated under the provisions of the *Water Management Act 2000*.

7.4.4 Water Management Act 2000

The *Water Management Act 2000* will eventually repeal the *Water Act 1912.* At this stage, it applies only to areas affected by WSPs. The subject site is included within the NSW Murray and Lower Darling Water Sharing Plan and is therefore governed by the provisions of the *Water Management Act 2000*.

The *Water Management Act 2000* sets out the procedures for issuing water use approvals and water access licences and governs dealings with regard to these approvals and licences whereby they can be bought and sold in part or in full.

The subject site already benefits from a 1,125ML water licence from the Murray River and a bore licence of 5,114ML. It is not anticipated that any additional water would required to service the proposed feedlot therefore no further water licence is required.

7.4.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal relics.

The NP&W Act is relevant to the protection of Aboriginal artefacts and the protection of native flora and fauna. Section 86 of the NP&W Act identifies offences relating to Aboriginal objects, including disturbing land to discover an artefact. Section 87(1) of the NP&W Act requires a permit to be obtained to remove any artefacts, while section 90 (2) of the NP&W Act requires consent from the Director General of DEC to knowingly destroy, deface or damage a relic or Aboriginal place.

An assessment of the impact of the proposed feedlot on Indigenous Archaeology is included in **Section 17** of this EA. This assessment concluded that there are unlikely to be significant impacts on recorded Aboriginal sites and therefore recommends that no section 90 consent is required for the project.

7.4.6 Rivers and Foreshores Improvement Act 1948

The *Rivers and Foreshores Improvement Act 1948* (RFI Act) provides protection for riverside land in NSW. Part 3A of the RFI Act requires anyone proposing to excavate or remove material from "protected land" or do anything likely to interfere with the flow of "protected waters" to first obtain a permit from Department of Natural Resoures (formerly the Department of Land and Water Conservation (DLWC)).

It is noted that protected land is defined as:

> *(a) land that is the bank, shore or bed of protected waters, or*
>
> *(b) land that is not 40 metres from the top bank or shore of protected waters (measured horizontally from the top of the bank or shore), or*
>
> *(c) material at any time deposited, naturally or otherwise and whether or not in layers, on or under land referred to in paragraph (a) or (b).*

The proposed works are not located within 40 metres of a creek and therefore a Part 3A permit is not required for the project.

7.4.7 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act* (TSC Act) provides for the conservation of threatened species, populations and ecological communities of animals and plants. This is achieved by the following:

- conserving biological diversity and promoting ecological sustainable development;
- preventing extinction and promote the recovery of threatened species, populations and ecological communities;
- protecting critical habitat of threatened species, populations and ecological communities;
- eliminating of managing certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities; and
- encouraging the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The TSC Act provides a framework to ensure that the impact of any action affecting threatened species is assessed. Schedule 1 of the TSC Act lists endangered species, populations and ecological communities, Schedule 2 lists vulnerable species and Schedule 3 lists key threatening processes. Part 3 of the TSC Act defines critical habitat.

The impact of the proposal on threatened species is discussed in **Sections 16** and **Appendix G** of this EA. The assessment concludes that no threatened species would be adversely affected as a result of the proposed project.

7.4.8 Native Vegetation Conservation Act 1997

The *Native Vegetation Conservation Act 1997* (NVC Act) provides a comprehensive system for conserving and managing native vegetation in NSW. Native vegetation is defined in this Act as any of the following types of indigenous vegetation:

(a) trees,

(b) understorey plants,

(c) groundcover,

(d) plants occurring in a wetland.

The NVC Act defines groundcover as any type of herbaceous vegetation, but it is only regarded as native vegetation for the purposes of this Act if it occurs in an area where not less than 50% of the herbaceous vegetation covering the area comprises indigenous species. In determining that percentage, not less than 10% of the area concerned must be covered with herbaceous vegetation (whether dead or alive).

Section 5 of the NVC Act provides the definition of clearing, which includes activities such as cutting down, felling, thinning, logging or removing vegetation. The definition also includes severing, topping or lopping branches, limbs, stems or trunks of native vegetation.

Section 7 of the NVC Act makes provisions for the Minister to identify land as State Protected Land, for the purposes of the Act. The DLWC (now DNR) *Guidelines for clearing vegetation under the Native Vegetation Conservation Act 1997* (June 1999) advise that State Protected Land includes the following:

- land that is generally in excess of 18 degrees slope;
- land within or within 20 metres of the bed of a prescribed stream;

- and land that is defined as 'environmentally sensitive.'

Clearing in relation to land identified as State Protected Land includes any vegetation. It is noted however, that any land that is State Protected land ceases to be State Protected Land if the land is identified as regional protected land in accordance with a regional vegetation management plan (RVMP) or the land otherwise becomes land to which a RVMP applies.

Part 2 of the NVC Act applies the development consent process under Part 4 of the EP&A Act to clearing of native vegetation and clearing protected land. Native vegetation on any land except land to which a RVMP applies, or State protected land, must not be cleared except with development consent. In respect of State Protected land, a person must not clear any vegetation except with development consent.

Part 1, section 12 of the NVC Act does however exclude certain types of clearing from the provisions of the Act. Clearing which is, or is part of a development within Part 3A of the EP&A Act is excluded under this section therefore the provisions of the NVC Act do not apply to the project.

7.4.9 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) was assented to on 11 December 2003 and is intended to replace the NVC Act. Prior to the NV Act commencing, a supporting Regulation is required to be approved by the Minister. The *draft Native Vegetation Regulation 2004* has been placed on public exhibition and the closing date for submissions was 31 January 2005.

Clause 27 of the draft Regulation includes savings and transitional provisions for development applications made under the EP&A Act before the repeal of the former NV Act for any clearing that requires consent under the new Act and that is pending on the commencement of the NV Act. Under these provisions, if an application is made on or after the date of public exhibition of the draft Regulation, the application is to be dealt with and finalised under the NV Act.

The *NV Act* establishes the following objectives:

> *(a) to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and*
>
> *(b) to prevent broadscale clearing unless it improves or maintains environmental outcomes, and*
>
> *(c) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and*
>
> *(d) to improve the condition of existing native vegetation, particularly where it has high conservation value, and*
>
> *(e) to encourage the revegetation of land, the rehabilitation of land, with appropriate native vegetation,*
>
> *in accordance with the principles of ecologically sustainable development.*

The NV Act provides a similar definition for native vegetation as that provided in the NVC Act. Part 3 of the NV Act restricts clearing of native vegetation except in accordance with a development consent granted in accordance with the NV Act or a property vegetation plan. However, the Act permits the clearing of vegetation without development consent or a property vegetation plan in the following circumstances:

- where native vegetation is regrowth, but not protected regrowth, as defined in the NV Act;
- where native vegetation is only groundcover if the vegetation comprises less than 50% of indigenous species of vegetation, and not less than 10% of the area is covered with vegetation (whether dead or alive).

Section 25 of the NV Act provides legislative exclusions from the Act for clearing in the following instances applicable to the Moira feedlot project:

- any clearing of land which is subject to the provisions of State Environmental Planning Policy 44 – Koala Habitat Protection.
- any clearing that is a project under Part 3A of the EP&A Act and for which approval has been granted under that Act.

Accordingly, the provisions of the NV Act do not apply to the proposal.

7.4.10 Heritage Act 1977 (As Amended 1998)

The purpose of the *Heritage Act 1977* (as amended 1998) is to protect and conserve non-Aboriginal cultural heritage, including scheduled heritage items, sites and relics. The Heritage Act is administered by the NSW Heritage Office.

The Heritage Act makes provision for a place, building, work, relic, moveable object, precinct, or land to be listed on the State Heritage Register. If an item is subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under section 58 of the Heritage Act for the following works or activities:

- demolition of the building or work;
- damaging or despoiling the place, precinct or land, or any part thereof;
- moving, damaging or destroying the relic or moveable object;
- excavating any land for the purpose of exposing or moving the relic;
- carrying out any development in relation to the land on which the building, work or relic is situated, the land that comprises the place, or land within the precinct;
- altering the building, work, relic or moveable object;
- displaying any notice or advertisement on the place, building, work, relic, moveable object or land, or in the precinct;
- damaging or destroying any tree or other vegetation on or remove any tree or other vegetation from the place, precinct or land.

There are no known items of heritage significance under the Heritage Act on the site subject of the proposed feedlot.

As the project falls under Part 3A of the EP&A Act, any approvals required under Part 4 the Heritage Act do not apply to the project.

7.4.11 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) is administered by NSW Fisheries. The FM Act includes provisions for licensing, regulating commercial and recreational fishing activities, and the protection of threatened species and their habitats.

The objects of the FM Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

Part 7 of the FM Act deals with the protection of aquatic ecosystems. Permits are required to be obtained for certain works, including the following:

- dredging or reclamation work;
- cutting, removing, damaging or destroying marine vegetation on public water land or an aquaculture lease, or on the foreshore of any such land or lease;
- setting a net, netting or other material, constructing or altering a dam, floodgate, causeway or weir, or creating an obstruction across or within a bay, inlet, river or creek, or across or around a flat.

As the proposed Moira Station feedlot falls under Part 3A of the EP&A Act, approval is not required under Part 7 of the FM Act for the project.

7.4.12 Rural Fires Act 1997

The *Rural Fires Act 1997* (RF Act) was assented to on 10 July 1997 and was supported by the *Rural Fires Regulation 1997*. This Regulation was repealed on 1 September 2002 and replaced by the *Rural Fires Regulation 2002*.

Section 63(2) of the RF Act imposes a duty on the owner or occupier of land to take the notified steps, being any steps advised by the Bush Fire Co-ordinating Committee or any steps in a bush fire risk management plan, to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bush fires on or from that land.

Division 8 of the RF Act relates to development of bush fire prone land and for bush fire hazard reduction. Section 100B(3) requires a bush fire safety authority to be obtained prior to developing bushfire prone land for the following types of development:

- subdivision that could lawfully be used for residential or rural residential purposes; or
- development for special fire protection purposes, which include schools, child care centres, hospitals, hotel, motel or other tourist accommodation, homes or other establishments for mentally incapacitated persons, housing for older people or people with disabilities, group, homes, retirement villages or other purposes prescribed by the regulations.

As the proposed Moira Station feedlot falls under Part 3A of the EP&A Act, approval is not required under section 100B of the RF Act for the project.

7.5 Commonwealth Matters

7.5.1 Murray-Darling Basin Act 1992

The *Murray-Darling Basin Act 1992* provides for the establishment and carrying out of an agreement between the Commonwealth and State Governments for the integrated management of land and water resources in the Murray-Darling Basin.

The *Murray-Darling Basin Agreement 1992* (MDBA) has been signed by six formal partner governments - the Commonwealth, New South Wales, Victoria, South Australia, Queensland and the Australian Capital Territory.

The agreement sets out the composition, function and operations of three key elements – the Murray-Darling Basin Ministerial Council, the Murray-Darling Basin Commission and the

Community Advisory Committee. It also sets out water entitlements for South Australia, New South Wales and Victoria, provides for annual reporting and specifies government responsibility for works such as dams and locks.

Clause 46 of the *Murray-Darling Basin Agreement 1992* requires matters, which may significantly affect the flow, use and control of water in the River Murray, to be referred to the Murray-Darling Basin Commission. The Commission must be notified when consents or approvals are granted for development where any consultation has taken place under the Murray Regional Environmental Plan No. 2 – Riverine Environments.

The proposed project utilises water from the Murray-Darling river system in accordance with a licence issued under the *Water Management Act 2000* and would have no significant effect on the flow, use and control of water in the River Murray. Therefore the referral provisions of the MDBA do not apply to the project.

7.5.2 Register of the National Estate (RNE)

The RNE is Australia's national inventory of natural and cultural heritage places and includes more than 13,000 places of natural, historic and indigenous significance. Up until recently, the Australian Heritage Commission had been responsible for advising the Commonwealth in relation to matters on the National Estate, under the provisions of the *Australian Heritage Commission Act 1975* (AHC Act).

Part IV of the AHC Act required the Australian Heritage Commission to keep an RNE and established procedures for matters to be listed on the RNE.

From 1 January 2004, the AHC Act has been repealed with the recent changes to heritage protection legislation (amendments to the Commonwealth EPBC Act and Regulations) and the introduction of the Australian Heritage Council, the responsibilities of which include the keeping of the RNE (see **Section 7.4.2**).

7.5.3 Environment Protection and Biodiversity Conservation (EPBC) Act 1999

The EPBC Act came into effect in July 2000 and requires the approval of the Commonwealth Minister for the Environment and Heritage for actions that may have a significant impact on matters of National Environmental Significance (NES). Approval from the Commonwealth is in addition to any approvals under NSW legislation.

The objects of the EPBC Act are as follows:-

(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance;

(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;

(c) to promote the conservation of biodiversity;

(d) to provide for the protection and conservation of heritage;

(e) to promote a co-operative approach to the protection and management of the environment involving governments, the community, landholders and indigenous peoples;

(f) to assist in the co-operative implementation of Australia's international environmental responsibilities;

(g) to recognize the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and

(h) to promote the use of indigenous people's knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

Approval under the EPBC Act is triggered by a proposal which has the potential to have a significant impact on a matter of NES or by a proposal which has the potential to have a significant impact on the environment which involves the Commonwealth. The EPBC Act lists eight matters of NES which must be addressed when assessing the impact of a proposal.

The EPBC Act also identifies approval requirements involving Commonwealth land and activities undertaken by Commonwealth agencies. The Moira feedlot project does not involve Commonwealth land and is not an activity proposed by a Commonwealth agency, and therefore, the relevance of the EPBC Act relates to matters of NES.

Under section 68 of the EPBC Act, a proposal must be referred to the Commonwealth Minister for Environment and Heritage if the applicant believes an approval under the EPBC Act is required. The Commonwealth Minister for the Environment and Heritage would subsequently decide whether the proposal requires approval under the EPBC Act.

An assessment of the proposal in relation to the listed matters of NES is provided below. A search of the Department of Environment and Heritage (DEH) EPBC Online Database was also undertaken, the results of which are included in **Appendix G**.

Activities with a significant impact on a declared World Heritage property.

There are no declared world heritage properties proximate to the proposed project, or that would potentially be affected by the project.

Activities with a significant impact on heritage matters.

Amendments were recently made to the EPBC Act to incorporate heritage protection, through:

- the creation of a new advisory body, the Australian Heritage Council.
- The creation of both a National Heritage List and a Commonwealth Heritage List
- Retention of the RNE.

The National Heritage List is a list of places with outstanding heritage value to Australia, and includes places overseas. Places listed on the National Heritage List are protected under the EPBC Act, and as such, a person is not able to take action that has, will have, or is likely to have, a significant impact on a national heritage place without approval of the Minister for Environment and Heritage.

The Commonwealth Heritage List is a list of places managed or owned by the Australian Government, and includes places, or groups of places in Commonwealth lands or waters, or under Commonwealth control, and are identified by the Minister as having Commonwealth heritage values. Similar to places listed on the National Heritage List, places on the Commonwealth Heritage List are protected under the EPBC Act.

There are no National Heritage Places or Commonwealth Heritage Places within or proximate to the proposed feedlot that would potentially be affected by the project.

Activities with a significant impact on a declared Ramsar wetland.

An assessment of the potential impact of the project upon the Moira Marshes (an identified Ramsar wetland) has been undertaken as part of this EA and concludes that there will be no significant impact. Further details are provided in **Section G**.

Actions with significant impact on Commonwealth-listed threatened species or endangered community.

The database search identified one Commonwealth-listed threatened ecological community and 20 Commonwealth-listed threatened species within proximity to the proposed feedlot. The Ecological Assessment undertaken as part of this EA and addressed in detail in **Section 16** and **Appendix G** of this EA has confirmed that there are no threatened species or endangered communities on the subject site which are likely to be significantly affected by the project.

Actions with significant impact on a Commonwealth-listed migratory species.

The database search identified five migratory species within proximity to the proposed feedlot site. The Ecological Assessment undertaken as part of this EA (**Section 16** and **Appendix G**) identified that the project is not expected to impact significantly on the habitat for these species.

Nuclear actions.

The project would not involve a nuclear action, as defined under the EPBC Act 1999.

Activities involving the Commonwealth marine environment.

There are no Commonwealth marine areas in proximity to the project, or that would potentially be affected by the project.

Actions prescribed by the regulations.

The project would not involve actions as prescribed by the *EPBC Regulations 2000*.

The proposal is not expected to impact on matters of NES, and as a consequence the EPBC Act is not triggered and referral to, and approval from, the Commonwealth Minister for Environment and Heritage is not required.

7.6 Conclusion

This EA has been prepared pursuant to the provisions of the EP&A Act and the EPIs created under the EP&A Act, together with relevant NSW environmental legislation. The EA has also taken into account the Commonwealth EPBC Act 1999.

The proposed cattle feedlot project is a major project, as defined under Part 3A of the EP&A Act and Regulation. As a major project, the Minister for Planning is the consent authority.

The proposed cattle feedlot is permissible under the provisions of Murray LEP 1989.

part e
issues identification

8 CONSULTATION

8.1 Formal Procedures for Consultation

8.1.1 New South Wales Formal Procedures

This EA has been prepared in accordance with Part 3A of the EP&A Act and its Regulation. Part 3A of the EP&A Act ensures that the potential environmental effect of a proposal is properly assessed and considered in the decision making process.

In preparing this EA, the requirements of the Director General were originally sought under Part 4 of the EP&A Act and as required by Clause 73 of the Regulation. In accordance with the introduction of Part 3A of the EP&A Act, the Department of Planning issued assessment requirements for the Moira Station EA under Part 3A of the EP&A Act. The Department of Planning confirmed that the assessment requirements originally issued under Part 4 of the EP&A Act were applicable to the project under Part 3A of the EP&A Act.

Each of the matters raised by the Director General for consideration in the EA is outlined in **Table 8-1**, together with the relevant section of the EA which addresses that matter. A copy of the original Director General's Requirements and also the updated assessment requirements from the Department of Planning is provided in **Appendix A**.

Table 8-1: Director-General's Requirements

Matter	Reference in EA
Environmental Planning Instruments	
Consideration of provisions and objectives of all relevant planning instruments, including: • State Environmental Planning Policy No 34 – Major Employment Generating Developments • State Environmental Planning Policy No 30 – Intensive Agriculture • State Environmental Planning Policy No 33 – Hazardous and Offensive Development • Murray Local Environmental Plan 1989	Section 7
Description of the Development and Environment	
Identify zoning of the land affected by the proposed development and the permissibility of the proposal	Section 7
Clearly outline scope of project, including site layout, methods of operation, type of machinery and equipment, associated facilities and construction methods and environmental safeguards	Section 6 and 28
Details on capital investment, hours of operation, workforce and any staging of the proposal	Section 6
Details of any new utilities required by the proposal	Section 6
Air Quality	
Impacts of construction activities on air quality, particularly dust emissions	Section 11

Matter	Reference in EA
Full air quality assessment to be undertaken and must identify all fugitive and point source emissions during operation and assess parameters in accordance with DEC	Section 11
Details of any air pollution control measures	Section 11
An outline of an air quality monitoring plan, if required	Section 11
Land and Soil Management	
Detail soil types on site and assess capacity of soil to receive effluent/manure [cation exchange, phosphorus sorption, permeability, plasticity etc.]	Section 12 and 14
Detail proposed irrigation and solid waste application practices on site, including nutrient loading rates, cropping regime, etc	Section 12
Details of past land uses with respect to potential presence of contaminated soil/material and any implications for the proposal	Section 14
Detail measures to prevent contamination from the proposed development	Section 14
Details of any soil excavations/ filling on site	Section 14
Waste Management	
Construction wastes, including quantities and qualities of waste, management, minimisation and treatment/disposal methods must be considered	Section 12
Identify types and likely annual rates of production of all waste streams	Section 12
Details of and wastes not reused or recycled	Section 12
Details of waste management on site should clearly reflect the principles of 'reduce, reuse and recycle'	Section 12
Water Management	
Details of water cycle and management, including description of water supply and need for licences etc	Section 13
Identify all potential surface water and groundwater impacts and describe measures to be implemented to minimise impacts	Section 13
Details of stormwater management systems with demonstration that they can accommodate likely storm events. Particular note should be made of any proposed measures to segregate stormwater runoff of varying qualities and proposed stormwater infrastructure	Section 13
Details of proposed erosion and sedimentation measures	Section 13
Transport Impacts	
Prepare a Traffic Impact Study in accordance with RTA guidelines which will include traffic generation and routes, design of internal roadways and parking, types of road transport, capability of proposed routes and any cumulative impacts	Section 15
Noise Impacts	
Assess predicted noise impacts resulting from construction and operation, including road traffic noise.	Section 19

Matter	Reference in EA
Noise assessment must be undertaken in accordance with DEC policy and guidelines	Section 19
Consideration of potential impacts resulting from vibration	Section 19
Visual Impacts	
Consider the visibility of the proposed development with reference to the height and scale of the proposal and materials used, particularly with regards to any nearby residential areas, adjacent development and publicly accessible places	Section 18
Animal Welfare and Disease Management	
Demonstrate adherence to relevant codes of practice and completion of an Animal Care Statement	Section 6
Include disease control measures and provide consideration of contingency measures for mass disposal of livestock in event of disease outbreak	Section 6
Consideration to the control of vermin and other pest species	Section 6
Flora and Fauna	
Consider potential impacts on flora and fauna particularly the need for any clearing of native vegetation and subsequent management measures to offset these losses	Section 16
Identify potentially impacted critical habitats; threatened species, populations or ecological communities, or their habitats, and apply Eight Part Tests	Section 16
European and Aboriginal Cultural Heritage	
Consider impact of the development with respect to indigenous and non-indigenous heritage significance, particularly in areas proposed to be disturbed. Details of consultation with LALC to be provided	Section 17
Socio-economic Impacts	
Address impact of proposal on agriculture in the region, particularly the grain industry	Section 21 and 23
Consider impacts on accommodation in Murray area	Section 23
Provide details on intended source of employment for the proposal	Section 23
Consider value-adding potential of the development to other industries	Section 23
Hazard and Risk Assessment	
Provide detail of transport, handling, storage and use of any dangerous goods on site	Section 20
Statement of Commitments	
Provide a draft Statement of Commitment for environmental mitigation, management and monitoring for the project	Part G - Sections 27, 28 and 29

Matter	Reference in EA
Consultation	
Address issues outlined in Planning Focus Meeting Consult with the following parties: • Department of Environment and Conservation • Murray Shire Council • Department of Primary Industries • Roads and Traffic Authority • Department of Housing • Relevant utility providers • Local Aboriginal Land Council • Relevant local community groups	Section 8

In addition to the above, the EA must include the general requirements for projects under Part 3A of the EP&A Act, as stated in correspondence from Department of Planning which is located in **Appendix A**. These requirements are outlined in **Table 8-2** below.

Table 8-2: Statutory Requirements for EA (Including EP&A Regulation Clause 51 Matters)

Requirement	Reference in EA
Executive Summary	Executive Summary
Description of the proposal, including construction, operation and staging	Section 6
Details of the location of the project and environmental planning provisions applicable to the site and the project	Section 7
Consideration of Alternatives	Section 5
An assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below	Part F
Proposed mitigation/ management measures of residual environmental impacts	Section 28
Justification for undertaking the project with consideration of the benefits/ impacts of the proposal, and proposed management/ mitigation	Section 29, Section 27 and 28
A draft Statement of Commitments for environmental mitigation, management and monitoring for the project	Part G
Certification by the author of the Environmental Assessment that the information contained in the Assessment is neither false nor misleading	Inside front cover

8.2 Consultation with Stakeholders and Other Relevant Authorities

8.2.1 Planning Focus Meeting

A Planning Focus Meeting (PFM) was held at Murray Shire Council Chambers on 17 June 2004 in order to introduce members of the study team to the statutory and other relevant authorities, and to provide an outline of the project and an opportunity for the regulatory authority representatives to undertake a site visit.

Representatives from the following organisations attended the PFM:

- Department of Planning (DoP, formerly DIPNR);
- Department of Environment and Conservation (DEC);
- Moira Private Irrigation District (MPID);
- Greater Murray Area Health Service (Department of Health);
- Department of State and Regional Development (DSRD);
- Department of Primary Industries (DPI); and
- Murray Shire Council.

8.2.2 Statutory and other relevant authorities

The proposed development is classed as a 'major project' as discussed in **Section 7**. As such, written comments from all the statutory agencies were requested by DoP. A full list of authorities' comments is provided in **Appendix A**.

In addition, the Cultural Heritage Assessment undertaken as part of this EA involved consultation with Moama and Cummeragunja Local Aboriginal Land Councils.

9 COMMUNITY CONSULTATION PROGRAM

9.1 Objectives

The overall objective of the community consultation program was to ensure clear, transparent, two-way communication by listening, recording and responding to the issues as they arose. Specific objectives were to:

- Disseminate information about the proposed cattle feedlot and the EA process to key stakeholders and the surrounding community;
- Increase community awareness and understanding of the project, the EA and the associated planning process;
- Ensure stakeholders and members of the community were provided with adequate opportunities through the consultation process to communicate feedback and voice concerns;
- Accurately report community and stakeholder issues and views;
- Build community confidence in the EA and approval process;
- Facilitate information exchange from the onset between the study team and the community to enable joint understanding of issues raised;
- Conform to relevant NSW and Commonwealth legislation; and
- Work in close cooperation with the relevant authorities.

9.2 Key Community Stakeholder Identification

The key stakeholders for the proposal were identified as those being directly impacted from the proposed project. As shown in **Figure 9.1**, the key stakeholders within the community are residents or landholders within approximately 10km of the centre of the site of the proposed project.

9.3 Community Consultation Methodology

The primary aim of the community involvement process was to provide information to the public about the project, and EA and obtain responses which would be addressed during the preparation of the EA.

A letter and project information DVD was distributed to residents living within 10km of the proposed site. A copy of this letter and project information and distribution map is attached in **Appendix B**.

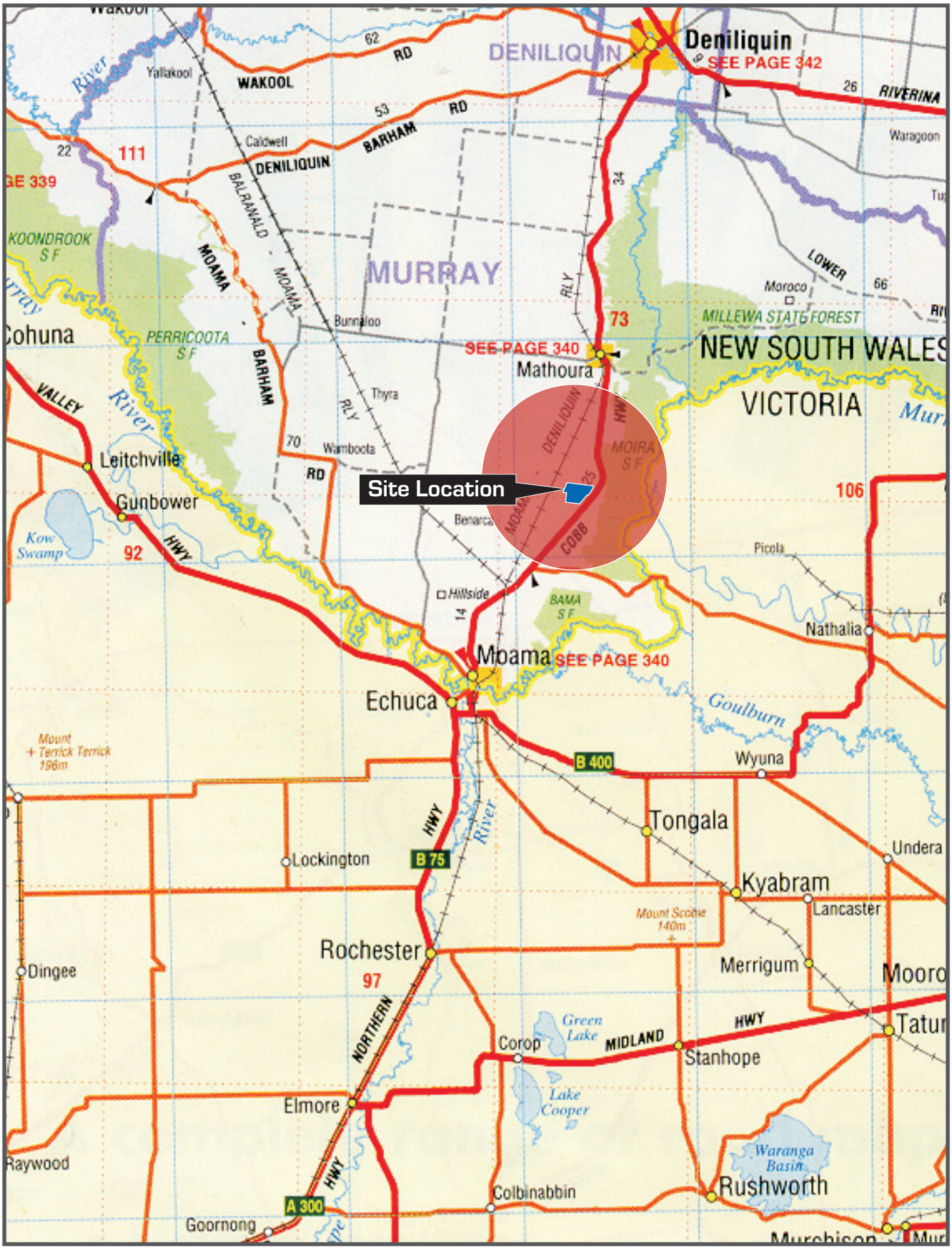
A public information session is scheduled to be held in the local area during the public exhibition period of the EA. It is envisaged that members of the project team, including representatives from the proponent would be present at this session.

The community was encouraged through the letter to make submissions on the project and several took up the opportunity to make submissions. Contact details were entered into the project consultation database. **Table 9-1** shows a summary of the 5 consultation responses from the local community received as a result of the consultation program

Table 9-1: Community Consultation Response

Respondent Type	Date	Issues	HLA Response	Date
Commercial	8/06/05	Irrigation and water requirements	Face to face meeting	29/06/05
	22/07/05	Follow-up questions	Letter	4/08/05
Local Resident	09/06/05	Odour	Letter	24/06/05
Local Resident	14/06/05	Traffic and amenity	Letter	24/06/05
Local Resident	15/06/05	Odour and Animal Welfare	Letter	24/06/05

A face to face meeting was held with Moira Private Irrigation District (MPID) to discuss the irrigation and water requirements of the proposed project. Another meeting was proposed following determination of the project.



HLA

Consultation Distribution Area
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Distribution area

FIGURE
9.1

PROJECT-FILE NAME	S60133	DATE	26 September 2005	DRAWN	TO	APPROVED

10 IDENTIFICATION AND PRIORITISATION OF ISSUES

10.1 Issues Identification

10.1.1 Methodology

Consultation with the statutory authorities together with the local community of Moira and a scoping assessment assisted the identification of issues relating to the project.

10.1.2 The Issues

The key issues identified by the community through the consultation process of the proposed cattle feedlot are listed in **Table 10-1**.

Table 10-1: Issues Identified by the Community

Aspect	Issue
Environment	Odour
Social	Amenity
Economic	Investment
Project/EA Process and Findings	Community Consultation
Project	Animal Welfare

The key issues identified by the statutory authorities through the Director General's Requirements and other consultations are listed in **Table 10-2**.

Table 10-2: Issues Identified by Research and Statutory Authorities

Aspect	Issue
Environment	Odour Waste Management Traffic Irrigation Management
Social	Amenity Consultation Employment Hazards and Risk Transport Impacts
Project/EA Process and Findings	Strategic Objectives
Project	Sourcing of materials Animal Welfare

10.2 Prioritisation of Issues

As with all environmental assessments, the assessment of issues needs to recognise that the higher the significance of a particular attribute and the potential for adverse environmental impact, the higher the degree of analysis required.

Where a significant risk of potentially detrimental impact was identified or an issue of significant concern to the community was raised, the attribute or issue was allocated a higher priority for assessment as it would be of greatest concern to the proponent and the wider community.

A priority level has been placed on each issue, either being low (L), medium (M) or high (H) and considers the potential for impact and the level of concern for this issue. This prioritisation is shown in **Table 10-3** below.

Table 10-3: Prioritisation of Issues

Aspect	Issue	Priority
Environment	Flora and Fauna Irrigation Management Odour Traffic Waste Management	M H H M M
Social	Amenity Consultation Employment Hazards and Risk Transport Impacts	H H H M M
Project/EA Process and Findings	Strategic Objectives	M
Project	Sourcing of materials Animal Welfare	M M

part f
assessment of effects

11 AIR QUALITY

11.1 Introduction

This section of the EA addresses issues relating to air quality and the proposed feedlot project. Odour is considered a key issue for this proposal and therefore a detailed Odour Impact Assessment was undertaken by Holmes Air Sciences (Holmes) to quantitatively assess the predicted odour impacts resulting from the proposed operation of the cattle feedlot as part of this EA. The full Odour Impact Assessment report is found in **Appendix C**. This section of the EA includes a summary of this assessment as well as addressing other relevant matters relating to air quality such as climate, meteorology, dust and greenhouse gases.

11.2 Climate and Meteorology

11.2.1 Local Climate

Local meteorology is recorded by the Bureau of Meteorology at Mathoura. Temperature, humidity and rainfall data collected from this station are presented in **Table 11-1.**

Temperature data show that January is typically the warmest month with a mean daily maximum of 31.4^{o}C. July is the coldest month with a mean daily minimum of 3.3^{o}C. Rainfall data collected at Mathoura show that October is, on average, the wettest month with a mean rainfall of 44.8mm over 8 rain days. Annual average rainfall is 443mm.

11.2.2 Meteorology

The meteorology at the site is influenced by several factors including the local terrain and land-use. On a relatively small scale, winds would be largely affected by the local topography. At larger scales, winds are affected by synoptic scale winds, which are modified by sea breezes near the coast in the daytime in summer (also to a certain extent in the winter) and also by a complex pattern of regional drainage flows that develop overnight.

As part of the Odour Impact Assessment, wind data were generated by The Air Pollution Model (TAPM) for Moira and were prepared into annual and seasonal windroses which are presented in **Figure 11.1**. The windroses show the frequency of wind speeds and wind directions. On an annual basis TAPM suggests that the predominant winds are from the south. Summer and autumn wind patterns are similar to the annual pattern. In winter the most common winds are from the north while the winds during spring are mainly from west-south west and south.

The percentage of calms (periods where winds are less than 0.5 m/s) is simulated by TAPM at less than 1% with an average wind speed of 3.6 m/s. It should be noted that TAPM is a prognostic model and data generated for Moira should be considered as an estimate of meteorological conditions occurring in the area. A meteorological station was installed for the project at Moira Station on 2 March 2005. The data generated for the site by TAPM has shown good agreement with the first few months of wind data collected by the weather station. This is discussed further in **Appendix C**.

Table 11-1: Climate Data

Mathoura	Mean Daily Max Temp (deg C)	Mean Daily Min Temp (deg C)	Mean 9am Air Temp (deg C)	Mean 9am Relative Humidity (%)	Mean 3pm Air Temp (deg C)	Mean 3pm Relative Humidity (%)	Mean Rainfall (mm)	Mean no. of Rain days
January	31.4	15.5	23.8	45	30.5	29	32.1	3.8
February	30.3	15.2	22.4	50	29.4	31	23	3.6
March	27.5	13.2	20	56	26.9	37	35.3	4.3
April	22.1	9.2	15.6	68	20.9	-	29.6	5.4
May	16.9	6.1	10.7	80	15.4	-	43.3	8.5
June	14.1	4.3	8	85	13.2	-	36.9	9.1
July	13	3.3	7	85	12.2	-	42.7	10.8
August	14.9	4.2	9	80	14.9	56	44.4	10.9
September	18.1	6	12.4	68	17.2	52	44.5	9.5
October	21.7	8.7	16.1	60	21	45	44.8	8.4
November	25.4	10.7	19.3	49	24.6	35	33.5	6.2
December	28.6	13.1	21.6	47	27.6	33	32.6	5
Annual	22	9	15.5	64	24.8	38	442.8	85.4

Station number 074069 MATHOURA STATE FOREST, 1949 to 2004; Latitude (deg S): -35.8115; Longitude (deg E): 144.9017; State: NSW

Source: Bureau of Meteorology (2005)

11.3 Odour

The Odour Impact Assessment used a computer-based dispersion model, CALPUFF, to predict off-site odour resulting from the operation of the feedlot. To assess the potential impacts that odour emissions could have on existing air quality, the dispersion model predictions were compared to relevant regulatory air quality criteria.

The Odour Impact Assessment was based on a conventional approach following the procedures outlined in the New South Wales Department of Environment and Conservation's (NSW DEC, formerly EPA) document titled *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2001[a]). The assessment also drew extensively from experience gained in the assessment of an extension to the Rangers Valley feedlot near Glen Innes which involved extensive consultation with the DEC on the factors affecting odour emission rates from feedlot pads.

A number of dispersion modelling scenarios were undertaken in the assessment. These scenarios were developed to present both a conservative assessment of odour impacts as well as a more realistic assessment of impacts which takes into account detailed feedlot management measures.

11.3.1 Odour Goals

The determination of air quality goals for odour and their use in the assessment of odour impacts is recognised as a difficult topic in air pollution science. The topic has received

considerable attention in the past five years and the procedures for assessing odour impacts using dispersion models have been refined considerably.

The DEC has in recent times attempted to refine odour goals and the way in which they should be applied with dispersion models to assess the likelihood of nuisance impact arising from the emission of odour. However, these procedures are still being developed and odour goals are likely to be revised in the future.

There are two factors that need to be considered:

1. what "level of exposure" to odour is considered acceptable to meet current community standards in NSW; and
2. how can dispersion models be used to determine whether a source of odour meets the goals which are based on this acceptable level of exposure.

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors, the most important of which are:

- the **F**requency of the exposure;
- the **I**ntensity of the odour;
- the **D**uration of the odour episodes;
- the **O**ffensiveness of the odour; and
- the **L**ocation of the source (the so-called FIDOL factor).

Whether or not an individual considers an odour to be a nuisance will depend on the FIDOL factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

The DEC Draft Odour Policy includes some recommendations for odour criteria. They have been refined by the DEC to take account of population density in the area. **Table 11-2** lists the odour certainty thresholds, to be exceeded not more than 1% of the time, for different population densities.

Table 11-2: Odour Performance Criteria for the Assessment of Odour

Population of affected community	Odour performance criteria (nose response odour certainty units at the 99th percentile)
Single residence (≤2)	7
10 – 30	6
30 - 125	5
125 – 500	4
500 – 2000	3
Urban	2

The goals assume that 7 odour units at the 99th percentile would be acceptable to the average person, but as the number of exposed people increases there is a chance that sensitive individuals would be exposed. The goal of 2 odour units at the 99th percentile is considered to be acceptable for the whole population.

A further complication with area sources such as feedlots is the way in which odour is measured. The predicted impacts of emissions from odorous sources would vary depending on such things as the sampling and measurement techniques used to determine odour levels from the source. The two most common sampling methods for measuring source emissions are the wind tunnel and the static flux hood methods. The assessment method applied will determine the assessment criteria used. If wind tunnel sampling methods are used, then a higher goal should apply. If the static flux hood methods are used then a lower goal will apply, which takes into account these lower measurements of the emission rates. The DEC odour goals are consistent with measurements made with the static flux hood. In short, the higher goal cannot be applied to static flux hood measurements as this would mean lower measurement of odour emission rates being compared to higher assessment criteria.

The DEC has also indicated that while the guidelines set out in **Table 11-2** are default guidelines, industries may develop their own criteria, based on observed levels of impacts. A recent study commissioned by Meat and Livestock Holdings Australia (MLH), showed that using an emission rate of 5 ou/m^2/s, a goal of 20 ou at the 99th percentile was consistent with the cattle feedlot guidelines, which have been in place in Queensland for over ten years (Holmes Air Sciences, 1999).

11.3.2 Odour Emissions from Feedlots

There are a number of difficulties in estimating odour emission rates from large area sources such as cattle feedlots, where emissions are not constant across the site and vary with time. A wide range of emission rates for cattle feedlots can be found in the literature, varying by as much as two orders of magnitude. The most significant factor affecting odour emissions from cattle feedlots is the state of the manure pad. Conditions which are conducive to the growth of anaerobic bacteria will give rise to the highest odour emission rates. If the manure pad is deep through infrequent cleaning and there is an episode of high rainfall and warm weather, high odour emission rates are likely to occur.

A number of approaches have been used to calculate emission rates from cattle feedlots. These include:

- Isolation flux hoods;
- Wind tunnels;
- Back calculations; and
- Emission models.

These different approaches are discussed in **Appendix C**.

11.3.3 Estimated Odour Emissions

The assessment involved modelling a number of different scenarios with different emission rates.

Constant Emission Rate

The first dispersion modelling scenario assumes a constant odour emission rate of 5 ou.m^3/m^2/s for the feedlot pad. This emission rate is consistent with measurements by method of back calculation for well run cattle feedlots. It is recognised that this is a simple approach which does not take into account variations in rainfall and feedlot management practices. However, this approach has been found to be more conservative than more detailed, and potentially more realistic, feedlot studies.

Dispersion Model: Runs 1 - 3

These scenarios have used an emissions model. This model is considered to more realistically simulate odour emissions for this project. Factors such as stocking density, pen clean-out procedures, daily rainfall and feed can be used to estimate the pad moisture content which, in turn, can be used as input to the odour emissions model. E.A. Systems Pty Ltd assisted in the assessment by using detailed feedlot and rainfall information to derive daily pad moisture content from their model on an 80,000 head of cattle feedlot. A copy of the E.A. Systems report is provided within the Odour Impact Assessment in **Appendix C** of this EA.

E.A. Systems used the model for three scenarios as follows:

1. Run 1: Base feedlot data supplied by AEI (through Holmes Air Sciences)
2. Run 2: Base feedlot data with an assumed maximum manure depth of 50 mm compared to 25 mm
3. Run 3: Base feedlot data with an assumed maximum manure depth of 50 mm and a pen slope of 3% compared to the initial 2%

Run 2 and Run 3 were added by E.A. Systems based on their experience that a maximum manure depth of 50 mm was a more realistic estimate by current manure removal and operational practices. Also, it was suggested that a pen slope of 3%, instead of 2%, would lead to improved pen surface drying conditions.

The odour emissions model used the pad moisture content data to estimate hourly odour emission rates. It should be noted that estimates using this equation report odour emission rates in detection units using the NVN 2820 standard. The calculated odour emissions from the model were divided by three to report the emissions in recognition units.

The odour emissions associated with each dispersion modelling scenario are given in **Table 11 - 3**.

Table 11-3: Odour Emissions Data used for Dispersion Modelling

Source	Average emission rate ($ou.m^3/m^2/s$)			
	Constant emission	Run 1 - model	Run 2 – model	Run 3 - model
Feedlot Pen Surface	5	1.9	2.0	2.0
Effluent holding	0.38[1]	0.38[1]	0.38[1]	0.38[1]
Sediment pond 1	0.38[1]	0.38[1]	0.38[1]	0.38[1]
Sediment pond 2	0.38[1]	0.38[1]	0.38[1]	0.38[1]
Effluent storage	5	1.9	2.0	2.0
Receivals area	5	1.9	2.0	2.0
Burial pit	5	1.9	2.0	2.0

[1]*Using emissions similar to anaerobic ponds (Holmes Air Sciences, 2000)*

Peak-to-mean factors (which are a measure of concentration fluctuation in the plume) for the near-field and far-field have been applied to the estimated variable odour emissions shown in **Table 11-3** (Runs 1 to 3). For area sources, near-field is considered to be within one kilometre of the source (Katestone, 1995). Alternatively the near-field is typically 10 times the largest source dimension, either height or width. For area sources of large dimensions such as feedlot pens, which are not specifically addressed in the supporting documentation, it is useful to

review the physical basis for the definition of near-field and far-field, to better estimate the extent of the near-field zone.

Close to the source, the detailed structure of the source and plume meander caused by large-scale eddies are important in determining the fluctuation intensity. This reaches a maximum when the plume size matches the dominant eddy size in the atmosphere. Under convective conditions this could be of the order of 1,000 to 1,500m. For areas source of dimensions 800 to 1,000m it will not take a distance of 8-10 km (ten times the largest dimension) for this matching of plume to eddy size to occur, as the plume size is already close to typical large-scale eddy sizes.

The far-field is defined as the zone where plume rise and meandering have fully occurred and the plume is well mixed in the vertical. A distance of approximately 2 km from the source should be sufficient for this mixing to occur and for the fluctuation intensity in the plume to be independent of source characteristics as required for far-field conditions. On this basis, it has been assumed conservatively that the near-field is within 2.5 km of the edge of the pens and the far-field is more than 2.5 km.

The following assumptions have been used for generating odour emissions from the odour emissions model.

- The ratio of wind tunnel to flux hood measurements is 15;
- The ratio of detection to certainty units is 3;
- Average beast weight is 34 kg/m^2/beast;
- Emissions have been adjusted for wind speed according to the relationship described by Smith and Watts (1994); and
- Peak-to-mean factors of 2.3 and 1.9 apply for unstable and stable conditions respectively.

It is recognised that there is unlikely to be a fixed relationship between wind tunnel and flux hood measurements. **Appendix C** provides some analysis of historical odour emissions from wind tunnels and flux hoods carried out as part of an odour study of another feedlot. The result was that a ratio of 15 was deemed a reasonable interim value, while still providing a level of conservatism. The use of a ratio higher than 15 would be a less conservative approach.

Figures 11.2 to **11.4** show the estimated odour emissions generated by the odour emissions model. Also shown on these graphs are the pad moisture content and the rainfall. The higher odour emissions can be seen to occur near the rainfall events.

The derived emission rates are generally within the range found by Ross (1989) and Carson & Round (1990) for isolation flux hoods (that is, between 0.1 and 20 ou.m^3/m^2/s).

11.3.4 Meteorology and Odour

Wind

In the odour impact assessment it is not necessary to understand the complex mechanisms that affect air movements in the area, it is simply necessary to ensure that these air movements are incorporated into the dispersion modelling studies that are done. This assessment made extensive use of the CALPUFF dispersion model. The CALPUFF model makes use of wind fields generated by the CALMET model. CALMET generates a three-dimensional wind field on an hourly basis by taking observations of winds at selected locations and interpolating these to produce information on wind speed and direction at a grid of regularly spaced points covering the area of interest. Modifications imposed on this interpolated wind field (by topography and

differential heating and differential surface roughness) are then applied to the winds at each grid point to develop a final wind field.

The final wind field reflects the effect of local topography and the effects of different temperatures experienced by water bodies and land surfaces as well as different surface roughness that arises because of changes in vegetation or other variations in land use.

More details on the data and parameters used as part of the meteorological component of the air assessment and wind data generated for the assessment are found in **Appendix C**.

Atmospheric Stability and Mixing Height

The CALPUFF dispersion model obtains estimates of atmospheric stability and mixing height from the CALMET meteorological model. CALMET determines these parameters using the cloud cover data and temperature profiles provided in order to run. The output of the CALMET model can subsequently be processed to extract meteorological information for any site of interest in the modelling domain, including atmospheric stability. Table 5 of **Appendix C** provides the frequency of occurrence of the six stability classes as determined by CALMET for Moira.

The most common stability class as determined by CALMET, is F-class (29.2%). Dispersion of pollutants is slow under these circumstances as F-class stabilities are generally associated with light winds and night-time conditions. The distribution of stability classes from TAPM was very similar to those from CALMET although D-class was determined to be the most common stability.

11.3.5 Assessment Methodology

There are two primary methods for assessing odour impacts from cattle feedlots. The two methods are:

- Generic calculations (known as a Level 1 assessment), and
- Odour dispersion modelling (Level 2 or 3 assessment)

Both these approaches were undertaken in the odour assessment. The details behind each approach are discussed below.

Generic Calculations

Level 1 odour assessments for cattle feedlots use a simple method to determine the separation distance between the feedlot and the nearest receptor. The methods to determine the separation distances are outlined in the DEC *Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW* (EPA, 2001[b]). They are based on the Queensland Department of Primary Industry guidelines (QDPI) originally developed in 1989 and recently revised.

Dispersion Modelling

Potential impacts of the proposed project on the surrounding area have been assessed using CALPUFF. The CALMET/CALPUFF modelling system is considered to be one of the most sophisticated models available. CALPUFF is an advanced computer-based dispersion model that simulates the dispersion of emissions by representing emissions as a series of puffs emitted sequentially. Provided the rate at which the puffs are emitted is sufficiently rapid, the puffs will overlap and the serial release will represent a continuous release.

The advantage of the puff modelling approach over the steady state Gaussian models such as ISCST3 and AUSPLUME, which have also been widely used in source dispersion assessments in the past, is that the progress and dispersion of each individual puff can be treated separately

and can be made to account for local wind conditions and the way in which wind conditions at a particular place vary with time.

The way in which the model was used in this study was to predict the 1-hour average odour levels at a set of receptors arranged 26km by 38km around the site. Spacing between receptors was set at 1km. This region has been chosen to include the nearest sensitive receptors as well as to provide an indication of the extent of odour impacts. The 1-hour averaging times, corrected for nose-response times, have been used for consistency with the DEC odour goals.

The modelling has been performed using meteorological data and the odour emissions estimates. Odour sources have been modelled as area sources and located according to the site layout. All hours in the meteorological data file have been simulated with an emission rate from the feedlot. This approach is consistent with a Level 3 assessment.

11.3.6 Dust

The site proposed for the location of the feedlot is a rural area, air quality in the local area would be considered to be of good quality and is unlikely to be influenced by agricultural activities and emissions from vehicles and trains.

11.3.7 Greenhouse Gases

Greenhouse gases (GHGs) are a natural part of the atmosphere, they absorb and re-emit infra-red radiation, trapping heat and warming the Earth's atmosphere, similar to the glass in a greenhouse. However, human activities are increasing the concentrations of these gases, and are considered to contribute to global climate change. The most significant greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_x) and various forms of fluorocarbons.

Methane is 23 times more potent in its warming potential than carbon dioxide. In cattle, methane is produced naturally as a by-product of digestion. Almost all of the methane is burped out by the animal. After carbon dioxide, methane makes the next biggest contribution to global warming - some 20 percent of the total. The digestive processes of cattle, rice cultivation, venting of natural gas, and waste decomposition in landfills are some of the major sources of methane emissions (CSIRO, 2005).

11.4 Assessment of Impacts

11.4.1 Odour

Generic Odour Assessment

As a preliminary investigation into the feasibility of the proposed feedlot, a Level 1 odour impact assessment was undertaken. Results of the Level 1 assessment are shown below in **Table 11 - 4** for single residences and for the nearest towns (see **Figure 11.5** for locations). **Figure 11.5** shows residential properties located within 10km of the proposed development. The Level 1 assessment indicated that a number of these residential properties were expected to experience acceptable odour emissions in accordance with DEC odour goals for the general population (approximately 2 odour units at the 99th percentile). Whilst this screening exercise indicated that further analysis of odour impact assessment at these locations was not required, some receptors were retained, such as R18, R19 and R20, as being representative of these receptors.

The composite site factor (S) is related to the stocking density, receptor type, terrain, vegetation and wind frequency factors as presented in the DEC guidelines. Some of the assumptions used for calculation of the composite site factor are given below.

- Stocking factor (S1): Same for all receptor types. Annual average rainfall less than 750 mm. Class 1 feedlot and stocking density of 12.5 m^2/head. Average beast weight of 420 kg used;
- Receptor factor (S2): Receptor types chosen for the assessment included "Rural residence", "Medium towns with 500-2000 people" and "Large towns with >2000 people";
- Terrain factor (S3): "Flat" chosen for all receptor types;
- Vegetation factor (S4): "Few trees, long grass" used for all receptor types; and
- Wind frequency factor (S5): "Normal wind conditions" chosen for all receptor types, ie. between 5% and 60% of winds blowing towards receptor (±40 degrees from source) over the year.

Table 11-4: Calculated separation distances at nearby residences

Receptor type	Composite site factor (S)	Calculated minimum separation distance (m)*	Existing separation distance (m)
Single residence	14.8	4,176	<2,000
Medium town (Mathoura)	59.1	16,702	13,000
Large town (Moama)	78.7	22,270	20,000

* Based on 80,000 head of cattle

Composite site factors have been obtained from DEC draft guidelines (NSW EPA, 2001[b]). From the results shown in **Table 11-4** it can be seen that the calculated minimum separation distances are greater than the actual distances from each receptor type to the feedlot. As the Level 1 assessment approach is considered to be more of a screening exercise, the results are designed to be conservative. It should be noted that the DEC guidelines state that Level 1 assessments may not be suitable for very large cattle feedlots.

As a consequence of the screening results, a more refined investigation is required and has been undertaken which was based on dispersion modelling (Level 3 assessment). The results from the Level 3 investigations are discussed below.

Odour Dispersion Modelling

The model runs were undertaken using the meteorological data described in **Section 11.2.2** and the estimated odour emissions described in **Section 11.3**.

This section provides an interpretation of the predicted concentrations of odour. Results have been presented in two formats. These two formats are:

- Maximum 1-hour average odour levels; and
- Odour levels at the 99th percentile.

Odour levels at the 99th percentile have been presented for comparison with the DEC odour criteria. **Figures 11.6** and **11.7** show the model results due to the proposed feedlot operations and **Table 11-5** shows the results for various locations.

The DEC Draft Odour Policy includes recommendations for odour criteria which take account of population density in the area. If it is assumed that the population density on the sliding scale of odour criteria (see **Table 11-2**) apply to a population per square kilometre (km^2), then an odour criterion may be established for each receptor, based on the approximate lot size of the receptor. Therefore, the odour criterion of 7 odour units (a single residence) would apply to a receptor of lot size approximately 1 km^2. Then, assuming there are 2.6 persons per household (lot), the odour criterion of 6 odour units (10 people per km^2) would apply to receptor lots of approximately 0.26 km^2 (i.e. 2.6/10) and so on for the 5, 4, 3 and 2 odour criteria. This methodology has been used to derive the odour criteria appropriate for each receptor location as shown in **Table 11-5**. Further discussion on the appropriate odour criteria for each receptor location is provided in **Appendix C**.

Apart from differences due to population density, it has been assumed that all receptors have similar sensitivity to odour, based on a potential exposure for 24-hours per day in a private residential setting. In reality, there will be different levels of sensitivity in the community being assessed. For example, properties which also operate livestock activities may have more tolerance to feedlot odour than others, although this is not necessarily the case. Furthermore, land ownership and usage can change over time. Staff at the Moira Irrigation District Head Office (R1) would not be present 24-hours a day and would therefore not experience the same frequency of odours as residential receptors. However for the purposes of this study, all receptors have been assessed to the most stringent standard appropriate for the population density.

A tiered approach was adopted to assess the results. Firstly, the predicted odour concentration using constant emissions was compared with the odour criteria. This is a conservative approach and if the predicted concentration was below the odour criteria then it was considered that no odour impact would be observed at that location. If the predicted concentration was above the odour criteria then the result of using variable odour emissions was considered.

Table 11-5: Predicted odour levels due to Moira Feedlot

Location	Description	Odour concentration at the 99th percentile (ou)				Odour criteria
		Constant emissions	Run 1: Base data	Run 2: 50 mm pad depth	Run 3: 50 mm pad depth, 3% slope	
R1	House[1]	22	5	5	5	6
R2*	House	100	32	35	33	7
R3	House	21	5	5	5	7
R4*	House	62	17	17	17	6
R5*	House	62	16	16	17	6
R6	House	35	7	8	8	7
R7	House	25	6	6	6	6
R8	House	23	5	6	6	6
R9	House	22	4	5	5	6
R10	House	21	4	5	5	6
R11	House	25	7	8	7	7
R12*	House	41	14	15	15	7

Location	Description	Odour concentration at the 99th percentile (ou)				Odour criteria
		Constant emissions	Run 1: Base data	Run 2: 50 mm pad depth	Run 3: 50 mm pad depth, 3% slope	
R16	House	21	4	5	5	6
R17	House	16	3	4	4	6
R18	House	13	4	4	4	7
R19	House	5	2	2	2	7
R20	House	6	2	2	2	7
Barmah	Town	2	1	1	1	5
Moama	Town	1	1	1	1	2
Mathoura	Town	6	1	2	2	3

Notes: (1) Moira Private Irrigation District Head Office
(*) Residential properties in near-field zone

For all locations, the use of constant odour emissions gave higher results than using variable odour emissions. This was expected as the constant odour emission rates were derived from feedlots and areas with higher rainfall than the Moira Station feedlot. The low rainfall at Moira would help to minimise the frequency of high odour emission events. For this reason the results using the odour emission model have been considered to represent a reasonably realistic variation in emissions and expected odour impacts. The differences between the variable emission scenarios (Run 1, Run 2, and Run 3) are minor.

A number of residences are located within about ten kilometres of the feedlot site. Although some of the results show that odour levels are predicted to be slightly below the odour criteria, it would be difficult to say that odours from the feedlot would not be detectable on occasions at these locations. Residences further from the feedlot site would be expected to observe lower odour levels and frequency of odour events than residences closer to the site. The results of the dispersion modelling indicate that residences at residences R2, R4, R5, R6, R11, and R12 are predicted to experience odour levels at the 99th percentile which are above the odour criteria.

Predicted odour impacts at the town of Barmah are considered to be low. Using the conservative "constant emissions" approach the predicted odour levels due to the feedlot at the town of Barmah are approximately 2 odour units. Assuming that the population of Barmah is in the order of 30 people the relevant odour criteria is 5 odour units. This suggests that odour impacts from the feedlot would be acceptable at Barmah.

Predicted 99th percentile odour levels at Moama are 1 odour unit when the dispersion modelling is based on the use of constant emissions and less than 1 odour unit (rounded up to 1 in **Table 11-5**) for variable odour emissions. The population of Moama is of the order of 4,000 and the relevant odour criteria would therefore be 2 odour units (from **Table 11-4**). Based on the dispersion modelling the odour impacts from the feedlot at Moama are considered to be acceptable.

At Mathoura, the predicted 99th percentile odour levels due to the feedlot are 6 odour units utilising the constant emissions approach. This prediction has been determined for the southern edge of Mathoura. Given that the population of Mathoura is approximately 860 the relevant DEC odour criteria is 3 odour units. A more refined approach of using variable odour

emissions reduced the predicted odour levels significantly – to about 1 or 2 odour units. This is below the odour criteria and is therefore considered to be an acceptable level of impact.

The primary method for the disposal of solid waste from the feedlot is removal from site. However, some manure would be used on site as an agronomic measure (see **Section 6** and **Section 12.4**). The spreading of manure would occur a maximum of once per year for a few days. To prevent odour impacts occurring during the spreading, this activity would occur when wind conditions are favourable and through the implementation of management measures outlined in **Section 11.5**. In general, this would mean that the wind is not blowing directly towards the near receptors and dispersion conditions are favourable. These issues would be addressed in the Operational Environmental Management Plan (OEMP), as detailed in **Section 28**.

11.4.2 Dust

During construction of the feedlot there is potential for impacts to air quality caused by the generation of dust during the earthworks involved in creating the feedlot pad. Once operational there is also potential for dust generation, particularly during prolonged dry periods. Observations of feedlots in the United States and Australia have found that dust problems can particularly develop during the late afternoon and dusk, when temperatures drop and cattle become more active (QCFAC, 2000). However, it is considered that the potential for dust can be minimised by the implementation of measures outlined in **Section 11.5** below.

11.4.3 Greenhouse Gases

Cattle produce methane (CH_4) as a by-product of their digestive process and the majority of the gas is burped or breathed out, with only about two percent being passed in the flatus. Researchers estimate that the world cattle herds yield around 15-20 per cent of all methane generated by human activity, up to 100 million tonnes per year (CSIRO, 2005).

Methane emissions from beef cattle have been estimated at 60kg per head per year (CSIRO, 2005). During a year of operation the proposed feedlot is expected to have a throughput of 160,000 cattle. Assuming this throughput, cattle at the feedlot would generate approximately 4,800 tonnes of methane a year.

Research into methane production in cattle has found that the amount of methane produced by cattle varies depending on the diet they are fed. Animals on poor quality feed produce more gas and produce less meat or milk (CSIRO, 1998). The diet proposed for cattle at the Moira feedlot would be a high quality grain based diet, which would minimise the amount of methane produced by the cattle.

Combustion emissions associated with the proposed feedlot may include exhaust emissions from construction equipment (eg. excavator, bulldozers etc) and vehicles used to transport cattle and feed. The vehicle emissions associated with the project are not considered to significantly impact upon the air quality of the local area.

11.5 Mitigation Measures

As indicated in **Section 11.4.1** and **Figure 11.7**, a number of residential receptors (R2, R4, R5, R6, R11 and R12) would be impacted from odour generated from the proposed project. However, the proponent is in negotiation with these affected property owners in order to reach a mutually acceptable solution (including acquisition) should the project application be approved by the Minister.

As discussed in **Section 11.4**, a number of air quality impacts were identified. The implementation of the following management and mitigation measures would minimise potential odour sources and the identified impacts to air quality as a result of the proposed project.

Table 11-6: Mitigation Measures

Issue	Safeguard	Phase
Manure stockpile management	Stockpiles would be constructed with their long axes perpendicular to the contours within the stockpile area.	Operation
Manure stockpile management	The layers of manure placed in stockpiles would be compacted to expel air and reduce the risk of fires.	Operation
Manure stockpile management	Wet manure or sludge (with moisture content of greater than 35%) would not be placed in the main stockpiles.	Operation
Composting management	Manure would be placed in windrows, approximately 1m to 1.5m in height with base widths between 3 and 5m.	Operation
Composting management	Windrows would be turned 5 to 10 times over a 5 week period using a grader, front-end loader or more specialised composting machinery.	Operation
Composting management	The compost temperature would be monitored to determine the need for turning to either stimulate or regulate heat generation.	Operation
Manure spreading	Application when wind conditions and dispersion conditions are favourable.	Operation
Dust	Operation of water carts on stockpiles and exposed soils.	Construction
Dust	Construction of 4 lateral move irrigators for use during the summer months to provide cooling, dust control and maintain manure pad moisture.	Operation
Dust	Maintenance of manure on feedlot surface at 25-35% moisture content to minimise dust generation.	Operation
Greenhouse gases	Cattle to be fed high-quality grain based diet as detailed in **Section 6**.	Operation

11.6 Conclusion

Odour emissions generated from the proposed feedlot are expected to be the primary impact to air quality as a result of the proposed project. An odour assessment was undertaken by Holmes Air Sciences to determine the likely odour impacts to receptors in the local area.

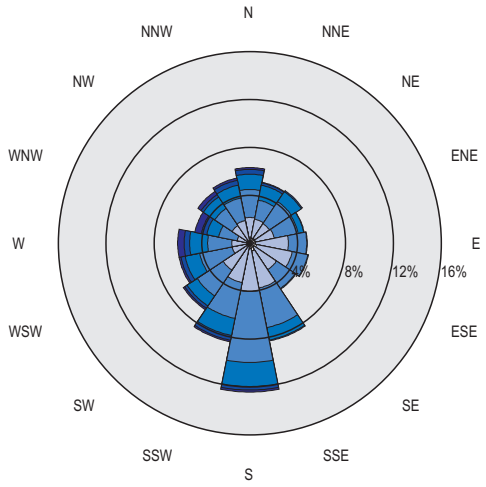
Dispersion modelling was used to predict off-site odour levels from the feedlot and these odour levels were compared with relevant odour criteria defined by the DEC.

The conclusions of the odour assessment were as follows:

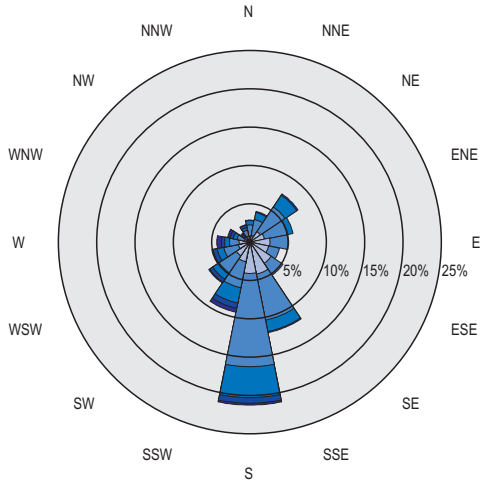
- Odour from the feedlot is likely to be detectable on occasions at the nearest residences (as shown in **Table 11-5** and **Section 11.5**);
- The highest odour impacts would be observed at the residences closest to the feedlot with locations R2, R4, R5, R6, R11 and R12 predicted to experience odour levels above the odour criteria;
- Odour levels at the remaining individual residences are predicted to be below the odour criteria however some predictions are close to the goal suggesting that these locations may not be free from odour impacts;
- Odour impacts at the towns of Barmah, Moama and Mathoura are predicted to be acceptable; and
- The low rainfall of the area would be beneficial for minimising the frequency of odour events.

The residential properties predicted to experience odour levels above the criteria are in negotiations with the proponent in order to reach a mutually acceptable solution (including possible acquisition).

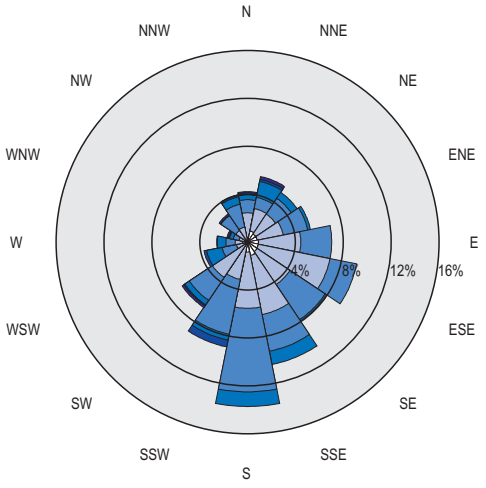
Other issues relating to air quality such as dust and greenhouse gases are not expected to create significant air quality impacts to the local area. Management measures outlined in **Section 11.5** would be implemented as part of the project's Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP), as detailed in **Section 28** of this EA, to manage these issues.



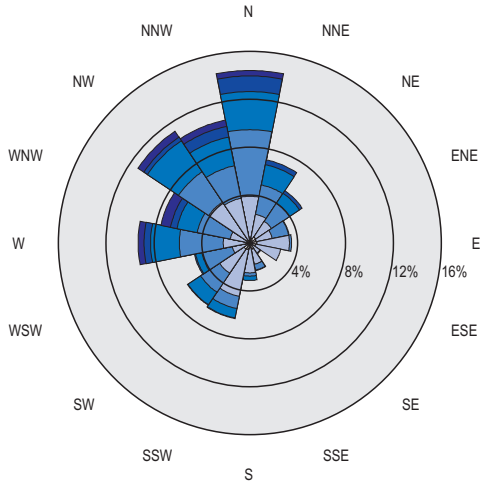
Annual



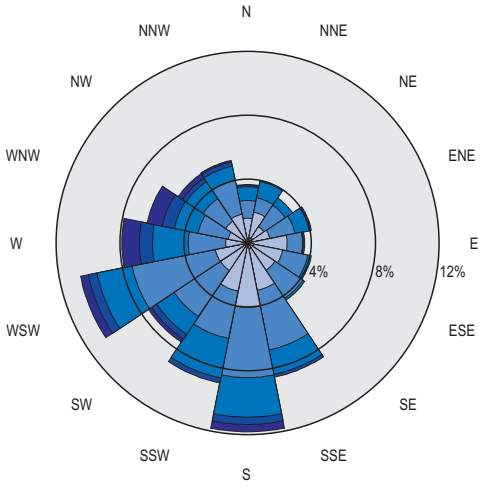
Summer



Autumn



Winter



Spring

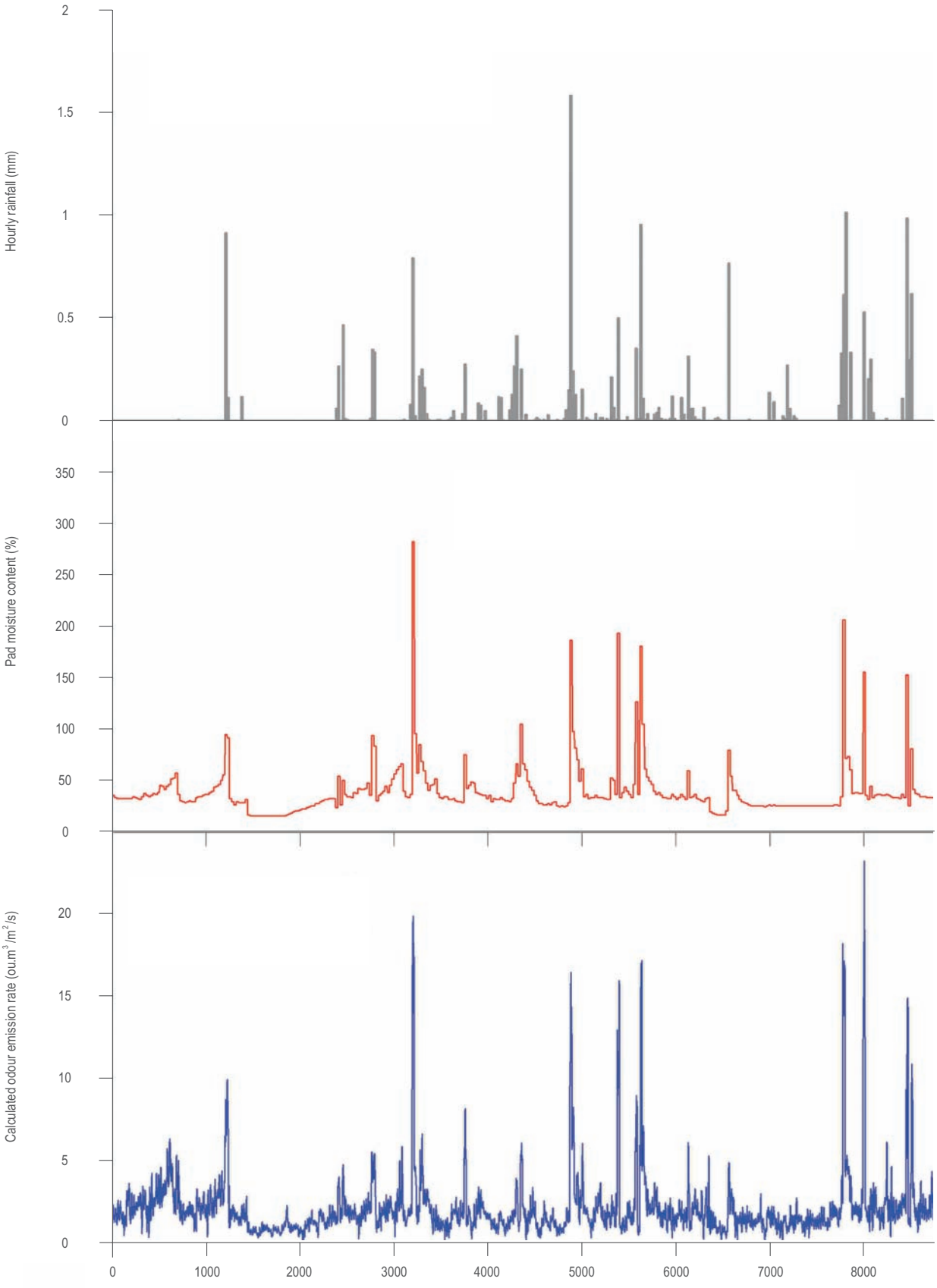
HLA

Annual and Seasonal Windroses for Moira 2003 (TAPM)
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Wind Speed (m/s)
- >0.5 - 1.5
- >1.5 - 3
- >3 - 4.5
- >4.5 - 6
- >6 - 7.5
- >7.5

FIGURE
11.1

PROJECT-FILE NAME **S60133** DATE **14 November 2005** DRAWN **TO** APPROVED



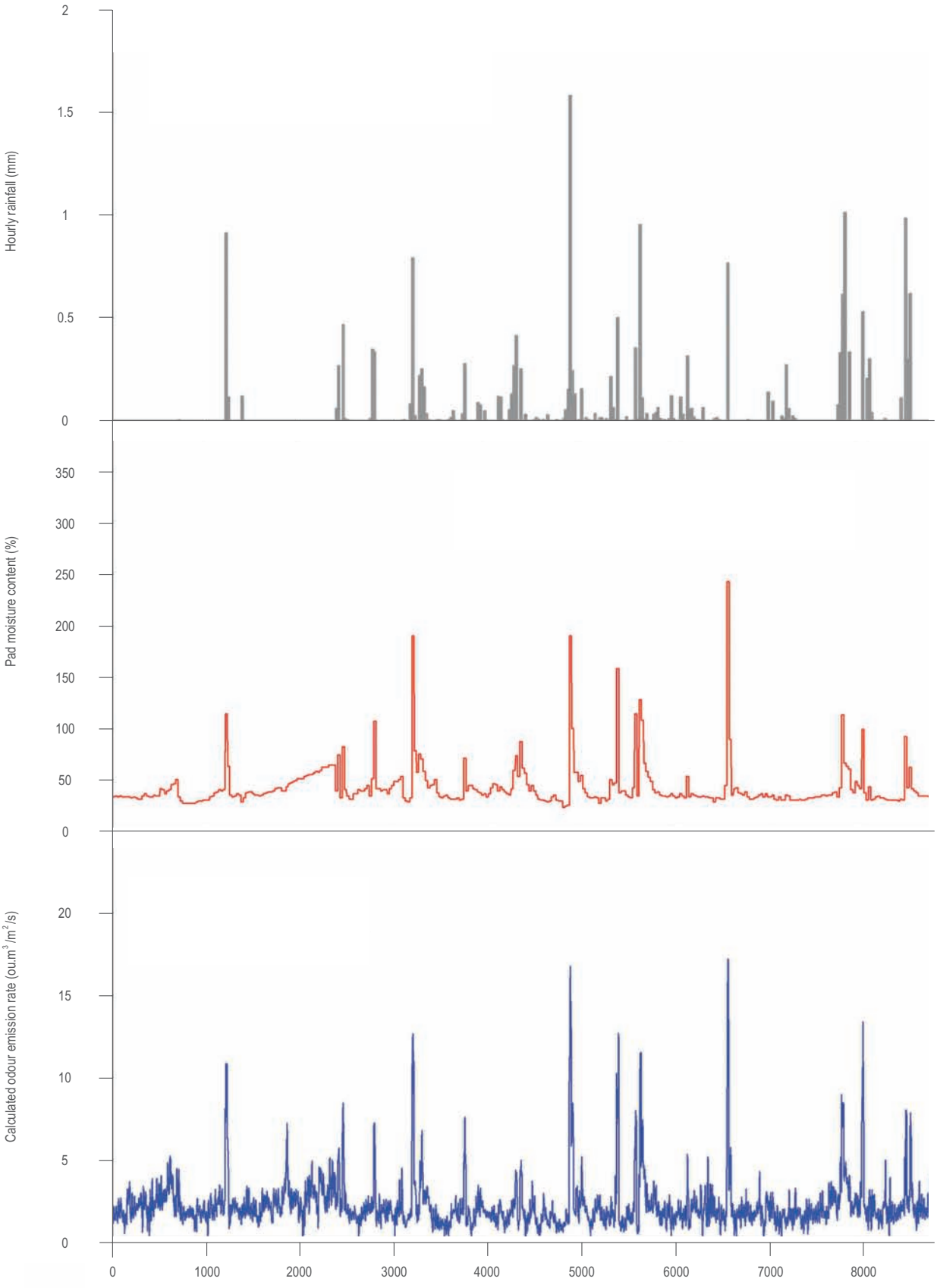
Source data: Holmes Air Sciences

Variable Odour Emissions as Determined by the Odour Emissions Model for Run 1
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Hourly rainfall
Pad moisture content
Odour emission data (Run 1)

FIGURE
11.2

PROJECT-FILE NAME **S60133** DATE **14 November 2005** DRAWN **TO** APPROVED



Source data: Holmes Air Sciences

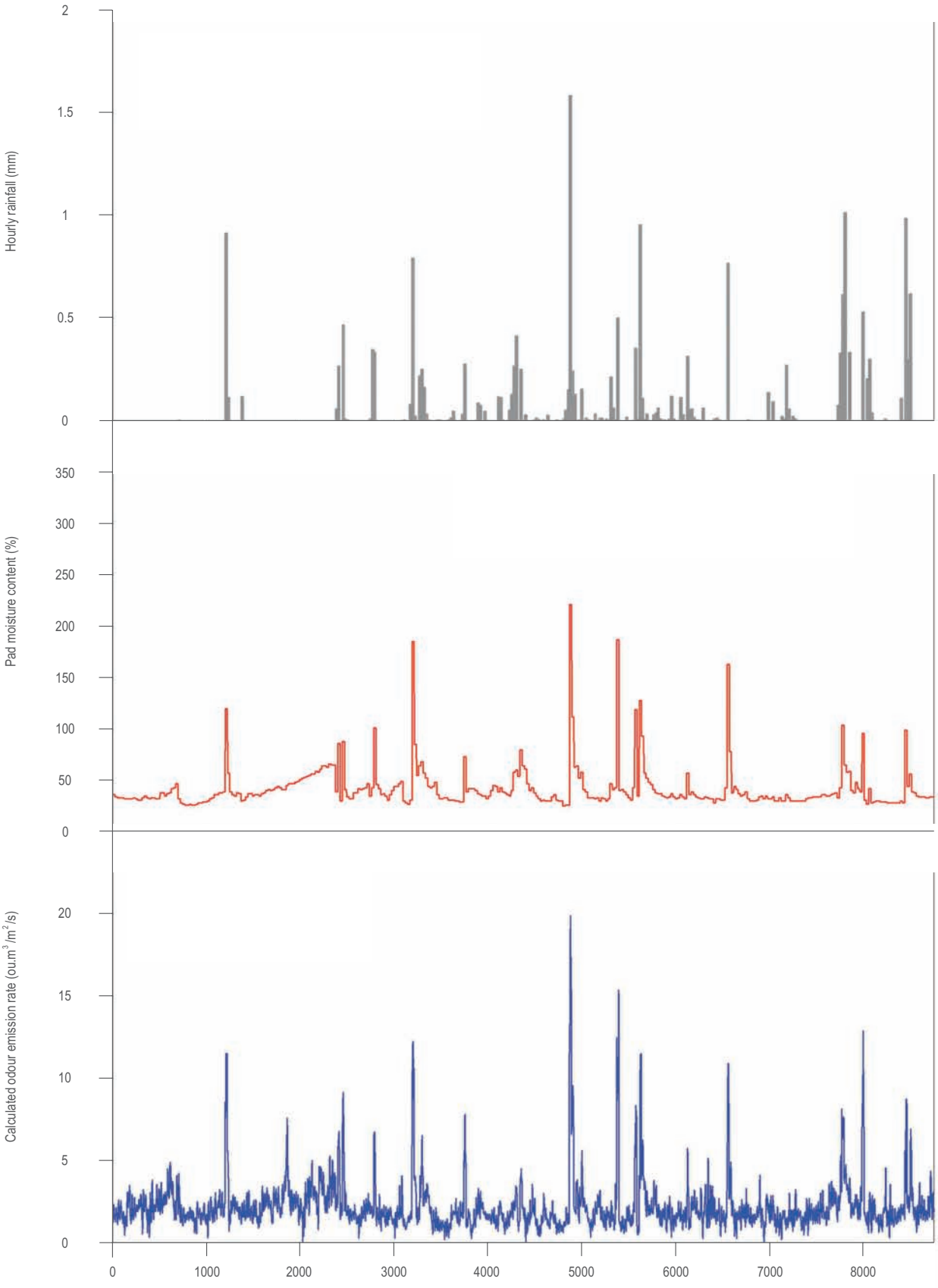
HLA

Variable Odour Emissions as Determined by the Odour Emissions Model for Run 2
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Hourly rainfall
Pad moisture content
Odour emission data (Run 2)

FIGURE
11.3

PROJECT-FILE NAME **S60133** DATE **14 November 2005** DRAWN **TO** APPROVED



Source data: Holmes Air Sciences

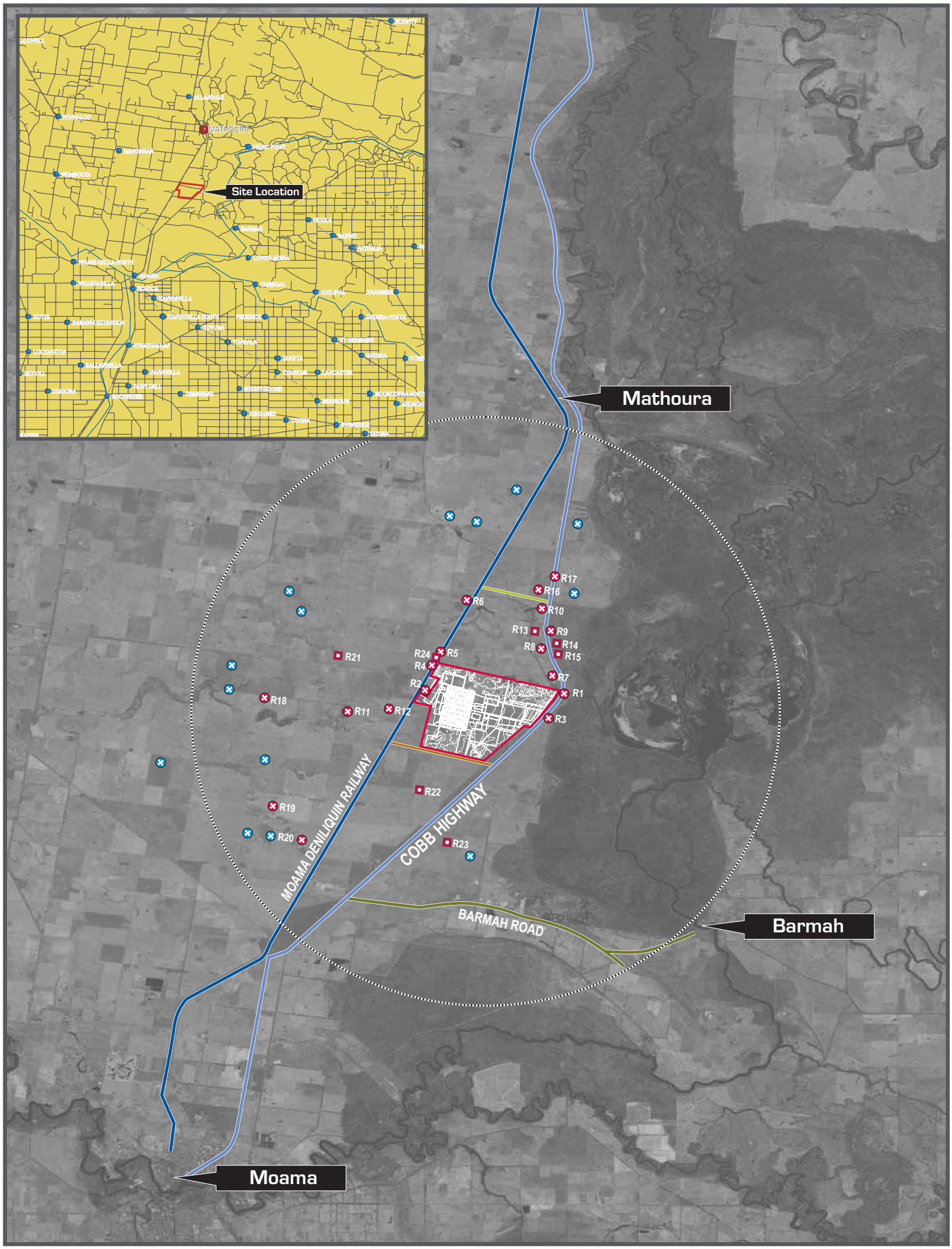
HLA

Variable Odour Emissions as Determined by the Odour Emissions Model for Run 3
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Hourly rainfall
Pad moisture content
Odour emission data (Run 3)

FIGURE
11.4

PROJECT-FILE NAME **S60133** DATE **14 November 2005** DRAWN **TO** APPROVED



HLA

Location of Study Area
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

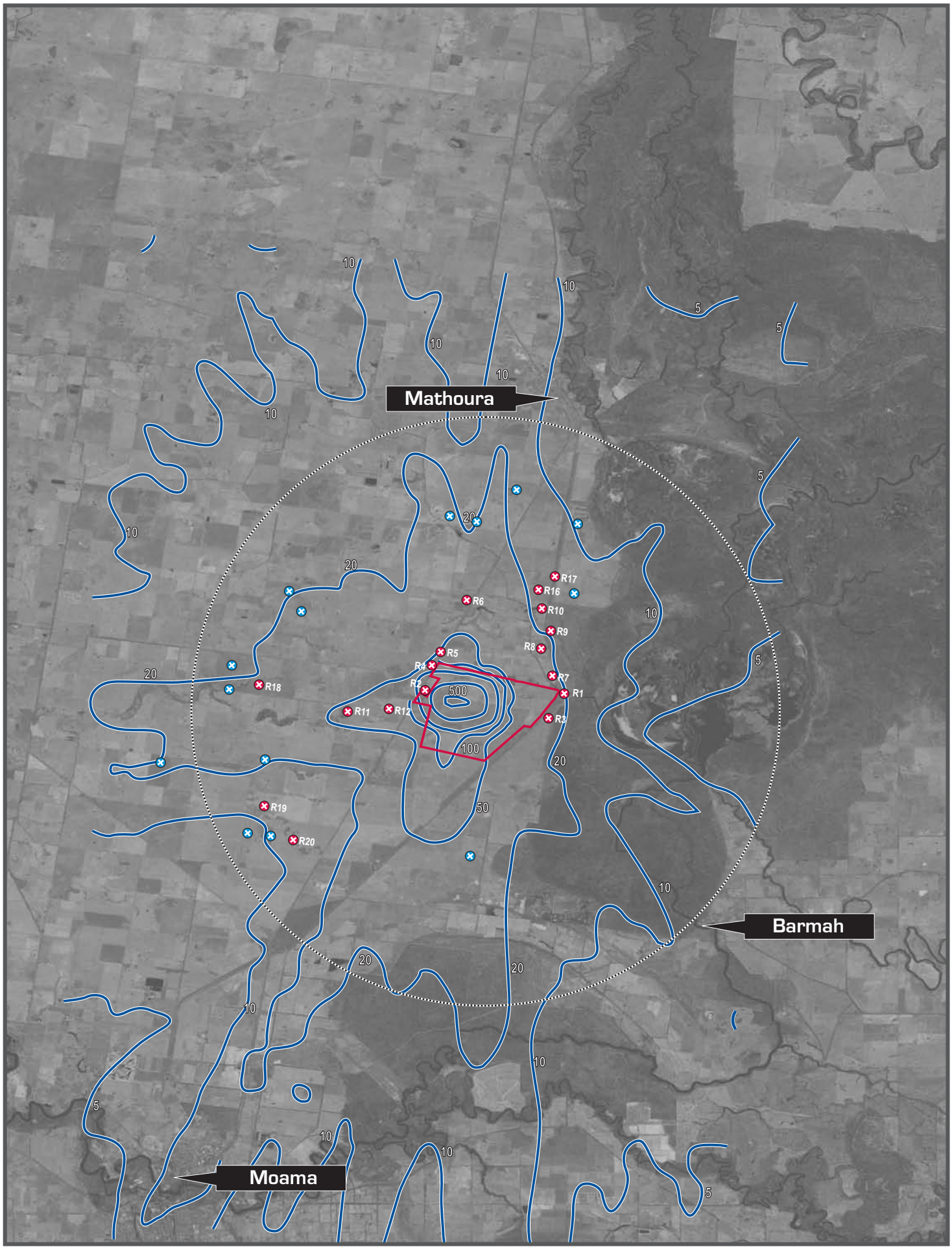
Stud Farm Lane
Cotswold Lane
10km from property boundary
Residence
Receptor (Level 1 Screening Exercise)
Silos/sheds

N

0 4
Kilometres

FIGURE
11.5

PROJECT-FILE NAME **S60133** DATE **18 November 2005** DRAWN **TO** APPROVED



HLA

Maximum Odour Levels
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

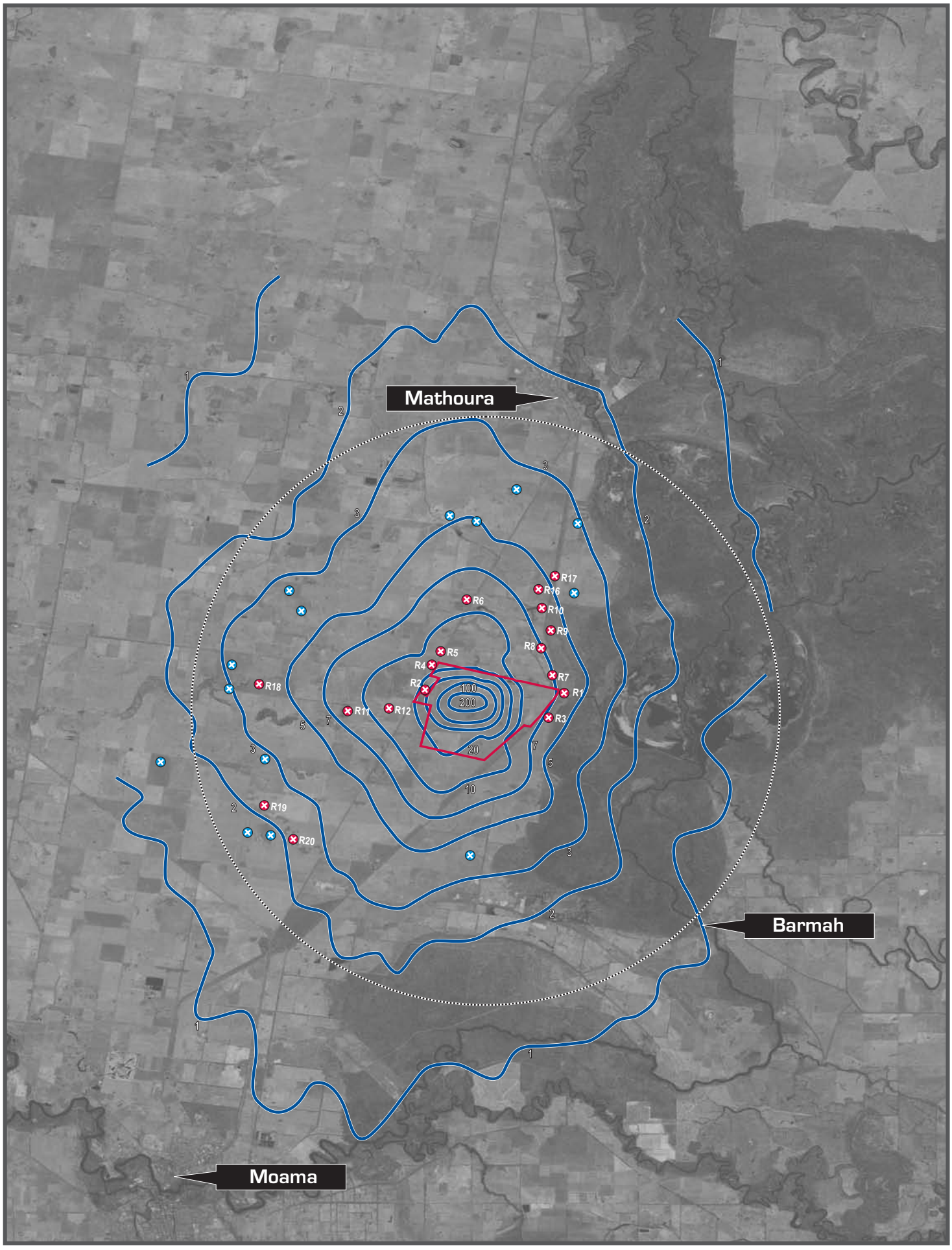
Site boundary
Contour
10km from property boundary
10 Odour unit
Residence
Receptor (Level 1 Screening Exercise)

N

0 4
Kilometres

FIGURE
11.6

PROJECT-FILE NAME **S60133** DATE **18 November 2005** DRAWN **TO** APPROVED



Odour levels at the 99th percentile
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Site boundary
Contour
10km from property boundary
3 Odour unit
Residential
Receptor (Level 1 Screening Exercise)

N

0 4
Kilometres

FIGURE
11.7

PROJECT-FILE NAME **S60133** DATE **18 November 2005** DRAWN **TO** APPROVED

12 LAND CAPABILITY FOR IRRIGATION

12.1 Overview

The proposed project would produce effluent during its operation and would require licensing approvals for effluent irrigation as part of site waste management. An Environment Protection Licence (EPL) would be required from the Department of Environment and Conservation (DEC).

This section provides a review of the areas suitable for irrigation based on topography, soil and groundwater characteristics, together with an assessment of the suitability of these areas for irrigation.

12.2 Existing Environment

12.2.1 Soil Suitability

The draft New South Wales Feedlot Manual (NSW Agriculture, 2003) contains a table regarding soil suitability, shown in **Table 12-1**.

Table 12-1: Soil Suitability for feedlot components

Component	Minimum desirable soil requirements
Effluent irrigation area	Deep well drained soil, suitable for irrigation pasture production and at least an occasional irrigated crop, moderate to high water holding capacity, not prone to waterlogging within the root zone.
Manure application area	Soils well suited to improved pasture or dryland cropping; able to withstand cultivation without incurring significant erosion or major soil structural degradation; not prone to surface waterlogging or frequent inundation.
Cattle pens and manure holding ponds	Plant growth not an issue; stable soil surface under wide range of moisture contents; low permeability subsoil; not prone to mass movement (such as a landslip).
Sedimentation systems and holding ponds	Plant growth not an issue; must contain a dense clay horizon of low permeability at least 0.5m thick.
Buildings and roadways	Plant growth not an issue; soils well suited to engineering purposes (that is, not prone to mass movement, free of acid sulphate conditions or highly compressible material at depth).

Detailed soil profile testing on the site was undertaken by bore log and trench excavation to a depth of 5.5m based on Preliminary Geotechnical Investigation (PGI) report (GHD LM, 2005) in **Appendix D** of this EA. This testing shows that there are several thick clay bands intermittently to a depth of 4 to 6 metres below the site. This work suggests the low permeability subsoil found is suitable for a feedlot.

The property has been an irrigation property for some time. This suggests that it is suitable for irrigation of liquid effluent. Details of data obtained from irrigation modelling are presented in **Section 12.4**.

12.2.2 Groundwater Suitability

The draft New South Wales Feedlot Manual (NSW Agriculture, 2003) has the following requirements:

- Effluent irrigation should always be separated from watercourses, with a minimum distance of 25 metres;
- A feedlot is unsuitable on a site where groundwater is within 1-5m of the surface; and
- Protect groundwaters by avoiding areas where there are existing shallow or rising groundwater tables, perched water tables, groundwater recharge areas or where groundwater is already polluted.

The National Guidelines for Beef Cattle Feedlots (ARMCANZ, 1997) require the following:

> *"A feedlot should not be sited above groundwater recharge areas or useable underground water resources unless those can be demonstrably protected. For example, protected by one or more impervious geological strata and/or by considerable depth."*

Previous investigations have shown the site to have deep groundwater at approximately 20 - 22m which is of relatively low salinity (Cadell Land and Water Management Plan, 2001) and which is consistent with the PGI undertaken by GHD (2005). An existing water bore of 29.2m[1] depth near the abandoned shearing shed encountered groundwater at 19 m depth in February 2005.

12.2.3 Climate

The draft New South Wales Feedlot Manual (NSW Agriculture, 2003) recommends that feedlots be sited in areas of less than 750 mm rainfall. The average annual rainfall for Moira is 443mm.

Table 12-2 presents data sourced from the NSW Bureau of Meteorology for the Mathoura State Forest area, which is located approximately 10km north east of the site. The data indicates that average monthly maximum temperatures range from a maximum of 31.4°C in January (summer) to a minimum of 3.3°C in July (winter).

Table 12-2: Mathoura Climate Data

	Mean Daily Max Temp (deg C)	Mean Daily Min Temp (deg C)	Mean 9am Air Temp (deg C)	Mean 9am Relative Humidity (%)	Mean 3pm Air Temp (deg C)	Mean 3pm Relative Humidity (%)	Mean Rainfall (mm)	Mean no. of Rain days
January	31.4	15.5	23.8	45	30.5	29	32.1	3.8
February	30.3	15.2	22.4	50	29.4	31	23	3.6
March	27.5	13.2	20	56	26.9	37	35.3	4.3
April	22.1	9.2	15.6	68	20.9	-	29.6	5.4
May	16.9	6.1	10.7	80	15.4	-	43.3	8.5
June	14.1	4.3	8	85	13.2	-	36.9	9.1
July	13	3.3	7	85	12.2	-	42.7	10.8
August	14.9	4.2	9	80	14.9	56	44.4	10.9

[1] GHD Preliminary Geotechnical Investigation Report March 2005 - Table 1

	Mean Daily Max Temp (deg C)	Mean Daily Min Temp (deg C)	Mean 9am Air Temp (deg C)	Mean 9am Relative Humidity (%)	Mean 3pm Air Temp (deg C)	Mean 3pm Relative Humidity (%)	Mean Rainfall (mm)	Mean no. of Rain days
September	18.1	6	12.4	68	17.2	52	44.5	9.5
October	21.7	8.7	16.1	60	21	45	44.8	8.4
November	25.4	10.7	19.3	49	24.6	35	33.5	6.2
December	28.6	13.1	21.6	47	27.6	33	32.6	5
Annual	22	9	15.5	64	24.8	38	442.8	85.4

12.3 Controlled Drainage Area

A controlled drainage area is the area of the proposed feedlot where runoff is generated from and flows to, and overall is subject to the site's designed drainage system. The maximum area inside the controlled drainage area has been estimated as approximately 201ha for calculating the expected runoff from the proposed project.

The breakdown of the controlled drainage area within the proposed feedlot is shown in **Table 12-3** and in **Figure 12.1**.

Table 12-3: Controlled Drainage Area

Site	Area (ha)	Runoff Co-efficient	Runoff + ML/mm of rainfall
Pens	98	0.8	0.784
Roads	12	1.0	0.120
Drains	18	0.8	0.144
Ponds	43	1.0	0.430
Effluent Storage Pond	18	1.0	0.180
Receivals and Commodities	12	0.8	0.096
Total	**201**		**1.754**

12.4 Waste Generation

Based on the NSW Feedlot Manual estimate of 0.8 tonnes of waste per animal per annum, it is expected that approximately 64,000 tonnes of manure would be produced each year during the operation of the proposed feedlot.

12.4.1 Solid Waste

It is considered that the area for farming other than the irrigation area can be used for solid waste usage and that the following would apply:

Area for farming = 420ha

Application rate = 15 tonnes per ha (NSW Feedlot Manual)

Total applied = 6,300 tonnes per year

Based on these data, it is expected that approximately 10% of waste would be able to be satisfactorily used on the property, with the remainder being transported off site for treatment and disposal.

The major reason for the use of manure on the dryland framing portion of the property is to provide the appropriate agronomic conditions for the growth of crops on this area. Prior to the addition of manure on this area, soil and manure analysis would be undertaken to determine the required amount of manure for growth of the crop.

The remainder of solid waste generated from the proposed project would be composted in stockpiles before being sold and transported off site to be used on other sites as fertiliser.

Dead animals would be composted as outlined in the relevant guidelines. This would be undertaken in the manure storage areas. An area would be set aside for a large scale death event. In this case, the animals would be buried in accordance with the appropriate guidelines.

Waste feed would be added to the manure stockpiles for composting and removal from the site.

12.4.2 Liquid Waste

The calculations for the amount of liquid waste generated from the operation of the feedlot are provided in **Appendix E**. The volume of liquid manure effluent is determined from the liquid and solid manure wastes and precipitation minus the loss experienced through evaporation and infiltration. It was calculated that the maximum volume of effluent produced would be 1,043ML per annum.

As shown in **Figure 12.2**, the collected liquid waste effluent would typically drain into a sedimentation pond. Liquid manure is first settled in one of the two available sedimentation ponds adjacent to either the north or south sections. The second drying pond would be off-line and used for drying the solids and the alternative would be in active use handling the collected runoff wastes. Supernatant liquid from the sedimentation ponds then drain into a 130ML holding pond. From there it is pumped to a 500ML Effluent Storage Pond.

12.5 Irrigation Design Considerations

According to the Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (DEC, 2004), the effluent produced from the feedlot would be classified as high strength. This classification is largely due to the medium range of BOD (40-1500 mg/L) and that the facultative conditions in the holding and storage ponds are unlikely to reduce the high range 146mg/L nitrogen levels to below the 100mg/L threshold.

12.5.1 Soils

The properties and type of soils on any site can determine the suitability of a site for irrigation of wastewater. DEC Guidelines outline typical soil characteristics required for wastewater irrigation systems. Some of the determining factors assessed within the soils at Moira Station include:

- Sodicity;
- Salinity;
- pH;
- Cation exchange capacity (CEC) and exchangeable cations;
- Emerson Aggregate Test (EAT); and

- Phosphorus adsorption.

Site geotechnical investigations undertaken at Moira Station (GHD, 2005) are provided in **Appendix D**. Bores were drilled in the proposed irrigation areas and these investigations concluded that the soils are suitable for irrigation and that groundwater was at approximately 20 to 22m below the surface and would not be affected.

12.5.2 Water Balance

For an effective wastewater irrigation system, the correct amount of wastewater must be applied at the appropriate times to meet the requirements of crops, while ensuring that increases in runoff and percolation are minimised.

The water balance calculated for a 90th percentile wet year shows that a minimum of 354 ML/year of storage is required. The storage capacity and type has been based on high strength wastewater. A new 500ML capacity storage pond would be constructed on the site as shown in **Table 12-4** and in **Figure 12.2**.

Table 12-4: Water Balance 90% decile

Parameter/ Month	Evaporation (mm)	Crop Factor	Evapotranspiration	Precipitation 90% decile (mm)	Irrigation Required 380ha			Effluent Produced	Excess ML
					Net (mm)	ML/ ha	ML		
January	301	0.95	286	51	235	2.35	893	89	
February	246	0.90	221	38	183	1.83	695	67	
March	202	0.85	172	48	124	1.24	471	84	
April	117	0.80	94	40	54	0.54	205	70	
May	62	0.70	43	56				98	98
June	39	0.55	21	41				72	170
July	40	0.55	22	50				88	258
August	62	0.65	40	52				91	349
September	99	0.75	74	54	20	0.20	76	95	368
October	164	0.85	139	64	75	0.75	285	112	195
November	225	0.95	214	48	166	1.66	631	84	
December	282	1.00	282	53	229	2.29	870	93	
Total				**595**		**10.86**	**4,126**	**1,043**	

12.5.3 Organic Balance

If organic matter is applied to soil at a greater rate than the soil's ability to assimilate it, then soil pores can become clogged and anaerobic odorous conditions can result. High organic loading requires an increased resting period between wastewater applications. An average loading rate of 1,500kg/ha/month is generally taken as the maximum organic loading for most soils (DEC, 2004).

It was calculated that a minimum area of 29 ha is required to absorb the organic material in the wastewater on a sustainable basis. The proposed irrigation area is 380ha, and therefore would sufficiently absorb organic material.

12.5.4 Salt Loading

The quantity of salt in wastewater is important to ensure irrigation does not result in soil degradation by increasing soil salinity. The main requirement for salinity control in irrigation systems is to ensure there is adequate leaching to prevent salt accumulation in the soil.

The average Electrical Conductivity (EC) of the proposed effluent irrigant is 4,500 µS/cm and SAR of 4.6. The proposed crop for the irrigation area is lucerne and as grass generally has a moderate tolerance to salt (see DEC *Table 4.4*) at this concentration, it is likely that the salt content of the effluent would have an estimated 10% reduction in yield impact on the irrigation crop because the plants are only moderately salt tolerant.

However, the EC of the wastewater is required to be less than 3,700 µS/cm to be sustainable. To ensure that wastewater to be used in irrigation is less than 3,700 µS/cm, the wastewater would be tested prior to irrigation. Should it be above 3,700 µS/cm, freshwater would be added to bring it below this concentration.

12.5.5 Nutrient Balance

Loading rates of nitrogen and phosphorus can also place limits on the quantity of wastewater to be irrigated on an area.

Nitrogen (N)

The behaviour of nitrogen in plant-soil systems is complex and includes additions and losses to the system as well as transformations of the forms of nitrogen. The capacity of an irrigation system to use nitrogen can be maintained and restored over time as the removal of nitrogen from wastewater largely depends on biological processes. To calculate the nitrogen balance nitrogen inputs are compared with nitrogen losses (DEC, 2004).

Calculations, as shown in **Appendix E**, concluded that the crop would remove some 266,000 kg of nitrogen per year. The irrigation would add around 114,996 kg nitrogen per year. Therefore the irrigation area is considered to be sustainable with respect to nitrogen as required by relevant guidelines.

Phosphorus (P)

Phosphorus (P) is removed from the wastewater through biological, chemical and physical processes in the soil. The existing P sorption capacity of the soil and the P uptake by plants to be grown determines how much P can be introduced before the site is saturated. The phosphorus saturation point of most soils is reached between 0.25 and 0.5 of total sorption capacity (Kruger et al. 1995 in DEC, 2004). If the amount of P applied exceeds this threshold, runoff and leaching of phosphorus to surface and groundwater may occur (DEC, 2004).

Calculations, as shown in **Appendix E**, concluded that the crop would remove around 30,400kg of phosphorus per year and the irrigation would add some 31,080kg of phosphorus per year. It is therefore considered that the proposed irrigation area would be sustainable with respect to phosphorus.

12.6 Irrigation System

12.6.1 Methods

The proposed effluent irrigation areas are outlined in the layout in **Figure 12.2** and areas detailed in Effluent and Runoff Calculations (**Appendix E**) have been included in the calculations for irrigation and would be required for routine irrigation.

The land available for irrigation to the sides of the feedlot site is approximately 380ha. During normal years, the effluent areas would require surface tailwater dams and drainage of runoff. It is expected that the land would be irrigated in dry periods to maintain grass cover. This would ensure that bare areas, which could result in wind blown dust, are not exposed. The flood irrigation method would be via a large scale irrigator similar to those currently used on the site for crop irrigation.

12.6.2 Control System

The control system for the irrigation would be designed to minimise risks of environmental pollution which may be caused by poor design, human error, weather conditions, or faulty equipment. The application of irrigant water would be controlled manually by the irrigation manager.

12.6.3 Recirculation System

Irrigation drainage would return water from the low areas west and south of the holding pond east along the south of the feed pens then north to the effluent storage. A recirculation pump would discharge into the effluent storage or a supply channel to deliver water to the higher eastern irrigation areas. All field tail drains would discharge into this system to allow recirculation of irrigation water over the total irrigation system. Fresh water would be delivered from the fresh water storage, the irrigation bore and the Moira Irrigation Channel located in the north east of the property.

The irrigation area would be bunded to retain a minimum of 13mm runoff over the total irrigation area.

12.6.4 Scheduling

Irrigation would occur only on suitable, selected areas in any year. Irrigation scheduling would be closely supervised by the irrigation manager. The irrigation schedule would be established to sustainably manage the irrigation. Effluent water would be irrigated primarily during the months of January to March and November to December, with irrigation in the colder months being based on rainfall and regular observation of the irrigation area. More detailed irrigation scheduling would be included in the Effluent Irrigation Management Plan (EIMP) which would be prepared upon approval of the project.

12.7 Mitigation Measures

12.7.1 Effluent Irrigation Management Plan

Irrigation management is an important factor in ensuring the sustainability of the operation. The operation would employ best management measures to ensure long term sustainability of the operation. The Effluent Irrigation Management Plan (EIMP) would provide measures to identify potential environmental impacts from the operation and provide measures to minimise these

impacts. The DEC guidelines state that an effective wastewater irrigation system should include:

- Efficient irrigation facilities for applying wastewater to the site;
- A control system to adjust the wastewater application rates or other factors to maintain optimum performance;
- Wet weather storage facilities where appropriate;
- Tailwater and stormwater controls where appropriate including a recovery system to capture and recycle any stormwater runoff;
- Wastewater transport facilities to convey Stabilisation Effluent Dam to the site;
- A site specific management plan detailing the necessary procedures to maintain optimum performance of the irrigation system and satisfy statutory requirements; and
- A monitoring system to measure, record and identify any action to ensure the environmental performance of the system.

A detailed Effluent Irrigation Management Plan (EIMP) would be prepared and implemented for the operation of the proposed provide.

12.7.2 Monitoring Requirements

The results of monitoring would assist in demonstrating due diligence in the protection of public health, agricultural resource and environmental risks.

Monitoring would be undertaken in accordance with the requirements outlined in DEC's Guidelines. These requirements are reproduced in **Table 12-5** and **Table 12-6** below. It should be noted, however, that DEC are responsible for granting a licence for the activity and monitoring requirements would be detailed in the licence.

12.7.3 Effluent Wastewater Monitoring

Table 12-5: Recommended Wastewater Sampling Frequency

Constituent[1]	Low strength	Medium strength	High strength
TSS	Quarterly	Quarterly	Monthly
Oil and grease	Biannually	Quarterly	Quarterly
Total P	Biannually	Quarterly	Quarterly
Total N	Biannually	Quarterly	Quarterly
BOD_5	Quarterly	Quarterly	Monthly
PH	Quarterly	Quarterly	Monthly
EC dS/m;TDS	Quarterly	Quarterly	Monthly
Cations	Quarterly	Quarterly	Quarterly
SAR (√ (meq/L))	Quarterly	Quarterly	Quarterly
Metals	Yearly	Yearly[2]	Yearly[2]
Ocs	Yearly	Yearly[2]	Yearly[2]
Herbicides	Yearly	Yearly[2]	Yearly[2]

Constituent[1]	Low strength	Medium strength	High strength
Thermotolerant coliforms (cfu/100ml)	Use specific[3]	Use specific[3]	Use specific[3]
Other	Advice should be sought from the Department of Environment and Conservation or local council[4]	Advice should be sought from the Department of Environment and Conservation or local council[4]	Advice should be sought from the Department of Environment and Conservation or local council[4]

Source: Table 5.1 (DEC 2004)

Notes: 1. Units are in mg/L unless otherwise stated

2. Higher frequencies would be required where these constituents are the constituents that determine the medium or high strength classification

3. See Appendix 1 in DEC 2004 for municipal sewage. Other effluents may not require monitoring for thermotolerant coliforms (see Section 3.10 in DEC 2004). Obtain advice from NSW Health and/or NSW Department of Primary Industries

4. Seek advice from the appropriate regulatory authority (see Section 6.1 in DEC 2004)

5. BOD_5 may be replaced by tests such as chemical oxygen demand provided the relationship between the two measurements is established.

12.7.4 Soil Monitoring

In accordance with DEC Guidelines, **Table 12-6** outlines a recommended soil monitoring strategy.

Table 12-6: Recommended Soil Monitoring Strategy

Constituent[1]	Frequency of sampling	
	Surface soil	Soil profile at four depth increments
pH (no units)	Annually	Annually
Electrical conductivity (EC) (dS/m)	Annually	Annually
Nitrate –N	Annually	Annually
Total N	After 3 years	N/A
Available P	Annually	N/A
Total P	After 3 years	Every 3 years
Exchangeable sodium percentage	Annually	Every 3 years
P sorption capacity[2] (kg/ha)	After 3 years (site specific)	Every 3 years (site specific)
Heavy metals and pesticides	After 10 years[3]	N/A

Source: Table 5.2 DEC 2004

Notes: 1. mg/L unless otherwise stated

2. As recommended by an accredited laboratory or soil scientist

3. Or more frequently if any are identified/calculated as a particular risk factor in effluent

12.7.5 Groundwater Monitoring

Requirements for groundwater monitoring are detailed in the PGI undertaken by GDH LM for the proposal.

12.7.6 Crop Monitoring

Sampling of crops or pastures is not considered necessary at this stage. However, should unacceptable levels of trace contaminants be identified in the system, a crop monitoring program would be established.

12.8 Conclusion

A major facet of the proposed cattle feedlot is the generation of liquid and solid waste. Liquid waste would be collected in the controlled drainage area and drain into the sedimentation basins and then into the holding pond. The effluent would then be pumped from the holding pond to the effluent storage area.

The design of the feedlot incorporates on site disposal of liquid waste from the effluent storage area in the form of irrigation. To ensure that it was appropriate to irrigate on Moira Station, a land capability assessment was undertaken. The assessment investigated the soil characteristics and concluded that the soil is capable of absorbing the level of salts and nutrients contained within the effluent. The assessment also confirmed the size of the irrigation area (approximately 380 ha) is adequate to sustainably irrigate the wastewater.

The assessment also determined that the sizes of the sedimentation basins (5ML each), holding pond (130ML) and the effluent storage area (500ML) were adequate given the amount of liquid waste expected to be generated during a 90^{th} percentile wet year.

Overall, the assessment concluded that the land is capable of supporting irrigation and also that the sizes of the retention ponds of the feedlot are appropriate.

PROJECT-FILE NAME S60133
DATE 17 September 2005
DRAWN TO
APPROVED

- Site boundary
- Proposed development
- Existing development
- Drainage area

N

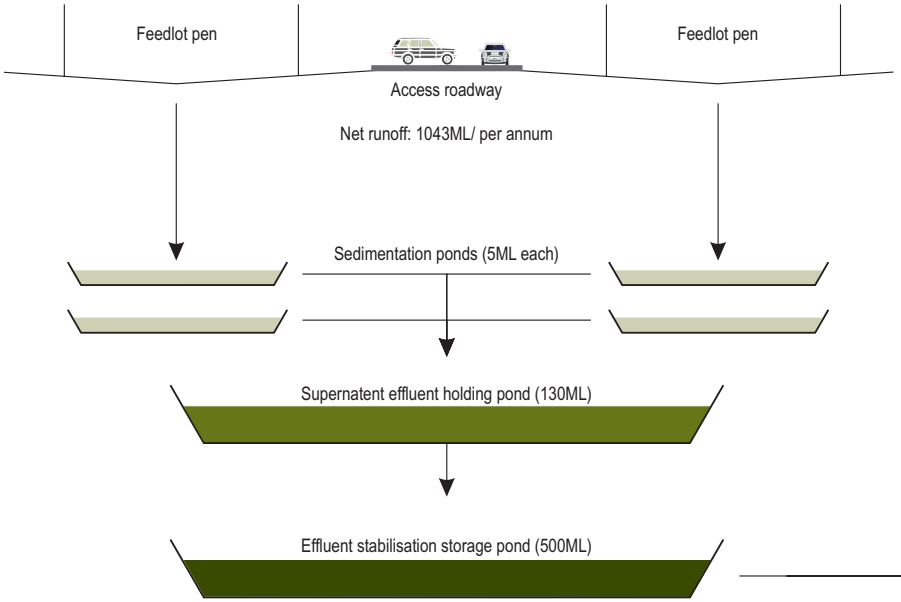
0 600

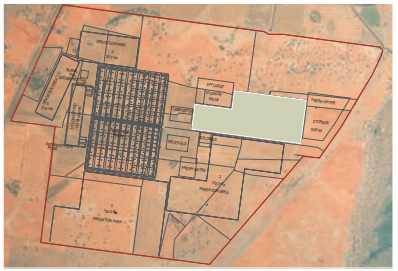
Metres

Controlled Drainage Area
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

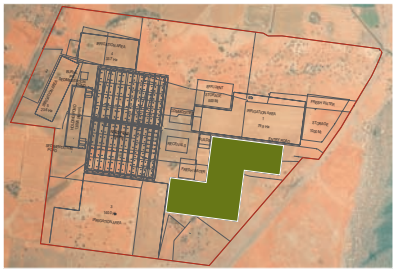
HLA

FIGURE
12.1

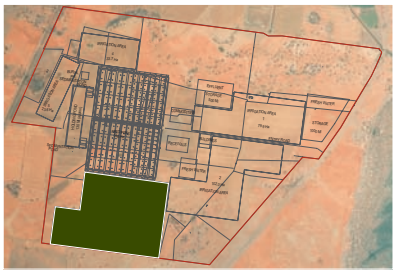




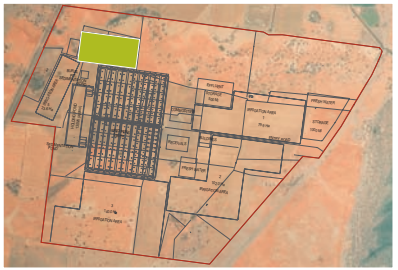
Irrigation area no. 1



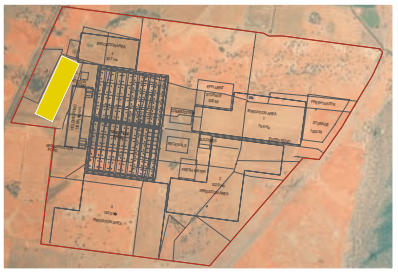
Irrigation area no. 2



Irrigation area no. 3



Irrigation area no. 4



Irrigation area no. 5

Total irrigation area - 380ha (approx)

PROJECT-FILE NAME	**S60133**
DATE	**27 September 2005**
DRAWN	**TO**
APPROVED	

Effluent Treatment and Irrigation Preliminary Concept Process Flows
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

HLA

FIGURE
12.2

13 SURFACE WATER

13.1 Existing Environment

The main features of the surface water environment in the surrounding area are the Murray River located some 9km to the east of the site, and the Moira Lake and wetland system, located approximately 5km to the east of the site. Irrigation channels for the Moira Private Irrigation District (MPID) traverse the area. Water is supplied to the area by the Moira Irrigation Channel which pumps water from the Murray River and channels it to the surrounding properties.

The start of the Moira Channel and associated pumps are located to the east of the Cobb Highway approximately 13km south of Mathoura. From here the channel travels under the Cobb Highway in a north west direction for approximately 1.5km where it continues to the north, branching off to the south west towards the site. The channel crosses the northern boundary of the site and continues south west for approximately 1km, before turning to the west for 0.5km, and then south for 0.5km and then west again towards the Moama Deniliquin Railway where it exits the site and continues to the west. The channel is approximately 7 metres wide in the vicinity of the site.

There are no permanent natural drainage lines occurring on the site. There are some drainage depressions located in the northern part of the site and vegetation is typically located in these areas. The topography of the site and the surrounding land is generally level and open. There is a slight slope from east to west across the site from 107m AHD to 101m AHD, the product of uplift as a result of the Cadell faultline running immediately east of the site boundary.

Precipitation at the site is generally low (average annual rainfall 443mm) and evaporation is high, typically resulting in a deficit of water on the site. Therefore, runoff generally infiltrates into the soil, or is lost by evaporation. The site is not subject to flooding.

13.2 Assessment of Impacts

13.2.1 Construction

Site preparation and construction would require significant earthworks involving clearing of trees, cut and fill, pond construction and road construction with the potential for soil erosion and soil loss during rainfall events.

As part of the site preparation works, the channels of the Moira Irrigation Channel which cross the site would be re-directed around the footprint of the proposed project as depicted in **Figure 6.1**.

As there are no existing significant surface water drainage lines, and as groundwater is well below the surface there is considered to be minimal potential for contamination of surface or groundwater from fuel spills or leaking equipment during construction of the feedlot. Notwithstanding this, measures would be undertaken to ensure accidental leaks or spills are minimised and managed.

Four sedimentation ponds would be constructed to the west of the feed pens, these would then flow into a holding pond during construction and would be utilised as sedimentation basins to capture runoff from disturbed areas during storms.

13.2.2 Operation

The potential causes of water pollution from the operation of the feedlot would be:

- spills as a result of pond overflows or machinery malfunctions;
- surface runoff of contaminated stormwater from pens to clean water, such as irrigation channels;
- surface runoff of contaminated stormwater from manure stockpiles to clean water, such as irrigation channels;
- surface runoff from the inappropriate application of effluent to land; and
- contamination of clean water storages from leaks and spills from vehicles and equipment used on the site.

Runoff from the feedlot is expected to be minimal due to low rainfall rates at the site. Runoff would primarily occur only after moderate storm events. In general, contaminated runoff from the feed pens and receivals area would be drained to the west to the sedimentation ponds and would be separated from clean water. Retention and holding ponds have been designed to contain these flows as discussed in **Section 6**.

During operation, runoff and wastewater would be stored, treated and disposed of on site by irrigation. **Section 12** details the measures which would be used to manage and treat wastewater from the site.

Operation of the feedlot, including the irrigation of wastewater is not expected to impact upon groundwater, which underlies the site at a depth of approximately 20 to 22 metres.

13.3 Mitigation Measures

13.3.1 Construction

A CEMP would be prepared for the construction of the feedlot and the following measures would be employed (where relevant) within that plan to minimise surface water pollution:

- Undertaking further geotechnical investigation to determine the requirement for clay liners within water retaining structures on the site;
- Construction of sedimentation and holding ponds in the west of the site prior to other earthworks on the site in order to retain soil and runoff on site and minimise potential for pollution of clean water with sediment;
- Construction of diversion bunds around irrigation channels and fresh water storages to separate contaminated stormwater from clean water and prevent contaminated runoff from entering fresh water supplies;
- Maintenance of vehicles and equipment to minimise leaks of oil or fuel; and
- Provision and implementation of procedures to manage spills on site.

13.3.2 Operation

An Operational Environmental Management Plan (OEMP) and an Effluent Irrigation Management Plan (EIMP) would be prepared for the feedlot operations. The EIMP would detail the management and monitoring requirements for wastewater treatment and irrigation. Further details on this plan are provided in **Section 12**.

The following measures would also be employed as part of these plans to minimise surface water pollution:

- Development and implementation of emergency and contingency plans within the EIMP detailing methods to manage spills or other emergencies on site, such as pipe breakages, pond overflows, pump failures etc;
- Maintenance of 50 metre buffer zones around irrigation channels and fresh water storages to prevent contamination of freshwater supplies;
- Manure stockpiles would be established within controlled drainage area to prevent contaminated runoff into clean water areas; and
- A layer of compacted gravel to be placed on all regularly used access routes to stockpile location, which would prevent contaminated runoff into clean water areas.

13.4 Conclusion

The site of the proposed Moira feedlot project was selected with its climate in mind as it has low rainfall and high evaporation rates, which would minimise the potential for impacts to water from contaminated stormwater. Safeguards would be employed during construction and operation to prevent impacts upon the irrigation channels and freshwater supplies on the site.

14 LANDFORM, GEOLOGY AND SOILS

14.1 Existing Environment

14.1.1 Landform and Geology

"Moira Station" is located between Mathoura and Moama in southern NSW and occupies an area of approximately 1,200 hectares. The study area consists of farm infrastructure in the form of ruins and a shearing shed in the north eastern portion of the site and shed silos and yards in the southern portion of the site. There are also irrigation channels and graded tracks onsite.

The geology of the study area is underlain by Quaternary Alluvium comprising sand, silt, clay and gravel. The geomorphic map of the Riverine Plain of South Eastern Australia (1973) details the nature and position of the alluvial deposits in the area such as Stream Traces. Stream Traces are features identified by aerial photography as indicative of ancient stream flow. The types of alluvial deposits which characterise the site are as follows:

- A plain with scalds (wind erosion of the surface soils) over the majority of the property;
- A Confined Stream Trace, greater than 650 metres wide, at the south western corner of the property; and
- An Unconfirmed Stream Trace along the eastern side of the property.

The "Stream Trace" materials are typically well-graded, rounded quartz sand, with a small portion of fine gravel. The fines within the "Stream Trace" materials are typically aggregated clay particles, which are dispersive.

14.1.2 Soils

The geotechnical study of the Moira property confirmes an alluvial soil profile as indicated by the Urana Geological Sheet and Geomorphic Map of the Riverine Plain of South Eastern Australia for the area. A generalised description of the various strata on the site is as follows:

Surface Topsoil/ Disturbed Layer
The surface layer predominantly comprises brown, low plasticity sandy clay to a depth of about 0.1 metres with the exception of an area in the centre of the site which comprises dark grey, medium grained clayey sand in the topsoil followed by underlying material of similar character to the topsoil encountered over the majority of the site.

Alluvial Clayey Soils
These soils generally comprise high plasticity clay underlain by medium plasticity clay, with layers of sandy clay at some locations. These soils can be further described as:

- Moist, red-brown or brown, stiff, high plasticity clay containing a trace of fine-grained sand encountered between 0.1 to 1.3 metres. This unit is underlain by moist becoming slightly moist at depth, mottled in colour, very stiff, medium plasticity clay containing a trace of fine-grained sand; and
- Sandy clayey soils are encountered in a number of locations and the layer thickness ranges from 0.8 to 2.5 metres. These material are typically low or medium plasticity and very stiff.

Alluvial Sandy Soils

Sandy soils are encountered between 2.0 to 4.3 metres below the surface. Interbedded sand and clay layers are encountered at a depth of 7 metres. The sandy soils comprise light grey and yellow brown, fine to medium grained sand. Clayey sand material is encountered between 9.8 to 10 metres.

Alluvial Silty Soils

Sandy silty soils are encountered between the depths of 2.3 to 3.2 metres. The materials above and below this layer comprise medium plasticity clay.

14.1.3 Groundwater

According to information on regional groundwater levels from the Cadell Community's Land and Water Management Plan publication prepared by the Cadell Land and Water Management Plan Working Group, groundwater at the site is in the vicinity of 20 metres to 22 metres below the surface.

14.1.4 Geotechnical

The farm infrastructure currently on site is considered to be of low scale. The primary geotechnical issue for the proposed project is the capability of the land to accept infrastructure involved in establishing the proposed cattle feedlot. GHD LongMac were engaged to undertake a Preliminary Geotechnical Investigation (PGI) to:

- assess the geotechnical issues for water retaining structures (freshwater and effluent storage dams, sedimentation and holding ponds/ basins, compacted earthworks, embankments), feedlot pens, commodities and receivals areas;
- provide a general discussion on groundwater issues; and
- undertake a limited assessment of soil issues for the proposed effluent/ wastewater irrigation areas.

The PGI was carried out in May 2005 and is provided in full in **Appendix E**.

14.2 Assessment Methodology

The PGI involved preliminary work prior to conducting fieldwork. The preliminary work involved discussions with relevant government stakeholders and the farm manager, and collation of information covering the area.

The fieldwork involved establishing a series of test pits distributed over the entire proposed project area and installation of a bore hole and piezometer at the western end of the site. These test pit locations are shown in **Figure 14.1**. A selection of soil samples recovered from the test pits and boreholes were forwarded to a NATA accredited laboratory for testing against a soil classification program.

In addition, a number of soil samples collected from shallow test pits excavated in the existing and proposed irrigation areas were dispatched to a specialist laboratory for testing of agricultural characteristics.

14.3 Assessment of Impacts

The findings of the PGI identified a number of geotechnical issues for consideration including:

- Treatment of dispersive soils;
- Variable subsurface conditions (clayey and sandy soils) and potentially undetected "Stream Traces" within the subsurface profile;
- Clay soil plasticity and cracking potential;
- Soil permeability;
- Stability of compacted earthworks embankments for water retaining structures;
- Stability of excavated slopes within water retaining structures; and
- Compaction and moisture content requirements for bulk earthworks.

Moreover, additional geotechnical investigations would be undertaken as part of the detailed design process. The final layout and design of the facilities would be subject to and account for sand layers/ Stream Traces and other conditions. The additional geotechnical investigation would ensure that appropriate geotechnical design input is incorporated into the detailed design process.

14.3.1 Dispersive Soils and Sand Layers

The soils at the site are dispersive and therefore require modification or replacement with suitable material, which will then render it appropriate for construction of the proposed water retaining structures. Dispersive soils that have been successfully used for construction of water retaining structures employ the following techniques:

- The addition of an appropriate percentage of gypsum (calcium sulphate) to the clay soil during construction;
- Stipulation of an appropriate construction specification for bulk earthworks with respect to both compaction and moisture content; and
- Controls and verification during construction to ensure the adopted construction specification and design is followed.

The investigation confirmed that sand layers are present in the vicinity of the holding pond and freshwater basins, which could adversely impact on the ability of the dams, ponds and basins to retain water. Based on these findings, a comprehensive investigation prior to development is recommended or alternatively, all the dams and ponds could be lined on the assumption that underlying adverse sand layers are present. The PGI concluded that provided appropriate design and construction measures are undertaken, together with any required additional site investigation, the presence of dispersive soils is not expected to be a significant constraint to the project.

14.3.2 Soil Cracking and Plasticity

The clay soils encountered typically ranged from medium to high plasticity. The soil characteristics analysis indicated the clay soils at the site were susceptible to cracking and shrink/ swell movements with variations in moisture content. Methods to be adopted to mitigate the impact of cracking soils include:

- Maintaining water in the reservoirs at all times to prevent drying out of the clay;
- Modifying the plasticity and shrinkage characteristics of the clay by adding an appropriate percentage of lime or gypsum;
- Encapsulating higher plasticity material with the placed earthworks; and
- Topsoiling with less plastic material.

The PGI concluded that provided appropriate design and construction measures are implemented, the presence of potentially cracking soils is not expected to be a significant constraint to the project.

14.3.3 Soil Permeability

The PGI concluded that the clay soils at the site were suitable, relatively impermeable and uniformly distributed across the site and, as such, are not expected to be a significant constraint to the project.

To mitigate potential impacts, a clay liner (or an appropriate alternative) is required at the base of the reservoir at the holding pond site.

14.3.4 Excavation

The PGI concluded that excavation of material for the proposed ponds, basins and dams is achievable using conventional earthmoving equipment such as excavators, backhoes and scrapers. Therefore, excavation of material is not expected to be a significant constraint to the project.

14.3.5 Stability of Compacted Earthworks Embankments and Excavated Slopes

Provided the earthworks embankments and excavated slopes are constructed to an appropriate specification, the stability of such structures is not expected to be a significant constraint to the project. Design parameters to ensure the impact is mitigated as far as possible are included in **Section 14.4** below.

14.3.6 Compaction and Moisture Content for Bulk Earthworks

Compaction of earthworks is not expected to be a significant constraint to the project due to the implementation of appropriate specifications to earthwork design and procedures. Design parameters to ensure the impact is mitigated as far as possible are included in **Section 14.4** below.

14.3.7 Groundwater

Due to the depth of the groundwater at the site, it is not expected to be a significant constraint to the project.

14.4 Mitigation Measures

Placed earthworks would be tested by a NATA registered soil laboratory at an appropriate test frequency and in accordance with Australian Standard AS3798 *Guidelines on Earthworks for Commercial and Residential Developments*.

All water retaining structures would be constructed under the fulltime presence of a geotechnical engineer/ geotechnician on site to enable:

- Inspection and approval of stripped areas prepared by the earthworks contractor for the placement of fill;
- Confirmation that the earthworks construction techniques are in accordance with specification; and
- Inspection of the reservoir area excavations for sand layers and bands.

14.4.1 Dispersive Soils and Sand Layers

To ensure the potential impact is mitigated as far as possible, the following techniques would be employed:

- The addition of an appropriate percentage of gypsum (calcium sulphate) to the clay soil during construction;
- Stipulation of an appropriate construction specification for bulk earthworks with respect to both compaction and moisture content; and
- Controls and verification during construction to ensure the adopted construction specification and design is followed.

A comprehensive investigation prior to development would be undertaken or alternatively, all the dams and ponds would be lined on the assumption that underlying adverse sand layers are present.

14.4.2 Soil Permeability

To mitigate potential adverse soil impacts, a clay liner (or appropriate alternative) is required at the base of the reservoir at the holding pond.

14.4.3 Stability of Compacted Earthworks Embankments

To ensure the potential impact is mitigated as far as possible the following techniques would be employed:

- Fill batters located on the external side of the embankment to be constructed at a slope of 2:1 (horizontal: vertical); and
- Fill batters located on the interior side of the embankment (water retaining) to be constructed at a slope of 3:1 (horizontal: vertical).

14.4.4 Stability of Excavated Slopes

To ensure the potential impact is mitigated as far as possible the following technique would be employed for batter slopes:

- Cut batters located within the reservoir area to be constructed at a slope of 3:1 (horizontal:vertical).

14.4.5 Compaction and Moisture Content for Bulk Earthworks

To ensure the impact is mitigated as far as possible the following technique would be employed:

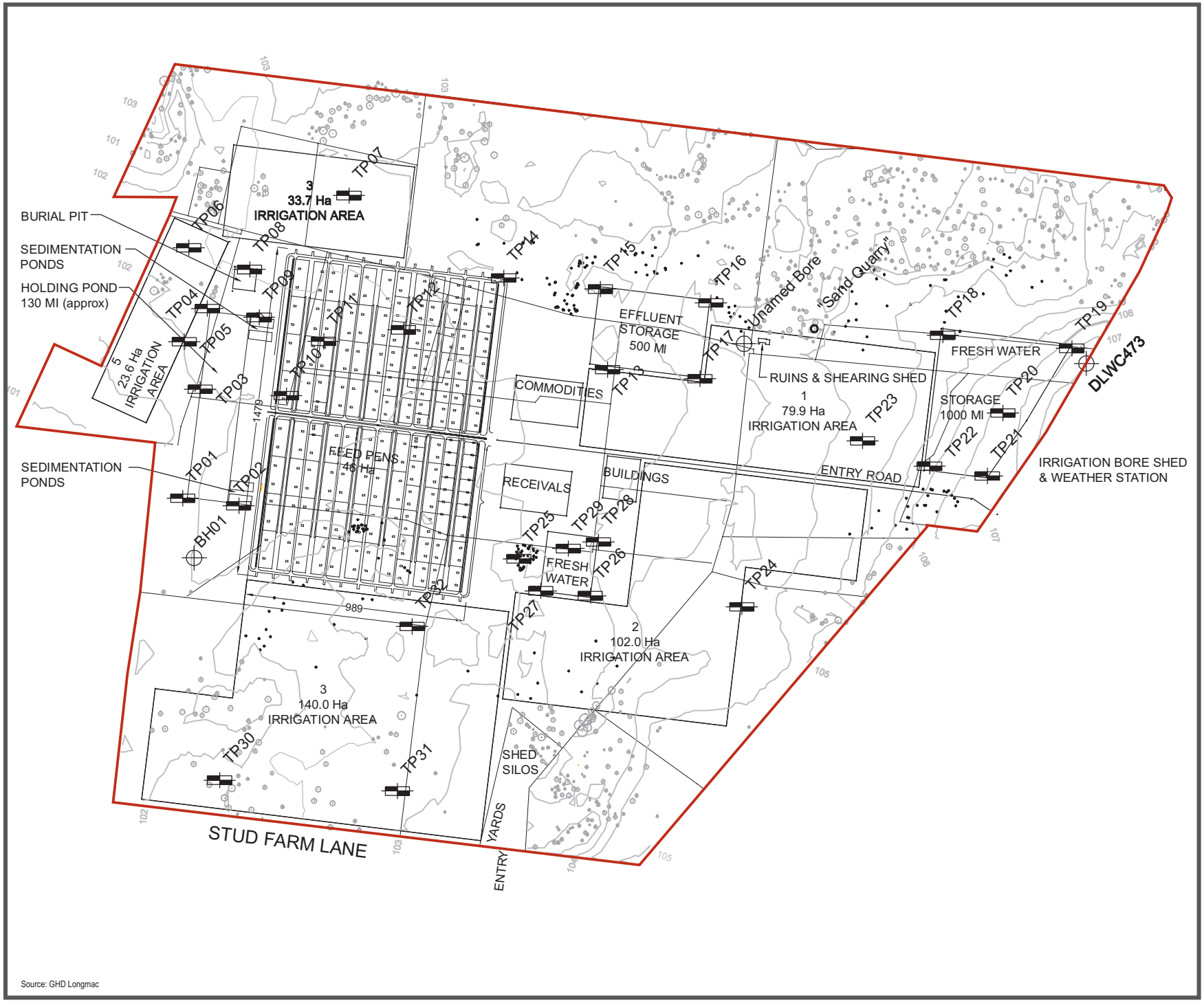
- Compacted earthworks embankments to be placed at a minimum of 95%.

14.5 Conclusion

The PGI identified that during preparation and construction of the facilities on site, there are a number of geotechnical issues to be considered. However, provided appropriate design and construction measures are undertaken, together with any required additional site investigation, the issues identified are not expected to be a significant constraint to the project.

As part of the detailed design process, additional geotechnical investigation would be undertaken to ensure that appropriate geotechnical design input is incorporated into the final

feedlot design. As a result, there are not expected to be any adverse environmental effects resulting from the proposed project.



Source: GHD Longmac

PROJECT-FILE NAME S60133
DATE 27 September 2005
DRAWN TO
APPROVED

Site boundary

TP01 Test pit (by GHD LM)

BH01 Borehole (by GHD LM)

DLWC473 Unnamed Borehole (by others)

"Sand Quarry" Locality

0 600
Metres

Test Location Plan
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

HLA

FIGURE
14.1

15 TRAFFIC AND TRANSPORT

15.1 Transport Requirements of the Proposal

The purpose of the proposed cattle feedlot at Moira Station is to produce an annual throughput of some 160,000 cattle for transportation to abattoirs for the production of beef products. The main sources of traffic generation for the facility are:

A new site access from the Cobb Highway to the proposed cattle feedlot would be provided which is shown in **Figure 15.1**.

- Delivery of approximately 160,000 head of cattle per annum into the site. The cattle would be sourced from various locations around NSW;
- Transportation of some 160,000 head of cattle per annum from the site. The cattle would be transported to various abattoir locations in the south of NSW;
- Approximately 220,000 tonnes per annum (tpa) of grain would be delivered in B-double vehicles. The grain would be sourced from local producers in the south of NSW;
- Transportation of manure from the site. Manure would be transported to various locations around the Riverina;
- Internal movements along the cattle lanes distributing feed into the feed bunks of the pens;
- Approximately 86 employee vehicles to and from the feedlot during operation; and
- Miscellaneous vehicle movements such as suppliers, representatives and service contractors.

15.2 Existing Network

The Cobb Highway is the primary route between the towns of Moama-Echuca on the Victorian border and Hay in NSW and generally runs north-south. The Cobb Highway is a State Highway (SH21) and comprises one lane in either direction with a speed limit of 100 kilometres per hour (km/h) in the vicinity of the project site location. Sight distance along the Cobb Highway is generally very good due to the relatively flat topography and very few curves in the road between Deniliquin and Moama.

The site is currently accessed by an entry located on Stud Farm Lane, which bounds the site to the south. It is proposed that this site access be closed during the construction and operation of the proposed project with site access from Cobb Highway for all vehicles.

The Deniliquin-Moama railway which bounds the site to the west is still operational, however it is not proposed to be used during the operation of the feedlot.

15.2.1 Existing Traffic Movements and Road Capacity

The Annual Average Daily Traffic (AADT) for various years, collected from two RTA count stations along the Cobb Highway is shown in **Table 15-1**. These count station locations are shown in **Figure 15.1**.

Table 15-1: Existing Traffic Movements on Cobb Highway (SH21)

Count Station	Count Location	1994	1997	2000	2003
97.039	Barnes (N of MR391, Barmah Rd)	1,784	2,083	2,241	2,347
97.041	Mathoura (6.5km N of P.O)	1,648	-	-	2,169*

Source: RTA (2003)

* - estimated extrapolated traffic volume using growth rate from Count Station 97.039 between 1994 and 2003, which is equivalent to an increase of 31.5%.

During several investigations in the vicinity of the sites, it was observed that approximately 15% of traffic along the Cobb Highway (SH21) consists of heavy vehicles which are transporting goods and materials from and to the region.

The RTA Guide to Traffic Generating Developments (RTA, 2002) states that for a rural road with a Level of Service B[2] with level terrain and with 15% of the traffic volume as heavy vehicles, the peak hour flow is 530 vehicles per hour. The RTA states that a rural road is operating desirably at Levels of Service A, B and C.

Given the absence of hourly traffic data for the Cobb Highway, the approximate peak hour traffic to determine the available capacity on the road has been calculated. It is generally accepted that peak hour traffic for a rural road is equivalent to approximately 15% of the AADT. The peak hour traffic volume for Cobb Highway has therefore been calculated as being equivalent to approximately 352 vehicles per hour (15% of existing AADT).

Therefore, the Cobb Highway has available spare capacity to absorb approximately 170 vehicles per hour before the Level of Service of the road is adversely affected.

15.3 Traffic Generation

15.3.1 Construction Traffic

As discussed in **Section 6**, the construction of the feedlot involves a number of activities that would generate traffic. The additional volumes of construction traffic from the activities are summarised in **Table 15-2**.

Table 15-2: Expected Traffic Movements During Construction

Activity	Vehicle Type	Movements per day
Phase One		
Earthworks	Self-loading scrapers; Excavators; Water carts; Rollers; and Graders Fuel trucks (2 trucks per day)	20
Employees	Light vehicles (maintenance vehicles included)	104
	Total	*124*

[2] This level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is less than that of Level of Service A.

Activity	Vehicle Type	Movements per day
Phase Two		
Cattle Pens and laneways	Cranes; and Concrete trucks. Fuel trucks (2 trucks per day)	60
Employees	Light vehicles (maintenance vehicles included)	104
	Total	*164*
Phase Three		
Road sealing	Spray seal trucks; Gravel trucks; Rollers; and Sweepers Fuel trucks (2 trucks per day)	60
Employees	Light vehicles (maintenance vehicles included)	104
	Total	*164*

The initial phase of construction would involve the delivery of plant which would remain on site for the duration of the construction phase. It is expected that approximately 10 items of plant would remain on site for the entire construction period. During construction there is expected to be a maximum of 60 movements per day, which would be spread over the entire day.

In order to provide an indicative estimate of traffic movements per day associated with personnel, it was assumed that all staff would travel by car with a car occupancy rate of 1.4 persons per vehicle. It has been estimated that there would be 57 trips to and from the feedlot site per day of construction. These trips would be expected to occur prior to and after each construction shift each day. It is expected that there would be one shift during the construction of the project. This shift would commence at 7am and finish at 6pm.

As indicated in **Table 15-2**, there are expected to be a maximum of 164 movements per day, which includes incoming and outgoing traffic numbers. These additional traffic movements would utilise the Cobb Highway (SH21) to access the regional road network. Due to the site location and the sources of materials required for the construction of the feedlot as well as the potential workforce located in towns to the north and south, it was assumed that there would be a relatively even distribution of traffic along the Cobb Highway (SH21). The predicted distribution of the construction traffic would be as follows:

- 50% of generated traffic north along Cobb Highway (SH21) – 82 movements; and
- 50% of generated traffic south along Cobb Highway (SH21) – 82 movements.

15.3.2 Operational Traffic

As discussed in **Section 6**, the operation of the proposed feedlot would require frequent deliveries of cattle and grain. Both cattle and grain trucks would enter the site via the access on Cobb Highway (SH21) and travel along the access road to the receivals area. The trucks would unload their cargo or load their cargo within the receivals area. There would be sufficient space within the receivals area which would enable these vehicles to turn around and travel along the access road and exit the site onto the Cobb Highway in a forward direction.

It is expected that cattle would be delivered to the site in B-Double vehicles and grain in either semi-trailers or B-Double vehicles.

Additionally, the stockpiled compost generated from the operation of the feedlot would be transported off site. It is expected that the stockpiled compost would be located near the receivals area and that trucks would be loaded with compost in the manure composting area prior to exiting the site along the access road.

A summary of the traffic movements associated with the operation of the feedlot is shown in **Table 15-3**.

Table 15-3: Expected Traffic Generation During Operation

Activity	Vehicle Type	Maximum number of movements per day
Cattle Input and Output	B-Double	20
Grain Delivery	Semi-trailer and B-Double	36
Compost Export	Semi-trailer	4
Employees	Light vehicles	122
Maintenance vehicles	Light vehicles and utility vehicles	Infrequent
	Total	**182**

As discussed in **Section 6**, it is expected that approximately 86 people would be employed during the operation of the feedlot. It has been estimated (based on an occupancy rate of 1.4 persons per vehicle) that there would be 61 inbound trips and 61 outbound trips made by site personnel at the feedlot on any given day.

The operation of the feedlot would also include approximately 10 inbound and 10 outbound cattle trucks, 18 inbound and 18 outbound grains trucks and also 2 inbound and 2 outbound compost trucks during the day. This equates to approximately 60 movements per day. It is expected that these heavy vehicles would be spread over the 12 hours of operation each day.

Overall, as indicated in **Table 15-3**, there are expected to be a maximum of 182 movements per day generated during operation of the feedlot, which includes incoming and outgoing traffic numbers. These additional traffic movements would utilise the Cobb Highway (SH21) to access the regional road network. Due to the site location and the potential to source grain locally and potential workforce located in towns to the north and south of the site, it was assumed that there would be a relatively even distribution of operational traffic along the Cobb Highway (SH21). The predicted distribution of the operation traffic would be as follows:

- 50% of generated traffic north along Cobb Highway (SH21) – 91 movements; and
- 50% of generated traffic south along Cobb Highway (SH21) – 91 movements.

15.4 Potential Traffic Impacts

15.4.1 Site Access and Internal Movements

A new site access is proposed as part of the cattle feedlot. This new access is shown in **Figure 6.1** and **Figure 15.1**. The access would be able to support B-Double vehicles, which would be transporting cattle to and from the site as well as delivering grain and transporting compost. The access would also include a deceleration lane to the south of the entry, which would allow vehicles approaching the site from the south to safely leave the roadway and enter

the site whilst allowing traffic to continue along the Cobb Highway. Detailed design of the site access would be submitted to the RTA for approval prior to construction.

The location of the proposed new site access is shown in **Plate 1** with sight distance views to the north and south shown in **Plates 2** and **3** respectively.

Plate 1
Proposed Site Access on Cobb Highway (SH21)

Plate 2
Sight Distance at eye level of 1.5m to the north from proposed site access on Cobb Highway (SH21)

Plate 3:
Sight Distance at eye level of 1.5m to the south from proposed site access on Cobb Highway (SH21

As shown above, the sight distance from the proposed site access in either direction is in excess of 600m. Therefore, it is considered that there is sufficient sight distance for vehicles to safely enter and exit the site from the proposed site access on the Cobb Highway.

The majority of vehicles entering the site would access the receivals area and unload/load their cargo. Hereafter, the vehicle would turn around utilising the available space, capable of supporting B-Double vehicles, and exit the site in a forward direction via the access road and exit point at the Cobb Highway. The access road linking the Cobb Highway and the receivals area would be some 10m wide. The road would include two 4m wide lanes plus two 1m wide hard shoulders and the road would be able to accommodate B-Doubles.

Employee vehicles would also enter the site via the Cobb Highway access. Vehicles would travel along the access road to the allocated car park, located south of the administration building (refer to **Figure 6.1**). There would be space for approximately 70 parking spaces to adequately cater for the operational staff.

15.4.2 Construction

The construction period for the proposed cattle feedlot would be approximately 6 months. The nature and intensity of activities affecting the existing road network would vary during the construction period.

Activities during the construction period that would generate traffic include construction contractor and workforce vehicles, supply of equipment and materials and transportation movements due to required services that would support the construction phase.

The early site construction work would involve the development of the new access road. Prior to this work, construction vehicles would utilise a new temporary access from the Cobb Highway.

Site activities would commence with site clearing, earthworks, civil and drainage works. The pens and ponds would also be constructed. Traffic would be generated during all stages of construction. It is expected that the construction traffic generated would peak at approximately a maximum of 60 movements per day.

Construction personnel are expected to peak at approximately 80 people. As noted in **Table 15 - 4**, it was calculated that traffic generated from the construction personnel equates to approximately 104 movements per day.

The distribution of construction traffic, both light and heavy vehicles, was assumed to be 50% travelling north from the feedlot and the remaining 50% travelling south along the Cobb Highway. As stated in **Section 15.3.1**, it is predicted that approximately 82 vehicles would travel north along the Cobb Highway and 82 vehicles would travel south along the Cobb Highway.

These traffic movements would increase the AADT of the Cobb Highway, as shown in **Table 15-4**, by less than 4%.

Table 15-4: Predicted Increased Traffic Volumes during Construction

Main Road	Count Location	Existing AADT	Future AADT	% Increase
Cobb Highway	Barnes (N of MR391, Barmah Rd)	2,347	2,429	3.5%
Cobbs Highway	Mathoura (6.5km N of P.O)	2,169*	2,251	3.8%

* - estimated traffic volume using extrapolated growth rate from Count Station 97.039 between 1994 and 2003.

As noted in **Section 15.2.1**, the existing traffic volumes in the road network indicate that there is sufficient spare capacity available on the Cobb Highway to accommodate the additional traffic generated from the construction. It is predicted that the traffic generated during the construction phase of the proposed feedlot at Moira Station would not create any significant traffic impacts to the surrounding road network.

15.4.3 Operation

Operation of the proposed cattle feedlot at Moira Station would occur on a 7 day per week, 12 hour per day basis. The deliveries to and from the site would occur between 7am and 7pm and are expected to be spread over this 12 hour period. These movements would utilise the site access from the Cobb Highway and would approach the site from either north or south of the access point.

The calculations for the traffic and transport assessment have been based on daily totals of the operation of the feedlot. The majority of operational traffic would be in the form of heavy vehicles transporting grain to the site as part of the Feed Management Plan (see **Section 6.8.1**). The arrival of these vehicles would be spread over the entire day in order to avoid congestion on the site as grain is being unloaded into the mill. Additionally, the cattle trucks transporting the cattle to and from the site would be scheduled to avoid queuing as cattle are being loaded into the receivals area and inducted into the feedlot. It is expected that there would be a maximum of 60 movements per day for the operational activities of the feedlot.

Site personnel are expected to be up to 86 people. As noted in **Table 15-3**, it was calculated that traffic generated from the operational personnel equates to approximately 122 movements per day.

During the operation of the feedlot, there would be infrequent maintenance vehicle movements. These maintenance trips would generally be within the site boundary and along the cattle lanes and feed lanes. It is not expected that these movements would adversely impact traffic on site or on the surrounding road network.

The distribution of construction traffic, both light and heavy vehicles, was assumed to be 50% travelling north from the feedlot and the remaining 50% travelling south along the Cobb Highway. As stated in **Section 15.3.2**, it is predicted that approximately 91 vehicles would travel north along the Cobb Highway and 91 vehicles would travel south along the Cobb Highway.

The predicted increase in traffic during the operation of the feedlot is shown in **Table 15-5**. It is predicted that traffic volumes along the Cobb Highway would increase by approximately 4%.

Table 15-5: Predicted Increase in Traffic Volumes during Operation

Main Road	Count Location	Existing AADT	Future AADT	% Increase
Cobb Highway	Barnes (N of MR391, Barmah Rd)	2,347	2,438	3.9%
Cobbs Highway	Mathoura (6.5km N of P.O)	2,169*	2,260	4.2%

* - estimated traffic volume using extrapolated growth rate from Count Station 97.039 between 1994 and 2003.

As noted in **Section 15.2.1**, the existing traffic volumes in the road network indicate that the Cobb Highway is operating at Level of Service B. It is predicted that the traffic generated from the operation of the proposed feedlot at Moira Station would result in a Level of Service C for the Cobb Highway. However, a Level of Service C is desirable for a rural road (RTA, 2002). Therefore, the operation of the proposed feedlot is not expected to create significant traffic impacts.

15.5 Road Safety

Road accident statistics for the Cobb Highway (SH21) were obtained from the RTA for the period from December 1999 to September 2004 plus the provisional data to the end of June 2005. There were a total of 37 accidents during this approximately 5 year period. The summarised data is shown in **Table 15-6** and **Table 15-7**.

Table 15-6: Accident vehicles on Cobb Highway (SH21)

Vehicles Type	Number of Accidents	Percentage
Car (Light vehicle)	28	75.7%
Light Truck	9	24.3%
Rigid Truck	-	-
Articulated Truck	4	10.8%
Motorcycle	2	5.4%
Pedal Cycle (Bicycle)	3	8.1%
Pedestrian	1	2.7%
Total	**37**	**100%**

Table 15-7: Accident Injuries on Cobb Highway (SH21)

Accident Type	Number of Accidents	Percentage
Fatal accident	-	-
Injury accident	19	51.4%
Non-casualty accident	18	48.6%

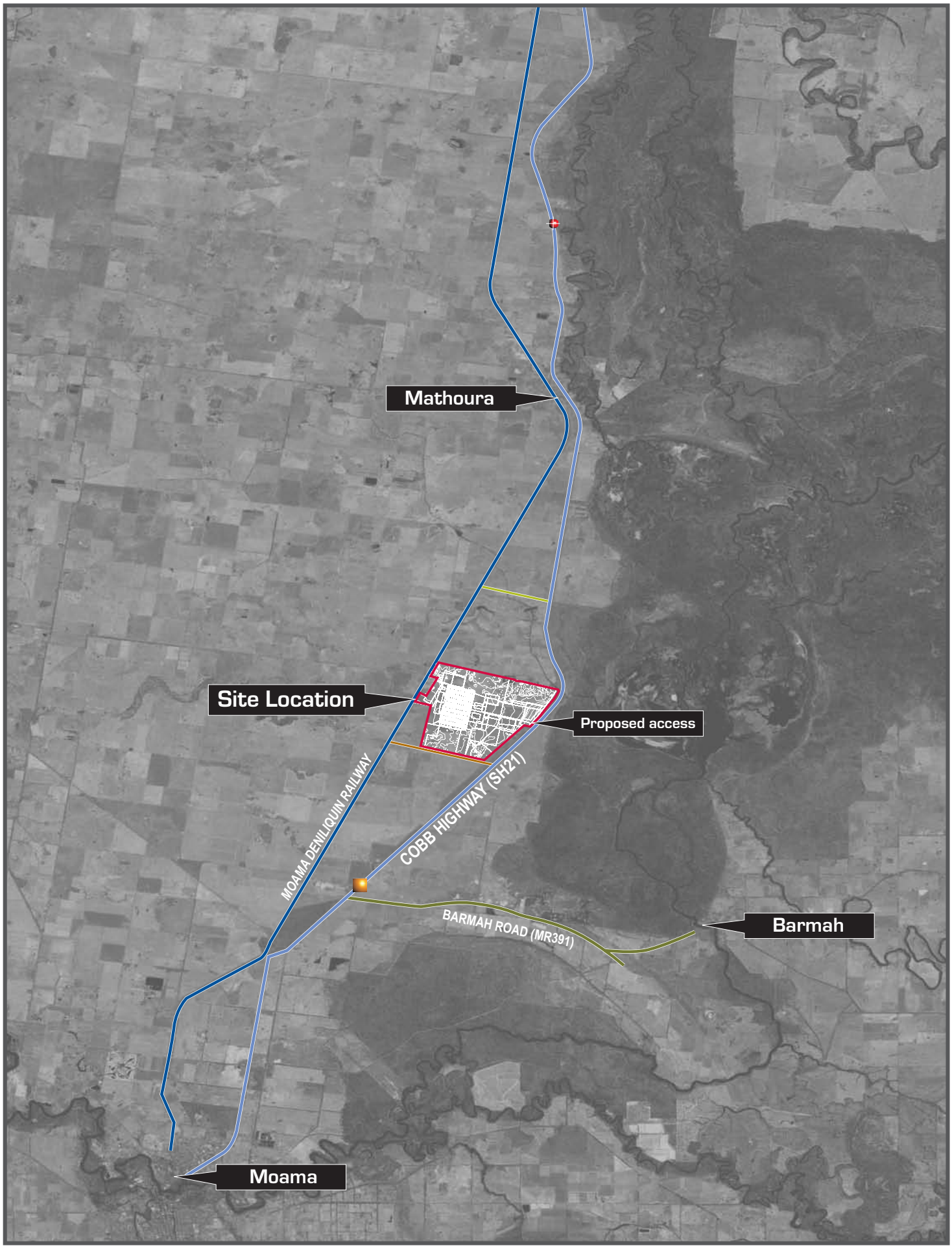
The number of accidents along the Cobb Highway, as shown in **Table 15-6** and **Table 15-7**, indicates that accidents are not prevalent on the Cobb Highway. It is considered that the low volume of traffic, as noted in **Section 15.2.1**, and the fact that sight distance is generally above average, as noted in **Section 15.2**, contributes to the relatively low level of serious accidents. It is expected that the addition in traffic volume as a result of the proposed feedlot would not adversely impact upon the road safety of the Cobb Highway.

15.6 Conclusion

The construction and operation of the proposed project would involve additional traffic movements. The site is situated along a State Highway, known as the Cobb Highway, which currently experiences traffic of a similar nature to the traffic associated with the proposed project.

The proposal also involves the construction of a new site access, which would connect the receivals area to the Cobb Highway. The receivals area is where the majority of traffic would unload/load its cargo. The receivals area, access road and access point would be able to accommodate B-Double vehicles, as well as smaller employee vehicles. The proposal also includes sufficient car parking facilities for employees.

An assessment of traffic and transport impacts resulting from the project concluded that the Cobb Highway has sufficient capacity to accommodate the traffic generated during the construction and operation of the proposed feedlot. Therefore, it is expected that traffic generated would not adversely impact the operation or safety of the local road network.



HLA

Traffic Features
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Stud Farm Lane
Cotswold Lane
Count station 97.039
Count station 97.041

N

0 4
Kilometres

FIGURE
15.1

PROJECT-FILE NAME **S60133** DATE **27 September 2005** DRAWN **TO** APPROVED

16 TERRESTRIAL ECOLOGY

HLA undertook an Ecological Assessment of the site in March 2005 to identify the flora and fauna issues associated with the proposed feedlot. The assessment was undertaken in the context of applicable State and Federal legislation. The associated report is provided in **Appendix F** and is summarised below.

16.1 Methodology

16.1.1 Information Review

The following information sources were examined to obtain an understanding of the existing environment at the site:

- aerial photographs and topographic maps of the study area;
- the DEC on-line Wildlife Atlas (WA);
- the DEH on-line Protected Matters Search Tool;
- the National Land and Water Resources Audit (NLWRA);
- climatic data from the Bureau of Meteorology; and
- research papers and relevant ecological and local area literature.

Regional Context

The Moira Station site is located in the Murray Fans subregion (RIV3) within the Riverina biogeographic region. The region is important for biodiversity as it contains areas of important habitat and 92 endangered or vulnerable flora and fauna species.

Birds such as the Long-billed Corella, Little Corella and Common Myna are on the increase in the subregion, while ground-feeding insectivores and grassland birds are being reported much less frequently. Forty-seven mammal species occur within the Riverina bioregion, eleven of which are introduced. No threatened reptiles or amphibians have been recorded in the local area (NLWRA, 2002).

A search for threatened species occurring in the area was conducted using the DEC WA and the EPBC Protected Matters Search Tool. The search of the DEC WA incorporated the Mathoura and Echuca 1:100 000 topographic map sheets. **Table 16-1** and **Table 16-2** show the results of both searches and the status of each species identified as locally occurring, under the *Threatened Species Conservation Act 1995* (TSC) and the *Environment Protection and Biodiversity Conservation* (EPBC) Act.

Table 16-1: Threatened flora species recorded in the region

Scientific Name	Common Name	Status TSC	Status EPBC
Lepidium monoplocoides	Winged Peppercress	Endangered	-
Swainsonia murrayana	Slender Darling Pea	Vulnerable	Vulnerable
Amphibromus fluitans	River Swamp Wallaby Grass	Vulnerable	Vulnerable
Sclerolaena napiformis	Turnip Copperbur	Endangered	Endangered
Brachyscome muelleroides	Mueller Daisy	-	Vulnerable

Scientific Name	Common Name	Status TSC	Status EPBC
Cullen parvum	Small Scurf-pea	-	Endangered
Swainsona plagiotropis	Red Darling Pea	Vulnerable	Vulnerable

Table 16-2: Threatened fauna species recorded in the region

Scientific Name	Common Name	Status TSC	Status EPBC
Botaurus poiciloptilus	Australasian Bittern	Vulnerable	-
Burhinus grallarius	Bush-stone-curlew	Endangered	-
Climacteris picumnus	Brown Treecreeper	Vulnerable	-
Grantiella picta	Painted Honeyeater	Vulnerable	-
Grus rubicundus	Brolga	Vulnerable	-
Lathamus discolor	Swift Parrot	Endangered	Endangered
Lophoictinia isura	Square-tailed Kite	Vulnerable	-
Melanodryas cucullata	Hooded Robin	Vulnerable	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subsp.)	Vulnerable	-
Neophema pulchella	Turquoise Parrot	Vulnerable	-
Ninox connivens	Barking Owl	Vulnerable	-
Pachycephala inornata	Gilbert's Whistler	Vulnerable	-
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subsp.)	Vulnerable	-
Rostratula benghalensis australis	Painted Snipe (Australian subsp.)	Endangered	Vulnerable
Stagonopleura guttata	Diamond Firetail	Vulnerable	-
Xanthomyza phrygia	Regent Honeyeater	Endangered	Endangered
Pedionomus torquatus	Plains-wanderer	-	Vulnerable
Antechinomys laniger	Kultarr	Endangered	-
Phascogale tapoatafa	Brush-tailed Phascogale	Vulnerable	-
Petrogale penicillata	Brush-tailed Rock-wallaby	Endangered	-
Phascolarctos cinereus	Koala	Vulnerable	-
Nyctophilus timoriensis	Greater Long-eared Bat (Eastern Long-eared Bat)	Vulnerable	Vulnerable
Delma impar	Striped Legless Lizard	-	Vulnerable
Litoria raniformis	Southern Bell Frog	-	Vulnerable
Craterocephalus fluviatilis	Murray Hardyhead	-	Vulnerable
Maccullochella peelii peelii	Murray Cod	-	Vulnerable
Macquaria australasica	Macquarie Perch	-	Vulnerable

The Northern Hairy-nosed Wombat (*Lasiorhinus krefftii*) has also been recorded, but is now considered to be extinct in NSW.

Additional matters of National Environmental Significance (NES) under the EPBC Act are presented in the table below.

Table 16-3: Potential for other matters of NES to occur within 10km of the site

Matter	Potential Occurrences
World Heritage Properties	None
Wetlands of International Significance	1
Threatened Ecological Communities	2
Migratory Species	5
Listed Marine Species	9
Commonwealth Lands	None
Critical Habitats	None
Commonwealth Reserves	None

16.1.2 Field Survey Methods

Flora Survey
Flora studies were conducted between 15 and 17 March 2005. Nine 20m x 20m quadrats were established on site and surveys were conducted along transects between quadrats. The quadrats were located in areas of relatively natural vegetation and also in areas where it is proposed to clear remnant woodland for the development of the feedlot (see **Figure 16.1**). Quadrats were generally not located in cropping areas due to the sustained history of disturbance.

Fauna Survey
Fauna surveys were conducted between 15 and 17 March 2005, using a combination of systematic and opportunistic methodologies. This included targeted survey points and incidental observations. Targeted survey techniques included call playback, use of the Anabat II bat detector and searches of suitable habitat.

16.2 Existing Environment

16.2.1 Flora

A total of 69 vascular plant species were identified within the site. Of these, 29 are introduced while two species are native to Australia but not the local area. The two native species that were not endemic were the Golden Wattle (*Acacia pycnantha*) and Sugar Gum (*Eucalyptus cladocalyx*). No threatened flora species were detected during the survey.

Aquatic / riparian herbaceous species associated with irrigation channels were not mapped separately. In addition to the common species found in the ground cover of the River Red Gum Community, *Juncus* sp., *Cyperus* sp. *Rumex* sp. and Knotweed (*Persicaria lapathifolia*) were present.

Vegetation Communities
The vegetation communities present on the site (see **Figure 16.2**) are:

- River Red Gum (*Eucalyptus camaldulensis*) Community;
- Black Box (*Eucalyptus largiflorens*) Community;
- Box Community with Exotic Understorey; and
- cropped.

River Red Gum (*Eucalyptus camaldulensis*) Community
The River Red Gum Community was restricted to drainage depressions in the northern part of the site. The tree canopy was exclusively River Red Gum, and there was no shrub understorey. The ground cover varied, with the north eastern remnant having the greatest cover and diversity of native species. Dominant ground cover species included *Eleocharis pusilla* and Common Nardoo (*Marsilea drummondi*). No other species dominated, however, several species were restricted to this community, including *Goodenia gracilis* and *Lythrum hyssopifolia*.

Black Box (*Eucalyptus largiflorens*) Community
The Black Box Community occurred in flood plains between the drainage depressions and higher areas. Canopy species were dominated by Black Box, however, River Red Gum, Yellow Box (*Eucalyptus melliodora*) and Grey Box (*Eucalyptus microcarpa*) were also present. The dominant shrub species were Galvanised Burr (*Sclerolaena birchii*) and *Maireana aphylla.* The ground cover beneath the trees was dominated by exotic species while native species such as Ringed Wallaby Grass (*Austrodanthonia caespitosa*) and Speargrass (*Austrostipa scabra subsp. scabra*) dominated away from the cover of trees.

Box Community with Exotic Understorey
Grey Box and Black Box were common in this community. Exotic species comprised crop species and weeds such as Wireweed (*Polygonum aviculare*), Patersons curse (*Echium plantagineum*) and the noxious Bathurst Burr (*Xanthium spinosum*). The ground cover under tree canopies was dominated by Nettle-leaf Goosefoot and Common Fiddleneck.

Cropped
This community dominated in terms of spatial extent, and included areas that are irrigated. Species that are presently grown include *Sorghum* sp., while many other areas have been harvested with crops such as Wheat (*Triticum aestivum*) and Barley (*Hordeum* sp.). The ground cover in fallow areas was typically dominated by Wireweed and Fiddleneck with Bathurst Burr and Patersons Curse also occurring.

16.2.2 Fauna

The field studies revealed a total of 56 species of vertebrate fauna at the site. There were three threatened species of bird observed during the survey: the Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), the Brown Tree Creeper (*Climacteris picumnus)* and the Blue-billed Duck (*Oxyura australis)*. The remains of a Major Mitchell's Cockatoo (*Cacatua leadbeateri*) were also found. This species is listed as Vulnerable under the TSC Act.

There were eight native mammal species detected during the field survey, including seven bat species and the Common Brushtail Possum. The three exotic species observed were the fox, rabbit and House Mouse. No threatened species were observed.

There were very few observations of reptiles or amphibians. Three species of skink were found on the site under or near building and fence debris: *Cryptoblepharus carnabyi*, *Ctenotus taeniolatus, and Morethia boulengeri.*

16.3 Assessment of Impacts

The proposed project would primarily impact areas that are currently used for agricultural activities. A small remnant stand of trees would be removed for the cattle feedlot and isolated trees are likely to be removed during the construction of buildings, water storages and access roads. Other potential impacts may result from the raising of the water table and associated salinisation if there is a significant increase in the amount of water used for irrigation.

As there were no threatened plant species recorded within the site, the assessment of impacts to threatened species is for fauna species only.

16.3.1 TSC Act Considerations

Of the 22 threatened fauna species listed under the TSC Act as occurring in the areas covered in the Mathoura and Echuca 1:100,000 map sheets, there are 17 for which habitat was present on the site. This includes 14 bird species and 3 mammal species. Eight part tests under section 5A of the EP&A Act were conducted for these species. The eight part tests revealed that many of the species are not adequately reserved in the region. It also revealed that seven species are believed to be at or outside of their known distribution. The eight part tests are provided in **Appendix F**.

16.3.2 EPBC Act Considerations

There is habitat present at the site for 5 of the 11 threatened species listed under the EPBC Act as occurring in the area. However, it is unlikely that the habitat present is of sufficient quality or size to support populations of these threatened species.

16.3.3 SEPP 44 Considerations

The site occurs in the Murray Local Government Area, which is listed in Schedule 1 of State Environmental Planning Policy No 44 - Koala Habitat Protection. Only one of the preferred Koala feed tree species is present on the site. The site is not considered 'Core Koala Habitat' and therefore SEPP 44 does not apply. No breeding females were observed on the site.

16.4 Mitigation Measures

From a regional perspective, the key management actions are to protect, enhance and link woodland fragments. This would involve preventing grazing in representative areas and the adoption of reduced, conservative grazing rates in key habitat across the bioregion. It is also important to maintain an on-going supply of hollows for fauna habitat (NLWRA, 2002).

A summary of the mitigation measures applicable to the site are provided below:

- protect the northern belt of native woodland by leaving it ungrazed or lightly grazed;
- in the event that the northern portion of the property is grazed, over-stocking should be avoided during times of drought, and weeds should be controlled;
- stock should be excluded form sensitive moist habitats and from parts of the woodland habitat that occur in areas with predominantly native grass species;
- deposit tree snags and branches removed as part of the project in a random and scattered pattern in the northern woodland belt to enhance the habitat for reptiles and mammals. Care should be taken to avoid stockpiling the woody debris in such a way that it encourages fox and rabbit sheltering; and

- trees that are native to the local area should be planted along the property boundary, fence lines and drainage lines that have few trees present. This would ensure these tree root systems would develop under the changed hydrological regime that would result from the proposed project and help to lower the water table.

16.5 Conclusion

The Ecological Assessment has identified potential habitat for two threatened woodland bird species: the Grey-crowned Babbler and the Brown Tree Creeper. Another threatened bird, the Blue-billed Duck, was observed in a farm dam in the south eastern part of the property. Eight part tests, provided in **Appendix F**, concluded that no significant impacts to these threatened species are expected as a result of the proposed project.

Ecological investigations found no evidence of threatened flora species on the site. Habitat for the majority of threatened fauna species under the TSC and EPBC Acts that potentially utilise the site would not be impacted by the proposed project as it is outside of the project footprint. It is expected that, with the implementation of appropriate mitigation measures, the proposed cattle feedlot project would not create significant ecological impacts.

PROJECT-FILE NAME S60133
DATE 27 September 2005
DRAWN TO
APPROVED

- Site boundary
- Proposed development
- Existing development
- Vegetation study plot location

N

0 600
Metres

Proposed Project and Aerial Photograph of Existing Vegetation and Study Plots
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

HLA

FIGURE
16.1

PROJECT-FILE NAME S60133
DATE 27 September 2005
DRAWN TO
APPROVED

- Site boundary
- Box Community with exotic understory
- River Red Gum Community
- Black Box Community
- Blue Billed Duck sighting
- Brown Tree Creeper sighting
- Grey-crowned Babbler nests in tree
- Grey-crowned Babbler sighting
- Pink Cockatoo

N

0 600
Metres

Locations of Significant Species and Habitat Trees
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

HLA

FIGURE
16.2

17 CULTURAL HERITAGE

HLA undertook an Aboriginal Heritage Assessment to identify Aboriginal heritage issues associated with the proposed feedlot. The assessment was undertaken in the context of applicable state and federal legislation. The associated report is provided in **Appendix G** and is summarised below.

17.1 Methodology

17.1.1 Information Review

The Aboriginal Heritage Assessment identifies the proosed activities within the study area and their potential impact to the Aboriginal archaeology. In summary, work undertaken in the Aboriginal Heritage Assessment involved the following:

- An Aboriginal Sites search of the Department of Environment & Conservation (DEC) AHIMS register.
- Site survey with professional archaeologists to identify archaeology and its potential impact.
- Identification and provision of management measures on future heritage issues within the study area.

The scope of works is based on the professional standards outlined by the DEC (formerly NSW National Parks and Wildlife Service) *Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997) and *Interim Community Consultation Guidelines for Applicants* (2005).

Regional Context
The Riverine Plain represents the gently sloping area west of the Great Dividing Range. The Riverine Plain has been formed from the deposition of vast alluvial fans by the precursors of the present rivers – Murrumbidgee, Murray and Goulburn – which flow across it from the east and from the south. It is flanked on the north, south and east by the low foothills of the main mountain zones from where the rivers rise and by mallee (a characteristic Aeolian landscape) on the west and in pockets to the north (Butler, 1967: 243).

Some idea of the way of life of the Aborigines on the Murray River, before the arrival of Europeans, can be seen in the written records made by early explorers and white settlers. Although there are problems and biases in these records, they allow some appreciation of Aboriginal society at the time of European contact. Recorded observations of Aboriginal life made by early settlers along the Murray River were selective and not all aspects of economic life were recorded.

The observations made of Aboriginal subsistence activities have been used to interpret the archaeological materials left by prehistoric peoples. As Aboriginal society was changing at the time of the first European settlement, and probably had been changing before this time, the observations made may not be an accurate reflection of Aboriginal society at the time prehistoric archaeological sites were being used. In any case, severe changes to Aboriginal society had already taken place as the result of introduced disease (see also Craib 1991: 46).

European settlement of the Central Murray region from the 1840s onwards caused the displacement from traditional lands of those remaining Aborigines who had survived the disease epidemics. Bushby (1980: 52) states that local Aborigines particularly resented European intrusion into the areas at the junction of the Edward and Murray Rivers (now Picnic Point) as well as the Moira/Barmah Lakes area. “Feuds” continued until about 1848.

The settlement of the Murray-Darling Basin region by Aboriginal people is represented by a series of sites located to the north (Willandra Lakes region) and west (Kow Swamp) of the Riverine Plain dating back to the Late Pleistocene and Holocene. These sites indicate that during periods of wetter climatic conditions than today, the increased rainfall fed both river systems and now extinct lakes (e.g. Lake Mungo), providing optimum conditions for Aboriginal people to settle the region. Based on current evidence and models, Aboriginal sites were concentrated around rivers, lakes and creek lines – i.e. the necessity for water as both a resource and as an environment attractive to game, water fowl and fish. The active Murray floodplain is also an excellent environment for exposing Aboriginal sites.

HLA undertook a site search of the study area and its surrounds (the search area being some 20 km north-south by 7 km east-west) using the Department of Environment and Conservation's Aboriginal Heritage Information System (AHIMS) on the 29 June 2005. The AHIMS search revealed 26 Aboriginal objects and places in proximity to the study area, a summary of which are presented in **Table 17-1** and **Figure 17.1**.

Table 17-1: List of known Aboriginal sites

DEC AHIMS Identification number	Site Name	Site Type	Easting	Northing
54-4-0030	Ochre mine	Ochre Quarry	310200	6019100
54-4-0032	Shield tree & Colomans	Scarred Tree	310700	6016800
54-4-0034	Dora oven mounds	Mound (Oven)	310750	6016800
54-5-0053	Mathoura; Moira State Forest	Burial/s, Midden	311902	6029794
54-5-0054	Moira	Burial/s	310636	6019540
54-5-0055	Algeboia	Aboriginal Place	310500	6017500
54-5-0063	Site 11 Shell Scatter	Midden; Scarred Tree	312800	6016680
54-5-0064	Site 12 A Algebonia	Scarred Tree	310800	6017950
54-5-0065	Site 12 C Scarred Tree	Mound (Oven); Scarred Tree	310750	6017850
54-5-0066	Site 12 C Scarred Tree	Burial/s; Mound (oven); Scarred Tree	310750	6017850
54-5-0067	Site 13 Scarred Tree	Burial/s; Midden; Mound (Oven); Ochre Quarry; Scarred Tree	310300	6019000
54-5-0069	Site 19 Scarred Tree	Midden; Mound (Oven); Scarred Tree	313350	6014570
54-5-0070	Site 20 Shell Midden	Midden; Scarred Tree	313250	6015800
54-5-0071	Site 21 Shell Midden	Midden; Scarred Tree	313200	6015850
54-5-0072	Site 22 Shell Midden	Midden; Scarred Tree	312800	6016350

DEC AHIMS Identification number	Site Name	Site Type	Easting	Northing
54-5-0073	Site 23 Shell Midden	Midden; Scarred Tree	312600	6015450
54-5-0074	Site 24 Shell Midden	Midden; Mound (Oven); Scarred Tree	312950	6016900
54-5-0152	Site 100 Cemetery	Burial/s; Mound (Oven); Scarred Tree	311520	6031500
54-5-0153	Site 101 Scarred Tree	Scarred Tree	311200	6030950
54-5-0154	Site 102 Scarred Tree	Scarred Tree	310900	6030950
54-5-0155	Site 103 Mound	Burial/s; Mound (Oven); Scarred Tree	312800	6027450
54-5-0156	Site 104 Burial	Burial/s; Mound (Oven) Scarred Tree	310150	6018400
54-5-0160	Site 112 Scarred Tree	Scarred Tree	311250	6029750
54-5-0174	Site 144	Midden; Mound (Oven); Scarred Tree	311400	6029600
59-2-0036	Site 17 Shell Midden	Midden; Scarred Tree	313700	6014050
59-2-0037	Site 18 Scarred Tree	Midden; Mound (Oven); Scarred Tree	313420	6014420

As shown in **Table 17-1** and **Figure 17.1**, 21 of the sites identified in AHIMS are scarred trees, which constitute the bulk of sites in this area. The other two main categories of site in the vicinity are shell middens and oven mounds, which occur in almost equal numbers: 12 shell midden sites are listed, followed by 11 recorded oven mounds. Burials make up a lesser, although significant, number of sites, with 7 recorded in the area. The remaining 3 sites are split between ochre mine locations (2) and Aboriginal places (1).

17.1.2 Field Survey Methods

The aim of the field survey was to identify the archaeological sensitivity of the study area. This assessment was determined by the criteria outlined below.

The archaeological survey team for the project consisted of Jakub Czastka and Emma Harrison of HLA, Richard Kerr of Moama LALC, and Rebecca Atkinson of Cummeragunja LALC.

The presence or absence of archaeological materials and the terrain features and integrity of sites were documented using a specifically designed recording form (see Table 3, **Appendix G**). A range of environmental attributes affects the detection of archaeological material during site surveys. Some of these features are vegetation cover, soil type and presence of naturally occurring surface rock. Ground surface visibility is also a major influence of artefact detection. The nature (i.e. size, colour, material type) of the archaeological material

also affects the effectiveness of the field survey. To assess the reliability of the survey results the following features were recorded for the site:

- Landform unit;
- Environmental setting within landform unit;
- Fall of slope along transect;
- Type of vegetation cover;
- Visibility levels measured as percentage of soil surface visible per transect;
- Type of ground exposure i.e. erosion or disturbance from mining activities;
- Frequency of exposures i.e. number in each transect;
- Size of exposures;
- Depth of soil erosion;
- Soil type and profile level exposed;
- Evidence of downslope movement of soil and rock particles;
- Presence of naturally occurring rock suitable for artefact production; and
- Presence of archaeological material.

The range of attributes relating to each of these environmental features across the site is reproduced in **Appendix G.** Terminology for all landscape descriptions was obtained from McDonald *et al* (1990).

Photography was also used to document the environmental and archaeological features of the survey area.

Transects were undertaken with a spacing of approximately 20 m between each person; therefore, with four people participating in the survey transects were up to 100 m wide. The effective field of vision (for detecting surface finds) was between 5 to 10 m (depending on vegetation) either side of each participant, giving a range for width of approximately 10 to 20 m for the surface area 'effectively' covered in any individual's transect. A conservative value of 10 m as the area effectively covered by each person, translates to coverage of approximately 40 % of any given 100 m wide transect.

The archaeological sensitivity of the study area was assessed on four criteria: the presence of known surface archaeological materials, the probability of undetected surface archaeological materials, the probability of subsurface archaeological materials, and the terrain integrity of each transect area. The presence or absence of surface archaeological materials and the level of effective ground surface visibility were documented during the field survey. The probability of additional surface artefacts occurring was based on these attributes. The assessment of the subsurface archaeological potential of the study area was based on the known patterning of archaeological materials in the area and field observations of the environmental characteristics and terrain integrity. These characteristics included the availability of stone materials, proximity to water resources, soil depth and landform unit.

17.2 Survey Results

The archaeological field survey of Moira Station cattle feedlot was conducted between Monday 4 April and Friday 8 April 2005. The survey was undertaken by: Jakub Czastka and Emma Harrison (HLA), Richard Kerr (Moama LALC), and Rebecca Atkinson (Cummeragunja LALC).

A systematic survey was undertaken, which covered transects across all sections of the study area. The route of the physical inspection paid particular attention to areas potentially impacted directly by surface and subsurface earthworks (i.e. for infrastructure). A small section of the irrigation areas was not covered, as they were either inundated at the time due to irrigation, and/or were deemed by HLA and the Aboriginal Sites Officers to be highly unlikely to contain heritage material - the latter based on direct experience gained from the Moira study area. Such areas were omitted on the basis that they were akin to a larger number of areas already surveyed at the site, these having withstood a high level of human and animal impact on the landscape. These practices are ultimately detrimental to the surface visibility of most archaeologically and culturally significant materials. The site survey results themselves show that no such areas surveyed at the site were found to contain heritage material.

The greatest influence on the landscape of the study area and hence the potential to detect archaeological sites is the irrigation, ploughing and laser levelling of the majority of the study area. The only area that was not obviously (recently) impacted by these farming practices was the north eastern block (the area between the 'ruins and shearing shed' and 'Moira irrigation channel' (Figure 11 in **Appendix G**) covering approximately 1,470m by 1,000m). Hence, although the visibility of the surface was excellent, a continuous process of sedimentation through irrigation and truncating surfaces through laser levelling of the landscape within much of the study area has affected potential archaeological deposits on or near the surface.

A total of 24 transects were walked across the study area, although the survey emphasis was on areas to be directly impacted by the proposed works. Transects are ideally separated on the basis of landscape features and landform type, but since the study area represents a large alluvial plain, largely featureless, man-made features such as irrigation channels and fencing usually demarcated transects. Each transect was individually described for potential surface and subsurface archaeology. The start, end and other relevant features were located with GPS, while multiple photographs across each transect were undertaken.

All transects were across what is identified as alluvial plain influenced by wind (scalding) erosion. The landform is essentially flat, relief across the study area being a maximum of 107 AHD and a minimum of 101 m AHD, the average relief across the study area being 103 – 104 m AHD. Gentle rises were present in the north east (to 107m AHD) and south west (to 105 m AHD) corners of the study area, with a slight depression in the south west (101m AHD). Overall the study area slopes from east to west – the product of uplift as a result of the Cadell faultline running immediately east of the study area boundary. All references in the ensuing discussion of transects to features such as the proposed 'feeding pens' or 'sedimentation pond' are marked on (Figure 11 in **Appendix G**).

17.2.1 Sites Located

Three Aboriginal sites were identified within the study area. All identified sites are located within Transect 15 of the survey, in an area that is not under direct impact from the proposed feedlot, and is relatively less disturbed than the surrounding landscape. All three archaeological sites have been identified as areas of high sensitivity.

The first Aboriginal site discovered was a scarred tree, identified as MF1. This scarred tree was found in the northern irrigation area, within a pocket of box tree and bull oak and associated sapling regrowth approximately 1 km west of the Cobb Highway. The area is adjacent to the northern extremity fence that runs in an east-west direction over the property. The site consists of a grey box tree (*Eucalyptus microcarpa*) of around 10 metres in height with at least 8 carved toeholds ascending up the central trunk of the tree. The substantial natural regrowth over these toeholds is indicative of the considerable age of the carvings. It is estimated that the tree itself is at least 150-200 years old. The carved tree would not be directly impacted by the proposed project, being located around 1km to the north of the area of potential impact.

Two further archaeological sites were identified. MF2 was identified as a hearth mound , located in the area adjacent to the northern extremity fence, approximately 800m west of the Cobb Highway. The mound consists of an area raised approximately 30cm above the surrounding flat, is approximately 9 metres in diameter from north to south, and is comprised of dark grey ashy deposits and large clumps of burnt clay. Such “oven mounds” are sites common to the Murray River Valley region.

The remaining site is an isolated artefact identified as MF3. Again situated in the area adjacent to the northern extremity fence, the site is approximately 480 metres west of the Cobb Highway. The site consists of a core fashioned from the base and lower walls of a bottle, indicating post-contact use of local Aboriginal stone tool technology. The core displays three clear flakes that have been struck off in a downward motion (towards the bottle base). Some microflaking may indicate earlier intentional flaking of the core. Stylistic traits of the bottle itself, such as the thick nature of the glass base and walls, the dark opaque colouring of the glass, and imperfections in the moulding of the base, show the considerable (historical) age of the glass medium.

17.3 Assessment of Archaeological Sensitivity

The assessment of the archaeological sensitivity of each survey unit is based on the following three criteria:

Criterion 1 The presence of known surface archaeological materials.

The known locations of previously recorded archaeological sites within the study area have been plotted on the topographic map of the region (Figure 1, **Appendix G)**. A review of archaeological work in the region and the AHIMS site cards, as well as the archaeological survey and assessment have identified that a number of previously recorded sites are near the study area.

Three new sites (MF1, MF2 and MF3) were identified, all at the northern extremity of the study area. MF1 is an Aboriginal carved tree; MF2 is a possible hearth mound, whilst MF3 is a glass core fashioned from a bottle base.

Criterion 2 The probability of undetected surface archaeological materials.

The probability of undetected surface materials occurring within the study area is assessed on a number of characteristics. These include:

- The analysis of effective ground surface visibility within the study area.
- The terrain context and integrity of areas.

The surface deposits of the study area revealed a highly disturbed landscape. Surface soils typically represented a mixed A and B horizon of loam. The post-war development of an irrigation system across the study area, with subsequent laser levelling, ploughing and irrigation (bringing in silts and clays to inundate and mix with surface deposits), in addition to around a 150 years of pastoral use of the study area, means that it has been impacted to such a high degree that the probability of the survey having missed surface archaeological materials is extremely low.

Criterion 3 The probability of subsurface archaeological materials.

The assessment of the subsurface archaeological potential of the survey area is based on a number of criteria, including:

- The known patterning of surface and subsurface archaeological materials throughout the local region.
- The terrain characteristics of known archaeological (surface and subsurface) sites.

Existing levels of terrain integrity and the demonstrated patterns of the surface and subsurface distribution of archaeological materials in the study area were used as the main evidence in the following evaluation. As there is no evidence of buried archaeological material in the immediate area, this evaluation is based upon the potential for intact natural soils to exist. Following geomorphological models. No areas were highlighted to have the potential to contain potential archaeological deposits. The alluvial floodplain represented by the study area has the potential to contain subsurface archaeological deposits wherever palaeosols are encountered dating to anywhere in the past 40-50 000 years. However, this point needs to be clarified in the context of the current study, no evidence of buried alluvial soils was observed during the course of the survey (although subsurface exposures were limited in number and value), nor did the geotechnical investigations identify any potential palaeosols. The last point should be made with the proviso, that the geotechnical investigations were limited to the engineering qualities of the study areas soils rather than their origin and chronosequence. Although the regional picture identifies a long history of landuse by Aboriginal people, these sites represent the exception rather than the rule. Therefore, the probability of subsurface archaeological materials within the study area is low.

17.4 Summary of Results

The archaeological survey and assessment divided the survey area into areas of low, moderate or high archaeological sensitivity. This assessment was based on three criteria: the presence of known surface archaeological materials, the probability of undetected surface archaeological materials, and the probability of subsurface archaeological materials. This assessment was therefore based on the results of the field survey, within the broader framework of the archaeological understanding of site distribution within this region.

In summary, there is a low to nil potential for archaeological material to occur in the areas currently affected by laser levelling, ploughing, irrigation services, and/or roads. This encompasses the vast majority of the study area (see Figure 5**, Appendix G)**.

Only one area has been assigned as moderate sensitivity due to its ‘relatively’ (in comparison with the remaining areas) undisturbed condition. It is located within the north eastern section of the study area and is outside the area of potential impact.

Three Aboriginal sites were identified: a scarred tree (MF1), a potential oven mound (MF2) and a glass bottle base reused as a core (MF3). All three locations have been identified as high sensitivity due to the presence of Aboriginal objects protected under the NP&W Act 1974 and are located outside the area of potential impact.

Table 17-2 lists the archaeological sensitivity of all transects recorded and areas examined and Figure 5 in **Appendix G** illustrates these locations.

Table 17-2: Archaeological sensitivity of areas examined

Low or Nil Archaeological Sensitivity	Moderate Archaeological Sensitivity	High Archaeological Sensitivity
All existing areas used for irrigation, ploughing and laser levelling, including roads and agricultural infrastructure – silos, sheds, irrigation channels	North eastern section of the study area	Areas containing known Aboriginal sites specifically MF1 to MF3

17.5 Statutory Controls

Sites of cultural heritage significance are protected or controlled by a number of varying levels of statutory control that vary according to Authority and site type. The nature and levels of controls on the project area are set out below.

17.5.1 Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC Act) Act, 1999* requires the approval of the Commonwealth Minister for the Environment and Heritage for actions that may have a significant impact on matters of National Environmental Significance (NES).

As of 1 January 2004 the EPBC Act also provides for the identification, conservation and protection of places of national heritage significance as a matter of NES. In addition the EPBC Act provides for the management of Commonwealth heritage places and establishes the Australian Heritage Council.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Heritage Protection Act) is the principal Commonwealth legislation protecting Indigenous heritage. The Act complements state/territory legislation and is intended to support state/territory laws and processes.

Under the Heritage Protection Act the responsible Minister can make temporary or long-term declarations to protect areas and objects of significance under threat of injury or desecration. The Heritage Protection Act also encourages heritage protection through mediated negotiation and agreement between land users, developers and Indigenous people.

Since the passage of this legislation:

- around 200 applications have been lodged under the Act
- eight declarations have been made protecting objects of significance to Indigenous people
- emergency (i.e. temporary) declarations have protected five significant places, and
- two long-term declarations remain in place, one protecting women's sites under threat from a dam near Alice Springs and the other (with effect from July 2000) protecting Boobera Lagoon in northern New South Wales.

On 17 December 1998 responsibility for administration of the Heritage Protection Act was transferred by Administrative Arrangement Orders from ATSIC to the Environment and Heritage

portfolio and the Heritage Protection Act is now administered by the Department of Environment and Heritage (DEH).

17.5.2 New South Wales

Environmental Planning and Assessment Act (1979)

The *Environmental Planning and Assessment Act* (EP&A Act) requires that consideration be given to environmental impacts as part of the land use planning process. In NSW environmental impacts are interpreted as including cultural heritage impact. Four parts of the EP&A Act are most relevant to Heritage. Part 3 relates to planning instruments including those at local and regional levels, Part 3A applies to environmental assessment and approval of major projects, Part 4 controls development assessment processes and Part 5 refers to approvals by determining authorities for projects which do not significantly affect the environment.

***National Parks and Wildlife Act* 1974**

The *National Parks and Wildlife Act* 1974 was amended in 2001 and some of the terms relating to Aboriginal archaeology have changed and the provisions have been tightened.

Under the provisions of the NP&W Act, Aboriginal archaeological sites are defined as Aboriginal objects (formerly called relics). Aboriginal object "means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains".

It should be noted that this definition technically would seem to exclude PADs as they are clearly not deposits, objects or material evidence; rather they are potential Aboriginal objects.

The most relevant section of the legislation is section 90, which deals with the destruction of Aboriginal objects.

It should be noted that section 90 applies to all Aboriginal objects irrespective of whether they are considered to be disturbed or not. The issue is whether reasonable precautions and due diligence was exercised to determine whether an Aboriginal object or place was going to be destroyed, defaced, damaged or desecrated or not. Thus if an area was identified as having archaeological potential and was disturbed or destroyed the defence of reasonable precautions and due diligence would not be available.

Section 87 of the Act covers permits to allow certain actions under section 86. This includes disturbing or excavating any land, or causing any land to be disturbed or excavated, for the purpose of discovering an Aboriginal object.

Under Part 3A of the EP&A Act, a project approval granted by the Minister exempts a project from the need to obtain a permit under section 87 of the NP&W Act, and provides the necessary defence under section 90 of the NP&W Act.

Murray Shire Local Environmental Plan 1989 (LEP 1989)

LEP 1989 requires that Aboriginal heritage assessments be conducted prior to the submission of development applications (part 3, clause 1d). The Council will not consent to an application to carry out development on land unless the potential impact on places and buildings of archaeological or heritage significance, including Aboriginal relics and places, has been

assessed. Council expects that the relevant steps (eg: permit applications as necessary) be taken prior to awarding development consent.

The proposed cattle feedlot project is a 'major project' under Part 3A of the EP&A Act and the Minister is the approval authority. As a consequence of part 3, clause 1(d) do not apply to the project. While this EA includes an Aboriginal heritage assessment, the need for permit applications does not apply to this project.

17.6 Mitigation Measures

The level of human impact, through irrigation, laser levelling and ploughing has substantially affected the study area. For this reason it seems highly unlikely that surface sites survive within the study area *in situ* and therefore these areas have been identified as being of low sensitivity. Areas that have been identified as being of low sensitivity do not require any further archaeological action.

However, regional studies (such as Kow Swamp and Lake Mungo) reveal that deep soil profiles, particularly spanning the last 50,000 years, are evident in the general area. No evidence of these sequences were found during the survey, but this is unsurprising due to the lack of sections within the study area and the normal location of these deposits relatively deep beneath the surface (which itself is often composed of modern European agricultural and grazing deposits.

No evidence of these deep soil profiles were located by the geotechnical personnel on site, however geological and quaternary maps do reveal palaeochannels (old river channels) within the general study area region. Typically geotechnical investigations do not observe or record the types of deposits that would be of archaeological interest.

Should substantial soil sequences be uncovered, the Moama LALC would be provided the opportunity to thoroughly investigate the deposits for archaeological material. The Moama LALC may wish to bring in specialist help, since significant existing archaeological material in this region is considered internationally and nationally significant.

A summary of the mitigation measures applicable to the site are provided below:

- Aboriginal objects are protected under the NP&W Act, regardless of location. Should any objects be identified during the course of site works, all works must cease and the DEC (South Western Branch, Environment Protection and Regulation Division, Regional Archaeologist) contacted in regard to appropriate requirements before any further impact is undertaken.
- Should suspected skeletal material be uncovered during the course of site works, all works must cease and the DEC, the NSW Police and the NSW Coroners office contacted immediately.
- The Moama LALC would be invited to undertake targeted monitoring of the excavations on site.
- Geotechnical personnel and Moama LALC working within the study area should be provided brief instructions by a qualified geoarchaeologist in identifying significant soil sequences and buried archaeological deposits. This may take place in a public forum to provide additional interest to the local community.
- If buried archaeological deposits are identified, work would stop and an investigation of the find should be undertaken by a qualified archaeologist in conjunction with the relevant aboriginal communities and DEC prior to work continuing.
- No further surface archaeological work is required in areas of low sensitivity.

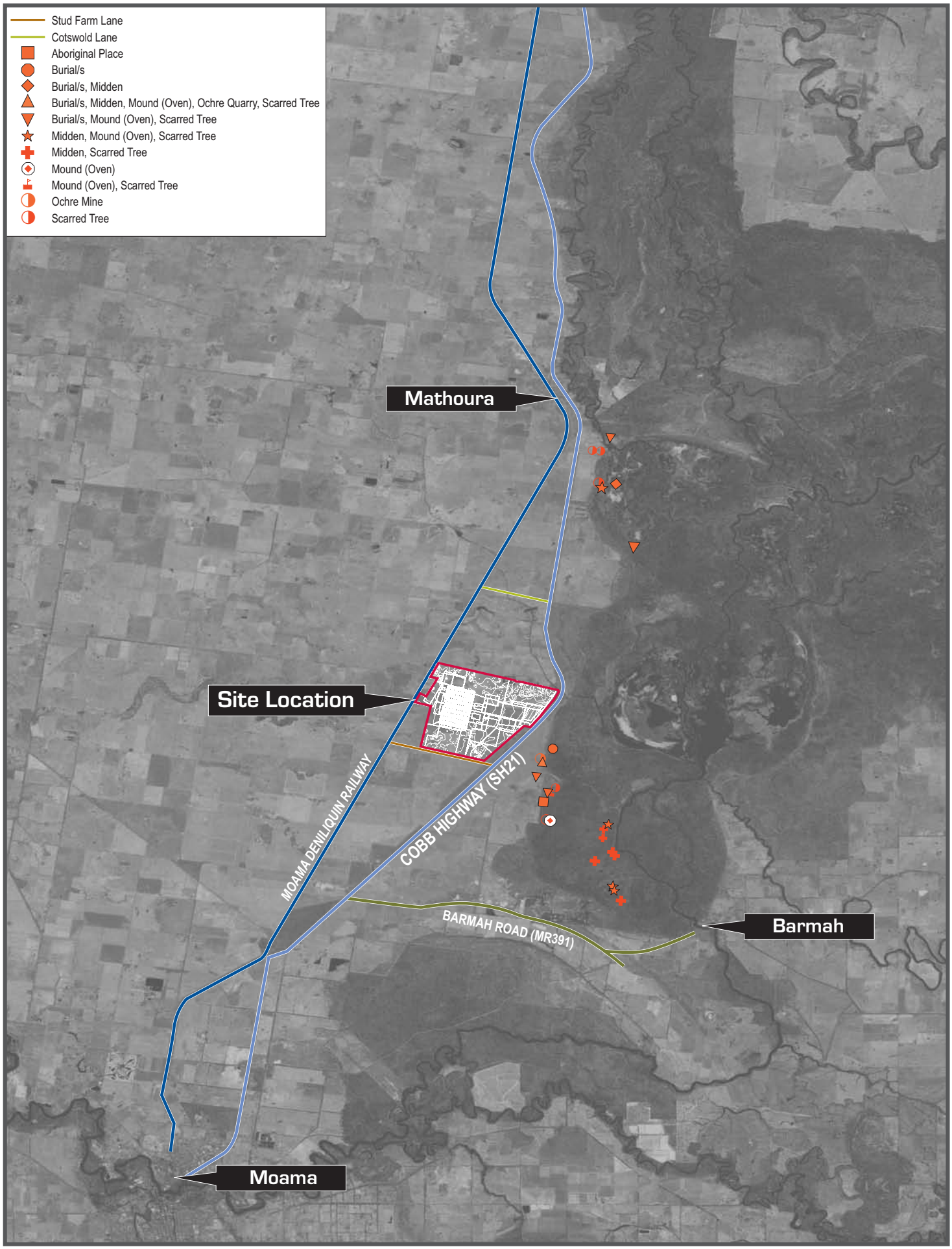
- All contractors who work within the confines of the study area would be made aware of the NP&W Act 1974 and the fact that it is an offence to move, disturb or destroy Aboriginal objects without the written permission of the Director General of the DEC.

17.7 Conclusion

The Aboriginal Heritage Assessment has identified three Aboriginal sites within the study area. However, the level of human impact, through irrigation, laser levelling and ploughing has substantially affected the study area and for this reason it seems highly unlikely that surface sites survive within the study area *in situ*. All identified sites are located within Transect 15 of the survey, in an area that is not under direct impact from the proposed feedlot. All archaeological sites have been identified as areas of high sensitivity.

As shown in Figure 10 (**Appendix G** in Volume 2 of this EA) the areas of high sensitivity located within the study area will not be impacted by the proposed development and there are therefore no further archaeological requirements. Any future proposed impacts should be preceded by detailed archaeological investigation. Management of these areas, at this stage, will not require any form of archaeological permit.

Prior to any development, all contractors on site should be advised of the potential for buried archaeological deposits, specifically burials, and the protocols that should be undertaken following their discovery.



HLA

AHIMS Registered Sites
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

0 4
Kilometres

FIGURE
17.1

PROJECT-FILE NAME **S60133** DATE **27 September 2005** DRAWN **TO** APPROVED

18 LANDSCAPE AND VISUAL AMENITY

18.1 Visual Character of the Surrounding Landscape

The landscape surrounding the project site is flat. Much of the area has been cleared and replaced with cultivated and uncultivated paddocks and irrigation channels, although some areas of remnant vegetation remain. The vegetation consists of Box Communities, Black Box Communities and River Red Gum Communities with trees typically 20m in height. The surrounding area contains no significant spot heights with the area at a relief of approximately 100 m AHD.

The landscape changes dramatically as one moves east towards Lake Moira, the wetland system and the Murray River. The land to the east of the site consists of dense vegetation, while vegetation becomes more sparse and remnant toward the west.

18.2 Visual Character of the Site

The topography of the site and the surrounding land is generally level and open. There is a slight slope from east to west across the site from 107m AHD to 101m AHD. In some areas there is a clear line of sight across the property from the Cobb Highway to the Moama-Deniliquin Railway line in the west.

The north eastern part of the site contains scattered stands and isolated remnants of mature native trees. Some areas of the site have been cultivated with lucerne but in general the land is covered with low grasses with little evidence of a shrub understorey due to grazing. Numerous irrigation channels cross the site. These channels connect with the Moira Irrigation Channel to the north of the site.

The shearing sheds and ruins located on the site date to the 19th century and provide evidence of the historic landuses of the site. These buildings are in a dilapidated state and would not be impacted by the proposed development.

18.3 Visual Receptors

The surrounding area to the proposed project comprises agricultural land with the main activity being cropping. As shown in **Figure 19.1**, there are few residences located within 5km of the site and it was considered appropriate that the residences identified in the Odour Impact Assessment (see **Section 11**) were used as visual receptors.

Each identified visual receptor was assessed with respect to:

- View type from the receptor (eg permanent or intermittent views);
- Distance from the receptor to the proposed project; and
- Sensitivity of the receptor (eg residences have a higher sensitivity than a road user).

A field inspection was undertaken between 28 and 30 June 2005 to identify and assess potential viewpoints. If the viewpoint was deemed to be a receptor, it was then classified as high, medium or low. A brief analysis of potential viewpoints is illustrated in **Table 18-1**.

Table 18-1: Viewpoint Selection

Identifier	Type of Viewer	Distance to proposal boundary	Type of View	Sensitivity
R1	House	265m	Static	High
R2	House	50m	Static	High
R3	House	300m	Static	High
R4	House	190m	Partially Obstructed	Medium
R5	House	360m	N/A	N/A
R6	House	2,565m	N/A	N/A
R7	House	470m	N/A	N/A
R8	House	1,400m	N/A	N/A
R9	House	2,110m	N/A	N/A
R10	House	2,880m	N/A	N/A
R11	House	2,540m	N/A	N/A
R12	House	1,020m	Partially Obstructed	Low
R13	Silos/Sheds	1,980m	N/A	N/A
R14	Silos/Sheds	1,725m	N/A	N/A
R15	Silos/Sheds	1,345m	N/A	N/A
R16	House	3,550m	N/A	N/A
R17	House	4,180m	N/A	N/A
R18	House	5,830m	N/A	N/A
R19	House	6,220m	N/A	N/A
R20	House	5,905m	N/A	N/A
R21	Silos/Sheds	3,460m	N/A	N/A
R22	Silos/Sheds	1,560m	N/A	N/A
R23	Silos/Sheds	3,290m	N/A	N/A
R24	Silos/Shed	215m	N/A	N/A
Cobb Highway	Road users	30m	Intermittent	Low

As indicated in **Table 18-1**, it was established that the majority of these residences do not have direct views to the proposed feedlot and would not be impacted by the project. Generally, there are two main factors contributing to the lack of a direct view of the proposed project. The primary factor is due to the amount of scattered vegetation in the area between receptor and the proposed project. This vegetation obstructs the view of the majority of the potential surrounding viewpoints. Secondly, the considerable distance between the majority of receptors and the proposed project minimised the probability of a sensitive view of the proposed feedlot.

Six viewpoints were selected as they may be potentially impacted by the proposed project. These viewpoints were R1, R2, R3, R4, R12 and Cobb Highway and are assessed in **Section 18.4.2**.

18.4 Impact Assessment

18.4.1 Visual Absorption Capacity

Visual absorption capacity is the level of visual contrast of the proposed cattle feedlot to the context in which it is placed. The existing landscape consists of some vegetation communities, as detailed in **Section 16** and shown in **Figure 16.2**. These vegetation communities are generally located in the northern section of the site. The majority of the site consists of cleared paddock, which resembles the nature of this section of the Riverina.

It is considered that the proposed project is consistent with the nature of the agribusiness undertaken in the local area. As such, the elements associated with the project are generally consistent with infrastructure usually associated with these agricultural activities. However, the infrastructure required for the proposal would be on a larger scale than currently exists in the Mathoura area.

The siting of the footprint of the proposed project in the western portion of the site increases the distance between the larger project elements (pens and retention ponds) and the majority of receptors, which would enhance the absorption capacity of the existing viewshed.

It is considered that the amount of vegetation in the area of the proposal and the distance between the receptors and the proposed project generally reduces the potential visual impact due to the visual absorption capacity of the existing environment.

18.4.2 Viewpoint Assessment

The potential visual impact of the project would be a result of construction activities and the impact of the final built form on the environment. As discussed in **Section 18.3**, there are relatively few sensitive visual receptors to the proposed project. An inspection of the site and surrounding area was undertaken from 28 to 30 June 2005 to determine the sensitivity of nearby receptors to the proposed project.

The impact assessment verified the location of sensitive visual receivers to the proposed project, as shown in **Figure 18.1**. The assessment took into account the nature of the landscape, topography, the distance between the receptor and the project as well as the type of view experienced. The assessment concluded that whilst there was a considerable amount of vegetation in the vicinity, a number of residential properties would experience some level of visual impact as a result of the proposed cattle feedlot.

The majority of the selected viewpoints, as shown in **Table 18-1**, would experience a relatively low level of visual impact, however R2 would experience a medium level of impact due to its close proximity to the proposed project.

A summary of the visual impact assessment is provided in **Table 18-2**.

Table 18-2: Viewpoint Assessment

Viewpoint	Distance to property boundary	Vegetative Cover/Topography	Impact Assessment	Significance of Impact
R1	265m	As noted in **Section 16**, there are considerable amounts of Box community in the north east corner of the site (refer **Figure 16.2**). The vegetation is typically 20m in height.	The Box community vegetation in the north eastern corner of the site effectively screens the proposed pens, holding pond and the effluent storage and from the view from R1. However, R1 would be able to view the walls of the freshwater storage located on the eastern section of the site. The remainder of elements associated with the project are not expected to be visible from R1 due to the considerable distance to the receptor.	Low
R2	50m	This property contains a large section of Black Box situated immediately to the north west of R2. The vegetation is typically 20m in height.	The Black Box community obstructs the view of the northern half of the proposed project from R2. However, R2 would be able to view the remainder of the site with an unobstructed view of the southern section of the pens and the southern section of the holding pond. Additionally, there expected to be distant views of the mill and receivals area. The views of these project elements are expected to impact the visual amenity from R2.	Medium
R3	300m	Minimal vegetation present between R3 and the proposal. A 2 metre high bund is located immediately west of R3 (refer to **Plate 4**).	As shown in **Plate 4**, a bund is situated between the receptor and the proposal. The height of the bund currently obstructs the view of a large portion of the site. It is considered that there would be minimal visual impact from the homestead at R3.	Low

Viewpoint	Distance to property boundary	Vegetative Cover/Topography	Impact Assessment	Significance of Impact
R4	190m	Scattered vegetation is located on the property of R4 between the receptor and the proposal (refer to **Plate 5**). The vegetation is typically 20m in height.	As shown in **Plate 5**, the vegetation located between the proposed project and R4 largely obstructs the proposed project from view. It is considered that the proposed project would result in minimal visual impact to R4 due to the vegetative screening and visual absorption capacity.	Low
R12	1,020m	Scattered vegetation is located on the property of R12 between the receptor and the project (refer to **Plate 6**).	As shown in **Plate 6**, the vegetation located between the proposed project and R12 largely obstructs the proposed project from view. Additionally, the absorption capacity (see **Section 18.4.1**) and the considerable distance to the proposal reduces the visibility of the project. As a result, there is expected to be minimal visual impact to R12.	Low
Cobb Highway	100m	Sparse vegetation lines the eastern boundary of the proposed site (refer to **Plate 7**).	The road occupies some 500m along the eastern boundary of the site The major elements of the project are located some 1.2km from the road. Road users are expected to experience minor and intermittent views of the proposed feedlot. Elements of the feedlot that would be expected to be visible include the feed mill and buildings. However, due to the considerable distance to these elements and the temporary nature of the view, it is considered that there would be minimal visible impact.	Low

Plate 4
View of bund in front of R3

Plate 5
Scattered vegetation screening R4

Plate 6
Vegetation screening R12

Plate 7
Scattered vegetation along Cobb Highway (looking south)

18.5 Conclusion

There are a number of residences surrounding the proposed cattle feedlot at Moira Station. As indicated in **Table 18-1**, few of these potential receptors are located within 400m of the proposed project.

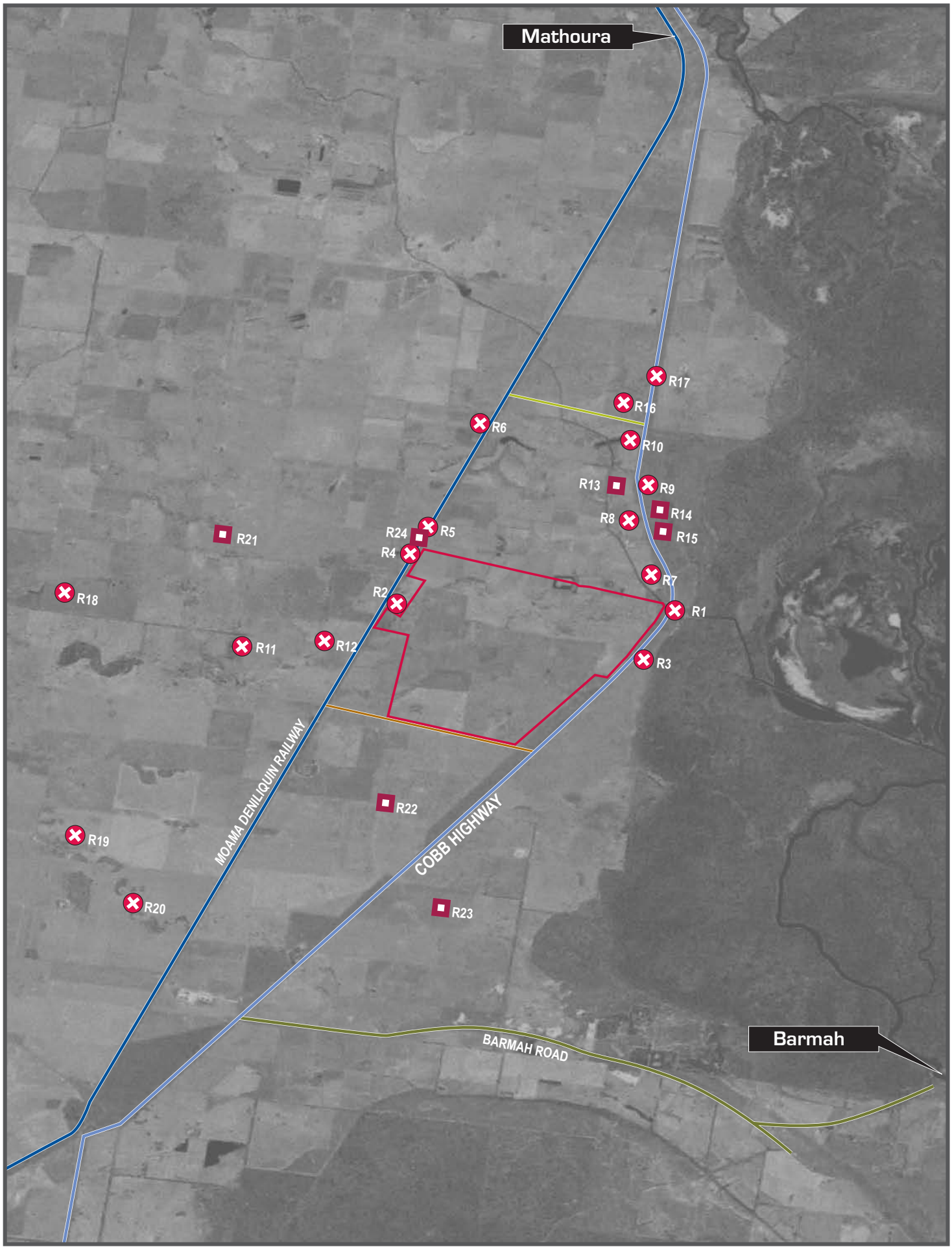
The views of the proposed project from these viewpoints were assessed by taking into account the visual absorption capacity of the proposal and the types of views experienced from these viewpoints. The type of view took into account the type of viewer, the nature of the view and also the distance to the proposal.

The assessment deemed that the nature of the proposed project would be consistent with the existing agricultural activities in the surrounding area. Whilst the infrastructure required for the proposed project, such as holding ponds and pens, would be on a larger scale to existing infrastructure in the local area, it is considered that the proposed project would assimilate into the local landscape due to the nature of the proposal and the high visual absorption capacity of the surrounding landscape.

The site where the project is proposed is some 1,200 hectares in area and contains some remnant vegetation along the northern boundary. This vegetation screens the proposed project from a number of potential receptors, as shown in **Table 18-2**. As a result, each of the viewpoint assessments indicated that there was expected to a low level of visual impact from to the proposed project.

A residential receptor, R2, which would experience a medium level of visual impact, is currently under negotiation for purchase with the applicant in order to reach a mutually acceptable solution should the development be granted approval from the Minister.

Overall, it is expected that the proposed project would not create significant visual impacts to receptors in the surrounding area.



HLA

Receptor Locations
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

Stud Farm Lane
Cotswold Lane
Residence
Silos/sheds

N

0 2
Kilometres

FIGURE
18.1

PROJECT-FILE NAME **S60133** DATE **27 September 2005** DRAWN **TO** APPROVED

19 NOISE

19.1 Existing Environment

The site is located in a rural area dominated by agricultural activities. There are a few residences in the vicinity of the proposed project. As shown in **Figure 18.1**, the nearest residential receiver is approximately 500 metres to the north west of the site of the proposed feedlot. The main sources of noise in the vicinity of the site are from traffic on the Cobb Highway (SH21) and trains on the Moama-Deniliquin Railway.

Due to the nature of the proposed project and the surrounding area, no monitoring was undertaken to define the existing background noise levels in the vicinity of the proposed project. As such, the noise assessment has undertaken the following assumptions:

- There are no significant noise sources in the locality; and
- Existing background levels would be comparable to those of a typical rural environment. The minimum background level for rural areas of 30dB(A) (DEC, 2000) has been used for this assessment.

19.2 Noise Assessment Criteria

19.2.1 Construction

Chapter 171 of the *Environmental Noise Control Manual* (EPA, 1994) recommends limits for construction noise.

For a construction period of 4 weeks and under:

> *The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20dB(A).*
>
> For a construction period greater than 4 weeks and not exceeding 26 weeks:
>
> *The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10dB(A).*

The construction periods and specified limits are generally considered to be interpreted that, within any construction period, noise can be up to 20dB(A) above the background for any four weeks, up to 10dB(A) above the background for any twenty six weeks, and no more than 5 dB(A) above the background for the remainder of the construction period.

The construction program required for the development of the feedlot would be undertaken over a 6 month period although certain construction activities would take place over a shorter construction period, within the overall program. Applicable noise criteria which would apply during the construction period are shown in **Table 19-1** below.

Table 19-1: Applicable Noise Criteria During Construction

	0 to 4 weeks	4 to 26 weeks
Maximum Construction Noise Levels	50 dB(A)	40 dB(A)

19.2.2 Operation

The *New South Wales Industrial Noise Policy* provides intrusiveness and amenity criteria. This proposal adopts the intrusive criteria only as there are no other significant noise sources in the vicinity.

Intrusiveness Criterion

The intrusiveness of a noise source is generally considered acceptable if the equivalent continuous (energy average) A-weighted level of noise from the source measured over a 15 minute period does not exceed the background noise level measurement by more than 5dB(A).

Monitoring has not been undertaken to establish background noise levels at the site as the background noise would be typical of a rural environment and therefore the minimum limit of 30dB(A) has been used. The intrusiveness criterion for the site is therefore 35dB(A).

19.2.3 Traffic

Construction

There are no noise criteria for construction traffic noise.

Operation

The EPA's *Environmental Criteria for Road Traffic Noise* provides criteria to be applied for particular types of road and land uses. The criterion considered relevant for the proposal is reproduced in **Table 19-2** below.

Table 19-2: Nominated Road Traffic Noise Criteria

Type of Development	Day 7am-10pm	Night 10pm-7am	Where Criteria are already Exceeded
7. Land use developments with potential to create additional traffic on existing freeways/arterials	$L_{eq(15hr)}$ 60	$L_{eq(9hr)}$ 55	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dB.

19.3 Assessment of Impacts

There is the potential for noise impacts as a result of the following:

- Construction noise;
- Operation of the feedlot; and
- Road traffic noise from the operation of the feedlot.

19.3.1 Construction

The construction of the feedlot is expected to take approximately 6 months. Noise generating equipment which would be required is shown in **Table 19-3** below.

Table 19-3: Noise Generating Construction Equipment

Type	Purpose	Typical Sound Power Level (db(A))
Bulldozers	Earthworks, clearing vegetation	110
Excavator	Excavation of soil for pens, ponds, drains.	105
Grader	Site levelling	109
Truck	Haulage of materials, pen construction	105
Concrete Mixer	Slab construction	105
Scraper	Earthworks	112

Source: AS 1055.1-1989 Acoustics – Description and measurement of environmental noise

Hours of construction activities would be limited to Monday to Friday, 7am to 6pm and Saturday 8am to 1pm. Construction work would not take place on Sundays or Public Holidays.

There are a number of residential receptors in the vicinity of the proposed project potentially impacted from construction noise. Predicted noise levels at these receptors have been calculated from noise attenuation data and are shown in **Table 19-4**.

Table 19-4: Predicted Sound Power Levels at Nearby Receptors

Receptor	Distance to nearest activity	Nearest Activity A-weighted Sound Power Level at Source (db(A))	Deduction from A-weighted Sound Power Level[1] (db(A))	Predicted A-weighted Sound Power Level (db(A))
R1	2,000m	109	74	35
R2	500m	112	64	48
R3	500m	112	64	48
R4	1,080m	112	68	44
R5	1,440m	110	71	39
R6	3,000m	109	78	31
R7	1,320m	112	70	40
R8	2,000m	112	74	38
R9	3,000m	112	78	34
R10	4,000m	112	80	32
R11	3,200m	112	78	34
R12	1,800m	112	72	40
R16	6,000m	109	84	Background levels
R17	6,500m	109	84	Background levels
R18	7,000m	112	84	Background levels

Receptor	Distance to nearest activity	Nearest Activity A-weighted Sound Power Level at Source (db(A))	Deduction from A-weighted Sound Power Level[1] (db(A))	Predicted A-weighted Sound Power Level (db(A))
R19	7,500m	112	86	Background levels
R20	8,000m	112	86	Background levels

Notes – (1) Deduction from A-weighted Sound Power Level obtained from Figure B1 and Table D1 in AS2436-1981 – Guide to Noise Control on Construction, Maintenance and Demolition Sites.

As shown in **Table 19-4**, temporary adverse noise impacts are expected at R2, R3 and R4 during the construction of the freshwater storage (R3) and holding pond (R2 and R4). However, the use of scrapers, scrapers and bulldozers for these project elements is expected to continue for less than 4 weeks and the predicted levels meet the DEC construction noise criteria for construction activities of between zero and four weeks duration.

The majority of receptors in the vicinity of the proposed project are located a considerable distance from the site. As a result, there are expected to be minimal adverse noise impacts from construction activities on residential receptors.

19.3.2 Operation

Noise generated from the operation of the feedlot would be from the infrequent operation of machinery and equipment on the site and from animal noise.

The feedlot would operate between 6am and 7pm seven days per week, fifty two weeks a year. Activities including the receipt and dispatch of cattle, feeding, cleaning and maintenance would occur throughout the day. Pens would be periodically cleaned using a front end loader and the manure placed into compost stockpiles.

Increased noise from cattle would generally occur during loading and unloading of cattle and any situations where cattle may be distressed. Stress impacts upon cattle growth, and would therefore be minimised to ensure cattle are healthy and well thereby ensuring optimum growth.

Table 19-5 below indicates the predicted noise levels during various operational activities associated with the feedlot.

Table 19-5: Operational Sound Power Levels

Plant/ Equipment	Typical Sound Power Level (db(A))
Feed Mill	86 at 7m
Front End Loader	86 at 7m
Tractor	84 at 7m
Trucks (cattle and grain)	86 at 7m

Noise generation from the operational activities of the feedlot are not expected to adversely impact upon residential receivers due to the considerable distance between the site location and receivers shown in **Table 19-4,** the typical sound power levels of operational equipment and the relatively short periods of continuous activity. It is expected that noise from the trucks associated with the proposed project would satisfy the road traffic noise criteria outlined in **Section 19.2.3**.

19.3.3 Traffic

Increased traffic generation on the Cobb Highway would result in an associated increase in traffic noise. The proposal is expected to generate approximately 182 vehicle movements per day (91 to the north and 91 to the south). However, due to the low numbers of existing traffic on this road, the similarity of vehicles generated by the project and those currently using the Cobb Highway, and the few sensitive receivers the potential increase in traffic noise is not expected to exceed the DEC Traffic Noise Criteria for this type of development and any additional noise is not likely to impact upon the surrounding population.

19.4 Mitigation Measures

Table 19-6 details the measures proposed to minimise the potential for noise as a result of the proposal.

Table 19-6: Mitigation Measures

Issue	Safeguard	Phase
Construction Noise	All plant and equipment required would be well maintained and regularly serviced.	Construction
	All plant and equipment would be installed with the appropriate noise attenuation apparatus.	Construction
Operational Noise	Experienced stockmen would be employed to manage cattle to ensure they are handled quietly and efficiently.	Operation
	Any distressed cattle would be investigated immediately to alleviate their stress.	Operation

19.5 Conclusion

Noise generated from the proposed cattle feedlot would occur during construction and operational activities. Traffic noise would also be generated from the traffic movements associated with each of these activities.

There are very few residential (sensitive) receptors in the vicinity of the noise sources of the proposed project. These residential receptor locations are shown in **Figure 18.1**, with the nearest residential receptor located approximately 1km away from the proposed project. Some minor adverse noise impacts are expected at R2, R3 and R4 during the noisiest construction activities, which is the excavation of the freshwater storage and holding pond. However, the activities generating these noise impacts would be temporary in nature and predicted noise levels from these activities meet the DEC construction noise criteria.

Operational activities of the feedlot involve infrequent noise generating activities through the use of plant and machinery on site. Due to the significant distance to the nearest receptor and as the operational activities of the proposed project are consistent with the activities of the existing agricultural activities of the surrounding area, the noise generated from the proposed project is not expected to create a significant impact on the surrounding environment.

While the operation of the proposed feedlot will generate additional traffic, the level and types of traffic generated would not be expected to exceed Traffic Noise Criteria.

20 HAZARD AND RISK

20.1 Introduction

A review of SEPP 33 and the Guideline document "Applying SEPP 33" was undertaken as part of the preparation of this EA. The proposed development falls within the definition of 'intensive livestock keeping establishment' under the Murray LEP 1989 and is therefore not within the definition of "industry" and *SEPP 33 Hazardous and Offensive Development* does not apply to the proposal. Therefore a Preliminary Hazard Analysis is not required.

However, other hazards and risks involved with the proposal include:

- Risks to human health and safety;
- Risks to animal health; and
- Other risks to the biophysical environment.

20.2 Assessment of Risk to Human Health and Safety

There are a number of risks involved in work with animals and these include the potential for contracting zoonotic diseases, which are diseases that are spread to humans by infected animals. One of these diseases is Q-Fever. Q fever is primarily a risk to workers in the livestock, agriculture, veterinary and meat industries, and therefore has been considered as part of this assessment for the proposed cattle feedlot.

Q-Fever is an infection resulting from the organism *Coxiella burnetii*, and was first identified in Australia in the 1930s and the infection became known as "Query" fever as the cause of the illness was then unknown. Cases of Q-fever have been recorded in every country except New Zealand (http://www.addl.purdue.edu/newsletters/2004/spring/qfever.htm). Q-Fever is a zoonotic disease, therefore it is spread to humans by infected animals.

C. burnetti can exist in a variety of domestic and wild animals without the animal displaying apparent signs of infection. In Australia *C. burnetti* is maintained in the wild by kangaroos, bandicoots and rodents. Domestic animals such as goats, cattle and sheep and their ticks also often carry the organism. Infected animals excrete the organism in their urine, faeces, milk and birth by-products.

The *C. burnetti* organism is very resilient and it has the ability to withstand harsh environmental conditions. It has been found to be resistant to heating, drying and sunlight and to survive for more than a year at 4°C in a dried state (O'Neill, 1997).

Humans are most commonly infected by the inhalation of the organism as a result of direct or indirect exposure from contaminated particles or droplets in the air. Infection can also occur via skin abrasions or splashes of infected material into the eye. Human to human infection is very uncommon as is infection from tick bites (O'Neill, 1997). The usual incubation period for the development of the disease in humans is 19 to 21 days. Symptoms of the disease include acute fever, chills, sweating, cough, severe headache, muscle pains and weakness. As the symptoms are similar to influenza and other viruses a series of laboratory tests are required to confirm the diagnosis. Individual responses to the infection vary. Some people exposed would not experience any symptoms, others may experience symptoms for a few days while typically, the disease manifests with fever lasting 7 to 10 days accompanied by nausea, vomiting, diarrhoea and weight loss. In some cases acute infection can develop into a chronic condition

and can lead to complications such as endocarditis (inflammation of the interior of the heart) and post Q-fever fatigue syndrome.

Q-fever is mainly acquired by workers in the livestock, agriculture, veterinary and meat industries as these people are more likely to come into contact with airborne particles created from tissue, waste and dust from infected animals. Therefore, there is the potential for employees at the site to come into contact with the organism.

Other general occupational health and safety (OH&S) risks for employees such as general safety for working with machinery and cattle would be managed with the implementation of an OH&S Management Plan for the operations at the feedlot.

20.3 Assessment of Risks to Animal Health

There are a number of potential risks to cattle health in a feedlot environment as animals reside in close contact. Potential risks include disease and heat stress. The welfare of cattle is an important consideration to maximise cattle growth and productivity therefore the feedlot has been designed and would be operated to ensure that the health and well being of cattle is maintained.

There are a number of illnesses and diseases which affect cattle, particularly in feedlots. However, the feedlot has been designed to best practice standards in order to minimise potential for disease and for spread of disease. The feedlot would also be operated in accordance with the requirements of NSW Agriculture.

High temperatures with high humidity and no wind, especially when temperatures are high overnight can result in heat stress in animals (NSW Department of Primary Industries, 2004). Healthy cattle can tolerate extremes of heat and cold if they are acclimatised and have adequate feed and water and this would be provided. Should there be conditions when heat stress may be likely, measures, as outlined below, would be implemented to prevent animals suffering heat stress.

20.4 Assessment of Risk to Biophysical Environment

Risks to the biophysical environment would include the impacts of pests, odour, dust and irrigation on the receiving environment. An assessment of odour and dust and measures proposed to minimise impacts is found in **Section 11**.

Irrigation of wastewater from the feedlot would be undertaken in accordance with the Effluent Irrigation Management Plan (EIMP) as outlined in **Section 12**.

The number of pests and insects, particularly flies, may increase as a result of the operation of the feedlot. Measures to manage pests are outlined in the **Section 20.5** below.

20.5 Mitigation Measures

Table 20-1 details the measures proposed to minimise potential risks to human and animal health and to the biophysical environment as a result of the proposal. The most significant potential risk or hazard that may result from the proposal is considered to be disease from the animals.

Table 20-1: Mitigation Measures

Issue	Safeguard	Phase
Human Health	Development and implementation of an OH&S Management Plan.	Pre-operation
	Employees required to be vaccinated against Q-fever.	Operation
	Maintenance of buffer areas between irrigation area and sensitive receivers.	Operation
Animal Health	Preparation of an Animal Care Statement (ACS) for the operation of the feedlot.	Operation
	Provision of sprinkler (cooling) systems for the feed pens.	Operation
	Provision of hospital pens to isolate sick animals.	Operation
Biophysical Environment	Development of an integrated feedlot management strategy which would include a pest control strategy. This would include: • Treating cattle with commercial fly control chemical; • Continual maintenance of the pen surface and drains; • Regular removal of manure from the feed pens; • Weekly cleaning of the water troughs; • Weekly cleaning of residual and spilt feed along the feed troughs; • Regular removal of solids from the sedimentation basin; • Maintaining a minimum inventory of manure at the feedlot	Operation

20.6 Conclusion

There are some potential hazards and risks associated with the construction and operation of the proposal. The assessment has identified potential risks to human health and safety, potential risks to animal health and potential risks to the biophysical environment.

The main human risk is the potential for Q-fever, which is mainly acquired by workers in the livestock, agriculture, veterinary and meat industries as these people are more likely to come into contact with airborne particles created from tissue, waste and dust from infected animals. The preparation and implementation of an Occupational Health and Safety (OH&S) Management Plan for the operations at the feedlot would manage the OH&S risks for employees such as general safety for working with machinery and cattle, including methods of managing the potential to acquire Q-fever.

The proposed cattle feedlot also has the potential to impact upon the health of the animals through heat stress created from the climatic conditions. Mismanagement of the feedlot would also adversely impact upon the welfare of the animals. As discussed in **Section 6.10**, an Animal Care Statement (ACS) would be prepared prior to stocking the feedlot. The ACS would outline management measures aimed at preserving the welfare of the animals within the feedlot.

The biophysical environment would also be potentially impacted by the proposal, in particular odour and wastewater. **Sections 11** and **12** assess the potential impacts to these biophysical elements and outline measures to be implemented in order to minimise potential adverse impacts.

In summary, the proposed cattle feedlot is not expected to create significant hazards or risks to humans, animals or the biophysical environment provided the mitigation measures outlined in **Section 11.5** are implemented.

21 SOCIAL AND COMMUNITY

21.1 Overview

The Murray Shire is situated in the Southern Riverina some 800km south of Sydney and around 205km north of Melbourne, and covers an area of approximately 90,287km^2. The main towns in the Murray Shire LGA are Mathoura and Moama. Echuca, located on the other side of the Murray River in the Moira Shire forms a joint urban area with Moama. Echuca-Moama was once the largest inland port in Australia as it was the closest port on the Murray River to Melbourne.

The main towns in the Murray Shire are typical of Australian rural towns, with the main street being the focal point for business and services. Many of the main social services are provided to the population of the Murray Shire by the larger centres of Deniliquin and Echuca. Many government services which were previously provided throughout the region have been moved to Albury in the last 5 to 10 years. The Murray Shire has grown over the last 5 years as shown in **Table 21-1** and in the growth of building approvals in the Murray.

The character of the area is founded upon the key agricultural industries which include sheep, beef, cropping and rice. Land uses surrounding the site are mainly agricultural in nature, and include other large agribusinesses, pastoral leases and some residences.

21.2 Social Impact

The social impact of a proposal is the effect that it may have on people. This includes how it may alter their way of life, the character, cohesion and demography of the community or their customs and values. Social impacts may be able to be quantified, such as effects on employment or population, or they may be qualitative, such as effects on the amenity of the area, the perceptions of the community towards the proposal or effects on community cohesion.

21.3 Social Characteristics

21.3.1 History

Prior to European settlement the area was occupied by local Aboriginal people. The Aboriginal population was sustained by the permanent, plentiful water supply and an abundance of animal and plant foods, particularly in lake and swampland areas.

The Murray Shire region was developed in the 1840s by squatters following the route of the overlanders as they drove cattle from Sydney to Adelaide in the late 1830s. From the 1860s onwards, the selectors, mainly from Victoria, moved onto the squatters' land, with their interest in agriculture. The settlements of Moama and Mathoura survived over the years as centres for the movement of agricultural produce and as the timber industry grew.

21.3.2 Population and housing

The population of the Murray Shire has been growing gradually over the past five years as shown in **Table 21-1**. The estimated total resident population of the Murray Shire in 2003 is 114,230, with the 2001 census recording a population of 113,397. Echuca-Moama is estimated to have a population of approximately 16,000 and the township of Mathoura a population of approximately 750.

Approximately 70% of the Murray Shires' population live within 'inner regional' cities which means that geographic distances to these areas impose some restrictions on the accessibility to the widest range of goods, services and opportunities for social interaction, while some 27.5% of the population live in 'outer regional' areas which have moderate restrictions on the accessibility to goods and services.

Table 21-1: Estimated Resident Population for the Murray Shire

	Year				
	1999	2000	2001	2002	2003
Total Population	112,024	112,342	113,397	113,956	114,230
Percentage aged 14 years and younger	22.3	22.1	21.9	21.7	21.2
Percentage aged 15 to 44 years	40.0	39.6	39.2	38.9	38.6
Percentage aged 45 to 64 years	23.4	23.9	24.2	24.4	24.9
Percentage aged 65 and over	14.3	14.4	14.7	15.0	15.3

Source: ABS National Regional Profile (cat. no. 1379.0.55.001)

Demographics of the Murray Shire are similar to those for NSW, with 21.2% of Murray Shire population aged 14 years and younger compared to 20.8% for NSW. The percentage of the population aged 65 and over at 15.3% is slightly higher than the NSW average of 13.1%. The percentage of the population aged over 45 has been growing, while the population younger than 45 is declining. In particular, river towns in the Murray catchment are growing, this is considered to be a result of retirees moving to these areas.

The vast majority of the population live in detached houses, and of these, 46% are fully owned and 28% are being purchased.

21.3.3 Education and Employment

The workforce in the Murray Shire is dominated by people with certified vocational skills or people who do not have a qualification (or those whose qualification was out of the scope of those surveyed in the census). Approximately 12.5% of the population have a Diploma or Degree qualification, as seen in **Table 21-2**.

Table 21-2: Qualification of Population aged 15 years and older in 2001

Qualification	Percentage
Postgraduate Degree	0.7
Graduate Diploma and Graduate Certificate	1
Bachelor Degree	6
Advanced Diploma and Diploma	4.8
Certificate	17
Not stated[1]	12.5
Not applicable[2]	58

Source: ABS 2001 Census of Population and Housing
1 Includes 'Inadequately described'.
2 Includes persons who do not have a qualification and persons who have a qualification out of scope of the Australian Standard

According to the 2001 census, a total of 31,119 Murray Shire residents were employed full time, 14,938 were employed part time and the unemployment rate was 6.2%.

The agriculture/forestry and fishing industries combine to employ the highest percentage of workers in the Murray Shire, as shown in **Table 21-3** below. This is followed by the retail and manufacturing industries which employ 14% and 13% respectively.

Table 21-3: Employment Distribution by Industry in 2001

Industry	No. of people employed	Percentage
Agriculture, Forestry and Fishing	8,173	17
Mining	61	0.1
Manufacturing	6,155	13
Electricity, Gas and Water Supply	418	0.9
Construction	2,654	5.6
Wholesale Trade	2,336	5
Retail Trade	6,727	14
Accommodation, Cafes and Restaurants	2,935	6
Transport and Storage	1,772	3.7
Communication Services	465	1
Finance and Insurance	804	1.7
Property and Business Services	2,802	5.9
Government Administration and Defence	1,864	4
Education	3,025	6.4
Health and Community Services	4,287	9
Cultural and Recreational Services	704	1.5

Industry	No. of people employed	Percentage
Personal and Other Services	1,313	2.7
Non-classifiable economic units	230	0.5
Not stated	898	2
Total	47,623	100

Source: ABS 2001 Census of Population and Housing

Other main industries include; health and community services, education, accommodation, cafes and restaurants, property and business services, construction and wholesale trade. Within these industries, the highest percentage of people are employed as managers and administrators.

21.3.4 Agriculture

The agriculture, forestry and fishing sector is the key industry and largest employer for the Murray Shire and instigated the development of towns and business in the area. The main agricultural activities are rice growing, wheat and barley cropping, sheep and beef production and vegetable and fruit growing. The Murray Shire contains large areas of irrigated farmland. Water is distributed from the Murray River by a broad network of irrigation channels, such as the Moira Irrigation Channel which supplies water to the proposed site.

The Murray Shire is home to the smallest wine region in NSW, known as the Perricoota Wine District which is based around Moama. The continued growth and success of viticulture in the region will see further development of industries associated with wine making.

21.3.5 Tourism

Tourism in the region is largely based around the Murray River. Echuca–Moama is renowned as “the paddle steamer capital of Australia” and tourism opportunities are based around the historic port of Echuca-Moama, once the largest inland port in Australia. The natural and ecological features of the River Redgum Forests are also a drawcard for tourists with opportunities for fishing, waterskiing, boating, canoeing, bushwalking, bird watching and swimming. There is also potential for further growth in the ecotourism sector with opportunities within the Barmah-Millewa Forest which is listed as a Wetland of International Importance under the Ramsar Convention.

21.3.6 Transport

There are 4 major road highways within or proximate to the Murray Shire. A freight rail network also services the area with access to Melbourne via Bendigo. There are direct passenger bus services to Melbourne daily which also connect other centres such as Deniliquin, Shepparton, Echuca-Moama and Bendigo. There is no passenger air service to the area and the passenger rail service terminated in the early 1980s (Hassall & Associates Pty Ltd *et. al*, 2003)

21.4 Potential Social Impacts

The social impacts have been assessed by investigating the social characteristics of the area, by reviewing statistical data and by qualitative assessment of how people may experience impacts from the feedlot. Overall, the feedlot is not expected to have very significant social impacts. However, both positive and negative social impacts and the significance of these has been assessed, and the requirement for measures to mitigate any impacts was also considered.

21.4.1 Construction Phase

Prior to construction of the feedlot, it is expected that successful negotiations with the potentially most affected properties proximate to the project site R2, R4, R5, R6, R11 and R12) would be completed with a mutually acceptable resolution. The locations of these properties are shown on **Figure 18.1**. This would moderately alter the area, with fewer people residing on properties surrounding the proposed feedlot. The formal acquisition of these properties would also reduce the off site impacts of construction such as dust and noise, as sensitive receivers would be located further away from the site.

During construction, proposed impacts that may negatively affect people are considered to be environmental and amenity related, such as the increased incidence of dust and noise. These issues have been addressed in this EA in **Sections 11** and **19** respectively. Impacts from dust and noise would be mitigated where possible and would be limited in duration.

The construction of the feedlot would also generate approximately 164 additional traffic movements per day during the construction period. Traffic has been addressed in **Section 15**, and the additional movements are considered to be acceptable. Visual impacts during construction may also be experienced, particularly by people travelling along the Cobb Highway. A visual assessment of the proposal was undertaken and detailed in **Section 18** of this EA. It is considered that existing vegetation and the siting of the proposed works would minimise the potential for significant visual impacts during construction.

The creation of employment opportunities for local workers and businesses would be the main social benefit of the construction phase of the feedlot. Approximately 80 jobs would be created in areas such as earthmoving, transportation, road construction, concrete batching and site management. The generation of employment would also have economic benefits as detailed in **Section 23**.

21.4.2 Operational Phase

The main social benefit of the proposal would be the creation of approximately 86 new jobs, 80 people would be employed for the feedlot operation and 6 people would be employed for other activities on the property. The generation of employment opportunities from the surrounding area and towns such as Mathoura and Moama would result in positive social and economic benefits for the families of those employed and the community as a whole. An assessment of the economic impacts of the proposal is provided in **Section 23**.

The impacts of the operation of the feedlot on the environment are detailed in other sections of this EA. **Section 15** addresses traffic and transport. The feedlot would generate approximately 182 vehicle movements each day during operation. These additional movements are not expected to limit or restrict the movement of people in the surrounding area, and the roads have the capacity to absorb the additional movements on the Cobb Highway and other roads.

The management of the feedlot would be undertaken in such a way as to reduce impacts from odour or dust. As noted in **Section 11**, the proponent is negotiating with residences potentially adversely affected by odour in order to reach a mutually acceptable solution.

The feedlot development is considered to be consistent with the nature of the surrounding environment, notwithstanding this there would only be obstructed views of the feedlot from visual receptors.

Generally, it is considered that as sensitive receivers are located greater than 1 kilometre from the proposed feedlot site, the impacts of the operational feedlot on people, and their social environment would be minimal.

21.5 Conclusion

The proposal is not expected to significantly alter the social environment for people in the area. The main social impact would be positive through the generation of approximately 80 jobs during construction and 86 jobs during operation. The provision of additional employment opportunities in the region would also have positive flow-on economic affects for Mathoura and the Murray Shire.

22 LAND USE

22.1 Overview

The site comprises agricultural land which is crossed by a network of irrigation channels. The irrigation channels are fed by water pumped from Moira Lake approximately 1km to the east. The site occupies several parcels of land comprising a total area of some 1,200 Ha.

22.2 Surrounding Landuse

The site is situated on the plains to the west of the Murray River. The surrounding landuses include:

- Rural;
- Rural residences;
- Transport;
- Infrastructure; and
- Recreation.

22.2.1 Rural

Rural landuses dominate the surrounding area and include paddocks used for grazing or cropping and irrigation areas. The area is also scattered with irrigation channels, ponds, tanks, sheds, animal yards and rural residences. A commercial dairy is located immediately to the north.

22.2.2 Transport Infrastructure

The proposed site is located between two primary elements of transport infrastructure in the Riverina. The Moama-Deniliquin Railway and Line Road are located to the west of the site, whilst the Cobb Highway (SH21) is located to the east of the site and runs through south western NSW to Wilcannia.

22.2.3 Service Infrastructure

Electricity infrastructure connects the site and surrounding sites to the electricity grid. The main Moira Irrigation Channel which provides water from Moira Lake for use in the irrigation system is located to the east of the site.

22.2.4 Recreation

The Moira Marshes which incorporate the Moira State Forest and Moira Lake are located to the east of the site. These areas are used for walking, picnicking, camping, fishing and other recreational activities.

22.3 Proposed Land Use

The proposed feedlot development would continue, but intensify, the existing rural land uses of the site. The proposal would also require associated administrative land uses, such as office buildings to manage the feedlot and irrigation system.

22.4 Assessment of Impacts During Construction

The construction of the new access road, feed pens, holding and storage ponds and buildings is not expected to adverse impact surrounding land uses. There is the potential for dust and noise to be generated during construction, however the implementation of prescribed mitigation measures (see **Sections 11** and **19**) would ensure that receivers surrounding the site, would not be adversely impacted from the construction works

22.5 Assessment of Impacts During Operation

The operation of the feedlot would substantially intensify the agricultural activities on the site, with up to 80,000 head of cattle to be located on the site with employment for up to 86 people.

Noise, odour and traffic have the potential to affect surrounding land users. Measures would be implemented to minimise noise and odour, and increases in traffic are not expected to significantly affect traffic on the Cobb Highway.

The proposal would not require water in addition to that already permitted by the licence from the Moira Irrigation Scheme.

22.6 Conclusion

It is considered that the proposed project is consistent with the surrounding land uses of the area. The construction and operation of the proposed feedlot are not expected to create significant impacts to the surrounding land uses. The implementation of management measures to mitigate air quality and noise, summarised in **Section 11** and **19**, would minimise the potential for the proposal to adversely affect the surrounding environment.

23 ECONOMIC

23.1 Existing Economic Profile

Traditionally the economic base of the Murray Shire was founded upon agriculture. However in recent years, tourism and viticulture have grown to be large economic sectors in the region. River towns along the Murray River are particularly experiencing economic growth as a result of tourism and the wine making industry in the area is expected to grow.

Water is an important resource in the area. Irrigated agriculture, and therefore the availability of water play a significant role in the economy of the area. Other related industries such as agricultural suppliers, transporters and processors, are also often completely dependent on irrigated agriculture and crops. Many aspects of the area's tourist industry are also based around water, and the proximity to the river or wetland areas for boating, fishing, canoeing and bird watching.

The economy of the Murray Shire has also been heavily impacted by drought in recent years, which has resulted in reduced production in the agricultural sector.

23.1.1 Incomes

Household incomes for the Murray Shire are shown in **Table 23-1** below.

Table 23-1: Weekly Household Income in Murray Shire

Weekly Income	No. of Households*	Percentage of Households
Negative/Nil income	316	0.9
$1-$199	1,859	5.2
$200-$299	3,751	10.5
$300-$399	4,144	11.7
$400-$499	3,410	9.6
$500-$599	2,458	7
$600-$699	2,934	8.3
$700-$799	2,137	6
$800-$999	3,902	11
$1,000-$1,199	3,061	8.6
$1,200-$1,499	2,971	8.4
$1,500-$1,999	2,969	8.3
$2,000 or more	1,619	4.5
Total	35,531	100

Source: ABS 2001 Census of Population and Housing

Data for families where at least one, but not all, member(s) aged 15 years and over did not state an income and/or at least one family member aged 15 years and over was temporarily absent and households where no members present stated an income have not been included.

Approximately 30% of households have a weekly income of between $200 and $499. The average total income for the Murray has increased since 1999 from $29,252 to $32, 900 in 2002. The unemployment rate in 2003 was estimated to be 6.2%.

23.1.2 Agricultural Production

There is increasing diversity in the primary sector in the Murray Shire with a variety of industries playing a role. These include rice growing, wheat and barley cropping, sheep and beef production, vegetable and fruit growing. The value of agricultural production in 2001 in the Murray Shire is shown in **Table 23-2**.

Table 23-2: Value of Agricultural Production in Murray Shire for FY2001

Agricultural Product	$ Million
Crops	$810.2
Livestock slaughterings and other disposals	$290.4
Livestock products	$184.7
Total value of agriculture	**$1,285.3**

Source: ABS National Regional Profile (cat. no. 1379.0.55.001)

The majority of people in the Murray Shire are employed in the agricultural, forestry and fishing sector (17%).

23.2 Potential Economic Impacts

The proposed feedlot would generate employment opportunities during both the construction and operational phases. The impacts have been assessed in terms of whether they would have a positive or negative effect on the existing local and regional economy.

23.2.1 Construction Phase

Economic impacts during the construction phase are likely to have a positive effect upon the region. This is due to the number of direct employment opportunities that the project would create, and also the indirect effects upon suppliers and businesses associated with the project.

The total set-up cost for the feedlot is estimated to be in the order of $80 million, including acquisition of land and construction costs. The feedlot would be constructed over a period of 6 months and it is anticipated that construction of the feedlot may involve a workforce of up to 80 people.

Employees utilised during the construction period would be sourced, where possible, from within the local area, as would the major types of goods and services used. The major types of goods and services required include excavation and earthmoving equipment, cement, concreting batching plant and mixers, sand and transport services.

23.2.2 Operation Phase

The operation of the feedlot is considered to have a beneficial impact upon the local and regional economy, primarily as a result of employment generation. The feedlot would directly employ 80 people in a variety of positions including administration, cattle management and feedlot maintenance. The feedlot would also have positive indirect effects on the local economy, with the creation of jobs associated with the production of feed and the transportation

of feed and cattle. Generation of employment would have multiplier effects from income expenditure, as local businesses benefit from providing goods and services to the feedlot and its employees. It is also expected that grain for the feed of the cattle would be sourced from local suppliers.

The proposed feedlot and the opportunities it would create would be an economic asset to the local area, resulting in a boost for the meat and grain industry and increasing the value of agricultural production in the Murray Shire.

23.3 Conclusion

The feedlot project would provide a number of economic benefits to the area by providing employment and multiplier effects from the feedlot would result in economic benefits to local businesses and investment in the area.

24 ENERGY

24.1 Energy Consumption

Vehicles and equipment used during the construction works on site and for the transportation of cattle and feed would consume diesel fuel. Vehicles utilised by employees travelling to and from the site would also consume petrol or diesel fuel.

Electricity consumed during operation of the feedlot, is not expected to be significant. The site has an existing power supply and power would be required for office activities and to operate pumps and irrigators. Means of supplying electricity to the areas of the site where it is required is described in **Section 6.3**.

24.2 Impact on Energy Consumption

The impacts of the proposal relating to the consumption of non-renewable energy are considered to be negligible.

24.3 Mitigation Measures

A number of mitigation measures to limit the use of non-renewable energy sources are outlined in **Table 24-1.**

Table 24-1: Energy Consumption Mitigation Measures

Issue	Measure	Phase
Energy Consumption	Modern and well maintained equipment is to be used to encourage fuel efficiency	Construction/Operation
	Idling times on equipment/vehicles are to be reduced by switching off when not operational	Construction/Operation
	Truck and construction equipment engines are to be switched off when waiting to enter or exit a site or during loading or unloading	Construction/Operation
	Lighting and office equipment is to be switched off when not in use	Operation

24.4 Conclusion

The construction and operation of the proposed cattle feedlot would result in the consumption of energy in the form of electricity and fuel.

25 CUMULATIVE IMPACTS

25.1 Introduction

Cumulative impacts on the environment can be considered on a project basis, taking into account each element on a locality or regional basis as well as taking into account the interacting impacts of other projects in the immediate locality and the region.

25.2 Cumulative Impact with other Projects

Discussions with Murray Shire Council indicated that there are no known proposed developments in the locality immediately surrounding the proposed cattle feedlot site. However, there are two smaller cattle feedlots (Lenian and Amaroo) located within the Shire, which are shown in **Figure 25.1**. Lenian feedlot is located approximately 26km to the west-northwest of the site and Amaroo feedlot is located approximately 9km to the north of the project and west of Mathoura.

Each of these feedlots has development consent for 5,000 cattle and are located a significant distance from the proposed cattle feedlot at Moira Station. A cumulative impact assessment of these feedlots and the interaction with Moira Station focussed upon the primary external environmental impacts associated with feedlots; odour and traffic. As demonstrated in **Section 15**, the Cobb Highway has sufficient capacity to accommodate additional traffic. It is envisaged that the Amaroo feedlot currently utilises the Cobb Highway to transport cattle and grain, however the Lenian feedlot utilises the Moama to Barham Road and not the Cobb Highway during its operations.

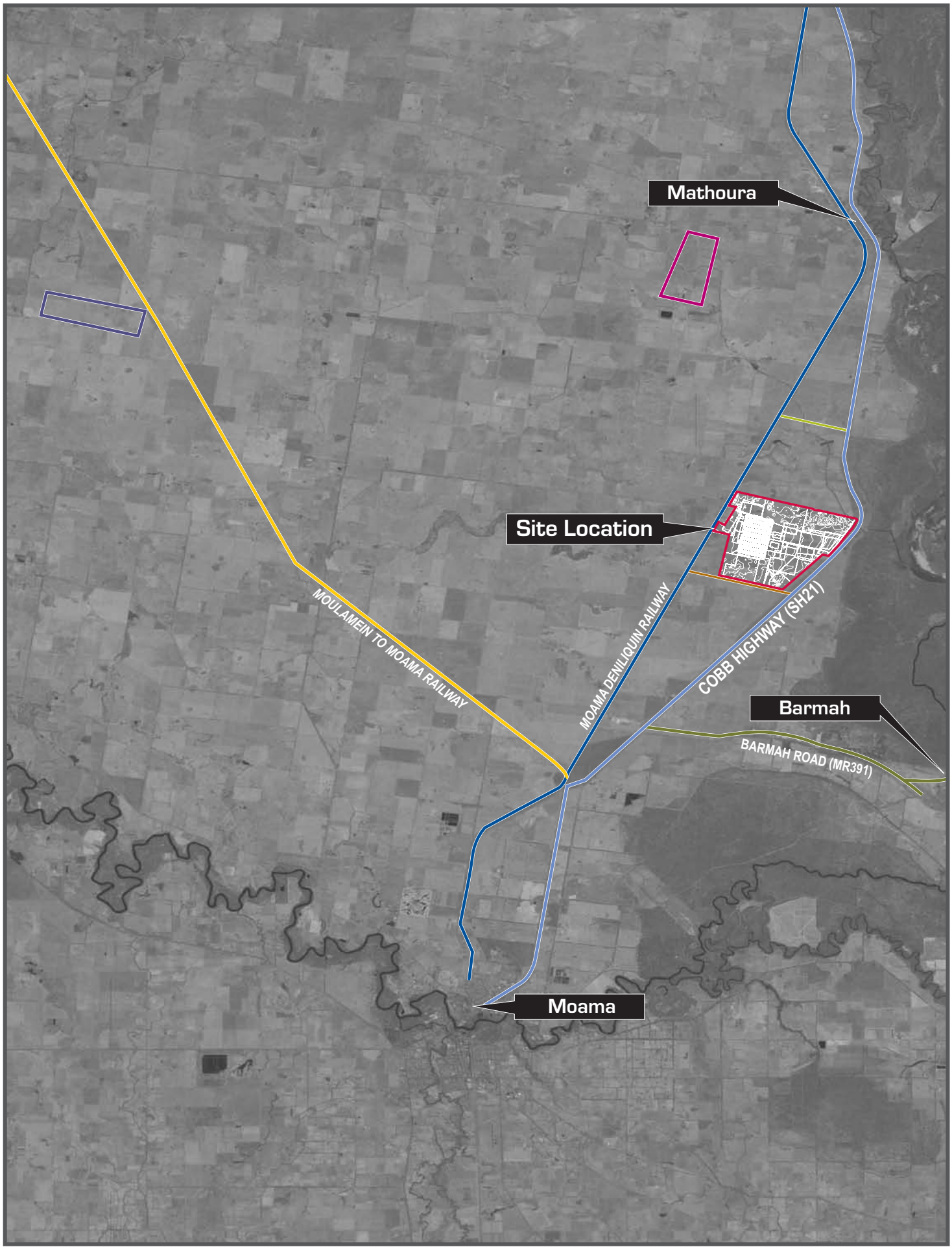
As shown in **Section 11**, cattle feedlot developments are required to satisfy and comply with DEC regulations and criteria for odour emissions. The frequency and magnitude of cumulative odour impacts of the project would be expected to be small. The DEC odour policy suggests that odour sources of similar odour character may need to be modelled together to determine cumulative odour impacts. The odour policy also indicates that modelling multiple sources may be necessary if the sources are sufficiently close to one another, however, this is not well defined. The size of the odour sources may be an important consideration for determining whether sources are sufficiently close.

Cumulative impacts of the Moira project with the Lenian feedlot would be considered to be very small, given that the distance between these two sources is large. Cumulative odour impacts with the Amaroo feedlot may possibly be observed either to the north of the Moira feedlot or to the south of the Amaroo feedlot. There are no known receptors directly to the south of the Moira feedlot site and cumulative odour impacts in this area should therefore not be of concern. To the north of the Amaroo feedlot, the contribution from the Moira feedlot is predicted to be of the order of 2 odour units (at the 99^{th} percentile). The management practices of the Amaroo feedlot will determine cumulative odour impacts observed to the north of this site, however, given the relatively small feedlot size and the 9 km distance between sources, cumulative odour impacts should be both low and infrequent and therefore modelling was not undertaken.

25.3 Conclusion

As the impacts of the individual environmental factors are minimal, no significant cumulative impact is anticipated from the proposed project provided the safeguards detailed in **Section 28** are implemented. The cumulative impact of the project with other known projects currently operating in the area as described in **Section 25.2**, has been taken into account since the

existing projects form part of the existing environment. There are no known proposed developments for the locality.



HLA

Other Projects in Region
Agricultural Equity Investments Pty Ltd
Moira Station Cattle Feedlot
Environmental Assessment
Moira NSW

- Stud Farm Lane
- Cotswold Lane
- Moira Station (80,000 Head of cattle)
- Approximate Location of Lenian Feedlot (5,000 Head of cattle)
- Approximate Location of Amaroo Feedlot (5,000 Head of cattle)

N

0 4
Kilometres

FIGURE
25.1

PROJECT-FILE NAME **S60133** DATE **27 September 2005** DRAWN **TO** APPROVED

26 SUMMARY OF KEY PLANNING ISSUES

26.1 Introduction

The proposed project at Moira Station has been assessed under Part 3A of the EP&A Act and is not subject to assessment matters listed in Section 79C(1) of the EP&A Act. However, these matters provide an appropriate summary of key planning issues. A summary of these matters with regard to the proposed Moira Station Cattle Feedlot is provided in the sections below.

26.2 Planning Instruments

Section 7 of the EA addresses the relevant provisions of local, regional and State EPIs as they relate to the proposed project. The proposed cattle feedlot is permissible with the approval of the Minister for Planning. The proposed project is a 'major project' under the provisions of the EP&A Act and SEPP 2005.

There are no draft EPIs relating to the proposed project site.

There are no DCPs of relevance to the project.

This EA has been prepared in accordance with the matters required to be addressed in the EP&A Regulation.

26.3 Potential Impacts on Natural, Built and Social Environment

Context and Setting

The subject site is located within a rural area, characterised by large agricultural properties with grazing on native pastures and some irrigated cropping. The proposed project is for the purposes of a cattle feedlot involving the erection of some rural buildings including two sheds and an administration building and associated structures including sedimentation ponds and freshwater storage areas.

The buildings proposed on the site are not substantial in height and are rural in character, and are therefore consistent with the surrounding rural environment without being obtrusive. Similarly, the use of the site for a cattle feedlot is an appropriate use within a rural area and would not detract from the existing character or setting of the surroundings.

Access, Transport and Traffic

Access to the site would be via a new private access road connected to the Cobb Highway. Transport and traffic issues are discussed in detail in **Section 15** of the EA.

Public domain

The proposed feedlot would be operated entirely on private land and would have no physical impact upon the public domain with the exception of the construction of the private access road to be connected to the Cobb Highway. All works associated with the road construction would be undertaken in accordance with RTA requirements to ensure that the safety and amenity of the public domain is maintained.

The feedlot would involve the construction of a number of buildings on the site which would be visible from the public domain. The buildings are however, rural in nature and character and would not have a significant adverse visual impact upon the public domain.

Utilities
The project would not create demand for additional services or utilities on the site and would not place considerable demand upon existing public utilities and services.

Heritage

Indigenous and Non-Indigenous heritage has been considered as part of the EA process. There are no known items of Non-Indigenous heritage significance located on the subject site.
A detailed heritage and archaeological survey, including Aboriginal and European heritage was undertaken on the site to identify items or places of significance. The survey revealed no items/places of heritage significance in the vicinity of the proposed project. A full discussion of these issues is given in **Section 17**.

Other Land Resources

The project would not sterilize land which is a valuable land resource.

Water

The project would utilise water in accordance with a valid water access licence issued under the *Water Management Act 2000*. Water management on the site is detailed in **Section 13** of the EA.

Soils

Soil testing on the site indicates that the land is suitable for a feedlot. Soil management on the site during construction and operation is addressed in **Section 14** of the EA.

Air and Microclimate

There would be some air quality and odour impacts as a result of the proposed feedlot. These impacts are discussed in **Section 11** and **Appendix C** of this EA and are expected to be acceptable due to the separation distance to the site from residential and urban areas.

Flora and Fauna

The proposed project would not impact upon threatened species, migratory species, endangered ecological communities or internationally significant wetlands. A detailed discussion of flora and fauna issues in relation to the proposal is provided in **Section 16.**

Waste

The primary waste product generated by the proposed feedlot would be effluent. Irrigation within the boundaries of the property would be used for the disposal of this waste. Further details on this process are provided in **Section 12** of the EA.

Energy

The proposed feedlot would not consume significant amounts of energy during operation. The primary energy costs associated with the project would be during construction (largely fuels and

oils for construction machinery and vehicles). The energy consumed during the construction period is not considered to be significant.

Natural Hazards

The site is not subject to earthquakes, land subsidence, flooding or bushfire.

Technological Hazards

Hazard and risk associated with the project are addressed in **Section 20** of the EA.

Safety, Security and Crime Prevention

The site would be fenced and secured to ensure no unauthorized access to the public. Appropriate occupational health and safety standards would be met during both the construction and operation of the feedlot.

Construction

The impacts of site preparation and construction activities on the natural, built and social environments have been addressed in this EA. Potential impacts include impacts on air quality, the acoustic environment, water quality and traffic generation. Measures would be implemented as part of a Construction Environmental Management Plan (CEMP) and an Operational Environmental Management Plan (OEMP) to minimise the potential for adverse impacts on the environment.

Cumulative Impacts

The project would not contribute significantly to the cumulation of environmental impacts in the region, provided the safeguards detailed in this EA are implemented. This issue is addressed in greater detail in **Section 25** of this EA. The cumulative impact of the project, with other known projects currently operating or proposed for the area, is also considered to be minimal.

26.4 Site Selection

Does the proposal fit in the locality?

The subject site is located within a rural area surrounded by large agricultural holdings. The proposed project is for a cattle feedlot which would involve the erection of sheds and the construction of sedimentation ponds and an administration building. The buildings to be erected are of a nature and scale which would blend with the surrounding rural environment and given that the proposal is for intensive agricultural use it is considered to be suited to the surrounding rural area.

Are the site attributes conducive to development?

Soil testing indicates that the subject land is suitable for both the operation of a cattle feedlot and for on-site irrigation for effluent disposal. The site has been historically used for agriculture and is located in a rural area which encourages agricultural uses and is therefore considered to be suitable for the proposed project.

Social and Economic Impacts in the locality

The proposed project would result in the employment of some 80 persons after the construction phase, many of whom are likely to be local to the area. Further, the project would intensify the use of the land, promoting agricultural activity in the area and boosting the local economy.

The potential adverse social impacts of the proposal are limited to factors such as noise and odour which may detract from the quality of life of surrounding residents. However, the site is located a significant distance from the nearest residential areas and mitigation measures would be put into place to ensure that impacts upon the amenity of the area is minimal.

Site design and internal design

The design of the feedlot takes account of the characteristics of the land including topography, soil types, drainage patterns and existing vegetation. The proposed design is considered to be the most efficient and effective for the site and would minimise potential adverse impacts upon the surrounding natural environment.

26.5 The Public Interest

The proposed cattle feedlot has been designed to minimise potential adverse impacts upon the local community and the surrounding environment. Given the significant benefits of the proposal to the local area such as providing employment for local people and promoting the efficient agricultural use of rural land, thus boosting the rural economy, the project is considered to be in the public interest.

part g
statement of commitments

27 ENVIRONMENTAL MANAGEMENT

27.1 Statement of Commitments

In accordance with the EA requirements issued under Part 3A of the EP&A Act, a Statement of Commitments is provided as Part G of this EA. The Statement of Commitments, comprising **Sections 27**, **28** and **29** of this EA, is intended to be considered as a stand alone document providing a draft Statement of Commitments to be attached to the conditions of consent from the Department of Planning should the proposed project be approved. The Statement states AEI's environmental commitments and details on the environmental management and monitoring of the proposed project during its construction and operational activities.

AEI commit to the preparation and implementation of the environmental management and monitoring plans and environmental mitigation measures detailed in the Statement of Commitments for the proposed Moira Station Cattle Feedlot.

27.2 Approvals and Licences

In order to proceed with the proposal, development consent would need to be granted by the NSW Minister for Planning under the EP&A Act.

In addition to the granting of development consent, an Environment Protection Licence (EPL) would be required from the NSW Department of Environment and Conservation (DEC) under the POEO Act, as shown in **Table 27-1**.

Table 27-1: Approvals and Licences

Type	Authority	Relevant Legislation	Section
Environment Protection Licence	Department of Environment and Conservation	Protection of Environment and Operations Act 1997	s43(b), 48 and 55

Approval from DEC relates to the issue of an Environment Protection Licence pursuant to sections 43(b), 48 and 55 of the POEO Act.

Under Part 3A of the EP&A Act, an assessment from the RTA under section 138 of the Roads Act would be required to be consistent with the Department of Planning as required under section 75(V) of the EP&A Act.

27.3 Environmental Management Plan

An Environmental Management Plan (EMP) is a procedural document which outlines the environmental goals of the project, the safeguard measures to be implemented, the timing of the implementation in relation to the progress of the project, responsibilities for implementation and management, and a review process. An EMP would be prepared to address each stage of the project namely, site preparation, construction and operation.

The key objectives of the EMP include:

- Ensuring the works are carried out in accordance with appropriate environmental statutory requirements and relevant non-statutory policy as is detailed throughout this EA;

- Ensuring that works are carried out in accordance with the goals and requirements presented in this EA;
- Ensuring that works are carried out in such a way as to minimise the likelihood of environmental degradation occurring;
- Ensuring that works are carried out in such a way as to manage the impact of the works on neighbouring properties;
- Ensuring that employees engaged in the works comply with the terms and conditions of the EMP;
- Providing clear procedures for management of environmental impact including corrective actions; and
- Identifying management responsibilities and reporting requirements to demonstrate compliance with the EMP.

A Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) would form an integral part of the EMP for the project and would be consistent with the requirements of ISO9001:2000 and ISO14001.

Preparation of the CEMP and OEMP would be a condition of a contractual agreement between AEI and a nominated contractor, ensuring that these plans are prepared prior to commencement of construction or operation of the proposed project.

The CEMP and OEMP would be prepared following assessment of the project and would serve as a working document to be used during the detailed design of the project.

The CEMP and OEMP would typically include:

- Establishment of environmental goals and objectives;
- Conditions of project approval;
- List of actions, timing and responsibilities;
- Supervision protocols fully identifying areas of responsibility for environmental management of the project;
- Statutory requirements – licences and approvals required (see **Section 27.2**);
- A structured reporting system detailing all relevant matters on a regular basis;
- Procedures and forms for documentation and reporting of issues;
- Standard specifications incorporating environmental safeguards;
- Training of personnel in environmental awareness and Best Practice Environmental Management Systems;
- Guidelines for emergencies, contact names and corrective actions for non-conformance and notifications to appropriate authorities and affected parties;
- Calibration and measuring of testing equipment;
- Process surveillance and auditing procedures;
- Review procedures and protocols for modification of the CEMP or OEMP;
- Complaint handling procedures;
- Site management and control procedures;
- Monitoring procedures; and

- Quality assurance procedures.

Key components of the CEMP and OEMP would include procedures aimed at:

- Land management and clearing;
- Erosion and sediment control;
- Waste water quality management;
- Vegetation and habitat management;
- The control of odour emissions;
- Traffic management; and
- Noise.

As a guide to establishing an EMP, the general structure would be similar to that shown in **Table 27-2**.

Table 27-2: EMP Structure

Item	Description
Introduction and Purpose	Details the objectives of the Plan. Chain of Command structure (including relevant environmental delegate). Responsibility and authority for implementation.
Statutory requirements and integration with other plans	Details the statutory requirements, if any, and other obligations required to be met as part of the licensing approval.
Environmental management procedures	Describes the operational procedures for preventing environmental impacts, nominates responsibility to individuals, establishes reporting protocols and procedures, and nominates corrective and preventative action procedures.
Monitoring requirements	Details the monitoring program for checking environmental performance of the project, nominates responsibilities to individuals, establishes reporting protocols and procedures, and nominates corrective and preventative action procedures.
Emergency response	Contains emergency response plans.

A key component of the CEMP and OEMP are the environmental safeguards developed in Part F of this EA, and summarised in **Section 28**. Further, monitoring procedures associated with the management strategies are key elements to measure the performance of the project against set criteria. A monitoring programme would be an integral part of the site CEMP and OEMP and is discussed further in **Section 29**.

Various specialist management sub-plans have been outlined in this EA and these plans are:

- Effluent Irrigation Management Plan (EIMP); and
- Animal Care Statement (ACS).

These plans would be prepared and incorporated into the OEMP with specific reference to each of the plans outlined in each item in the overall structure of the OEMP, as shown in **Table 27-2**.

27.3.1 Environmental Reporting

Environmental performance reporting is a key decision making tool that provides management with the information to make meaningful and positive change. It is also an integral part of ISO14001. To ensure that relevant authorities are appropriately informed of how AEI is managing its environmental performance, periodic reports would be prepared by the contractor during the construction phase and AEI during the operational phase, in accordance with each party's Quality System.

If the reports identify shortcomings regarding construction activities or in the manner which operational activities are being conducted or in the performance of environmental control structures, the necessary changes would be made and the CEMP and OEMP would be updated to reflect these changes.

As part of the adopted EMS, environmental audits would be undertaken during the construction and operational phases of the project.

27.3.2 Environmental Audit

An independent accredited auditor would conduct environmental audits in accordance with a schedule nominated in the site EMP. Quantified and unquantified information contained in the EA would be assessed to ensure that the construction and operational phases of the project meet acceptable environmental standards. The audit would be based on available information and observations and would not include additional sampling or data collection. An environmental audit would also test the rigour of the project against any conditions/approvals and licences imposed on the project by statutory authorities.

28 SUMMARY OF MITIGATION MEASURES

A number of environmental safeguards/mitigation measures to prevent or minimise environmental impacts which may be generated by the proposed cattle feedlot have been detailed in the various subject sections. As part of the Statement of Commitments, these measures would be implemented throughout the duration of the project. **Table 28-1** summarises these safeguard measures, sets out priorities for implementation (construction and operation), and lists the responsibility for ensuring that these safeguard procedures are undertaken.

Table 28-1: Compilation of Safeguards

Issue	Safeguard	Implementation Stage
Air Quality		
Control dust emissions	Keep areas of open excavation to a minimum.	Construction
	Operation of water carts on stockpiles and exposed soils.	Construction
	Minimise stockpiling by coordinating excavation, spreading, regrading and compaction activities.	Construction
	Construction of 4 lateral move irrigators for use during the summer months to provide cooling, dust control and to maintain pad moisture.	Operation
	Maintenance of manure on feedlot surface at 25-35% moisture content to minimise dust generation.	Operation
Odour from manure stockpiling	The layers of manure placed in stockpiles would be compacted to expel air and reduce the risk of fires.	Operation
	Wet manure or sludge (with a moisture content of greater than 35%) would not be placed in the main stockpiles.	Operation
Odour from manure composting	Manure would be placed in windrows, approximately 1m to 1.5m in height with base widths between 3 and 5m.	Operation
	Windrows would be turned 5 to 10 times over a 5 week period using a grader, front-end loader or more specialised composting machinery.	Operation
	The compost temperature would be monitored to determine the need for turning to either stimulate or regulate heat generation.	Operation
Odour from manure spreading	Application when wind conditions and dispersion conditions are favourable.	Operation
Wastewater		
Irrigation	A detailed Effluent Irrigation Management Plan (EIMP) would be prepared and implemented during the operation of the proposed project.	Operation
Wastewater Quality	Regular monitoring of wastewater quality would be undertaken in accordance with DEC guidelines, as stipulated in **Section 12** of this EA.	Operation

Issue	Safeguard	Implementation Stage
Surface Water		
Construction activities	A CEMP would be prepared for the construction of the feedlot to minimise surface water pollution.	Construction
Runoff management	Construction of sedimentation basins and holding ponds in the west of the site prior to other earthworks on the site in order to retain soil and runoff on site and minimise potential for pollution of clean water with sediment.	Construction
	Construction of diversion bunds around irrigation channels and fresh water storages to separate contaminated stormwater from clean water and prevent contaminated runoff from entering clean fresh water storage areas.	Construction
Sediment control	Installation of silt fences and bunds around the irrigation channel during re-alignment works.	Construction
Water Quality	An EMP and an Effluent Irrigation Management Plan (EIMP) would be prepared for the feedlot operations.	Operation
	Maintenance of vehicles and equipment to minimise leaks of oil or fuel.	Construction/ Operation
	Maintenance of 50m buffer zone around irrigation channels and fresh water storages to prevent contamination of freshwater supplies.	Operation
	Development and implementation of emergency and contingency plans within the EIMP detailing methods to manage spills or other emergencies on site, such as pipe breakages, pond overflows, pump failures etc.	Operation
	Manure stockpiles would be established within controlled drainage area to prevent contaminated runoff into clean water areas.	Operation
	A layer of compacted gravel to be placed on all regularly used access routes to stockpile location, which would prevent contaminated runoff into clean water areas.	Operation
Landform, Geology and Soils		
Retention ponds	Constructed under supervision of full-time geotechnician to enable: • Inspection and approval of stripped areas; • Confirmation of compliance with respect to construction techniques; and • Inspection of reservoir area excavations for sand layers and bands.	Construction
Dispersive Soils and Sand Layers	Addition of appropriate percentage of gypsum to clay soil.	Construction

Issue	Safeguard	Implementation Stage
	Stipulation of an appropriate construction specification for bulk earthworks with respect to both compaction and moisture content.	Construction
	Controls and verification during construction to ensure the adopted construction specification and design is followed.	Construction
Soil Permeability	A clay liner (or appropriate alternative) is required at the base of the Holding Pond.	Construction
Stability of Compacted Earthworks Embankments	Construct fill batters located on the external side of the embankment at a slope of 2:1 (horizontal:vertical).	Construction
	Construct fill batters located on the interior side of the embankment (water retaining) at a slope of 3:1 (horizontal:vertical).	Construction
Stability of Excavated Slopes	Construct cut batters located within the reservoir area at a slope 3:1 (horizontal:vertical).	Construction
Compaction and Moisture Content for Bulk Earthworks	Compacted earthworks embankments to be placed at a minimum of 95%.	Construction
Ecology		
Native Woodland	Protection of the northern belt of native woodland by leaving it ungrazed or lightly grazed.	Construction and Operation
	Avoid over-stocking northern portion of property during times of drought and control weeds in this area.	Operation
Habitats	Stock should be excluded from sensitive moist habitats and from parts of the woodland habitat that occurs in predominantly native grass species.	Operation
	Deposit tree snags and branches removed as part of the project in a random and scattered pattern in the northern woodland belt to enhance the habitat for reptiles and mammals.	Construction
	Care should be taken to avoid stockpiling the woody debris in such a way that encourages fox and rabbit sheltering.	Construction
	Trees that are native to the area should be planted along the property boundary, fence lines and drainage lines that have few remaining trees.	Construction
Indigenous Heritage		
Protection of Aboriginal objects	Aboriginal objects are protected under the NPW Act (as amended), regardless of location. Should any objects be identified during the course of site works, all works must cease and the DEC (South Western Branch, Environment Protection and Regulation Division, Regional Archaeologist) contacted in regard to appropriate permit requirements before any further impact is undertaken.	Construction

Issue	Safeguard	Implementation Stage
	Should **suspected** skeletal material be uncovered during the course of site works, all works must cease and the DEC, the NSW Police and the NSW Coroners office contacted immediately.	Construction
Local Aboriginal Consultation	The Moama LALC would be invited to undertake targeted monitoring of the excavations on site.	Construction
	Geotechnical personnel and Moama LALC working within the study area should be provided brief instruction by a qualified geoarchaeologist in identifying significant soil sequences and buried archaeological deposits. This may take place in a public forum to provide additional interest to the local community.	Construction
Contingency Work	If buried archaeological deposits are identified, work would stop and a section 87 "Preliminary Research Permit" from the Department of Environment & Conservation would be obtained.	Construction
Training	All contractors who work within the confines of the study area would be made aware of the NPW Act 1974 (as amended) and the fact that it is an offence to move, disturb or destroy Aboriginal objects without the written permission of the Director General of the DEC.	Construction and Operation
Hazard and Risk		
Human Health	Development and implementation of an Occupational Health and Safety (OH&S) Plan.	Pre-operation
	Employees required to be vaccinated against Q-fever.	Operation
	Maintenance of buffer areas between irrigation area and sensitive receivers.	Operation
Animal Health	Preparation of an Animal Care Statement (ACS) for the operation of the feedlot.	Operation
	Provision of sprinkler (cooling) systems for the feed pens.	Operation
	Provision of hospital pens to isolate sick animals.	Operation

Issue	Safeguard	Implementation Stage
Biophysical Environment	Development of an integrated feedlot management strategy which would include a pest control strategy. This would include: • Treating cattle with commercial fly control chemical; • Continual maintenance of the pen surface and drains; • Regular removal of manure from the feed pens; • Weekly cleaning of the water troughs; • Weekly cleaning of residual and split feed along the feed troughs; • Regular removal of solids from the sedimentation basins and • Maintaining a minimum inventory of manure at the feedlot.	Operation
Energy Consumption		
	Modern and well maintained equipment is to be used to encourage fuel efficiency.	Construction/ Operation
	Idling times on equipment/vehicles are to be reduced by switching off when not operational.	Construction/ Operation
	Truck and construction equipment engines are to be switched off when waiting to enter or exit the site or during loading or unloading.	Construction/ Operation
	Lighting and office equipment is to be switched off when not in use.	Operation

29 MONITORING

29.1 Construction Environmental Management Plan

As outlined in **Section 27**, a CEMP would be prepared to manage the environmental issues associated with the construction of the proposal and the CEMP would be in accordance with the Statement of Commitments. The monitoring procedures associated with the environmental strategies to be implemented during construction are outlined in **Table 29-1**.

Table 29-1: Monitoring Requirements - Site Preparation and Construction Phases

Monitoring Requirements	Frequency	Parameters	Implementation
Air Quality			
Visually monitor dust generation from work zones to ensure that excessive dust is not being produced.	Daily	N/A	Construction
Inspect sites to ensure that adequate dust controls are being used such as regularly watering soil stockpiles.	Daily	N/A	Construction
Routinely check for odours at the site boundary resulting from construction activities.	Daily	N/A	Construction
Surface Water			
Inspect the site prior to the commencement of each stage of works, to ensure the necessary erosion and sediment control measures are in place.	As required	N/A	Prior to commencement of each stage of works
Inspect erosion and sediment controls to ensure they are installed and operating correctly. Corrective action would be instituted if necessary, and follow up inspection would be undertaken to verify outcome of the corrective action.	Weekly and within 24hours of significant rainfall event	N/A	Site preparation and Construction
Landform, Geology and Soils			
Monitor the condition of areas affected by construction activities	Weekly	N/A	Construction
Monitor compliance of the construction activities with the NSW EPA Construction Site Guidelines	Weekly	N/A	Construction
Inspect disturbed areas which have the potential for wind and water erosion to confirm stability of prepared construction sites.	Weekly	N/A	Construction
Monitor excavation and construction of retention ponds for sandy layers and bands	As required	N/A	Construction
Monitor addition of gypsum to soil where required	As required	N/A	Construction
Monitor construction of fill batters and cut batters to ensure compliance with appropriate design standards	As required	N/A	Construction

Monitoring Requirements	Frequency	Parameters	Implementation
Ecology			
Monitor northern belt of native woodland to ensure that it is protected from construction activities	Fortnightly	N/A	Construction
Monitor tree snags and branches removed from disturbed areas and deposited in the northern woodland belt to enhance the habitat for reptiles and mammals.	Fortnightly	N/A	Construction
Monitor stockpiles of any woody debris to ensure that it doesn't encourage fox and rabbit sheltering.	As required	N/A	Construction
Indigenous Heritage			
Report any archaeological sites discovered during construction activities to the Regional Archaeologist of DEC and the Moama Local Aboriginal Land Council. Cease works pending consideration.	As necessary	N/A	Site preparation and Construction
Hazard and Risk			
Inspect firebreaks, groundcover, fuel loads, construction sites and work practices to assess general fire hazard conditions (especially during the fire season)	Quarterly	N/A	Construction/ Post Construction
Traffic Management			
Visual inspection of construction zones to ensure construction vehicles are using defined roads and access points	Weekly	N/A	Site Preparation/ Construction

29.2 Operational Environmental Management Plan

The monitoring procedures associated with the management strategies which would be implemented during operation are outlined in **Table 29-2**. The OEMP would be prepared and implemented in accordance with the Statement of Commitments.

Table 29-2: Monitoring Requirements - Operation

Monitoring Requirement	Frequency	Parameter	Implementation
Air Quality			
Monitor use of lateral move irrigators which would provide cooling, dust control and to maintain pad moisture	Weekly (During summer)	N/A	Irrigation
Monitor compliance with Environment Protection Licence	Annually	Parameters as agreed with DEC	Operation
Monitor the maintenance of manure on feedlot surface to ensure 25-35% moisture content to minimise dust generation	Weekly	N/A	Operation
Windrows would be turned 5 to 10 times over a 5 week period using a grader, front-end loader or more specialised composting machinery.	Weekly	N/A	Operation

Monitoring Requirement	Frequency	Parameter	Implementation
Wastewater			
Monitor implementation of Effluent Irrigation Management Plan (EIMP)	Monthly	N/A	Operation
Regular monitoring of wastewater quality would be undertaken in accordance with DEC guidelines, as stipulated in **Table 12-5** of this EA.	In accordance with **Table 12-5** of this EA	In accordance with **Table 12-5** of this EA	Operation
Surface Water and Groundwater			
Monitoring of buffer zones around irrigation channels and fresh water storages to prevent contamination of freshwater supplies.	Monthly	N/A	Operation
Inspect site equipment to ensure it is in a good state of repair and is not leaking fuel or oil.	Monthly	N/A	Operation
Ecology			
Monitor identified sensitive moist habitats and parts of the woodland habitat that occurs in predominantly native grass species to ensure no stocking of cattle.	Monthly	N/A	Operation
Hazard and Risk			
Monitor compliance with Animal Care Statement (ACS)	Quarterly	N/A	Operation
Monitor implementation of integrated feedlot management strategy including pest control strategy.	Quarterly	N/A	Operation
Inspect firebreaks and monitor fuel loads to assess general fire hazard conditions (especially during fire season)	Quarterly	N/A	Operation

part h
project justification

30 PROJECT JUSTIFICATION

30.1 Justification

Schedule 2 of the EP&A Regulation requires justification for the project to be provided, having regard to biophysical, economic and social considerations together with the principles of Ecologically Sustainable Development (ESD). The assessment of the proposal undertaken in this EA, and in particular in **Part F** has incorporated biophysical, economic and social considerations.

30.1.1 Biophysical

The potential biophysical impacts associated with the proposed project have been assessed in **Part F** of this EA and include examination of the following impacts:

- Terrestrial ecology;
- Landform, geology and soils (primarily for suitability for irrigation purposes);
- Hydrology, hydrogeology and water quality; and
- Waste treatment.

As discussed in this EA, the proposed project would have a minimal impact upon terrestrial ecology, given the lack of significant habitat on the site and minimal clearing required to undertake the proposal.

The proposed project can result in impacts upon the soils through irrigating the waste generated from the project if the waste is not treated appropriately. However, as discussed in this EA, the irrigation of this waste is not expected to create significant impacts provided that the mitigation measures outlined in **Section 28** are implemented.

The assessment of the impact of the proposed development on each of the biophysical elements of the environment has concluded that providing management measures and monitoring systems are implemented to mitigate potential impacts, the proposed project would not have a significant impact.

As required under Part 3A of the EP&A Act, environmental mitigation, management and monitoring requirements have been compiled and summarised into a Statement of Commitments, which is located in Part G of this EA.

The project is therefore justifiable in terms of the biophysical elements of the environment.

30.1.2 Economic

The economic impact assessment demonstrates that the proposed project would provide both direct and indirect economic benefits to the local, regional and state economies. The construction phase of the proposal would generate local employment opportunities and income to local businesses in the Murray Shire. Similarly, the operational phase of the proposed project would provide direct economic benefits in the form of local employment opportunities, both on-site and in the road haulage of cattle, grain and compost, and indirect benefits through activities such as maintenance of equipment and environmental monitoring.

The proposed project would also provide economic benefits to the State through royalties and export taxes.

Given these benefits, the proposed project is justifiable on economic grounds.

30.1.3 Social

The potential social impacts of the proposed project have also been assessed in **Part F** of this EA, and include consideration of an extensive range of issues, including the following key issues raised by the community during the community consultation program:

- Odour;
- Traffic and transportation;
- Noise;
- Amenity; and
- Landscape character and visual impact.

Other social or cultural issues assessed as part of the EA include hazard and risk, Aboriginal heritage, social and economic environments, energy, waste and cumulative impacts of the project on the environment.

A number of these issues interrelate with the biophysical and economic impacts of the project, where, as described above, it has been concluded that the project would not have a significant impact provided mitigation measures are implemented, and that the project is justifiable on biophysical and economic grounds.

Through the consultation program, the community raised issues about the proposed development, based on its perception of the project and its likely impacts. Many of these issues raised, such as odour, landscape character and visual impact and traffic and transportation have been demonstrated through the EA assessment to have an acceptable level of impact providing management measures are implemented.

This EA also demonstrates that AEI has endeavoured to address all concerns raised by the community as part of its social impact assessment. The noise impact assessment predicted that a few residential receptors would experience short term noise impacts during construction. However, the project is not considered to have significant social impacts on the community, given its location with respect to sensitive receptors, design and management measures to be implemented in accordance with the Statement of Commitments.

The project is justifiable on social grounds.

30.2 Ecologically Sustainable Development

The term ‘ecologically sustainable development’ was introduced by the Commonwealth Government in June 1990, defined as:

> *Using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. (ref: Ecologically Sustainable Development: A Commonwealth Discussion Paper)*

ESD Working Groups were subsequently established and involved representatives of government, industry, environment, union, welfare and consumer groups. The ESD Working Groups developed a series of policy directions and recommendations which provided the foundation for development of the *National Strategy for Ecologically Sustainable Development*.

The *National Strategy for Ecologically Sustainable Development* was endorsed by the Council of Australian Governments in December 1992. In addition, the *Intergovernmental Agreement on the Environment* (IGAE) was signed in 1992 by Federal and State Governments, Territories and the Australian Local Government Association, promoting intergovernmental cooperation.

ESD is a concept now firmly entrenched in NSW environmental legislation and government policy. The concept of ESD has been given legal definition in NSW by the Protection of the Environment Administration Act 1991 (NSW). Section 6(1)(a) of that Act requires the NSW DEC (formerly EPA) which was established by the Act, in its role in protecting, restoring and enhancing the quality of the environment in NSW, to have regard to the need to maintain ecologically sustainable development requiring the effective integration of economic and environmental considerations in decision making processes.

Schedule 2 of the EP&A Regulation clearly establishes four guiding principles to assist in achieving ESD, as follows:

- **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.
- **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.
- **Conservation of biological diversity and ecological integrity** – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.
- **Improved valuation and pricing of environmental resources** - namely, that environmental factors should be included in the valuation of assets and services, such as polluter pays, full life cycle costing, and utilising incentive structures/market mechanisms to meet environmental goals.

The EPBC Act also identifies a fifth principle for consideration in environmental impact, namely:

> *Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations.*

These five principles are interrelated and need to be considered both individually and collectively as part of determining whether or not a project would contribute be consistent with the principles of ESD in Australia.

30.2.1 Precautionary Principle

The IGAE in its definition of the precautionary principle advises that both public and private decisions should undertake the following:

- *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*
- *an assessment of the risk-weighted consequences of various options.*

AEI has taken on board the 'precautionary principle' for the Moira Station feedlot, as represented by investigation of alternative site locations and through the detailed investigations undertaken to determine the characteristics of the environment, and the likely impacts associated with the preferred option at Moira Station.

As detailed in **Section 5**, AEI discarded alternative site locations due to the likelihood of development at these sites to cause significant harm to the environment.

The identification of potential impacts to the environment through environmental studies undertaken as part of this EA has enabled the proposed project to be designed to avoid significant environmental impacts, and allowed environmental management measures to be developed to manage potential impacts to ensure that significant adverse environmental impacts are prevented.

Environmental monitoring of the operations and the recommended safeguards would also be undertaken for the life of the feedlot, to ensure that the environmental impacts are appropriately managed and adjustments made to ensure environmental strategies and goals are met for the site.

30.2.2 Intergenerational Equity

The principle of 'intergenerational equity' requires that decisions made by the present generation would not result in a degradation of the environment for future generations.

The proposed feedlot at Moira Station would have minimal long-term impacts on the environment as a result of detailed planning of the preferred design and location of the feedlot to avoid significant impacts on the environment, and in particular on biodiversity, archaeology and water resources.

The operational impacts associated with the feedlot, such as the impacts on odour and traffic, would be managed through the implementation of environmental management measures, and are reversible in nature, that is, they relate to the operational phase of the feedlot, and would therefore not result in significant environmental degradation for future generations.

The design and management of the proposed project would ensure that environmental impacts are managed during the operational phase of the feedlot and would not result in significant long term environmental damage, thereby meeting the principle of 'intergenerational equity'.

30.2.3 Biological Diversity and Ecological Integrity

The principle of 'biological diversity and ecological integrity' requires a full and diverse range of plant and animal species to be maintained and conserved.

Consideration of the impacts of the proposed project on terrestrial ecology has been undertaken as part of developing the preferred feedlot design through environmental investigations.

The terrestrial ecology investigations undertaken concluded that the proposed feedlot is unlikely to have significant impacts on flora and fauna species or habitat. The proposed feedlot design would not result in the removal of significant areas or types of plant species.

Monitoring of the environmental safeguards and environmental impacts would be carried out for the lifetime of the project.

The proposed feedlot maintains ecosystems, species and genetic diversity and therefore meets the principle of biological diversity and ecological integrity.

30.2.4 Valuation and Pricing of Environmental Resources

The IGAE and POEO Act require improved valuation, pricing and incentive mechanisms to be included in policy making and program implementation. In the context of environmental

assessment and management, this would translate to environmental factors being considered in the valuation of assets and services.

Integration of environmental and economic goals is a key principle of ESD, which can be measured undertaking a cost-benefit analysis, that is, by measuring the costs of proceeding with a project against the benefits arising from the project.

Given the different values placed on an environment, and the various components of an environment, it is difficult to assign a monetary value against the environmental costs and benefits associated with the project. Given this, the approach adopted for this project is the management of environmental impacts through appropriate safeguards, and to include the cost of implementing recommended safeguards in the total cost of the project.

Relevant to the consideration of the valuation and pricing of environmental resources are the environmental assessment and alternative options which have been developed during planning of the feedlot.

The value of the environment is also managed through the legislative process by imposing financial penalties or requirements to rehabilitate on persons responsible for polluting the environment.

AEI would implement the safeguards and monitoring requirements outlined in this EA to minimise environmental impacts caused by the proposed feedlot, and to minimise the potential for pollution to occur.

30.2.5 Decision Making Process

The proposed project requires approval under Part 3A of the NSW EP&A Act 1979. As part of this approval, an Environment Protection Licence is required under the POEO Act, as described in **Section 7** of this EA.

An assessment of the short, medium and long term impacts of the proposed feedlot, taking into account the principles of ESD is described in this EA. The Statement of Commitments, provided as Part G, forms the environmental mitigation, management and monitoring of the site and its proposed operations.

The project approval and subsequent environmental management frameworks ensure that decision making and monitoring of the project would be undertaken in an integrated manner, having regard to relevant issues associated with the project within its context.

30.3 Climate Change and Greenhouse Effect

The Greenhouse Effect involves certain gases, known as greenhouse gases, capturing heat radiated from the earth and re-radiating heat back to the earth. The thermal balance that is known to control earth's climate is maintained by this mechanism, and is influenced by the steadily increasing concentrations of certain greenhouse gases, with other greenhouse gases including methane, ozone (O_3), NO_x and Chloro-Fluorocarbons (CFCs).

As described in **Section 11**, the direct amount of CO_2 generated as a result of methane produced from the cattle is 9,600 tonnes per year.

Overall, the construction and operation of the proposed feedlot is not expected to contribute significant levels of greenhouse gases, and would not therefore have a significant impact on the greenhouse effect.

30.4 Consequences of Not Proceeding

The beef industry has been affected in recent years through the contamination of beef in the supply of major beef producers around the world. The United Kingdom and Europe has been affected by Foot and Mouth Disease and BSE and is unable to export their beef to Asia. Beef producers in South America have been affected by Foot and Mouth Disease and are currently unable to export their beef to other regions, and the United States of America has recently suffered a minor outbreak of BSE and their supply chain to other regions has been impacted.

As a result, Australia is currently the only major producer of beef in the world that is able to export its products to all regions of the world. The beef industry is forecast to grow at a rate of approximately 10% per annum to the year 2013 (Boal, 2004). Should the proposed cattle feedlot at Moira Station not proceed, the opportunity to increase exports and take advantage of the international growth in demand for beef would be missed.

30.5 Conclusion

The proposed cattle feedlot at Moira Station described in this EA is consistent with the principles of ESD and is justifiable taking into account potential health, biophysical, economic and social considerations.

part i
ea findings

31 CONCLUDING STATEMENT

31.1 The Project

The proposed project, as described in this EA, involves site preparation works and construction of an 80,000 head of cattle feedlot located at Moira Station, which is approximately 13km south of Mathoura in south western NSW. The proposed feedlot would occupy a footprint of approximately 600 hectares (ha), which includes feed pens, sedimentation basins, effluent storage and irrigation areas.

Cattle weighing 300kg would be transported to the feedlot and housed in pens. The cattle would be fed rations which would include specific quantities of grain until they reach a designated weight (an average of 529kg) whereby they would be transported from the site to an abattoir.

The Moira feedlot would be classified as a Class One feedlot, which has the highest standard of design, operation, maintenance, pad management and cleaning frequency.

As demonstrated in **Section 5**, a number of alternative sites were considered. However, the Moira Station site provided the best fit with the project objectives, environmental acceptability of the project and sustainability considerations.

31.2 Justification for Project

The proposed project is consistent with the principles of ESD and is justifiable taking into account potential health, biophysical, economic and social considerations.

31.3 Sustainability of Project

The proposed project is sustainable as it allows a commercial gain from the export of cattle whilst at the same time, minimising impacts on health and the social environment, and protecting biodiversity and biophysical aspects of the environment.

The proposed project has adopted a precautionary approach in developing the preferred project, and has incorporated management measures and monitoring outlined in the Statement of Commitments to ensure that significant adverse impacts do not occur.

31.4 Conclusion

The proposed project as outlined in this EA meets the objectives identified in **Section 4**. As demonstrated through the environmental assessment, the proposed project is not expected to have significant impacts on the physical and biological environment. The predicted impacts would be managed through the implementation of management measures and ongoing monitoring as outlined in the Statement of Commitments.

A significant level of commitment has been provided from AEI to manage the social impacts of the project. As described in the EA, the project is not predicted to have significant impacts in terms of noise, traffic and archaeology and heritage.

The community has raised issues regarding odour and traffic and their associated social impacts, particularly on amenity.

Implementation of management measures through the Statement of Commitments would minimise these potential impacts upon the amenity of the local environment as a result of the project.

Construction and operation of the proposed cattle feedlot project at Moira Station is therefore justifiable on biophysical, social and economic grounds.

part j
references

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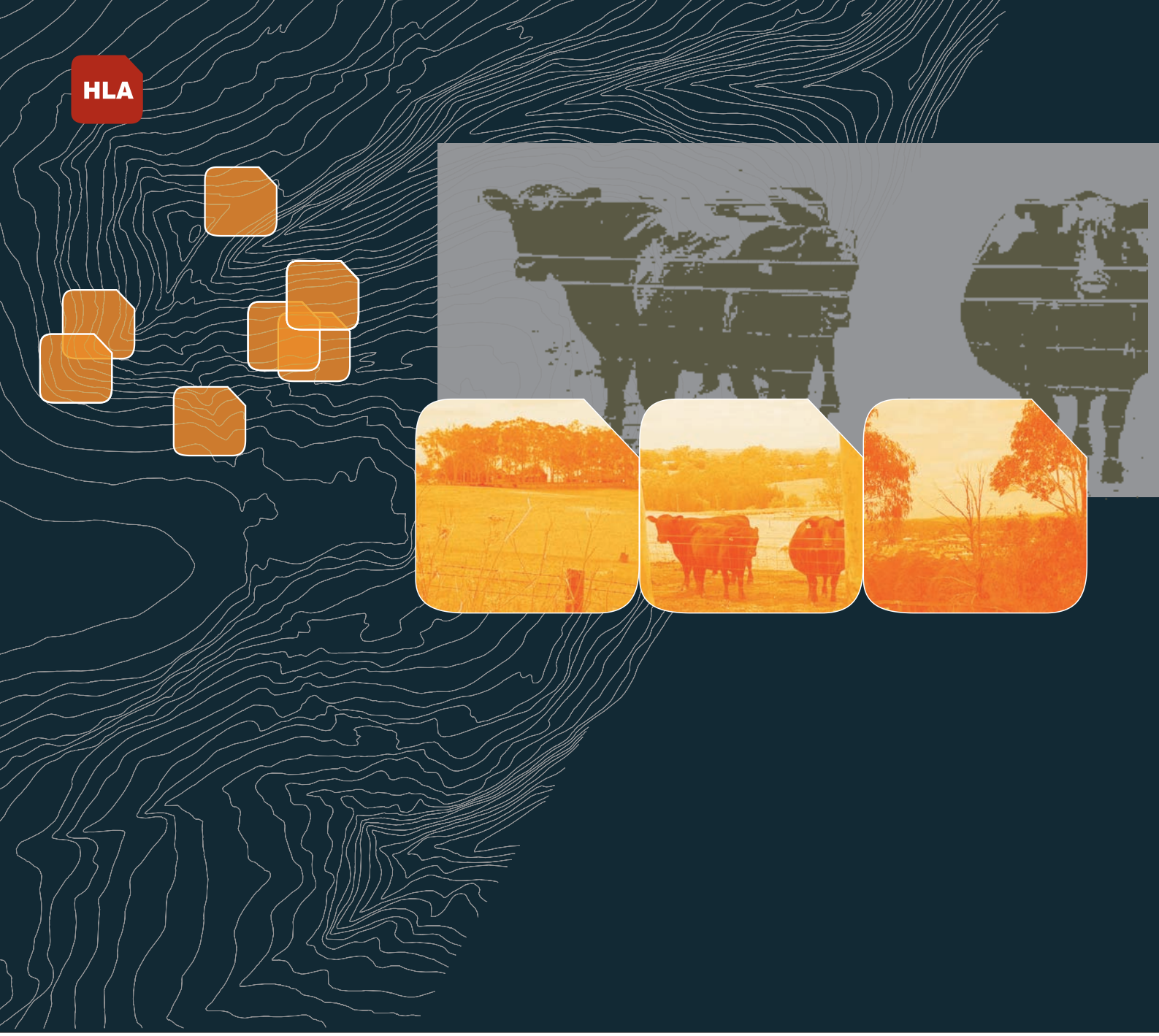

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