



**Environmental Assessment
Proposed Alternative Waste Technology Facility
at Jacks Gully Waste and Recycling Centre**

Volume 1 - Main Report

WSN Environmental Solutions

March 2006



Submission of Environmental Assessment

Prepared under the Environmental Planning and Assessment Act 1979, Section 75H

Environmental Assessment prepared by

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Address:	GHD Pty Ltd 10 Bond Street Sydney NSW 2000
In respect of:	Proposed Alternative Waste Technology and Garden Organics Processing Facilities at the Jacks Gully Waste and Recycling Centre.

Development Application

Applicant name:	WSN Environmental Solutions
Applicant address:	Level 4, 821 Pacific Hwy, Chatswood, NSW, 2067.
Land to be developed:	The proposal is to be carried out on land as shown in the EA.
Lot no, DP/MPS, vol/fol etc	Lots 2, 3 and 4 in DP 250033 and Lot 2 in DP 1076817

Environmental Assessment

An Environmental Assessment (EA) is attached.

Certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge:

- It is in accordance with the requirements of Part 3A;
- It contains all available information that is relevant to the environmental assessment of the development; and
- That the information contained in the EA is neither false nor misleading.

Signature

Name

David Gamble

Date

31 March 2006



Executive Summary

INTRODUCTION

WSN Environmental Solutions (WSN) is committed to providing environmentally sound and sustainable waste management solutions that improve resource recovery, and reduce the quantities of waste being disposed to landfill. WSN will achieve this using appropriate alternate waste treatment processes.

The development of alternative waste technologies is a key strategy for WSN, as evident in its development of the UR-3R Facility at Eastern Creek in conjunction with Global Renewables Limited.

As an alternative to landfilling of putrescible wastes, WSN is proposing to build and operate an alternative waste technology (AWT) facility at Jacks Gully Waste and Recycling Centre (WRC) in order to receive, treat and manage the Macarthur region's municipal waste materials in a more sustainable manner.

Development of an integrated Resource Recovery Facility at Jacks Gully WRC, processing putrescible waste, garden organics and recyclables, provides a local, sustainable solution to waste management for the region. This would permit all of the region's waste management needs to be met at the one location, maximising convenience for residents and minimising transport distances and costs.

THE PROPOSED DEVELOPMENT

WSN is developing Australia's first fully integrated Resource Recovery Centre for all municipal waste streams. An alternative waste technology (AWT) Facility, to be owned and operated by WSN, is the foundation of this development. This facility will comprise a solid waste processing plant, based on the ArrowBio technology and a tunnel composting plant for garden organics.

The ArrowBio processing plant, based on proven commercially operating technology, is designed to process the municipal solid waste (MSW) stream (excluding garden organics and separately collected recyclables) at a rate of 90,000 tonnes per annum. As well as MSW, the plant will be able to process commercial waste streams. Waste processed by the proposed ArrowBio plant would otherwise have been landfilled.

To complement the ArrowBio processing plant, WSN is also proposing to construct a tunnel composting plant that would process up to 30,000 tonnes per annum of separately collected municipal garden organics and biosolids.

THE PROPONENT

WSN Environmental Solutions is the trading name for the Waste Recycling and Processing Corporation of New South Wales, a NSW State Government owned corporation established under the *Waste Recycling and Processing Corporation Act 2001*. It is responsible to the NSW Minister for the Environment.

WSN manages a network of waste facilities in the Sydney metropolitan area, including seven solid waste transfer stations, four engineered landfills and two recycling facilities. WSN recently opened Sydney's first AWT Facility for municipal solid waste at Eastern Creek, in conjunction with its partner, Global Renewables Limited. This facility now processes over 170,000 tonnes per annum of contracted municipal waste.

STRATEGIC PLANNING FRAMEWORK

Recent legislative changes have created the concept of an “Environmental Assessment” (EA) document to replace the formerly required Environmental Impact Statement (EIS) for developments classified as “Major Projects”.

This EA addresses the requirements for environmental assessment set out by the Department of Planning and the statutory planning and legislative requirements pertaining to both this proposal (presented in Appendix A) and the subsequent submission of a Development Application for consideration of the consent authority, who in this case is the NSW Minister for Planning.

This EA also addresses all the requirements of the various State Environmental Planning Policies, Regional Environmental Plans, Local Environmental Plans and other relevant State and Commonwealth environmental and/or planning legislation.

CONSULTATION

Statutory consultation was undertaken according to the Director General Requirements for the project. All stakeholders responded to the letter that informed them about the proposed development, and all of their comments were addressed in the EA.

DESCRIPTION OF THE PROPOSAL

The proposed development includes an anaerobic digestion type plant to process up to 90,000 tonnes per annum of municipal solid waste (using the patented ArrowBio technology from Arrow Ecology), plus a tunnel composting plant to process up to 30,000 tonnes per annum of separated garden organics and biosolids. The following activities would be undertaken within the proposed AWT Facility:

- ▶ Material separation and removal of recyclables from the domestic waste stream;
- ▶ Extraction of the organic component of the domestic waste;
- ▶ Biological treatment of the organic component to produce biogas;
- ▶ Generation of approximately 2 MW of green electricity for export to the grid;
- ▶ Production of stabilised sludge/soil conditioner with market potential; and
- ▶ Production of high quality compost from garden organics and biosolids.

The proposed AWT Facility would employ approximately 30-50 people during construction and 40 full time employees when fully operational. It would use proven material separation technologies and conventional anaerobic digestion to recover recyclable materials from the municipal waste stream and produce biogas, suitable for electricity generation and divert in excess of 75% of material from landfill.

The tunnel composting facility would convert separately collected garden organics to high-grade compost, using a similar tunnel composting technology currently used near Port Macquarie.

NEED AND JUSTIFICATION

WSN is committed to the principles of waste avoidance and resource recovery. The proposed AWT Facility development delivers outcomes consistent with state strategies for sustainable waste management including the *Waste Avoidance and Resource Recovery Strategy 2003*, by exceeding the 66% municipal waste diversion from landfill target.

The proposed AWT Facility is being developed to meet the requirements of Councils in southwest Sydney as they move towards a more sustainable waste management solution. Planning for the establishment of this facility is proceeding on the basis that the contract for receipt and processing of domestic waste streams from the four Councils of Camden, Campbelltown City, Wollondilly Shire and Wingecaribee Shire, as part of the South West Sydney Councils Resource Recovery Project has been awarded to WSN.

The development will therefore guarantee the provision of sustainable waste management practices to serve a growing population in the Macarthur Region in the long term.

The AWT Facility aligns with the philosophy of viewing waste as a resource – and recovering resources in their highest net resource value state. The recovery of resources in this manner decreases pressure on virgin resources and creates value from the waste stream.

The AWT Facility achieves the following benefits:

- ▶ Maximum recovery of the major elements of the waste stream, thereby maximising energy and resource recovery;
- ▶ Significant reduction in Greenhouse Gas (GHG) emissions through:
 - The capture of 100% of Biogas, produced through the organic component of the waste stream;
 - Recovering (for recycling) homogenous streams of plastic, metal and glass; and
 - Avoiding emissions from otherwise landfilled material.
- ▶ Generation of Renewable Energy;
- ▶ Reduction in disposal to landfill of potential resources. The MSW treatment plant will divert in excess of 75% and the composting plant in excess of 96%; and
- ▶ Production of marketable compost from garden organics as an organic replacement for chemical fertilisers in the agricultural and horticultural markets.

The proposed facility will also provide benefits to the Macarthur region including:

- ▶ Development of a new industry and new employment opportunities in the south west region of Sydney;
- ▶ Local treatment of waste and recovery of recyclables generated within the Macarthur region, avoiding the need to transport unprocessed materials to another region;
- ▶ Reduction in environmental impacts. This can come from minimising the transport of waste, and consequent generation of greenhouse gas emissions, road congestion and maintenance costs, as well as significant impacts on other communities outside the region.

ALTERNATIVES TO THE PROPOSED DEVELOPMENT

WSN considered a range of alternatives to traditional landfill disposal of municipal solid waste, including several technologies that have recently emerged for the effective management and ultimate disposal of putrescible waste. WSN rejected these technology options in favour of the ArrowBio Process, developed by Arrow Ecology. The ArrowBio System is a mechanical biological treatment (MBT) process.

This technology has the following features:

- ▶ Recovers a high proportion of recyclable material;
- ▶ Has a high landfill diversion rate, in excess of 75%;
- ▶ Produces green electricity;
- ▶ Maximises reduction in greenhouse gases;
- ▶ Reduces risks associated with poor quality compost production;
- ▶ Is a net producer of water;
- ▶ Captures 100% of biogas produced; and
- ▶ Has a small environmental and physical footprint.

In terms of the garden organics composting technology, WSN has selected an enclosed, environmentally controlled, aerobic biodegradation system, based upon the system deployed at the Port Macquarie composting plant (operated by Remondis). This facility is recognised in the industry as setting the standard for local processing. This will negate any potential impacts on future residential development and proactively addresses odour management issues.

A 'Do nothing' option has been discussed in this EA. It concludes that, if this project does not proceed, the Macarthur Region's putrescible waste and garden organics would need to be sent to an alternative facility. This may not achieve comparable performance in resource recovery, waste reduction, diversion from landfill and production of marketable products, as well as social and economic considerations including increased employment opportunities.

PROPOSED SITE AND SURROUNDING LANDUSE

The site proposed for the AWT Facility is described as being partly within Lot 2 on Deposited Plan 1076817, and Lots 3 and 4 on Deposited Plan 250033, in the Camden Local Government Area. It is wholly within the Jacks Gully WRC. The proposed facilities would cover approximately 2.7 hectares and would be located on an engineered platform along the southern edge of the current landfill site.

A siting study for the proposed AWT Facility was undertaken in 2003, when several different site locations were considered. The proposed location was considered to be the most appropriate location for the proposed AWT Facility, in terms of minimising environmental impacts on residents, and engineering and planning issues.

The Jacks Gully WRC site is located in Narellan, within the Camden Local Government Area (LGA), in the Macarthur region of Sydney. Jacks Gully is approximately 55 kilometres southwest from Sydney and 5 km southwest from Campbelltown. The Jacks Gully site covers an area of approximately 36 hectares.

The area surrounding the Jacks Gully WRC includes the suburbs of Spring Farm to the west; Mount Annan to the east, Narellan Vale to the north and Glenlee and Menangle to the south.



Land uses around the broader area include transport companies, a coal preparation plant, composting, research uses (as part of the Elizabeth Macarthur Agricultural Institute), sand mining, botanic gardens, poultry farms, open space and a winery.

ENVIRONMENTAL ASSESSMENT

The environmental characteristics of the site were the subject of intensive investigation for the Environmental Assessment. A brief summary of these characteristics, the environmental impact assessment and the environmental management practices are as follows:

Water and Groundwater

The residual wastes produced by the proposed development will be inert and non-putrescible. As only these and other non-putrescible wastes will be landfilled after 2007, the potential for future negative impacts on groundwater quality will be reduced.

The proposed development is self sufficient in water. Water is captured and recirculated from moisture inherent in the putrescible waste, and also produced during the biological processing stage. This water, which is recirculated through the process, is of suitable quality to be used in the plant for washdown purposes and for fire protection, permitting high levels of water re-use.

Rainwater collected from the roofs of buildings would be used for non potable staff amenities and for firefighting purposes. Potable water would be imported to the site only for drinking and amenity purposes. The ArrowBio processing technology itself does not require a source of potable water.

Traffic

The proposed development would result in an overall net reduction in traffic accessing the Jacks Gully WRC and the number of heavy vehicles would also be greatly reduced.

There would be short-term increases in traffic and associated traffic noise along roads leading to the Jacks Gully site, mainly over the first 6 months of the construction period, when fill material is being imported to the site, to construct the engineered platform on which the AWT Facility will be located.

Since the roads and intersections would operate within their acceptable limits during the construction of the AWT Facility, and the main construction activities would all occur during a 12 month period, no specific mitigation measures are recommended. However a traffic management plan would be prepared prior to construction to minimise the impact of heavy vehicle movements during the period when spoil is being imported to the site.

Once the AWT Facility is operational, there would be a net reduction in the amount of waste received at the site, including the delivery of waste to the site and the removal of treated waste, of 100,100 tonnes annually. This will result in approximately 3,490 fewer trucks accessing the site annually, and a reduction in the number of heavy vehicles accessing the site daily (based on a 5 day collection week, 52 weeks per year) of about 13 vehicles/day.

During operation of the facility, nearby roads and intersections would also operate within their acceptable limits. The impact on the road network surrounding the site is likely to be reduced in the long term, through the construction of the proposed arterial road linking Spring Farm to the Camden Bypass, which will reduce the amount of heavy vehicles using Springs Road, Richardson Road and Macarthur Road.

Dust

During the construction of the proposed facility, the total dust emissions (during the earthworks stage) may increase, particularly when works are undertaken in conjunction with the existing landfilling operations. While the total dust generated at the site is likely to increase during this initial earthworks stage, they would be well below the EPA Guideline of 4 g/m²/month. Since average concentrations of PM₁₀ are also less than half the EPA guideline value, dust emissions (TSP, PM₁₀ and dust deposition levels) should still be within guidelines limits during the construction period, even if they increase in the short-term.

During the construction period, a number of control measures will be implemented which will assist in greatly reducing dust impacts to help ensure the dust generated from the construction activities do not cause excessive nuisance to nearby residents.

During operation of the AWT Facility, dust impacts would be reduced significantly from current levels, since only dry wastes and approximately 22,440 tonnes/yr of residual wastes from the AWT Facility would be landfilled in the future. While total material received at the facility will be similar to the existing rates, the vehicles will all generally travel on sealed roads (unlike at present) and empty their loads within designated, enclosed buildings. Relative to the existing landfilling operations, the proposed development would result in significantly lower (over 70% reduction) dust emissions from the site during operation.

Odour

Over the past five years, odour emissions from the Jacks Gully WRC have been significantly improved through better site management practices, and the proposed AWT Facility would continue this trend. The ArrowBio process is a low odour technology, largely due to the waste being immersed in water soon after entering the plant. The ArrowBio plant will be operated under negative pressure and exhaust air will be vented through a biofilter to absorb any potential odours. The tunnel composting plant also has low odour emissions. The tunnels, where the composting of materials will take place, are fully enclosed and all process air is vented through a biofilter to reduce odours.

Odour modelling, which was undertaken using conservative assumptions, showed that there would be no exceedences of the (99th percentile) 2 OU criteria in existing residential areas or proposed future residential areas to the north of the Jacks Gully WRC due to operation of the AWT Facility.

Ceasing putrescible waste landfilling in 2007, combined with operation of the proposed AWT Facility would reduce odour levels associated with the Jacks Gully WRC in the surrounding area, in the medium to long term. The scaled down operations of the Jacks Gully landfilling operation (residuals and dry waste) would result in the 2 OU criteria being met in existing and future residential areas to the north. Modelling of other odour sources in the region indicates that the odour resulting from the proposed AWT Facility at Jacks Gully WRC is not significant compared to the odours from these sources.

Although predicted odour levels in some parts of industrial areas to the south west of the site would exceed the 2 OU criteria, the levels in the main operations areas would meet this 2 OU criteria.

Noise

The proposed AWT Facility is located as far as possible from existing and future residential areas, on the southern side of the gully. This reduces potential noise impacts from construction and operation.

Since construction of the AWT Facility will take more than 26 weeks, the LA10 level in any 15 minute period must not exceed background LA90 level by more than 5 dBA. The design goal of 39 dBA will be achieved at existing residences during the following time periods:

- ▶ Monday to Friday, 7:00 am to 6:00 pm.
- ▶ Saturday, 7:00 am to 1:00 pm if inaudible on residential premises, otherwise: 8:00 am to 1:00 pm.

Noise from construction related activities outside these hours would be below the night-time typical minimum LA90 noise level of 34 dBA at existing residences.

Existing traffic noise levels at residences on the current public access roads exceed the RTA's road noise criteria (ECRTN) by approximately 5 dBA during daytime and night-time (early morning). During both construction and operation of the proposed AWT Facility, any traffic noise increases would be 1 dBA or less above current levels.

Operational noise levels from the AWT Facility and other future site activities (landfilling, material recovery facility and existing landfill gas engine) would be less than current noise levels during the daytime, depending upon the receptor location, but slightly higher in the early morning. Providing a high performance muffler for the existing landfill gas engine and increasing the height of the north western bund wall from 4m to 6m along the private access road means that the Industrial Noise Policy (INP) criteria (39 dBA) would be met at all existing residences at Mt Annan and Narellan Vale.

The INP criteria would be met within approximately 650m from the site, but would be exceeded by about 5 -10 dBA during the day, and 4 dBA at night at locations, within 70m of the northern boundary. There are currently no residences with this proximity to the site.

Flora and Fauna

Removal of 0.4 hectares of bushland within the Jacks Gully WRC site is necessary in order to build the plant. However, the flora and fauna assessment concluded that this proposal would be unlikely to have significant impacts on any threatened or endangered species/ecological communities.

Visual Quality

An assessment of the proposed development concluded that the potential impact would be insignificant on vistas within the visual catchment. The 70 m wide buffer zone along the northern boundary of Jack Gully WRC will effectively screen the facility from the planned Spring Farm residential area.

Heritage

The proposed development would result in no impacts on indigenous or non-indigenous heritage on the site or in the surrounding area. Landscaping and tree plantings will be used to soften the look of the Facility, and to ensure that it cannot be viewed in the context of surrounding historical areas.

Bush Fires

The proposed development would comply with the principles of *Planning for Bushfire Protection (PBP)* (Planning NSW, 2001) in order to reduce the threats of fires to both the proposed waste management facility and adjacent lands and property.

Landfill Gas

Although there is the potential for landfill gas migration from the existing landfill to the proposed AWT Facility, WSN currently utilises best practice techniques for landfill technical design and landfill gas collection and processing on the site. This ensures that all available landfill gas generated from landfill is being effectively managed. However other precautions will be taken during construction and operations to ensure that there is an extremely low risk associated with landfill gas.

Social and Economic

Positive social and economic impacts of the proposal include an estimated 30-50 construction jobs over a 12- month period, and 40 full-time positions once the plant is operating.

The proposed development would permit all of the region's waste management needs to be met at one location, maximising convenience for residents and minimising transport costs. It would result in the diversion of more than 75% of putrescible waste, generated in the region, from landfill. These high levels of resource recovery would provide economic and social benefits to the region.

Waste Minimisation and Demand on Resources

The AWT Facility is self sufficient in water and energy requirements using resources produced from the ArrowBio Plant. The effectiveness of water in dissolving the organic fraction of the wastes so that it can be converted into biogas in a two-stage process means that the plant requires relatively low energy inputs, compared to other energy producing plants. Similarly, the tunnel composting technology selected for garden organics processing has relatively low energy inputs, because air requirements (for accelerating the decomposition of the garden organics) are minimised by the design.

Raw materials such as iron ore, bauxite and fossil fuels such as coal (i.e. fuels used to produce steel and aluminium, for example) would be preserved due to high recovery rates for recyclables. In addition, valuable landfill space on-site can be reserved for only the non-recyclable / non-recoverable wastes in the future, instead of being consumed by putrescible wastes and potentially recyclable materials, as it is currently.

Greenhouse gas emissions

There would be significant reductions in greenhouse gas emissions due to processing of putrescible wastes and production of green energy on the site. Between 50-75% of the green energy produced on-site would be exported to the grid, saving more than 23,000 tonnes of greenhouse gases being produced at NSW power stations each year. Over the estimated 15 year life of the plant, the production of 1.39 million tonnes of greenhouse gases from waste would be avoided. This is equivalent to taking approximately 345,000 cars (each travelling 15,000 km per year) off the roads.

Cumulative Impacts

The proposed development will result in positive cumulative impacts in terms of air and water quality, noise, and traffic. It is consistent with the aims of the *NSW Waste Avoidance and Resource Recovery Strategy 2003*.

Ecologically Sustainable Development

The guiding principles of Ecologically Sustainable Development (ESD) include:

- ▶ The precautionary principle;
- ▶ Inter-generational equity;
- ▶ Conservation of biological diversity; and
- ▶ The principle of improved valuation, pricing and incentive mechanisms.

In summary, the proposal:

- ▶ Does not pose a threat of serious irreversible environmental damage;
- ▶ Facilitates inter-generational equity as it allows for waste to be disposed of, treated or reprocessed within the region;
- ▶ Reduces the financial impact on the local community and provides it with a greater degree of control over its own future waste management practices;
- ▶ Improves local employment potential and contributes to economic growth in the region with only minor impact on the local visual environment;
- ▶ Will divert significant quantities of waste from landfilling and therefore conserves local ecological integrity; and
- ▶ Utilises the “polluter pays” principle, proposing that those who generate waste in the region should bear full cost of containment, avoidance or abatement and facilitating that the users of goods and services pay prices based on the full “life cycle” costs of those goods, including the use of all natural resources and assets and the ultimate disposal of all wastes.

Environmental Management Plans

Strategic mitigation measures have been developed to manage all negative impacts that have been identified in this EA. A series of Environmental Commitments that WSN is required to make, and implement effectively over the course of the project, are stated in Chapter 27. An outline of the proposed Construction and Operational Environmental Management Plans (EMPs), which will be used to manage, monitor and mitigate environmental impacts from the proposal, are provided.

Justifications and Conclusions

The proposed operation of the AWT Facility, comprising the ArrowBio Plant and Garden Organics Plant is considered to be justified in that it delivers outcomes consistent with the factors that are driving both regional and state waste management strategies.

The proposal to establish the AWT Facility at Jacks Gully WRC has been developed to meet the requirements of the South West Sydney Councils for the receipt, treatment and processing of mixed solid waste and garden organics, while at the same time maximising the diversion of waste from landfill.

This EA has assessed all key environmental issues and identified appropriate mitigation measures associated with construction and operation of the proposed development.



It is GHD's opinion that the potentially adverse effects of the proposed development can be appropriately managed by the implementation of specific mitigation measures proposed and incorporated in the document. The construction and operation of the AWT Facility will be undertaken in accordance with the undertakings given in the EA and all relevant legislative guidelines. The proposed development should therefore be approved subject to the implementation of the mitigation measures identified in Chapter 28 of this Environmental Assessment.

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PART F Summary of EA Findings

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Glossary of Terms

Term	Definition
Aquifer	Rock or soil formation containing groundwater in recoverable quantities
Aquitard	A layer of material that confines the aquifer
Catchment	The area drained by a stream, lake or other body of water
Cumulative impact	A significant impact created by accumulation or successive additions of individual impacts, which may not in themselves be significant
Development Consent	Approval to undertake a development. Also referred to as a development approval
Ecologically Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs
Effluent	Liquid industrial waste or wastewater, which may or may not have been passed through a type of purification process
Emission	The release of material into the atmosphere (eg: gas, noise)
Environmental Management Plan	A document setting out the management, control and monitoring measures to be implemented during construction (a Construction Environmental Management Plan) and /or operation (Operational Environmental Management Plan) of a development, to avoid or minimise the potential environmental impacts identified during an environmental assessment process (such as an EIS)
Flora and Fauna	Plants and Animals
Greenhouse Gases	Gases that accumulate within the earth's atmosphere (eg: primarily water vapour, carbon dioxide and methane) and contribute to global climatic change/global warming (e.g: "greenhouse effect")
Hydrology	The science dealing with water on the land or under the surface, its properties and distribution
Particulate	Small particles, usually occurring in suspension
pH	Measure of acidity (or alkalinity) $pH = -\log_{10}[H^+]$. Ranges from 0→14 with lower values being more acidic, higher values being more alkaline, 7 being neutral
Preliminary Hazard Analysis	A hazard analysis is used to develop an understanding of the hazards and risks associated with an operation or facility and of the adequacy of safeguards. A preliminary hazard analysis occurs at an early stage of a project
Preliminary risk screening	An assessment of the likelihood of risk, required under State Environmental Planning Policy No. 33 to determine the need for a Preliminary Hazard Analysis
Preloading	The process of placing soil or sand over the site prior to construction of buildings/structures, to accelerate settlement of underlying soils and minimise the potential for future movement
Putrescible	Capable of biological decomposition



Term	Definition
Sedimentation basin	A basin in which stormwater or wastewater is temporarily stored, so that suspended matter may sink to the bottom, in order to separate it from the water, from which it can be removed
Sewer	A conduit for carrying of wastewater (sewage)
The Proponent	WSN Environmental Solutions
Threatened Species	Species of animals or plants that are at risk of extinction (also known as 'endangered species') or becoming endangered within the next 25 years ('vulnerable species'), defined by the <i>Threatened Species Conservation Act 1995</i>
Water Balance	Modelling the use of water in a development

List of Abbreviations

Abbreviation	Name
AADT	Average Annual Daily Traffic
ADC	Alternative Daily Cover
AHD	Australian Height Datum
AS/NZS	Australian Standard/New Zealand Standard
AWS	Automatic Weather Station
AWT	Alternative Waste Technology
Council	Camden Council
CAC	Community Advisory Committee
CBD	Central Business District
C&D	Construction and Demolition
CEMP	Contractor's Environment Management Plan
C&I	Commercial and Industrial
CPW	Cumberland Plain Woodland
CSM	Camden Soil Mix
DA	Development Application
DCP	Development Control Plan
DEC	NSW Department of Environment and Conservation (incorporating the former NSW Environment Protection Authority/EPA)
DG	Director General
DIPNR	NSW Department of Infrastructure and Planning and Natural Resources (now the Department of Planning)
DLWC	NSW Department of Land and Water Conservation
DOP	Department of Planning
DS	Degree of Saturation
EA	Environmental Assessment
ECRTN	Environmental Criteria for Road Traffic Noise
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ENCM	Environmental Noise Control Manual
EMP	Environmental Management Plan
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979



EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPCM	Engineering Procurement and Construction Management
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
GCCP	Glenlee Coal Preparation Plant
GG	Greenhouse Gas
GHD	GHD Pty Ltd
GRL	Global Renewables Limited
HPD	Hearing Protective Devices
INP	Industrial Noise Policy
LEP	Local Environmental Plan
LALC	Tharawal Local Aboriginal Land Council
LES	Local Environmental Study
LGA	Local Government Area
LPG	Liquid Petroleum Gas
LOS	Level of Service
MACROC	Macarthur Regional Organisation of Councils (Councils of Camden, Campbelltown City, Wingecarribee Shire & Wollondilly Shire Councils)
MDP	Metropolitan Development Program
MGB	Mobile Garbage Bin
MRF	Materials Recycling Facility
MSW	Municipal Solid Waste
NES	National Environmental Significance
NOx	Oxides of Nitrogen
NPW Act	The National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OHS	Occupational Health and Safety
PEMP	Project Environmental Management Plan
POEO Act	Protection of the Environment Operations Act 1997
PPE	Personal Protective Equipment
PRP	Pollution Reduction Program
Regulations 2000	Environmental Planning and Assessment Regulations 2000
RBL	Rating Background Noise Level
REP	Regional Environmental Plan



RL	Reduced Level
SD	Statistical Division
SEPP	State Environmental Planning Policy
SOx	Oxides of Sulphur
SWL	Sound Power Levels
SREP	Sydney Regional Environmental Plan
SRT	Solids Retention Time
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates
VENM	Virgin Excavated Natural Materials
VOCs	Volatile Organic Compounds
WARRS	Waste Avoidance and Resource Recovery Strategy
WRC	Waste and Recycling Centre
WSN	WSN Environmental Solutions (the proponent)

Units of Measure

Length	mm	Millimetres
	m	Metres
	km	Kilometres
	RL	Reduced Level
Area	m ²	Square metres
	ha	Hectares
Volume	L	Litres
	v/v	Volume for volume
	m ³	Cubic metres
Mass	µg	Micrograms
	mg	Milligrams
	g	Grams
	kg	Kilogram
Noise	dB	Decibel – unit of sound measurement
	dB(A)	Unit used to measure 'A-weighted' sound pressure levels
	Hz	Hertz – unit used to measure frequency
	L _N	Noise exceedance level (N = percentage of sampling period)
Time	s	Seconds
Odour	OU	Odour Units
Miscellaneous	%	Percentage
	\$	Australian dollars
	@	At
	°C	Degrees Celsius
	°	Degree (angle between slope and horizontal)
	pH	Measure of acidity

PART A

Preliminaries

1. Introduction

This chapter provides a general background to the proposed development of an alternative waste technology (AWT) facility at Jacks Gully Waste and Recycling Centre (WRC). It provides a description of the site, the proposed technologies and the Proponent. The objectives and contents of the Environmental Assessment (EA) are also outlined in this chapter.

1.1 The Proponent

1.1.1 Current activities

WSN Environmental Solutions (WSN), formerly known as Waste Service NSW, is a NSW Government owned corporation and has been operating for over 30 years in the business of integrated waste management.

WSN is Sydney's major provider of waste management and recycling services handling over 1.3 million tonnes of putrescible waste annually. It owns and operates four major landfills, seven large waste transfer stations, and two Materials Recycling Facilities (MRFs). Sydney's first AWT Facility for domestic waste, at Eastern Creek, is also part of the WSN network.

1.1.2 Proponents Objectives

The objectives of WSN are set out in the *Waste Recycling and Processing Corporation Act 2001* and include the requirement to:

- ▶ Protect the environment by managing waste in accordance with the principles of ecological sustainable development;
- ▶ Exhibit social responsibility by achieving international best practice of waste management;
- ▶ Minimise adverse health and environmental impacts in managing waste; and
- ▶ Be a successful business.

WSN provides for a significant portion of the waste management needs of greater metropolitan Sydney, a population of 4.7 million.

1.1.3 Proponents Business strategy

WSN is committed to providing environmentally sound and sustainable waste management solutions that improve resource recovery, and reduce the quantities of waste being disposed to landfill. WSN will achieve this using appropriate alternate waste treatment processes and simple separation solutions such as MRFs.

These facilities divert valuable resources from landfill, allowing the maximum recovery and recycling of resources from the waste stream.

WSN operates in accordance with the *NSW Waste Avoidance and Resource Recovery Strategy (WARRS) 2003*, which contains four (4) operating principles including;



- ▶ Avoiding and preventing waste.
- ▶ Increased use of renewable and recovered materials.
- ▶ Reducing toxicity in products and materials; and
- ▶ Reducing litter and illegal dumping.

The proposed AWT Facility is a strategic response aimed at implementing the key objectives of the *NSW WARRS 2003*.

The AWT Facility also forms a key part of WSN's regional resource recovery solution tendered to the South West Sydney Councils, following a call to tender for waste processing and resource recovery.

Landfilling of putrescible waste still remains the dominant method for waste disposal in Australia and worldwide. Its attraction lies in its superficial and short term cost advantages. It is now widely recognised that landfilling of waste, particularly putrescible materials, can result in significant environmental impacts that need to be managed in the medium to long term.

WSN is transforming its business from a predominantly landfill operation for putrescible waste to an environmentally sound and sustainable business platform, using appropriate engineering solutions such as MRFs and AWT Facilities.

Engineered solutions in the waste industry have rapidly grown over the last 10 years. Several AWT solutions have emerged for the management and disposal of waste. At the same time, public expectations and concerns for the environment have increased. Therefore, any AWT solutions need to be technically feasible and financially viable in the long term, as well as meeting environmental objectives and community expectations.

WSN has demonstrated its commitment to sustainable waste management practices and the provision of facilities to process and recover resources from waste. The Jacks Gully AWT Facility would be the second major AWT Facility in WSN's Sydney network. The AWT Facility would utilise technologies ideally suited to the proposed location of the plant and the regional waste characteristics.

1.2 Background

1.2.1 Existing operations

WSN has been operating the Jacks Gully WRC, Richardson Road, in Narellan since 1974. Jacks Gully WRC is one of the larger WRCs in the Sydney Metropolitan Region and currently receives approximately 210,000 tonnes of putrescible waste per annum from the Local Government Areas (LGAs) of Camden, Wollondilly Shire, Campbelltown City and Wingecarribee Shire, as well as other WSN facilities.

Jacks Gully WRC also receives commercial and industrial (C&I) and construction and demolition waste (C&D) from the Macarthur Region and from Liverpool City LGA. Jacks Gully WRC was upgraded in the 1990s with a Materials Recycling Facility (1996) and a Small Vehicle Dropoff Facility (1997) serving the resident and small business needs of the region.

1.2.2 Need for the AWT Facility

There is an ongoing need for waste management facilities in the Macarthur Region to serve local communities. WSN is ceasing putrescible landfilling at the Jacks Gully WRC after 2007

and facilitating a process of replacing landfilling with sustainable waste recovery technology solutions.

The development of an integrated Resource Recovery Facility, processing putrescible waste, garden organics and recyclables provides a local, sustainable solution to waste management for the region. This development would permit all of the region's waste management needs to be met at the one location, maximising convenience for residents and minimising transport distances and costs.

South West Sydney Councils, comprising the LGAs of Camden, Campbelltown City, Wollondilly Shire and Wingecaribee Shire recently called tenders for the processing and resource recovery of all domestic waste streams from their LGAs. This tender is designed to establish the next generation of waste management and resource recovery infrastructure in the region. This application is to implement WSN's successful bid in securing the contract from the four Councils for the receipt and processing of their domestic waste through the proposed AWT Facility.

It is clear from this tender and other tender processes initiated in metropolitan Sydney that Councils are demanding more sustainable waste management practices. This requirement will be met through the proposed AWT Facility development.

1.3 The Site

The Jacks Gully WRC site is located in the Camden Local Government Area (LGA), that is part of the Macarthur Region of Sydney. It is approximately 55 km south-west from Sydney CBD and 5 km south-west from Campbelltown CBD. The entire site covers an area of approximately 36 hectares. The area surrounding the Jacks Gully WRC includes the suburbs of Spring Farm to the west; Mount Annan to the east, Narellan Vale to the north and Glenlee and Menangle to the south.

Land uses in the broader area include transport companies, a coal preparation plant, land used for research as part of the Elizabeth Macarthur Agricultural Institute, sand mining, botanic gardens, poultry farms, an open windrow composting facility, a winery, and existing and proposed residential developments.

Over the past 10 years, the NSW State Government has released a significant amount of land in the Macarthur Region for urban development as part of the Metropolitan Development Program (MDP). This has occurred near the Jacks Gully WRC at Narellan and Mount Annan. Further land releases will occur at Mount Annan South, Spring Farm and Menangle Park.

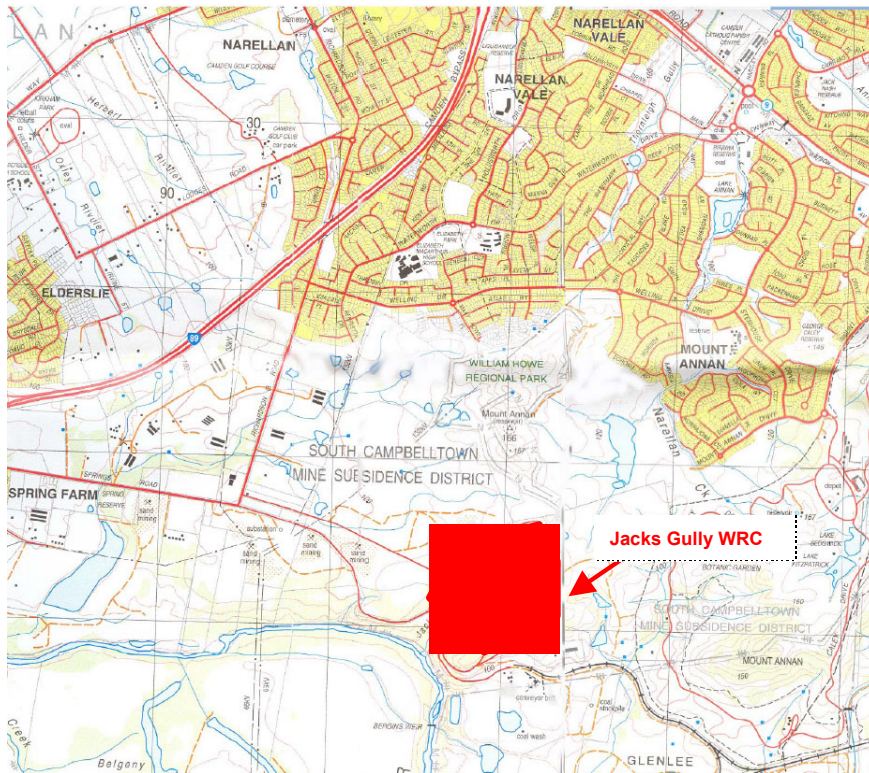


Figure 1-1 Location of Jacks Gully WRC

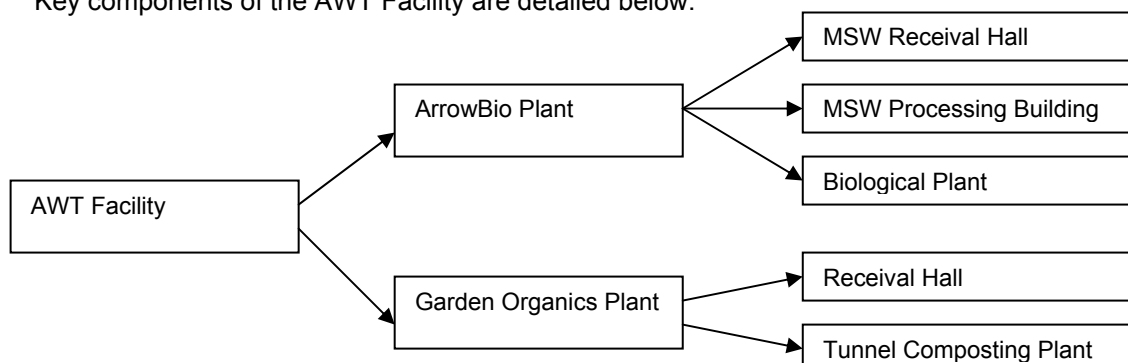
1.4 Proposed AWT Facility

The proposed AWT Facility consists of two main components – a Garden Organics Plant and an ArrowBio Plant for municipal solid waste. These facilities will be located on an engineered platform in the southern part of the existing Jacks Gully WRC site. The overall layout of the AWT Facility is illustrated on Figure 1-2.

The engineered platform is an extension of an existing rock platform, which extends into the current landfilling area, which is approximately 20-30 metres below the top of the platform. However over a period of time, the site will be landfilled and the platform will eventually blend into the new topography created by the final landform of the landfill.

The eventual profile of the landfill is shown in the foreground of Figure 1-2, in brown (active landfill area) and in green (revegetated areas). To the right (west) is the Garden Organics Plant, with the ArrowBio Plant located in the centre of the platform. The anaerobic digestion plant is located within the ArrowBio Plant on the eastern end of the platform.

Key components of the AWT Facility are detailed below:



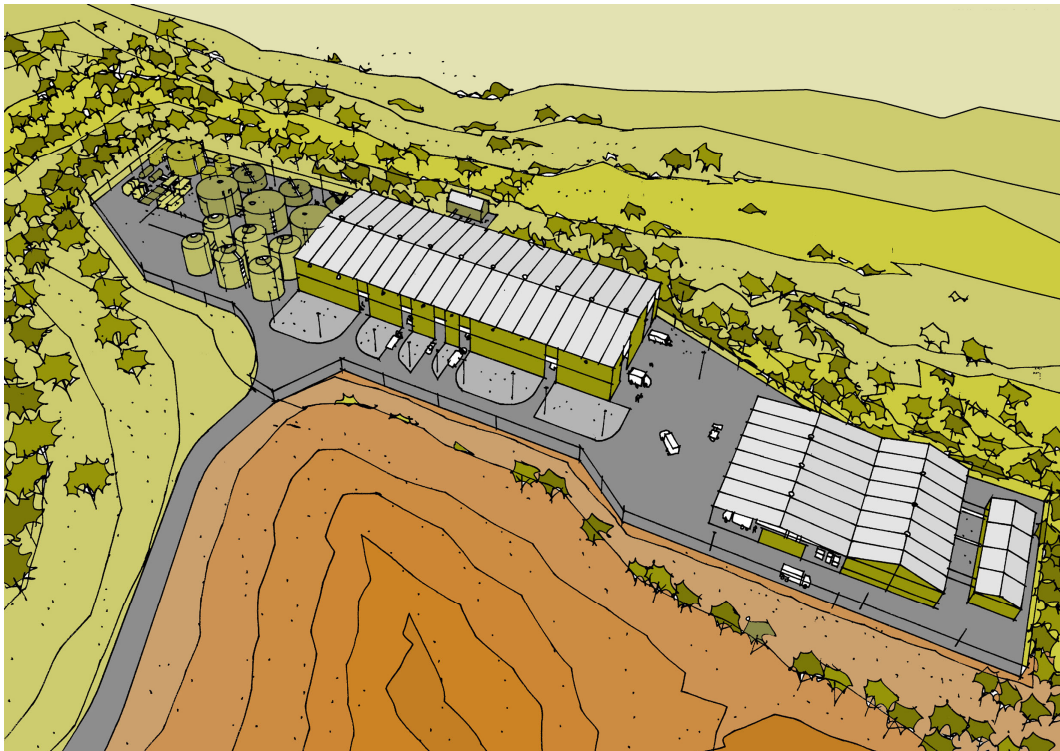


Figure 1-2 Artistic architectural view of proposed AWT Facility and engineered platform

1.4.1 Technology selection and siting

New residential areas such as Spring Farm are to be situated relatively close to the northern boundary of the site. Therefore it is particularly important that:

1. Any technologies used on the site for municipal solid waste (MSW) treatment and garden organics composting have low noise and odour emissions,
2. The AWT Facility is suitably sited to minimise potential environmental impacts on nearby residents (both in construction and operational phases), and
3. The AWT Facility has been designed as fully enclosed plants that provide a high degree of control over environmental emissions such as odour and noise.

The proposed AWT Facility includes an ArrowBio Plant for MSW treatment, based on ArrowBio technology utilising advanced materials separation technologies and anaerobic digestion to produce biogas for on-site renewable energy generation. Along with a Garden Organics Plant utilising enclosed composting in aerated tunnels, to produce high-grade marketable compost.

Both of these technologies have low odour and noise emissions. The ArrowBio Plant achieves this by immersing the waste in water soon after it is received at the facility. In addition, the AWT Facility's Receival Hall will be under negative air pressure which is vented through a biofilter for odour reduction. Observations made by GHD at the ArrowBio Plant in Tel Aviv, Israel confirmed the low odour emissions at the plant.

Noise levels measured inside the plant (refer Chapter 14) were observed to be below the level where hearing protection is required (85 dBA), resulting in relatively low noise emissions to the surrounding area.

The Garden Organics Plant uses an enclosed, environmentally controlled, aerobic biodegradation process. The system contains the material in tunnels allowing a higher degree of process control and odour containment. Biofilters will be employed for odour reduction.



Figure 1-3 Location of the AWT Facility in regional context

The proposed site for the AWT Facility forms a part of Lots 3 and Lot 4 in DP 250033 and Lot 2 in DP 1076817 and is located in the south-western corner of the Jacks Gully WRC, on a specially engineered platform. This engineered platform, which would be an extension of an existing rock ledge on the southern side of the gully, covers an area of approximately 2.7 hectares.

The platform access road will impact on Lots 2 and 3 in DP250033 and Lot 2 in DP1076817.

The location of the AWT Facility, on an engineered platform maximises the distance of the facility from the nearest residential area (Spring Farm) to the west, which will minimise noise, dust and odour impacts on residents during construction and operation. Landfilling will cease when the AWT Facility becomes operational in 2007.

Following the establishment of the AWT Facility, the Jacks Gully landfill would only be used for non-putrescible wastes including residuals from the AWT Facility and non-recoverable hard wastes delivered to the site by local residents. This will result in overall improvements in odour emissions from the site. It should be noted that the odours are currently being effectively managed by extraction of landfill gas for the generation of significant quantities of electricity and flaring, which will continue into the medium to long term.



Figure 1-4 Location of proposed AWT Facility as viewed from existing operational area

1.4.2 ArrowBio Plant

The ArrowBio Plant comprises three integrated processing units, utilising a combination of advanced MRF technologies and innovative biological processing techniques to recover materials that are currently in the domestic waste stream.

- ▶ A receival hall and front end processing unit for dry separation and removal of recyclable materials, bulky and hazardous items;
- ▶ Separation of organic matter from any remaining recyclable material using a fully recycled water based solution; and
- ▶ Biological treatment of the remaining organic matter to produce biogas for electricity generation and a nutrient rich stabilised sludge, for sale into the local market.

All this material would otherwise be landfilled.

The ArrowBio technology used for the ArrowBio Plant has successfully operated in a full scale commercial plant in Israel for over 2 years. This is a third generation of the technology following almost nine years of development. This plant processes approximately 100 tonnes per day, equivalent to 30,000 tonnes per year, producing approximately 0.9 MW of electricity, and diverting 75% of the input stream from landfill.



Figure 1-5 Processing building at Tel Aviv facility (photo)

(source: Finstein, M. S. (2004))



Figure 1-6 Tank farm at Tel Aviv facility (photo)

(source: Finstein, M. S. (2004))

The proposed plant at Jacks Gully WRC would consist of two parallel processing lines. The plant would operate over a 12 hour working cycle and this, combined with a materials recovery system in the Receiving Hall, would enable it to process approximately 300 tonnes/day or 90,000 tonnes of delivered putrescible waste per annum.

The anaerobic digestion plant would produce about 2 MW of electricity, of which about 1 MW would be used for powering the entire plant during the day and 0.5 MW at night, when only the biological plant is operating. The plant would be a net exporter of energy, and it is expected that it would typically divert from landfill about 75% of the material received.

1.4.3 Garden Organics Plant

The proposed Garden Organics Plant is a fully enclosed, environmentally controlled system, which provides a high degree of environmental protection. It utilises identical tunnel composting technology to that which is successfully operating at the Remondis (formerly Rethmanns) plant near Port Macquarie. This facility is recognised in the waste industry as achieving excellent performance standards for the last four years of commercial operation.



Figure 1-7 Existing garden organics plant at Port Macquarie

The Garden Organics plant at Jacks Gully WRC would receive approximately 25,000 tonnes/yr of separately collected garden organics and 5,000 tonnes/yr of biosolids, to produce approximately 18,300 tonnes/yr of high grade, high quality marketable compost and mulch through a process of enclosed composting.

Of the 30,000 tonnes of feedstock entering the plant per year, in excess of 96% will be converted to high quality compost.

The compost produced from the garden organics would meet Australian Standard AS 4454 - 1999 and Biosolid Guidelines Grade A for unrestricted use.

1.4.4 Environmental Sustainability

The proposed AWT Facility greatly improves the environmental sustainability of waste management in the Macarthur Region. More than 75% of stabilised material will be diverted from landfill, exceeding NSW State Government Targets for resource recovery.

The proposed AWT Facility will deliver:

- Substantially reduced greenhouse gas emissions,
- Energy production from the organic fraction,
- The production of compost to minimise the use of synthetic products in agricultural and horticultural uses;
- Resource recovery of recyclable materials.

The AWT Facility would therefore meet the key objectives of the *NSW Waste Strategy 2003*, and the Macarthur regional waste tender, which has specified environmental sustainability as a key focus. Local Councils within the Macarthur Region would continue to deliver municipal solid waste to the Jacks Gully WRC, and to also deliver garden organics from separate kerbside collection systems to the same site, minimising transport distances for waste vehicles and further contributing towards environmental sustainability.

1.5 The Environmental Assessment Process

The *Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Act, 2005* commenced on 1 August 2005. A key component of this amendment is the insertion of a new Part 3A (Major Projects) into the existing Environmental Planning and Assessment (EP&A) Act.

This consolidates the assessment and approval regime for all major projects requiring approval of the Minister for Planning, which were previously addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment) of the EP&A Act. The proposed facility would fall within Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005*. As such, in accordance with Clause 6 of the Major Projects SEPP, Part 3A of the EP&A Act applies to the proposed AWT Facility.

These recent legislative changes also created the concept of an “Environmental Assessment” document for projects under Part 3A, to replace the formerly required Environmental Impact Statement (EIS).

Chapter 2 of the EA provides a summary of the relevant statutory framework and legislative requirements pertaining to both the submission and assessment of the DA and the compilation and consideration of the EA.

1.6 Objectives of the EA

The objectives of this Environmental Assessment (EA) are to:

- ▶ Establish the need for the proposed AWT in relation to its strategic setting;
- ▶ Provide a detailed description of the proposed AWT Facility, assess potential environmental impacts and recommend mitigation measures for any adverse impacts;
- ▶ Comply with relevant legislative requirements for the planning and development of the proposed development;
- ▶ Outline the statutory and community consultation which has been undertaken as part of preparing the EA;
- ▶ Describe how the proposed development will meet the waste management and recycling needs of the surrounding regional area;
- ▶ Discuss alternatives to the proposed development and justify the selection of the preferred option;
- ▶ Outline environmental management practices to manage and where possible, mitigate any adverse environmental impacts during both the construction and operational phases of the AWT Facility;
- ▶ Assess conformance of the proposed development with the principles of ESD; and
- ▶ Enable the community and the consent authority to properly consider the potential environmental consequences of proceeding with the proposed AWT Facility.

1.7 Contents of the EA

The EA describes the proposed development and the existing environment. Potential impacts are assessed and mitigation measures are recommended to minimise potential impacts. All specialist investigation reports are included in Volume 2 – Appendices. The main report is contained in Volume 1.

Volume 1 – The EA

Volume 1 contains the EA document, which is divided into six parts including:

Part A – Preliminaries

This provides an introduction to the proposal and the environmental assessment process. It also provides information on the proponent and the factors that provide the framework and background for the EA and the issues considered, including the statutory framework and the consultation process.

Part B – Planning and Legislative Framework

This provides the statutory framework for the assessment of the EA to address relevant environmental planning instruments and Federal and State environmental legislation. Part B also provides an assessment of the consultation undertaken as part of the preparation of the EA with the Federal, State and Local agencies and the community.

Part C – The Proposal

This provides a description of the need and justification for the proposal, a description of the proposed development and associated works and a description of the alternatives that have been considered.

Part D – Environmental Assessment

This provides an assessment of the potential environmental impacts of the proposal. The chapters include a description of the existing environment, against which potential environmental impacts are considered and assessed. Measures are recommended to mitigate the potential impacts. Part D also provides a socio-economic assessment of the proposed development.

Part E – Environmental Management

This provides information on the recommended environmental management and monitoring requirements for the proposal, and a summary of the mitigation measures and any approvals required.

Part F – Summary of EA findings

This provides a summary of the findings of the EA, outlining the conclusions that support the justification of the proposal and the certification requirements for the proposed development.

Volume 2 – Appendices

Volume 2 contains the specialist technical reports prepared as part of the EA process, as well as other reference material. The contents of Volume 2 are listed in Table 1-1.

Table 1-1 Contents of EA Volume 2

Appendix		Author
A	Director-General Requirements	Department of Planning
B	Department of Planning Correspondence	Department of Planning
C	Statutory Consultation Responses	Various
D	Site Environmental Licence	NSW DEC (EPA)
E	Traffic and Transport Study	GHD
F	Air Quality Report	Holmes Air Sciences
G	Noise Assessment	Heggies Australia
H	Noise Measurements taken in Israel	GHD
I	Flora and Fauna Assessment	Eco Logical Australia
J	Flora and Fauna Supplementary Report	GHD
K	Bushfire Assessment	GHD
L	Landscape and Visual Assessment	Bryant Associates
M	Indigenous Heritage Assessment	Waters Historical Consultancy
N	Non-indigenous Heritage Assessment	History Works
O	Landfill Gas Risk Assessment	GHD

PART B

Planning and Legislative Framework

2. The Statutory Framework

This chapter outlines the decision making process for the proposal in terms of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), the statutory approvals process and other statutory requirements.

2.1 Overview

On 1 August 2005 the *Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Act, 2005* commenced. A key component of this amendment is the insertion of a new Part 3A (Major Projects) into the existing EP&A Act.

The aim of the amendment is to encourage economic development in NSW by facilitating major project and infrastructure delivery, whilst also strengthening the environmental safeguards for, and community participation in such projects. The new Part 3A of the Act consolidates the assessment and approval regime for all major projects requiring approval of the Minister for Planning which were previously addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment) of the EP&A Act.

These recent legislative changes have created the concept of an “Environmental Assessment” document for projects under Part 3A, to replace the formerly required Environmental Impact Statement (EIS).

This Environmental Assessment (EA) has therefore been compiled to accompany a Development Application (DA) for this proposal. This Chapter of the EA provides a summary of the relevant statutory framework and legislative requirements pertaining to both the submission and assessment of the DA and the compilation and consideration of the EA.

2.2 Commonwealth Legislation

The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is an act that requires actions which are likely to have a significant impact on matters of National Environmental Significance (NES matters) or that has a significant impact on Commonwealth land or that requires referral to the Commonwealth Minister of the Environment for approval. NES matters include:

- ▶ World Heritage Properties;
- ▶ Listed Migratory Species;
- ▶ Listed Threatened Species and Communities;
- ▶ Nuclear Actions;
- ▶ Wetlands of International importance; and
- ▶ Commonwealth Marine areas.

The impacts of the proposed AWT Facility on this community have been assessed as part of the Flora and Fauna assessment (See Chapter 15). The site contains a listed threatened ecological community under the EPBC Act, however, this assessment concludes that the proposal would be unlikely to have significant impacts on the endangered ecological community.



The proposed development is unlikely to have a significant impact on any other NES matters. Accordingly, the proposed development does not need to be referred to the Commonwealth Minister for the Environment.

2.3 State Environmental Planning Legislation

The EP&A Act is the principal statutory NSW State Government act that covers environmental planning and assessment. The Minister for Planning, local councils, and the Director-General of the Department of Planning are jointly responsible for the implementation of the EP&A Act.

The EP&A Act contains three schemes which impose requirements for planning approval:

- ▶ Part 3A provides for control of 'major infrastructure or other projects' that require development consent or other approval from the Minister for Planning;
- ▶ Part 4 provides for control of 'local development' that requires development consent from the local Council; and
- ▶ Part 5 provides for control of 'activities' that do not require development consent or approval of the Minister for Planning.

The need or otherwise for development consent is set out in environmental planning instruments – State Environmental Planning Policies (SEPP), Regional Environmental Plans (REP) or Local Environmental Plans (LEP).

As discussed in Section 2.6.1, the site is zoned 5(a) Special Uses (Waste Management Centre) under Camden LEP No. 48. The proposed AWT Facility is permissible with development consent in this zone.

Furthermore, as discussed in Section 2.4.2, the proposed facility would fall within Schedule 1 of *State Environmental Planning Policy (Major Projects)*. As such, in accordance with Clause 6 of the Major Projects SEPP, Part 3A of the EP&A Act applies to the proposed AWT Facility.

2.3.1 Planning Approval Process under Part 3A

Under the provisions of Part 3A, the proponent of a potentially significant or large project is required to first consult with the Director General of the Department of Planning to determine if the project would be subject to the provisions of Part 3A. WSN has consulted with the Department of Planning, and a copy of correspondence confirming that the project is subject to Part 3A is contained in Appendix B

Step 1: Preparation of an Environmental Assessment

Following initial consultation, the Director General of the Department of Planning normally issues the proponent with requirements for the Environmental Assessment. These identify key issues to be addressed and the level of assessment required.

They also include a requirement to prepare a Statement of Commitments, which sets out how the project will be managed in an environmentally sustainable manner, the consultation requirements to be met and the "deemed refusal" period. The proponent must prepare its Environmental Assessment in accordance with the Director General's requirements.

The original Director General's requirements for the project were issued on 28 June 2004. (Refer Appendix A). WSN was subsequently advised by the Department of Planning in a letter (refer Appendix B) that the requirements that formerly applied to the preparation of an EIS are

“accredited” as being applicable to the preparation of an EA. WSN has therefore proceeded to prepare this Environmental Assessment on this understanding and in accordance with the requirements issued in 2004, and presented in Appendix A.

Step 2: Lodgement, exhibition, consultation and review

After this Environmental Assessment (EA) is lodged, the Director General of the Department of Planning will seek advice to determine if the EA adequately addresses the matters in the requirements and if the information presented is considered adequate, prior to its public exhibition.

The Director General may request additional information, may refuse to exhibit the EA or the proponent may also seek an independent peer review of any aspect of the assessment. Following this, the Environmental Assessment will be made public for a period of at least 30 days and public submissions on the proposal will be invited.

All relevant agencies, including the local council, will also be invited to provide preliminary recommendations including measures for environmental management and mitigation of impacts.

The Minister may at any time during the assessment process convene an Independent Hearing and Assessment Panel to provide advice on any aspects or, for major complex projects where there are a range of issues and a high level of community concern, the Minister may also direct that a Commission of Inquiry be held to independently assess the proposal and to make appropriate recommendations.

At the conclusion of the exhibition, the Director General will provide the proponent with a copy of the submissions or a summary of all the issues raised in the submissions and the proponent will be asked to respond to all these issues. At this stage it may be appropriate for the proponent to modify the project, and/or their draft Statement of Commitments aimed at minimising the project's impacts on the environment and the affected community.

If so, the proponent must then submit a Preferred Project Report that clearly describes the revised scope of the project. The Director General will make this report publicly available.

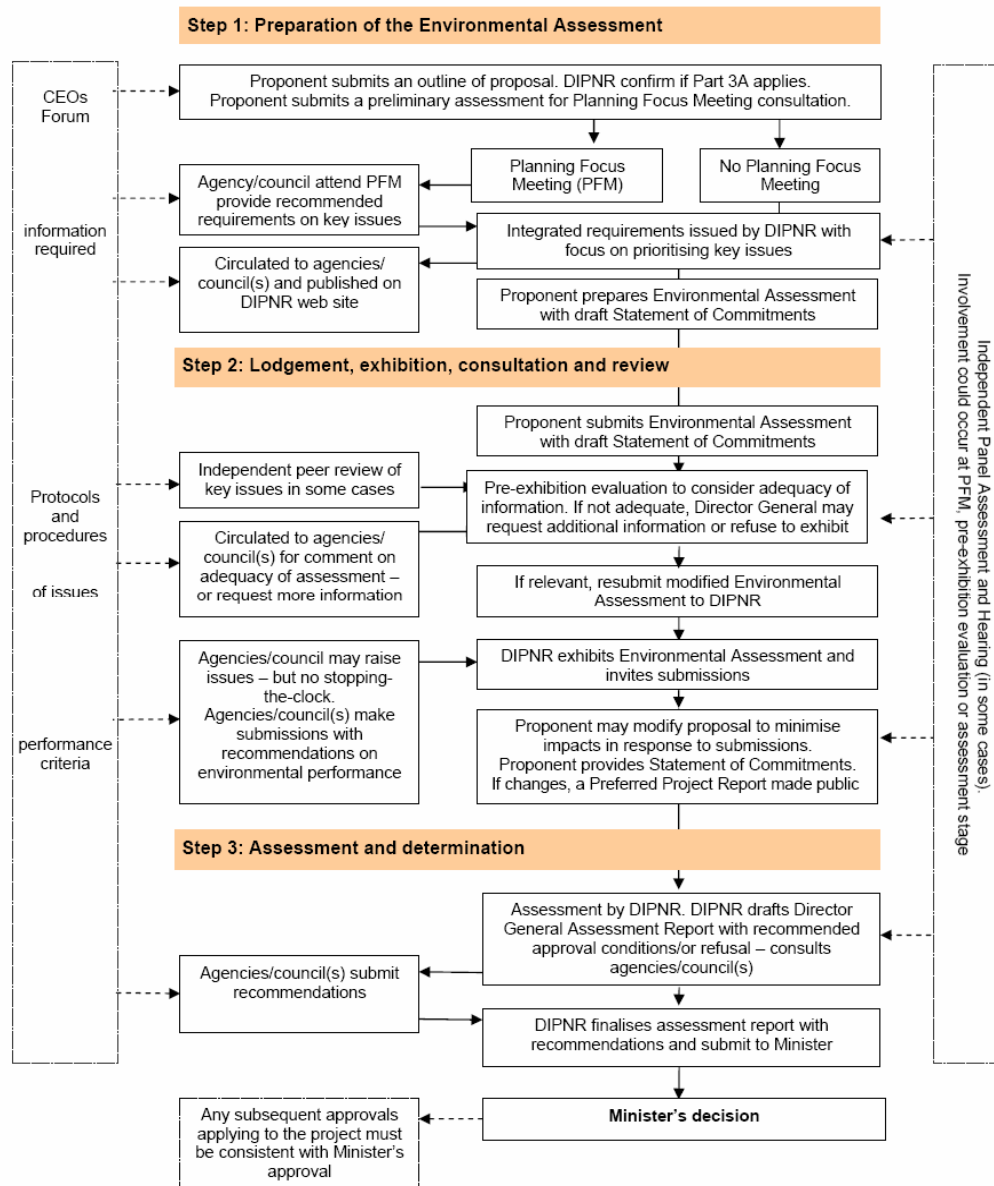
Step 3: Assessment and determination

Once the Department of Planning has completed its assessment of the proposal, the Director General will prepare a draft assessment report, which includes recommended conditions of approval. The Director General will then consult with relevant agencies prior to finalising the assessment report. The recommended conditions will directly refer to the proponent's Statement of Commitments, and may modify them and/or set additional provisions. The assessment report will then be submitted to the Minister for determination of the project.

The Minister's determination and the Director General's report will be published on the Department of Planning web site (www.planning.nsw.gov.au) immediately following any determination of the development proposal made by the Minister.

An illustrated summary of the assessment and approval process required for Major Projects under Part 3A of the EP&A Act is provided in Figure 2-1, below. It should be noted that the former name of the Department of Planning is still shown on this figure, which was obtained from the Department of Planning website.

Integrating assessment and approval for project or concept plan applications under Part 3A of the EP&A Act



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Figure 2-1 Summary of Assessment and Approval Process under Part 3A of EP&A Act

2.4 State Environmental Planning Policies

2.4.1 Potentially relevant SEPPs

The SEPPs that are potentially relevant to the proposed AWT Facility are:

- ▶ State Environmental Planning Policy (Major Projects);
- ▶ State Environmental Planning Policy No. 33 – Potentially Hazardous or Offensive Developments; and
- ▶ State Environmental Planning Policy No. 55 – Remediation of Land.

The provisions of these instruments are discussed in this section.

Other SEPPs that were considered in relation to the proposed AWT Facility but deemed not to be applicable include:

- ▶ State Environmental Planning Policy No. 11 – Traffic Generating Developments
 - The proposal does not fall within the schedules contained in SEPP 11;
- ▶ State Environmental Planning Policy No. 19 – Bushland in Urban Areas
 - The site is not located on or adjacent to bushland zoned or reserved for public open space;
- ▶ State Environmental Planning Policy No. 44 – Koala Habitat Protection
 - This SEPP does not apply to the Camden LGA;
- ▶ State Environmental Planning Policy No. 48 – Major Putrescible Landfill Sites
 - The proposal does not involve landfilling of putrescible waste; and
- ▶ State Environmental Planning Policy No. 58 – Protecting Sydney’s Water Supply
 - The study area does not lie within Sydney’s drinking water catchment.

2.4.2 State Environmental Planning Policy (Major Projects)

The Major Projects SEPP defines certain developments that are major projects under Part 3A of the EP&A Act 1979 and determined by the Minister for Planning. The SEPP also lists State Significant Sites.

Under Clause 6 of the SEPP, development that, in the opinion of the Minister, is development that is described in Schedule 1 of the SEPP, is declared to be a project to which Part 3A of the Act applies.

Schedule 1 includes the following categories of development:

“24 Electricity generation

Development for the purpose of an electricity generation facility that:

- (a) *has a capital investment value of more than \$30 million for gas or coal-fired generation, or co-generation, or bioenergy, bio-fuels, waste gas, bio-digestion or waste to energy generation, or hydro or wave power generation, or solar power generation, or wind generation, or*
- (b) *(Repealed)*

(c) *is located in an environmentally sensitive area of State significance.*"

"27 Resource recovery or waste facilities

(1) *Development for the purpose of regional putrescible landfills or an extension to a regional putrescible landfill that:*

(a) *has a capacity to receive more than 75,000 tonnes per year of putrescible waste, or*

(b) *has a capacity to receive more than 650,000 tonnes of putrescible waste over the life of the site, or*

(c) *is located in an environmentally sensitive area of State significance.*

(2) *Development for the purpose of waste transfer stations in metropolitan areas of the Sydney region that handle more than 75,000 tonnes per year of waste.*

(3) *Development for the purpose of resource recovery or recycling facilities that handle more than 75,000 tonnes per year of waste or have a capital investment value of more than \$30 million.*

(4) *Development for the purpose of waste incineration that handles more than 1,000 tonnes per year of waste.*

(5) *Development for the purpose of hazardous waste facilities that transfer, store or dispose of solid or liquid waste classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste that handles more than 1,000 tonnes per year of waste.*

(6) *Development for the purpose of any other liquid waste depot that treats, stores or disposes of industrial liquid waste and:*

(a) *handles more than 10,000 tonnes per year of liquid food or grease trap waste, or*

(b) *handles more than 1,000 tonnes per year of other aqueous or non-aqueous liquid industrial waste."*

The proposed AWT Facility is considered to fall within Clause 24(a) of Schedule 1, as it involves construction of an electricity generation facility using biogas and has a capital investment value of more than \$30 million.

The proposed AWT Facility is also considered to fall within Clause 27(3) of Schedule 1, as it involves construction of a resource recovery facility that handles more than 75,000 tonnes per annum of waste, and has a capital investment value of more than \$30 million.

As such, the proposal is considered to be a Part 3A project, and the Minister for Planning is the consent authority.

2.4.3 State Environmental Planning Policy No. 33 – Potentially Hazardous or Offensive Developments

State Environmental Planning Policy No. 33 (SEPP 33) aims to ensure that appropriate measures are employed to minimise the impacts of developments that are deemed to be either 'hazardous' or 'offensive'. SEPP 33 also outlines matters to be considered by the Consent

Authority when assessing hazardous and offensive development proposals and requires that applications be advertised in the same manner as is required by 'designated' developments.

Under SEPP 33, the proposed development is considered as potentially offensive because waste related activities could potentially impact on the surrounding locality, even after measures are taken to reduce or minimise the potential impacts.

However, the development is not considered hazardous, as environmental management controls proposed for the development would limit the potential health risk to workers and surrounding residents and risk to the biophysical environment. Mitigation measures for these risks are outlined in detail later in this chapter.

SEPP 33 requires that potentially hazardous or offensive developments are publicly advertised under the same requirements as for designated developments. As the proposed development is already classified as a designated development, statutory and community consultation has been carried out as per the requirements of the EP&A Act. Consultation activities that will be undertaken for the proposed development are described in Chapter 4.

Matters to be considered by the Consent Authority are contained in Part 3(13) of SEPP 33. These matters are listed in Chapter 22, and addressed in specific chapters of the EA (refer Chapter 22 for details).

2.4.4 State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. The SEPP applies to the whole of the State.

Under Clause 7(1) of the SEPP, a consent authority must not consent to the carrying out of any development on land unless:

- “(a) it has considered whether the land is contaminated, and*
- (b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
- (c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.”*

The site for the proposed AWT Facility is a rock platform on the southern side of the gully, within the Jacks Gully WRC. This platform (which is very unlikely to be contaminated as it was the main source of VENM for daily cover) needs to be extended further north, west and south, to create sufficient area for the proposed facilities.

Even if the underlying rock and soil has been slightly contaminated by the waste material above it, it would still be suitable for its intended purpose, which is to provide a foundation for the rock platform. There is little possibility of any contaminants migrating from this area, as they would be covered with engineering fill, and would be above the water table. Further details about the impacts of potential soil contamination are provided in Chapter 9.

2.5 Regional Environmental Plans

This section provides an assessment of the Regional Environmental Plans (REP) that applies to the site of the proposed AWT Facility.

2.5.1 Sydney Regional Environmental Plan No. 20 - Hawkesbury–Nepean River (No.2 – 1997)

Sydney Regional Environmental Plan No. 20 (SREP 20) applies to the Camden LGA and aims to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context. SREP 20 integrates planning and catchment management issues in order to protect the river system and to assess the impact of future land use within a regional context.

The Plan covers water quality and quantity, environmentally sensitive areas, riverine scenic quality, agriculture and urban and rural residential development. It controls development that has the potential to impact on the river environment. The Plan applies to the Camden LGA and is supported by an Action Plan, which suggests actions necessary to improve existing conditions.

Specific Planning Policies

Clause 6 of SREP 20 contains specific planning policies that must be taken into consideration by a consent authority in determining a DA on land to which the REP applies.

Table 2-1 provides an assessment of the specific planning issues and policies contained in Clause 6 in relation to the proposed AWT Facility.

Table 2-1 Assessment of SREP 20 Specific Planning Issues

SREP 20 Specific Planning Issue – Policy	Comment
Total catchment management	
Total catchment management is to be integrated with environmental planning for the catchment.	Roofwater collected from the buildings associated with the proposed AWT Facility will be collected for re-use, while stormwater falling on paved areas would also be collected in a sedimentation pond. This water would be re-used on-site wherever possible. On the rare occasions during extreme wet weather events, excess water will be control released into the Nepean River stormwater outlet, once it has been tested to meet environmental licence requirements.
Environmentally Sensitive Areas	
The environmental quality of environmentally sensitive areas must be protected and enhanced through careful control of future land use changes and through management and (where necessary) remediation of existing uses.	No environmentally sensitive areas within the Jacks Gully WRC exist in the area of the proposed AWT Facility, and therefore none would be impacted by the proposal.

SREP 20 Specific Planning Issue – Policy

Comment

Water Quality

Future development must not prejudice the achievement of the goals of use of the river for primary contact recreation (being recreational activities involving direct water contact, such as swimming) and aquatic ecosystem protection in the river system. If the quality of the receiving waters does not currently allow these uses, the current water quality must be maintained, or improved, so as not to jeopardise the achievement of the goals in the future. When water quality goals are set by the Government these are to be the goals to be achieved under this policy.

The proposed development has no significant impacts on water quality, since it comprises roofed buildings and paved hardstand areas. Areas containing process equipment will be bunded and this water will be collected separately from other stormwater, in case it is contaminated.

Stormwater collected from all areas will be re-used on-site wherever possible. Excess water will be tested to ensure that it meets environmental licence requirements or needs to be treated before being control released into the Nepean River stormwater outlet.

Water Quantity

Aquatic ecosystems must not be adversely affected by development, which changes the flow characteristics of surface or groundwater in the catchment.

The development has no impact on flow characteristics of ground water or surface water in the catchment.

Cultural Heritage

The importance of the river in contributing to the significance of items and places of cultural heritage significance should be recognised, and these items and places should be protected and sensitively managed and, if appropriate, enhanced.

Not applicable to this development.

Flora and Fauna

Manage flora and fauna communities so that the diversity of species and genetics within the catchment is conserved and enhanced.

The proposal development will have minimal impact on flora and fauna within the catchment as the site is mainly cleared of vegetation, with a long history of industrial and quarrying land use. The small area of vegetation required to be cleared for the development to proceed, would have insignificant impact on the flora and fauna.

Riverine scenic quality

The scenic quality of the riverine corridor must be protected.

Not applicable to this development.

Agriculture/aqua culture and fishing

Agriculture must be planned and managed to minimise adverse environmental impacts and be protected from adverse impacts of other forms of development.

The proposed AWT Facility area is located so that operational impacts are effectively contained within the boundaries of the Jacks Gully WRC. There would be no significant environmental impacts upon nearby areas.

Rural residential development

Rural residential development should not reduce agricultural sustainability, contribute to urban sprawl, or have adverse environmental impacts (particularly on the water cycle or on flora or fauna).

Not applicable to this development.

SREP 20 Specific Planning Issue – Policy

Comment

Urban development

All potential adverse environmental impacts of urban development must be assessed and controlled.

Not applicable to this development.

Recreation and tourism

The value of the riverine corridor as a significant recreational and tourist asset must be protected.

The proposed development is physically separated from the Nepean River and will not impact on the tourist value of this section of the riverine corridor.

Clause 11 of SREP 20 contains development controls for a range of different types of development. The proposed AWT Facility would fit within the categories of “Composting facilities” and “Waste management facilities or works”. Under these clauses, development consent would be required, and the consent authority is required to consult with the Hawkesbury-Nepean Catchment Management Trust. In addition, there are a number of additional matters for consideration by the consent authority, as addressed in Table 2-2.

Table 2-2 Assessment of SREP 20 Additional Matters for Consideration

SREP 20 Specific Planning Issue – Policy	Comment
Any potential for groundwater contamination	There is no potential for groundwater contamination, as the proposed AWT Facility will be located on an engineered platform, and areas used for processing activities will be paved.
The adequacy of the proposed leachate management system and surface water controls	Leachate produced by the tunnel composting is captured and will be processed and recirculated back into the garden organics tunnel composting system.
The long-term stability of the final landform and the adequacy of the site management plan	The landform created when the engineered platform is built will be extremely stable. The engineered platform will be built on an existing rock platform with soils and other materials compacted to an engineering standard. Batters will be constructed to further strengthen the northern and western edges of the platform. Additional works will be undertaken during construction to stabilise the existing slope above the platform, which will actually improve its stability.
If extraction of material is involved in the creation or other development of the waste management site, whether the extractive operation will have an adverse impact on the river system.	Some of the VENM material that will be used as fill for the engineered platform will be obtained from within the gully area of the Jacks Gully WRC. Since there is no direct connection between the Nepean River and the site, there is little possibility of adverse impacts on the river system.

2.5.2 Sydney Regional Environmental Plan No.9 – Extractive Industry

Sydney Regional Environmental Plan No. 9 (SREP 9) identifies regionally significant extractive resources within the Sydney Region to facilitate their utilisation. The Plan ensures extraction is carried out in an environmentally acceptable manner and prohibits extraction from certain environmentally sensitive areas. It ensures that decisions on future urban expansion take into account the ability to realise the full potential of important deposits.

Land at Elderslie is identified in SREP 9 as containing regionally significant sand and soil deposits, however the proposed AWT Facility will not impact on these regionally significant sand/soil deposits.

2.6 Local Environmental Plans

This section makes an assessment of the relevant Local Environmental Plans (LEPs) that apply to the site of the proposed AWT Facility.

2.6.1 Camden Local Environmental Plan No.48

The Camden LEP No. 48 (LEP 48) is the principal environmental planning instrument that applies to the site of the proposed AWT Facility and surrounding locality. LEP 48 aims to achieve the following:

- Simplify, update and consolidate all planning controls in relation to rural lands for the Municipality of Camden in accordance with the current environmental planning and assessment legislation and practices;
- Maintain the agricultural productivity of the Municipality of Camden and to encourage further development of agriculture within a framework of appropriate environmental safeguards;
- Maintain the rural atmosphere of the Municipality of Camden;
- Ensure that development maintains the rural character of the locality and minimises disturbances to the landscape, is in harmony with the environment and does not unreasonably increase demands for public services or reduce the existing levels of service;
- Enable certain non-agricultural activities to be carried out within a particular zone if they are in keeping with the objectives of that zone and compatible with development of adjoining and adjacent lands;
- Regulate the subdivision of rural lands to ensure that actual or potentially productive land is not withdrawn from production or sterilised;
- Enable development to occur that will serve the needs of the rural community;
- Preserve the lifestyles and amenities of the people living in the Municipality of Camden by controlling the type and magnitude of development within the rural areas;
- Encourage the conservation of historical buildings and significant landscapes throughout the rural area; and
- Ensure that future urban lands are not fragmented or developed in such a way as to make urban development more costly and difficult.

The site of the proposed AWT Facility is located in the Special Uses (Waste Management Centre) zone that also covers the whole of the site of the Jacks Gully Waste and Recycling Centre. The proposed AWT Facility would therefore be considered to be permissible development under the provisions of LEP 48.

LEP 48 contains a number of specific clauses that are relevant to the proposed AWT Facility.

Table 2-3 provides an assessment of the relevant clauses of the Camden LEP 48.

Table 2-3 Assessment of the clauses of Camden LEP No.48

Clause of Camden LEP No.48	Comment on Draft EA
Clause 19. Development on steep land Establishes Council consent requirements for excavation and filling on steep land (20% slope)	The proposed site of the proposed AWT Facility would not be subject to landslip or erosion. The engineered platform will be designed so that batters support the main body of the platform, and these batters will be reinforced to maintain their stability. The slope above the platform will be reinforced and otherwise treated to minimise the possibility of future landslips and erosion.
Clause 21. Flood Prone Land Aims to prevent buildings and work in flood prone land which may exacerbate the flooding impact	The height of the proposed platform means that it would not be affected by flooding. The gully where landfilling is conducted is not currently subject to flooding.
Clause 22. Land subject to bushfire hazards Council oppose the subdivision of land affected by bushfire hazards affected by vegetation unless adequate safeguards are provided	The site of the proposed AWT Facility is not likely to be affected by bushfire, as there is only a small area of bushland adjacent to the proposed engineered platform. Future landfilling activities mean that bushland within the operational area of the Jacks Gully WRC site will be confined to a strip of land directly south of the site entrance road and materials recycling facility, which presents no risk to the proposed AWT Facility. (Refer to Chapter 18 – Bushfire Assessment).
Clause 24. Items of environmental heritage Aims to protect items of environmental heritage in the Camden area by requiring a heritage assessment for development of land in the vicinity of a heritage item.	The site of the proposed AWT Facility is not located near any existing heritage items in the Camden LGA.
Clause 28. Tree preservation Aims to minimise disturbance and removal of trees.	Approximately 0.4 hectares of vegetation would be removed as a direct consequence of constructing the AWT Facility (see Chapter 15 – Flora and Fauna). WSN adopts a planting strategy of vegetation, by planting additional vegetation within the Jacks Gully WRC and on the bunds surrounding the facilities.
Clause 33. Mine subsidence board Requires an applicant to contact the Mine Subsidence Board for land within an area, which has been proclaimed as a mine subsidence district under section 15 of the <i>Mine Subsidence Act 1961</i>.	The land is within the Campbelltown Mine Subsidence District. This issue will need to be further investigated during the development approval process, but it is understood that there is no existing mining beneath the proposed location for the AWT Facility. The depth of the current gully (below the surrounding land area) suggests that future mining is extremely unlikely.
Clause 30. Advertisements Aims to prevent advertising structures in rural zones, special use zones and environmental protection zones.	Not applicable.

2.6.2 Camden Local Environmental Plan No. 104

Camden LEP 104 is a simple map amendment of LEP 48.

2.6.3 Camden Local Environmental Plan No. 95

Camden LEP 95 applies to land to the north of the Nepean River and allows composting facilities with recycling of waste products. This land is also affected by the Spring Farm Draft LEP 121 and does not affect the outcomes of this EA for the AWT site.

2.6.4 Camden Local Environmental Plan No. 121

Camden LEP 121 allows for the release of land for residential development at Spring Farm, which lies immediately west of the Waste and Recycling Centre. This LEP allows residential, rural, special uses (electricity substation), an arterial road reservation and environmentally sensitive land. An odour buffer is nominated within the LEP to protect the amenity of future residents from potential odour impacts from the Jacks Gully WRC.

2.6.5 Camden Structure Plan 2000

In 2000 Camden Council released the “Camden Structure Plan 2000” to set the future-planning framework for the Camden LGA. The main planning outcome in the Structure Plan was to encourage containment for its urban areas to protect its strong rural landscape and character. The Structure Plan promotes land adjacent to the Jacks Gully site for employment purposes to serve the local population.

The Structure Plan is relevant as it represents an opportunity to further encourage the development of the locality as an employment precinct for the local and regional population.

2.6.6 Camden 2025: A Strategic Plan For Camden

This Camden strategic plan broadly outlines a future vision and sets goals to guide Camden’s development towards 2025. It aims to increase and diversify local economic opportunities and achieve sustainable urban development. The plan advocates waste minimisation, increased recycling and community engagement and stewardship.

The proposed development supports the strategic direction of Camden and other surrounding communities in response to resource recovery and ecologically sustainable development for waste minimisation.

2.7 Other Relevant State Legislation

The following State legislation has also been assessed as part of the preparation of this EA.

2.7.1 Threatened Species Conservation Act 1995

The Threatened Species Conservation Act 1995 (TSC Act) lists a number of factors to be taken into account in deciding whether there is likely to be a significant impact on threatened species, threatened populations, endangered ecological communities or their habitats. Should a threatened species or community be impacted, an eight-part test must be completed to determine the significance of the impact. A Species Impact Statement (SIS) is required if there is likely to be a significant impact on a threatened species or community.

The potential impact of the proposal on threatened species and communities has been assessed in Chapter 15. The proposal is not likely to have a significant impact on threatened species or communities and an SIS is therefore not required.

2.7.2 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) provides the basis for legal protection and management of Aboriginal sites in NSW, amongst other things. The implementation of the Aboriginal heritage provisions within the Act are the responsibility of the National Parks and Wildlife Service, which now forms part of the NSW Department of Environment and Conservation (DEC).

The NPW Act, together with the policies of the DEC include the following provisions that apply to land owners in NSW:

- ▶ It is an offence to knowingly disturb an Aboriginal artefact or site without an appropriate permit issued by NPWS;
- ▶ Prior to instigating any action which may conceivably disturb a “relic”, an appropriate archaeological survey and assessment is required; and
- ▶ When the archaeological resource of an area is known or can be reliably predicted, appropriate land use practices should be adopted which will minimise the necessity for the destruction of sites/relics, and prevent the destruction of sites/relics which warrant further consideration.

Chapter 17 of this EA makes an assessment of Indigenous heritage issues relevant to this proposal, and concludes that the proposal would have no adverse impacts on Indigenous heritage items. Accordingly, an approval from DEC would only be required if items of significance are discovered during construction of the proposed AWT Facility.

2.7.3 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) aims to protect NSW's environment. The POEO Act also aims to reduce risks to human health and the environment through improved management of pollution and to provide increased opportunities for public involvement and participation in environmental protection.

The POEO Act aims to minimise pollution, reduce waste and more effectively monitor pollution generating industries.

As a waste receipt and processing facility, the proposed AWT will need to be licensed by the DEC under the POEO Act and must operate in an environmentally sensitive manner to minimise pollution of the environment, the risk of pollution and associated risks to human health.

Instead of varying the existing Jacks Gully WRC licence to accommodate the new activities undertaken on the site, the DEC has indicated to the proponent that the facility will need to have its own separate licence.

2.7.4 Waste Avoidance and Resource Recovery Act 2001

The Waste Avoidance and Resource Recovery Act 2001 (WARR Act) was implemented to achieve environmentally sound management of waste, waste avoidance and resource recovery in NSW. The WARR Act aims to encourage the most efficient use of resources and to reduce



environmental harm in accordance with the principles of ESD. The WARR Act aims to minimise and avoid resource consumption and ensure resource recovery and disposal. The WARR Act operates in concert with the provisions of the POEO Act 1997.

Operation of the AWT Facility (rather than landfilling putrescible waste) is consistent with the WARR Act, which aims to make better use of resources and minimise waste disposal.

3. Environmental Assessment Requirements

This chapter provides an overview of the planning and environmental requirements relevant to the preparation of this Environmental Assessment (EA). Requirements include the Director-General's requirements issued on 29 June 2004 and the outcomes of the statutory consultation undertaken as part of the preparation of this EA.

3.1 Preparation of the Environmental Assessment

The content of this EA has been prepared in accordance with the Department of Planning Director-General's requirements issued on 29 June 2004 (presented in Appendix A).

Preparation of this EA has also considered the requirements from Government Authorities that arose from statutory consultation with those authorities, which is normally part of the preparation of an Environmental Impact Statement (EIS) under either Parts 4 or 5 of the EP&A Act (although this EA was prepared in accordance with the recently gazetted Part 3A of the Act, as discussed in more detail in Chapter 2).

The requirements of Government Authorities are summarised in Table 3-1. Authorities that were consulted are listed in Table 3-2 and responses to issues raised in their submissions are provided in Table 3-3.

3.2 Director General's Requirements

The Director General (DG) of the Department of Planning issues requirements for matters to be addressed by an EIS or an EA. A summary of the DG's requirements are outlined in Table 3-1, together with the relevant section of the EA that addresses these matters. A copy of the requirements is presented in Appendix A.

Table 3-1 Summary of Director General's requirements to be addressed

Issue	Summary of matters to be addressed by the EIS/EA	Reference in EA
Issues of Key Environmental Planning Importance for EA Preparation	Waste management;	Chapter 20
	Input waste management and treatment;	Chapter 5
	Impacts on existing landfill;	Chapter 5 & 20
	Role in strategic waste management in the Sydney Metropolitan Region and consistency with the Waste Avoidance and Resource Recovery Act 2001;	Chapter 6
	Air quality implications covering dust and odour impacts, air emissions and management of greenhouse gas emissions;	Chapters 13
	Traffic and transport;	Chapter 12
	Hazard and Risk impacts including SEPP 33.	Chapter 22 & 2

Issues of Environmental Planning Importance for EA Preparation	Potential environmental impacts in construction and operation;	Chapter 22
	Noise and vibration impacts on nearby residential and sensitive land uses;	Chapter 14
	Surface water discharge and stormwater run off	Chapter 11
	Soil and groundwater contamination;	Chapter 9 & 11
	Visual impacts on nearby residential areas;	Chapter 16
	Infrastructure requirements, particularly water and electricity infrastructure.	Chapter 5
Other Important Issues	Flora and fauna relating to surrounding habitats;	Chapter 15
	Consider cumulative impact assessment of surrounding resource and waste industries;	Chapter 25
	Statutory Planning Instruments including SEPP 19, SEPP 58, SREP 20, Camden LEP 48 and Camden LEP 104;	Chapters 2 & 29
	Relevant DCP's and Draft LEP for Camden and <i>Camden 2025: A Strategic Plan For Camden</i> ;	Chapter 2
	Environmental monitoring and management covering environmental performance during construction and operation;	Chapter 28
	Provide list of mitigation measures/commitments that will be implemented and applied with proposed timing.	Chapter 27
Consultation	Consultation is required with;	Chapter 4; also see Section 3.3
	▶ Camden Council,	
	▶ Campbelltown City Council,	
	▶ Roads and Traffic Authority,	
	▶ DIPNR,	
	▶ Sydney Water,	
	▶ Sydney Catchment Authority,	
	▶ Landcom,	
	▶ Integral Energy,	
	▶ Department of Mineral Resources,	
	▶ Sydney Gas, and	
	▶ Potentially affected communities.	
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	Must be assessed and additional approvals may be required if the proposal contains any actions that may have significant impact on any matters of National Environmental Significance.	Chapters 2 & 15

3.3 Government and Statutory Consultation

Consultation with government authorities and agencies was undertaken through individual correspondence and discussions. Consultation with statutory authorities involved making initial contact with relevant personnel from the authority or agency. A letter followed the initial contact, requesting a formal response identifying whether the authorities or agencies had any issues or concerns that would need to be considered in the EA along with any licences and approvals applicable to the project.

Government organisations that were consulted (in accordance with the DG's requirements) for this EA are listed in Table 3-2. Additionally, the Department of Environment and Conservation (incorporating the NSW Environmental Protection Authority and the former National Parks and Wildlife Service) have also been consulted.

Table 3-2 Government and Statutory Authority Consultation

Organisation	Method of Consultation
Camden Council	Correspondence
Campbelltown Council	Correspondence
Roads and Traffic Authority	Correspondence
Department of Planning	Correspondence
Sydney Water	Correspondence
Sydney Catchment Authority	Correspondence
Landcom	Correspondence
Integral Energy	Correspondence
Department of Mineral Resources (now Department of Primary Industries)	Correspondence
Sydney Gas	Correspondence

3.3.1 Issues Raised through Government and Statutory Authority Consultation

Table 3-3 provides an outline of the issues raised by agencies, together with a reference to where each specific issues is addressed in the EA. A full copy of the responses received is provided in Appendix C.

Table 3-3 Summary of issues raised by statutory/government agencies

Statutory Authority	Issue	Location in EA
Camden Council	Health Potential health impacts on nearby residential communities need to be addressed. The impacts may include odour, emission of air toxins or changes in atmospheric concentrations.	Chapter 13
	Transport Assessment of the impacts of heavy vehicles on the constituents of the area should be performed to ensure the route to be travelled by delivery vehicles does not traverse residential areas.	Chapter 12
Campbelltown Council	The EA should show that the proposal:	
	Has an acceptable environmental impact upon the locality in terms of potential odour, noise, visual and aquatic impacts.	Chapter 13 Chapter 14 Chapter 16 Chapter 11
	Does not limit or compromise the potential for further urban development within the Menangle Park locality	Chapter 8
	Details all truck routes and the volume of traffic that would occur on local roads.	Chapter 12
	Details the proposal's consistency or otherwise with Resource NSW waste strategy for waste minimisation and reduction.	Chapter 20
	Details proposed hours of operation of the facility.	Chapter 5
Roads and Traffic Authority	The EA should detail:	
	The proposed means of vehicular access to/from the site.	Chapter 12
	The likely daily and peak traffic movements generated by the development and the potential increase in the level and type of traffic associated with the proposal.	Chapter 12
	The impact of development on surrounding arterial road intersections and the need for upgrading or improvement work.	Chapter 12
	The potential need for the preparation of a Local Area Traffic Management plan.	Chapter 12

Statutory Authority	Issue	Location in EA
	An assessment of the likely impact of traffic upon nearby residential areas. The anticipated route of trucks through the metropolitan and local road network. Assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an Incident Management Strategy for accidents if relevant.	Chapter 12 Chapter 12 Chapter 12
DEC	The EA should address: Odour Management Dust and Air Emissions Management Noise and Vibration Stormwater & Waste water management Chemicals and hazardous material, storage and use Fire Management Quality of the final products Waste Management (including waste classification, receipt and stockpiling)	Chapter 13 Chapter 13 Chapter 14 Chapter 11 Chapter 22 Chapter 18 Chapter 5 Chapter 20 & 5
Sydney Water	The EA should: Address the Sydney water trade waste permit that would be required (and complied to) for the disposal of wastewater to a Sydney water sewer. Identify the footprint of the property and the study area clearly. Provide information on the AWT Facility's servicing needs. The AWT Facility must specify the quantity of potable water that it requires from Sydney Water (including peak and average daily demand) and quantity of wastewater which it proposes to discharge to the sewer. Provide an assessment of the quantity and quality of pre-treated wastewater in light of the requirements of the receiving sewer. Provide measurements and assessment of TDS in the effluent.	Chapter 11 Chapter 5 Chapter 11 Chapter 11 Chapter 11



Proposed Alternative Waste Technology Facility at Jacks Gully WMRC
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Statutory Authority	Issue	Location in EA
	Ensure that infrastructure systems and site management controls such as a fully enclosed facility for all composting, processing and transfer activities; best practice bio-filters; dust control sprinklers, etc, will contain all odour emissions and other environmental impacts within Jacks Gully WRC Ensure that the proposed AWT Facility and its operation will have zero odour and dust impacts on adjoining and proposed residential development areas. That the identified Study Area within Jacks Gully WRC is of a realistic sustainable size and the best available location option in terms of potential and unanticipated odour plumes, seasonal odour inversion, heavy vehicle access, bio-gas and electricity production and associated environmental and risk of harm impacts (even if control systems are envisaged to fully mitigate); and That heavy vehicle movements associated with all operations at Jacks Gully WRC will comply with applicable noise controls (including Australian Standards) and otherwise will not adversely impact upon residential development in the vicinity. Confirm abidance to the Jacks Gully Odour Reduction Agreement, Deed of Variation and Supplementary Agreement	Chapter 5 Chapter 13 Chapter 6 Chapter 12 Chapter 13
Integral Energy	Peak or maximum energy demand (MVA or MWh) in terms of import and export Voltage required in network connection Proposed upgrades/modification to the network Measures to reduce peak demand Energy conservation measures (base load energy savings in addition to overall energy savings).	Chapter 23
Department of Mineral Resources (now Department of Primary Industries)	No adverse impact. Unlikely that Jacks Gully site would be included in any underground coal-mining proposal at least during the lower estimated operational life of the AWT.	Not Applicable
Sydney Gas	Sydney Gas has no concerns on the proposal providing that the facility does not impact on their space requirements. They would like to be kept informed of all work and its phases of development.	Not Applicable

4. Community Consultation

This chapter outlines the work that has currently been undertaken in terms of consulting with the local community about the proposed AWT Facility, and the proposed consultation program for the EA exhibition period and the construction and operation phases of the proposed facility.

4.1 Objectives of the consultation program

Consultation assists in identifying issues and potential impacts (particularly social and community impacts), as well as building relationships between the Proponent and the community. Consultation facilitates ongoing communication and allows the community to become constructively involved throughout the planning and development process.

The objectives of the consultation program during the EA preparation phase were to:

- ▶ Create awareness in the community of WSN's proposal to develop an AWT Facility at Jacks Gully; and
- ▶ Ensure that all issues of concern to the community were identified and addressed in the EA.

The objectives of the consultation program during the EA exhibition phase are to:

- ▶ Create awareness in the community of the proposed AWT Facility and an understanding of the technology.
- ▶ Provide the community with the opportunity to discuss the proposal with WSN.
- ▶ Address any questions or concerns that the community has about potential environmental or community impacts of the proposed AWT Facility.
- ▶ Advise the community of how they can make a formal submission about the proposal to the Department of Planning.

The objectives of the consultation program during the construction and operational phases of the proposed AWT are to:

- ▶ Create awareness in the community of the proposed AWT and an understanding of the technology.
- ▶ Keep the community informed about progress and performance.
- ▶ Ensure that the community know how they can contact WSN should they experience any adverse impacts due to construction or operational activities.

4.2 Community Consultation Activities

4.2.1 EA preparation phase

Community Advisory Committee meetings

WSN has been engaging with the local community through a Community Advisory Committee (CAC) for over 10 years. The CAC is a consultative forum where representatives of the community and WSN staff can discuss the operations of the Jacks Gully WRC. The role of the CAC is advisory – WSN considers comments and suggestions made by the group, and provides responses to the comments and suggestions. The CAC is asked to provide advice on a range of

items brought forward by WSN and may bring forward matters of importance to members. This assists WSN to make robust decisions in relation to its facilities.

Participation in the CAC is voluntary and open to any interested person who lives, works or has an interest in the vicinity of Jacks Gully WRC. Members generally represent the following groups:

- ▶ Local residents;
- ▶ Local businesses;
- ▶ Local environmental groups and community groups (e.g. precinct committees and progress associations);
- ▶ Local Council staff;
- ▶ Local Councillors; and
- ▶ Local Members of Parliament.

CAC meetings are chaired by an independent facilitator and minuted by an independent minute-taker.

WSN discussed its plans for an AWT at Jacks Gully WRC with members of the Jacks Gully CAC on four occasions.

On 3 August 2004, WSN staff members advised the CAC that WSN proposed to establish an AWT Facility at Jacks Gully and that preparation of an EA (then called an EIS) was about to commence. WSN asked community members to provide feedback on any matters that they felt should be considered in the EA.

At the meeting on 2 August 2005, WSN staff members presented an overview of the proposal for activities at the Jacks Gully WRC following cessation of putrescible landfilling in 2007. The proposal for establishment of an AWT, including the proposed location, was outlined. Due to the commercially sensitive nature of the proposal at that time, no details about the technology were able to be provided.

Additional meetings were held with the CAC on 3 November 2005 and 8 February 2006 to provide updates on the project.

4.2.2 EA exhibition phase

It is proposed to undertake extensive community consultation during exhibition of the EA. Consultation activities at this time may include information sessions and a letterbox drop of a brochure outlining the proposal. The CAC will be a key consultation forum during this time and special meetings of this group will be scheduled if required.

These activities will be in addition to the formal public submission process coordinated by the Department of Planning.

4.2.3 Construction and operational phases

During the construction period, the local community will be kept up to date on progress through a newsletter letterbox-dropped to households that could potentially be affected by construction activities. The newsletter will highlight WSN contact details to ensure the local community knows how to obtain further information or register feedback.

The CAC will continue to be an important consultation method during construction and also once the AWT Facility is operational. The CAC provides the opportunity for the community to ask questions about the facility, or to register any concerns. WSN will provide regular updates on the performance of the facility and provide responses to any issues raised by community members.

4.3 Outcomes of the Consultation

The main outcome of community consultation during the EA preparation phase was that the CAC was informed of WSN's proposal for establishment of an AWT at Jacks Gully WRC. Due to commercial sensitivities, little information about the technology could be provided to the CAC in its early meetings. This meant that the feedback received was limited to general interest from CAC members. No written feedback was received. However, some members of the CAC were positive about alternate waste technologies in general.

Additional details on the proposed technology and facility was provided in the February 2006 meeting.

Further consultation at the EA exhibition phase will include the opportunity for detailed information about the proposal to be provided to the community. It is anticipated that this will result in a range of specific questions and concerns about the proposal that WSN will actively address and respond to.

PART C

Information on the Proposal

5. Description of the Proposal

This chapter of the EA describes in detail the proposed alternative waste technology (AWT) facility and outlines how it would be constructed and operated.

5.1 Description of the AWT Facility

The proposed alternative waste technology (AWT) facility comprises an ArrowBio Plant to process up to 90,000 tonnes per annum of municipal solid waste. The plant will use proven material separation technologies and conventional anaerobic digestion to recover approximately 19,170 tonnes of recyclable materials from the municipal waste stream and to produce biogas, suitable for generating approximately 2 MW of electricity. The proposed ArrowBio Plant would be very similar to a plant that is currently operating in Tel Aviv, Israel, which has a capacity of approximately 30,000 tonnes per year, or 100 tonnes/day.

The proposal also comprises a Garden Organics Plant to process up to 25,000 tonnes per annum of separated garden organics, plus up to 5,000 tonnes per annum of biosolids and other organic materials, making a total throughput of approximately 30,000 tonnes per annum. The Garden Organics Plant would convert separately collected garden waste into approximately 18,300 tonnes high-grade compost. It would use tunnel-composting technology that has been successfully used at the Remondis (formerly Rethmann) plant at Port Macquarie on a similar material stream.



Figure 5-1 ArrowBio plant in Tel Aviv, Israel

5.2 AWT process activities

The following activities would take place within the AWT Facility:

- Material separation and recovery of recyclables;
- Mechanical treatment of MSW and garden organics;
- Biological treatment of MSW and garden organics;
- Stabilised Sludge and compost production;
- Biogas production; and
- Electricity generation.

5.3 Operation of AWT Facility

5.3.1 Access to facility

All Council trucks would first be weighed at the existing weighbridge at the entrance to the Jacks Gully WRC, and would drive along a sealed road on the top of the existing landfill to the AWT Facility. This is illustrated in Figure 5-2

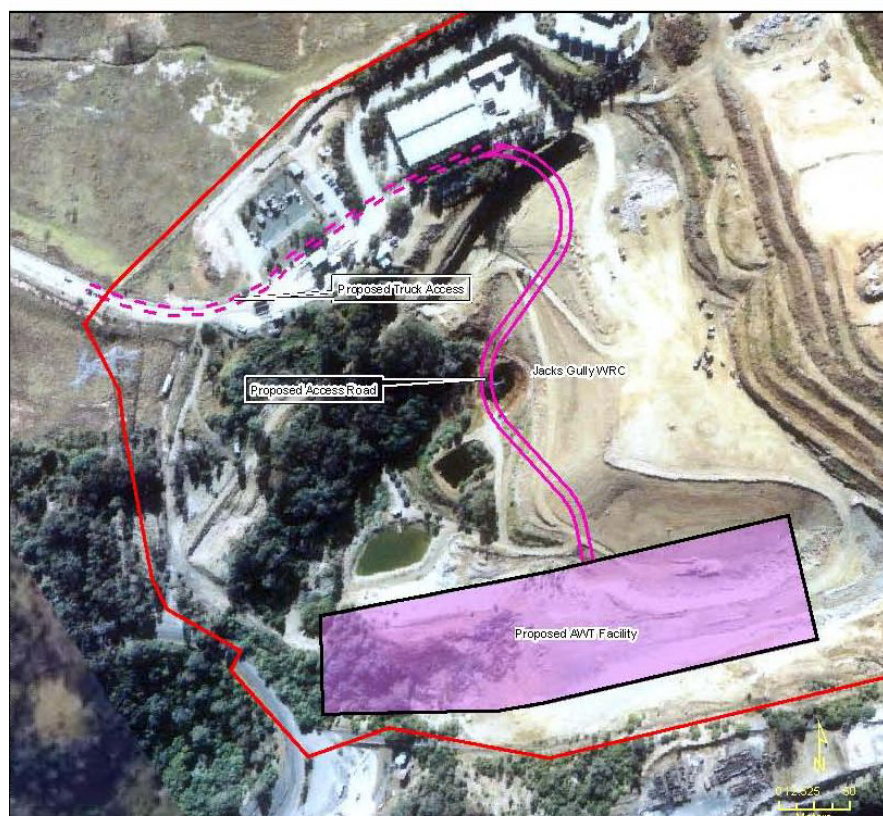


Figure 5-2 Location of proposed AWT Facility at Jacks Gully

5.3.2 Hours of Operation of AWT Facility

The ArrowBio Plant is a continuous process, which operates 24 hours per day, seven days per week, 52 weeks per year. The facility accepts waste 7 days per week, with some waste stored in the Receival Hall prior to processing.

The AWT Facility will be open 6am to 4pm Monday to Friday for receipt of materials and 6am to 2pm on Public Holidays. On weekends, only the ArrowBio Facility will be open 8am to 4pm.

Normally, received waste will not be held in the Receival Hall (prior to processing) for a period no longer than 8 hours. The Receival Hall will be under negative pressure and this air will be deodorised in a biofilter prior to being exhausted to the outside environment.

5.3.3 Overall layout and appearance

The proposed AWT Facility consists of three main areas – the Garden Organics Plant, in a building at the western end of the platform, the ArrowBio Plant in a building near the centre of the platform, and the ArrowBio biological plant in an open area to the east of the platform. The overall layout of the AWT Facility is generally illustrated in Figure 5-2 and on the subsequent foldout page.

The buildings would be steel framed, constructed of concrete and clad with coated steel sheeting, to match the existing MRF building on the site. Details of the building sizes are provided in section 16 with indicative photographs provided in this section. Their height would be lower than the surrounding topography to the south, so that they would not be visible from the south, and would be oriented in an east west direction. This would permit passive lighting to minimise the energy requirements for lighting the plant during the day. The AWT Facility would be eucalyptus green in colour. Buildings would be architecturally designed to show a modern and streamlined appearance that is often associated with high technology facilities.

A road sealed with asphaltic concrete would permit truck and other vehicle access for removal of inert waste residuals and recyclable materials. Operational areas of the site that would experience heavy use, such as the waste and garden organics drop-off areas would be paved with concrete. Non-operational areas would be covered with gravel. There may be opportunities to plant trees and other vegetation in selected areas to soften the look of the buildings.

Within the ArrowBio Plant there would be two parallel ArrowBio processing lines, which could be operated independently during periods of low demand. This also provides an active standby capability in case one line temporarily shuts down for adjustments or maintenance.

Correspondingly, two parallel biological processing lines would exist within the ArrowBio biological plant, allowing for temporary shutdowns of a single line, during periods of low demand, or for operational reasons.

On the other hand, the Garden Organics Plant would have a single materials preparation line, but would have up to 12 parallel composting tunnels, operating independently of each other. This would enable some tunnels to be shut down for maintenance, when necessary.

The AWT platform would be constructed from compacted soil and other engineering materials, such as coal washery reject material. This material would be used to extend the existing rock shelf on the southern side of the gully. It would be placed and compacted to engineering standard, after engineering preparation of the existing rock shelf. Batters would be formed around the northern and western edges of the platform, rising above the surrounding base of



the gully. The embankment slopes on the southern side (above the platform) would be reinforced using various engineering techniques.

Engineering fill would most likely be sourced from clean or uncontaminated excavated spoil that has been delivered to the site by contractors disposing of materials from housing projects. Since some material would need to be excavated from the southern edge of the existing rock platform (to provide additional space on the engineered platform). This material could also be used for constructing the platform. The final design and location of buildings and tanks on the platform would take into account the areas that would have large filling depths, and non-critical items will be located in these areas to minimise settlement.

5.4 ArrowBio Plant

5.4.1 Capabilities

The ArrowBio Plant proposed for Jacks Gully WRC has been designed to process up to 90,000 tonnes per annum of municipal solid waste, through two parallel processing lines. Each line would be capable of processing approximately 150 tonnes/day over a 12-hour cycle. An innovative materials separation facility would be provided at the front end of the plant, to remove large items, recyclables and other items such as cardboard from the process. Sources of heavy metals such as car batteries will be removed at the reception hall.

Due to immersion in water, the recyclable materials such as steel, aluminium and plastics would be relatively clean after extraction from the water, improving their market value and also reducing potential odour, which can occur in dry processes due to contact with organic materials in the waste stream.

The use of buoyancy in the water based process to separate heavy materials such as glass and metals from lighter materials such as paper, cardboard and plastics would minimise energy consumption, as the forces are applied in the direction that the materials would tend to go if unassisted. The fact that water is a good solvent also means that the maximum amount of organic matter is removed from the incoming waste stream in the early part of the process. It also aids the anaerobic digestion process, since it is more efficient to digest liquids than solids, or semi solids, as other AWT processes tend to do.

The residence time of material in the methanogenic reactor is longer than in conventional anaerobic digestion systems (typically 80-90 days). Most of the currently used processes have a solids retention time (SRT) of only around 30-40 days, and hence produce significantly less methane than the ArrowBio process. The estimated production of biogas from the ArrowBio process is 100 m³ per tonne of waste processed.

Diversion of materials from landfill is a key performance indicator for AWT processes. The fact that the process efficiently dissolves organics from the waste stream and extracts recyclable materials with relative ease means that more than 75% of materials entering the plant would be able to be diverted from landfill, on average. This would of course depend upon the daily composition of the waste stream.

5.4.2 Power Generation

This gas will be captured and used to generate electricity, with minimal releases to the environment. Approximately 2 MW of electricity would be produced from the 90,000 tonnes per annum waste throughput.

The energy requirements of the plant are approximately 1 MW per annum during the day, when material is being received and processed, and 0.5 MW per annum at night, when only the tank farm is operating. It would therefore export about 50% of the energy that it produces during the day. At night, the plant would export up to 75% of the energy that it produces.

5.4.3 Emissions from process

Low odour emissions are one of the main features of the ArrowBio process. The main reason for this is that the wastes are immersed in water very early in the process. Continuous

circulation of water within the vat prevents anaerobic activity in the wastes and thereby reduces the production of volatile organic compounds, which tend to be quite odorous.

Both the receival hall and processing building will be fully enclosed and maintained under negative pressure to prevent egress of odours. Air will be extracted by exhaust fans and vented through biofilters for the removal of any odours, prior to release to the atmosphere.

An additional benefit of the use of a water-based process compared to conventional dry methods is that it minimises the amount of dust generated when the waste materials are handled. This leads to a more pleasant working environment in the processing area and minimises OHS issues and dust impacts on the community. Chapter 23 discusses potential health issues associated with the ArrowBio process, including dust and noise. These are minimised due to the water based nature of the process.



Figure 5-4 Physical separation/preparation area

(source: Finstein, M. S. (2004))

The ArrowBio process is typically less noisy than many other material recovery processes. Noise sources in the plant include pumps with steady (but low) noise emissions, and conveyor systems, which are relatively quiet. Noise associated with material handling is controlled by careful selection and design of the equipment. Noise measurements taken within the plant in Israel by GHD indicated that the maximum noise level within the plant was below 85 dBA, the industrial standard. This means that workers would not need to wear hearing protection. This is beneficial to both the plant operator and the workers as it results in a more pleasant working environment.

5.4.4 Process description

Within the Arrowbio Plant there are two parallel ArrowBio lines, which can be operated independently during periods of low demand. The main stages are as follows:

- Receiving Hall;
- Main Processing Building; and
- Biological Plant.

The functions and components of each stage are described below.

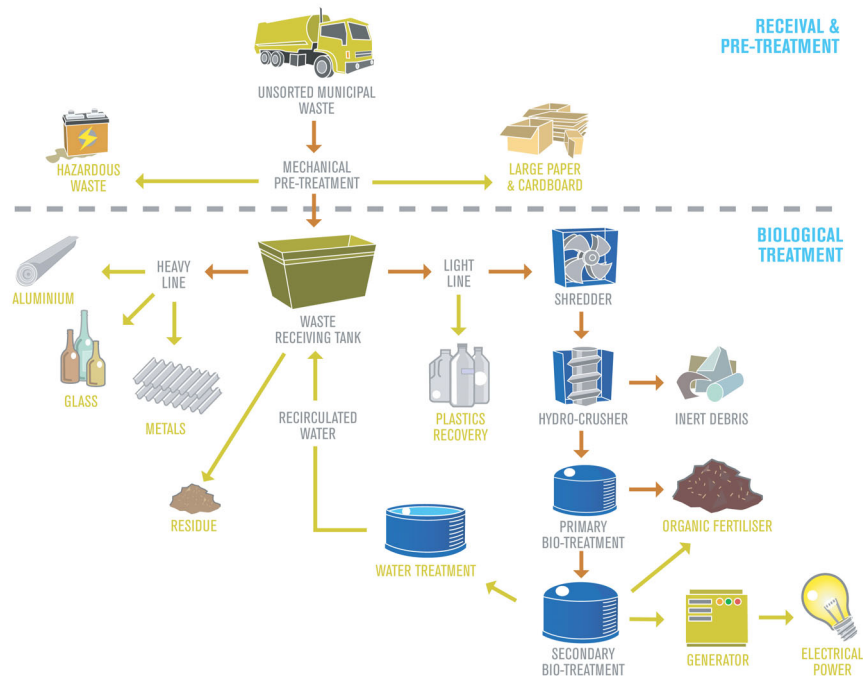


Figure 5-5 ArrowBio municipal waste process flow diagram

Receiving Hall

Council waste trucks reverse up to the northern side of the receiving hall and dump putrescible waste onto the floor of the building, where a small excavator fitted with a grab removes large inorganic/non-recyclable items from the waste, and deposit these in a large rejects bin. The bin is emptied into larger roll-on roll-off bins located outside in the transfer annex, for eventual disposal in the on-site landfill.

The remaining waste on the floor is scraped up by a front-end loader, and put into a loading chamber. A slow conveyor then transfers the material past a manual sorting bay, where car batteries, cardboard and other large items are removed. The balance of the material is transferred onto a loading conveyor.

The loading conveyor transports all of the smaller items and organics into the next stage of the process, where they can be put into one of the two vats of circulating water. The water is

recirculated throughout the system and is topped up from water contained in the incoming waste. The process requires no potable water.

The receipt hall also has the capability to transfer up to 40,000 tonnes/year of municipal solid waste into transfer trailer vehicles, in the event of scheduled or unscheduled plant downtime, or periods of peak supply demand.

Main processing building

In the main processing building, the waste is immersed in water, to commence separation of organics and non-organic materials, such as recyclables. Various items of equipment including electromagnets and eddy current separators are used to remove metals from the waste stream. The organics mainly dissolve in water to form a slurry, which is preconditioned and pumped to the tank farm for biological treatment.

The main items of plant in this stage are as follows:

- ▶ Receive trough, sorting conveyor & inspection stations;
- ▶ Primary sorting pool and immersion paddle;
- ▶ Light & heavy stream conveyors;
- ▶ Coarse trommel, fluidisation duct and compactor;
- ▶ Magnetic separator & eddy current separator;
- ▶ Secondary vat;
- ▶ Light & heavy stream conveyors;
- ▶ Shredder & hydrocrusher;
- ▶ Fine, medium and coarse separation screens;
- ▶ Sand and glass settlers, and
- ▶ Liquid slurry pumps to biological processing.

Materials separation

In the vat, the heavy and light components of the input stream become separated, and organics such as food dissolve in the water to become a slurry or light liquid. Heavy inorganic components like glass, batteries, stones, aluminium and steel cans sink to the bottom of the vat. A conveyor then transfers these materials to a line where a number of mechanisms including magnets (to recover ferrous metals), eddy current separators (to recover aluminium) and manual sorting (to recover glass and also residuals for disposal to landfill), are applied.



Figure 5-6 Vat and waste dropoff area

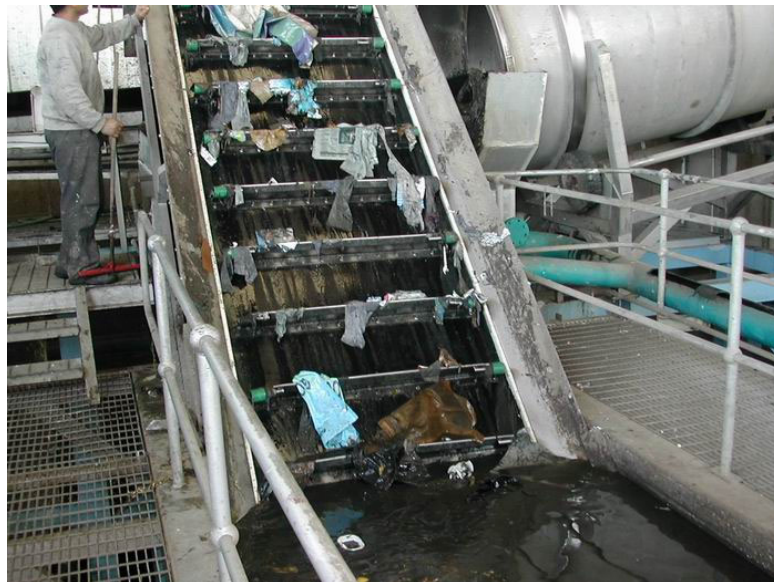


Figure 5-7 Inclined conveyor

Light components like paper, cardboard, plastics, biodegradable organics (including food scraps) and unopened plastic bags tend to float in the vat and be scraped off the surface onto an inclined conveyor. These then pass through a shredder/bag opener, and through a trommel. Paper and plastics are extracted using an air classifier after passing through the trommel. Smaller items are removed and disposed of as rejects. This is achieved by a number of screens, settling tanks and traps that remove sand, stones, small batteries and glass pieces that form the residue to landfill. This residue will need to satisfy the EPA's Environmental Guidelines: Assessment, Classification and Management of Liquid and Non Liquid Wastes (1999) as non-putrescible. If not, it will be transported to a putrescible landfill for disposal.

The organic slurry from the vat enters a hydrocrusher, to be crushed into very fine pieces. This forms a slightly thicker slurry containing biodegradable material such as organic matter, paper and other substances. The slurry is pumped to the tank farm for biological treatment.

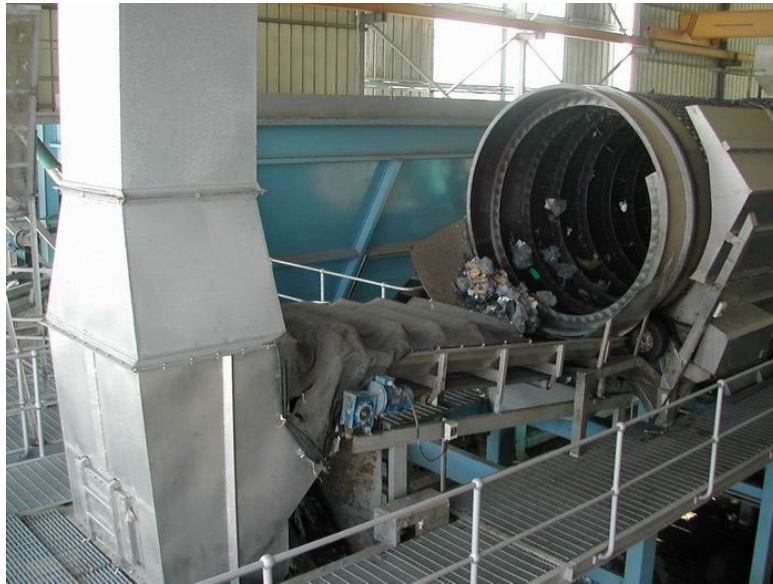


Figure 5-8 Trommel and air classifier

5.4.5 Biological Plant

The main function of the biological plant is to convert the readily biodegradable putrescible waste into biogas and stabilised sludge and to dewater the stabilised sludge and other organic biomass. This biogas is provided to the gas power plant and to the flare unit should there be excess gas or the gas engines are unavailable.

Two parallel biological processing streams exist within the biological treatment area. This allows for temporary shutdowns of a single line, during periods of low demand, or to meet operational and maintenance requirements. The main components of the biological plant are as follows:

- ▶ Acidogenic Tanks (4-off);
- ▶ Medium & fine screens;
- ▶ Belt Filter Presses (2-off);
- ▶ Methagenic Tanks (2-off);
- ▶ Plate & Frame Filter Press (2-off);
- ▶ Biogas Storage (double membrane);
- ▶ Biogas Engine & Generator (2x 1MW);
- ▶ Flares (2-off); and
- ▶ Heat exchangers, water heater, chillers, condensers & moisture separators.

In addition, there is a small wastewater treatment plant, which treats process water from the plant, to reduce its biological content. The main components of the water treatment plant are as follows:

- ▶ Balance Tank;
- ▶ Polishing Tank;

- Treated Water Tank; and
- Pumps, blowers and air compressors.

Biological treatment

The slurry undergoes two processes in the biological tanks, orchestrated by naturally occurring micro-organisms. In the first acidogenic tank, fermentation is used to transform complex organic material into simpler organic acids and fatty acids. In the second acidogenic tank, the matter is heated to 35-40°C, using hot water generated from exhaust gases from the on-site gas engines.

The slurry is then transported to the methanogenic fermentation tank for anaerobic degradation of the organic materials. This reactor is an Upflow Anaerobic Sludge Blanket (UASB) design. In this type of system the suspension is introduced from the bottom of the digester, upward through a sludge blanket composed of biologically formed granules. Treatment occurs as the suspension comes into contact with the granules.

In the methanogenic digester, pH and temperature are closely controlled to optimise the conversion of the products from the first stage to biogas rich in methane. The optimum conditions (such as pH and temperature) for methanogenesis are different from those required for hydrolysis and acidogenesis, and the reactions are much slower. This is why the ArrowBio process separates the two reaction steps.

The products from this methanogenic stage are:

- Biogas;
- Wastewater, a portion of which is recycled to the waste pre-preparation tank (some is disposed of to the wastewater treatment plant); and
- A solid digestate.



Figure 5-9 Biological treatment plant

The biogas produced on-site is stored in an inflatable buffer tank, and is used for generating electricity in two 1 MW on-site gas engines. An on-site flare burns any excess gas that cannot be used by the engines. The waste heat from the engine exhausts passes through a heat exchanger, where it is used to heat water. The water is then used to heat the second stage acidogenic tank, as part of the co-generation cycle.

In the event that the biological plant shuts down, and during initial start-up, the acidogenic tank needs an external source of heat to bring it up to temperature. This would be provided by combustion of LPG, stored on-site in a small pressure vessel.



Figure 5-10 Gas engines



Figure 5-11 Flare unit

The solid digestate component is dewatered in a solid/liquid separator and the water component is recirculated back into the initial pre-sorting water vat. The digestate is then dewatered in a filter press or belt press. There is potential for this dewatered material to be blended in compost materials or sold as a quality stabilised sludge product, as it is in Israel. This will be subject to compliance with the Protection of the Environment Operations (Waste) Amendment (Residue Wastes) Regulation 2005.

Any remaining water is treated in the wastewater treatment plant in a sequencing batch reactor, and stored in separate tanks for industrial uses. This water can then be used for irrigation, fire-fighting purposes or for washing waste transport vehicles. Off-site markets for this water could also be explored, once water quality is established.



Figure 5-12 Solid digestate

5.5 Garden Organics Plant

5.5.1 Capabilities

The proposed facility would process garden organics together with other biosolids, to produce a high quality compost product that complies with Australian Standard AS 4454-1999 and Biosolid Guidelines Grade A for unrestricted use (contamination, pathogen level, vector attraction). This would be achieved through tunnel composting technology.

Tunnel composting is a much simpler, more energy-efficient and safer working environment than other types of composting plants. In tunnel composting, the aeration process is extremely energy efficient due to the fact that only the tunnels themselves are ventilated, and only the tunnels in use need to be provided with air. High quality air is not necessary within the tunnels as they would only be accessed by workers when they are open, for recharging with unprocessed material, or removal of finished compost.

5.5.2 Emissions from process

The main odour-generating activities (accelerated decomposition of a mixture of garden organics and biosolids) are fully contained within the multiple concrete tunnels. This ensures a high degree of emission control for odour, and minimum exposure of workers to this environment. The high level of automation and process control in the tunnels enables OHS regulations to be easily met.

The odorous air from the tunnel is discharged to the environment through a large biofilter, which reduces its odour level significantly, and ensures that the plant does not have an adverse impact on surrounding residents.

5.5.3 Process description

The plant includes the following processing units:

- ▶ Mechanical pre-treatment of garden organics and other organics solid wastes including physical contamination removal, shredding, mixing and homogenisation for subsequent composting of the raw material mix;
- ▶ Two cycles of tunnel composting, each a minimum 10-15 days, using forced aeration and moistening to produce a pasteurised and composted product; and
- ▶ Raw compost refinement and grading in accordance with market requirements for end product marketing and sale.

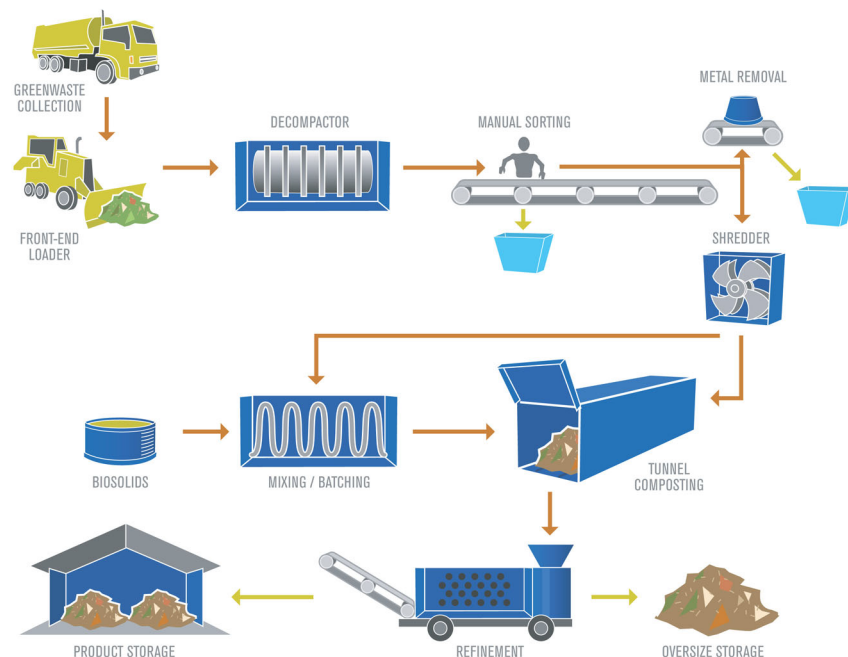


Figure 5-13 Garden organics process flow diagram

Material receival

Garden organic material is delivered to the receiving bays of the garden organics building, which are located on its northern side. Each load is first tipped onto a heavy-duty concrete tipping floor to be screened for gross contaminants. Garden organics sourced from kerbside collection, (Mobile Garbage Bin (MGB), loose, bundled), drop-off facilities or commercial sources, generally contains some level of physical/visual contamination, which needs to be removed.



Figure 5-14 Material receival



Figure 5-15 Initial processing

Initial processing

A front-end loader operator inspects each delivered load of garden organics before it is fed into the process. After the material has been unloaded onto the floor, bulky and undesired items (eg steel bars, glass bottles) are manually removed from the waste and placed into bins. The front-end loader then pushes the screened waste into a dedicated storage bay or feeds it into a de-compactor hopper.

The de-compactor breaks up lumps and evens the material stream to enable small sized contaminants to be manually removed at a picking station. There are two picking spots, and rejected items are discarded into a bin located under the mezzanine.

A separate storage bay is provided for bulky garden wastes, which are delivered through drop off facilities, councils or contractors. Since these materials are generally free from contamination, they are processed straight away.

Shredding / Metal Removal

Garden organics from both streams is fed into the feeding hopper of a low-speed shredder, which has low noise emissions. This unit (diesel driven) incorporates a hammermill and has an easily replaceable screen to produce various product grades. The discharge conveyor has a magnetic pulley to remove all remaining ferrous items from the shredded material (nails etc).

Mixing and Homogenisation

As well as garden organics, the composting process requires a source of moisture and nitrogen. Biosolids from wastewater treatment plants are a readily available source of both. Trucks deliver

biosolids to a separate reception area within the building, and they are stored in a separate storage pit.

The storage pit is fully sealed to minimise odour generation and is equipped with an electrical winch system to automatically lift the lid once a tanker / skip bin truck delivers material. This concept has been purpose designed for sludges of up to approximately 20 per cent solid content and is very effective in containing emissions. The pit can also handle commercial food wastes. Material is discharged from the pit either via shaft-less screws or by a pump.

The most important mechanical treatment step is thorough mixing, homogenisation and conditioning of the various input materials for the subsequent static composting process. Whilst green and other bulky waste are transferred into the mixer automatically via a conveyor, the desired dosing rate of the biosolids is set by loading cells and a time programmed process control.

A sequence of screw conveyors conveys the sludge automatically into the mixer. After mixing, the raw material batch is discharged into a storage box, picked up by the front-end loader and put straight into the designated tunnel.

Tunnel Composting

The tunnel composting plant constructed of concrete panels comprises 12 tunnels of approximately 25m in length by 6 m wide by 5 m high. Each tunnel is self-operating and comprises an air ducting system, blowers, process water collection and recycling systems, and various process control features (temperature, pressure, etc.). Trenches in the slab run parallel over the full length of the slab and are covered with purpose-designed panels. Access to each tunnel is via the front door, which can be lifted using an electrical winch.



Figure 5-16 Compost tunnel



Figure 5-17 Aeration of compost

During the composting process, the door is locked hermetically to contain any odour and leachate. The input mix is then placed into each tunnel individually and removed after the desired composting time by means of a front-end loader. Each tunnel is equipped with a fan, which blows a mixture of fresh air and recycled air through the trenches into the tunnel. At the same time surplus exhaust air is discharged to the deodorisation stage (biofilter). The mixture of fresh and recycled air can be automatically controlled via the central process control for each tunnel.

All exhaust air from the tunnels is eventually discharged into the deodorisation stage for treatment and dispersion. The deodorisation stage comprises biofilter fan, humidifier (scrubber)

and biofilter. The purpose of this stage is to eliminate offensive odours and deodorise the exhaust air from the tunnel-composting units before it is discharged into the atmosphere.

Air volume, moisture and temperature in the biofilter are also controlled via central process control. The biofilter structure comprises a segmented sub-ground concrete basement with perimeter walls, a grate floor ('false floor') at ground level with a layer of filter medium on top. The filter medium comprises a 1-1.5 m thick layer of compost, bark or other mature organic matter. The biofilter is under cover (roof) and is equipped with a sprinkler system, which will be mounted onto the ceiling.



Figure 5-18 Air supply system



Figure 5-19 Biofilter

Exhaust process air from the different sources is drawn via the biofilter fan through the humidifier into the biofilter, which absorbs odorous compounds from the exhaust air stream and conditions air moisture and temperature. Segmentation of the filter structure enables maintenance and material replacement works to be done on one segment while operating (no shut down required). Depending on the type of biofilter material, replacement will be required every two to five years.

Leachate from the tunnels drains through the duct and piping system via siphons into a sealed process water tank, which is also connected to the biofilter / humidifier unit at the drainage facility. The process water is then collected and recycled back into the composting process to establish and/or maintain the desired material moisture content.

A pump mounted on the process water tank is used for topping up the humidifier and for supplying process water to the tunnel spraying system. Each tunnel is equipped with an array of nozzles, mounted onto the tunnel ceiling in a way to cover the entire tunnel surface area.

During the dry/hot period of the year, some fresh water may be required to cover the water demand for the tunnel system. This make-up water would be drawn from the adjacent ArrowBio Plant or from storm water ponds on-site.



Figure 5-20 Unloading of compost from tunnels at the Port Macquarie facility

Compost Refinement

After the tunnel composting process, the raw product is sanitised and mature with low odour emissions. A range of equipment is employed to remove remaining physical and visual contamination from the composted and cured product. Refinement involves screening and removal of any light items such as plastic film and non-decomposed fibre using air separation.

Various grades of compost are produced according to the final application. A drum magnet may be integrated into the discharge conveyor to remove remaining metal items. De-stoner equipment is employed to remove stones and glass from the product before the compost is transported to market.

5.6 Plant Mass and Water Balances

5.6.1 ArrowBio Plant mass balance

The ArrowBio Plant is designed to process up to 90,000 tonnes of mixed solid waste per annum. When the facility is operational, more than 75% of the total incoming municipal solid waste stream would be recovered and diverted from landfill.

This is summarised as follows:

MSW received	90,000 tonnes/yr
Equals:	
Recyclables recovered	19,170 tonnes/yr
Residuals/rejects landfilled on-site	22,440 tonnes/yr
Stabilised Sludge produced	17,370 tonnes/yr
Water produced	11,700 tonnes/yr
Methane produced	4,320 tonnes/yr
CO2 and moisture loss	15,000 tonnes/yr

Recyclable materials will be sent to the existing MRF on-site and the residuals will be able to be disposed of in a licensed landfill.

5.6.2 ArrowBio Plant water balance

The water balance for 300 tonnes/day of municipal solid waste processed at the plant is as follows:

Inputs:

Moisture from input waste	90,000 litres/day
Water produced by anaerobic degradation	45,000 litres/day

Outputs:

Moisture in recycled material	15,000 litres/day
Moisture in stabilised sludge	36,000 litres/day
Evaporation	45,000 litres/day

Net water produced:

Process water surplus	39,000 litres/day
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The net water production from the proposed AWT Facility at Jacks Gully WRC, which has an estimated throughput of 300 tonnes/day, would be of the order of 39,000 litres/day, or 40 kL/day, on average.

This water will be treated and used for irrigation, fire-fighting purposes and for washing of vehicles. Off-site markets for this water will also be explored.

5.6.3 Recyclables Recovered

The high efficiency nature of the ArrowBio process recovers 81% of available recyclable material.

5.6.4 Garden Organics Plant mass balance

The Garden Organics Plant will process up to 25,000 tonnes per annum of separated garden organics, plus an additional 5,000 tonnes per annum of biosolids and other organic materials, making a total throughput of approximately 30,000 tonnes per annum.

The approximate mass balance for the garden organics composting plant is as follows.

Garden organics in	25,000 tonnes/yr
Biosolids in	5,000 tonnes/yr
Equals:	
Loss of water (evaporation)	10,500 tonnes/yr
Compost produced	18,300 tonnes/yr
Contaminants removed	1,200 tonnes/yr

The garden organics sourced from kerbside collection, drop-off facilities or commercial sources will contain some level of physical/visual contamination, which needs to be removed. These contaminants will be manually removed and disposed of in the adjacent landfill, provided it will meet the criteria for Class 2 (non-putrescible) solid waste landfilling. Any putrescible material will be transferred to the AWT Facility.

5.7 Quality of Final Products

5.7.1 ArrowBio Plant

The ArrowBio Plant will produce a number of products, broadly categorised into biogas, recyclable materials, stabilised sludge and water as per Section 1.6.1.

Biogas

Arrow Ecology provided WSN with results of analysis on the biogas from the Tel Aviv plant to demonstrate the relatively low concentrations of volatile organics produced by the anaerobic digestion process. The results are given in Table 5-1.

Table 5 –1 Summary of Biogas Analysis

Analyte	Tel Aviv Plant
Methane %	81
Carbon dioxide %	17.5
Hydrogen sulphide (ppm)	90

Oxygen (ppm)	<0.5
Ammonia (ppm)	1.3
Chlorine (ppm)	<1
Fluorine (ppm)	<1
Bromium (ppm)	<1
BenzeneTolueneEthylbenzeneXylene	<1
Mercaptans (ppm)	0.9
Sulphur (ppm)	<1
Methylsulphide (ppm)	<1
Vinyl Chloride (ppm)	<1
Chloroform (ppm)	<1
Carbon tetrachloride (ppm)	<1
Chlorobenzene (ppm)	<1
Ethane (ppm)	<5
Butane (ppm)	<5
Ethylene (ppm)	<5
Ethanol (ppm)	<1
Isopropyl Alcohol(ppm)	<1
Acetone (ppm)	<1

The results indicate that approximately 99% of the gas produced by the anaerobic digestion process is methane or carbon dioxide with very low concentrations of odorous compounds such as hydrogen sulphide and mercaptans.

Stabilised Sludge

Table 5-2 shows the results of sludge analysis for samples collected from the acidogenic and methanogenic tanks by Arrow Ecology Ltd and Douglas Partners (on behalf of WSN). It also provides results of leachability testing undertaken using the Toxicity Characteristics Leaching Procedure (TCLP) outlined in the NSW EPA Non Liquid Waste Guidelines.

Table 5-2 also shows the highest level (unrestricted application) Grade A criteria from the NSW Biosolids Guidelines. These are used for assessing the suitability of biosolids for land application. Guidelines for the use of organics derived from municipal solid waste treatment processes are not yet in existence, however some work is currently being done by the Waste Management Association of Australia to determine the contaminants of concern, and propose limits for these contaminants. Until a set of guidelines are developed by the Department of Environment and Conservation, the biosolids guidelines provide some guidance in respect of potential beneficial uses for such materials.

The results of the analyses undertaken by Arrow Ecology and Douglas Partners at different times, are consistent. They indicate that the materials taken from the acidogenic and methanogenic tanks have high calcium, sodium and magnesium concentrations. The concentrations of heavy metals such as arsenic, cadmium, chromium, copper, mercury, and lead are below Biosolids Grade A Guideline levels in the acidogenic sludge. In the methanogenic sludge, chromium exceeds the Grade A Guidelines.



WSN intends to implement a testing and sampling regime for the stabilised sludge material which, together with process optimisation, will eventually result in the necessary authorisations being obtained to permit the material to be applied to land on or off-site as a soil conditioner. In the interim period, while guidelines for such materials are being developed and data is being collected, WSN intends to dispose of this material to a suitably licensed landfill.

Table 5-2 Results of Sludge Analysis

Analyte	Tested by Arrow (mg / kg)		Tested by Douglas Partners				Criteria from Biosolids Guidelines Grade A (mg / kg)
			Concentration (dry weight basis) (mg / kg)		Concentration in in leachate from TCLP test (mg / L)		
			Acid- ogenic	Meth- anogenic	Acid- ogenic	Meth- anogenic	
Aluminium	4,018	9,772	5,500	5,200	0.06	I.S.	
Arsenic	<5		<3	<3	<0.05	I.S.	20
Calcium	37,190	118,900	36,305	95,870			
Cadmium	1	2	<0.5	1.0	<0.006	I.S.	3
Chromium	36	140	17	48	<0.005	I.S.	100
Copper	57	182	50	130	0.03	I.S.	100
Iron	5,389	12,380	3,000	6,100	0.37	I.S.	
Mercury	2	4	0.42	0.34	<0.0005	I.S.	
Potassium	2,742	5,119	2,100	4,900	42	I.S.	
Magnesium	2,808	6,950	1,700	5,800	18	I.S.	1
Sodium	2,276	3,277	3,400	8,100	530	I.S.	
Nickel	12	24	8	13	0.008	I.S.	60
Phosphorus	5,888	25,310					
Lead	30	58	15	34	<0.04	I.S.	150
Sulphur	7,450	17,490	3,600	9,200			
Zinc	335	1122	160	540	0.14	I.S.	200

I.S. = Insufficient Sample

SCC = Specific contaminant concentration (Total Concentration)

TCLP = Toxicity Characteristics Leaching Procedure (Leachate Concentration)

5.7.2 Garden Organics Plant

The proposed tunnel composting facility has been modelled on the production of two or three key products:

- A finely graded high nutrient value soil conditioner suitable for soil or garden bed incorporation;
- A lower nutrient value coarsely graded cover mulch; and
- An agricultural product that is a coarsely screened soil conditioner.

Precise volumes produced of each product will be dependent on market uptake in each sector. Production volumes of each product can be easily varied with selection of screen sizes in the final process.

Based on the given input composition the following proportion of products would be expected to be generated:

Table 5-3 Generated Products from Garden Organics Plant (per 100 tonnes)

Product Stream	Quantity
Compost Fine	45 tonnes
Coarse Mulch	10 tonnes
Soil Conditioner	6 tonnes

Table 5-4 provides some analytical data for garden organics, biosolids and finished products from the Port Macquarie Facility, and compares them with the requirements of the Australian Standard for Compost Products, AS4454, which applies to composts derived from source separated garden organics.

Table 5-4 Analysis of Garden Organics and Finished Compost

Quality Parameter	Unit	Garden Organics	Bio-solids	Finished Compost	AS 4454 / BSG
Organic matter	%	70-85		40 - 60	>25
pH		6.7-7.2		6.5 - 6.7	5.0-7-5
Moisture	%	30-35	88%	~30	>25
Conductivity	mS/cm	1.2-1.6		3 - 6	no limit
Nitrogen (total)	%	1		1.9 - 2.6	>0.8
C/N		15-20		11 - 17	No Limit
Phosphorus (total)	%	0.15		0.5 - 0.6	(<0.1)
Potassium	%	0.2		0.8 - 1.0	No limit
Calcium	%	1.5		1.2 - 1.3	No limit

Quality Parameter	Unit	Garden Organics	Bio-solids	Finished Compost	AS 4454 / BSG
Magnesium	%	0.3		~ 0.3	No limit
Arsenic	mg/kg	13	~ 5.0	~12	<20
Cadmium	mg/kg	0.5	~2.0	<0.5	<3
Chromium	mg/kg	15	~ 45	~ 50	<100
Copper	mg/kg	35	~ 400	60 - 80	<100
Lead	mg/kg	30	~ 40	~ 40	<150
Zinc	mg/kg	130	~ 450	120 - 210	<200
Mercury	mg/kg	<0.2	~ 1.0	<0.2	<1
Nickel	mg/kg	8	~ 20	~15	<60
Selenium	mg/kg	<0.5	<5.0	<0.5	<5
Boron	mg/kg	15		50 - 80	<200
Faecal Coliform	MPN/g			<1	<1,000
Ecoli	MPN/g			<1	<100
Salmonella	MPN/g			Not det.	Not detected
Dieldrin/Chlordane	mg/kg	0.05	<0.1	0.03	<0.02
Toxicity index		100		~100	>60 (compost)
PCB	mg/kg		<0.1	<0.2	<0.3

The results demonstrate the effectiveness of the tunnel composting process in terms of nitrogen (N) fixation and pathogen destruction. Other parameters meet the requirements of the NSW EPA Biosolids Guidelines (Grade A) and Australian Standard AS4454.

The compost is expected to have high nutrient levels (1.9 to 2.6%N vs up to 1% for Garden organics) together with high organic content. All material produced from the Remondis reference facility at Port Macquarie has been able to be marketed as Grade A compost, “suitable for unrestricted use”, due to compliance with AS4454.

5.8 Residuals Management

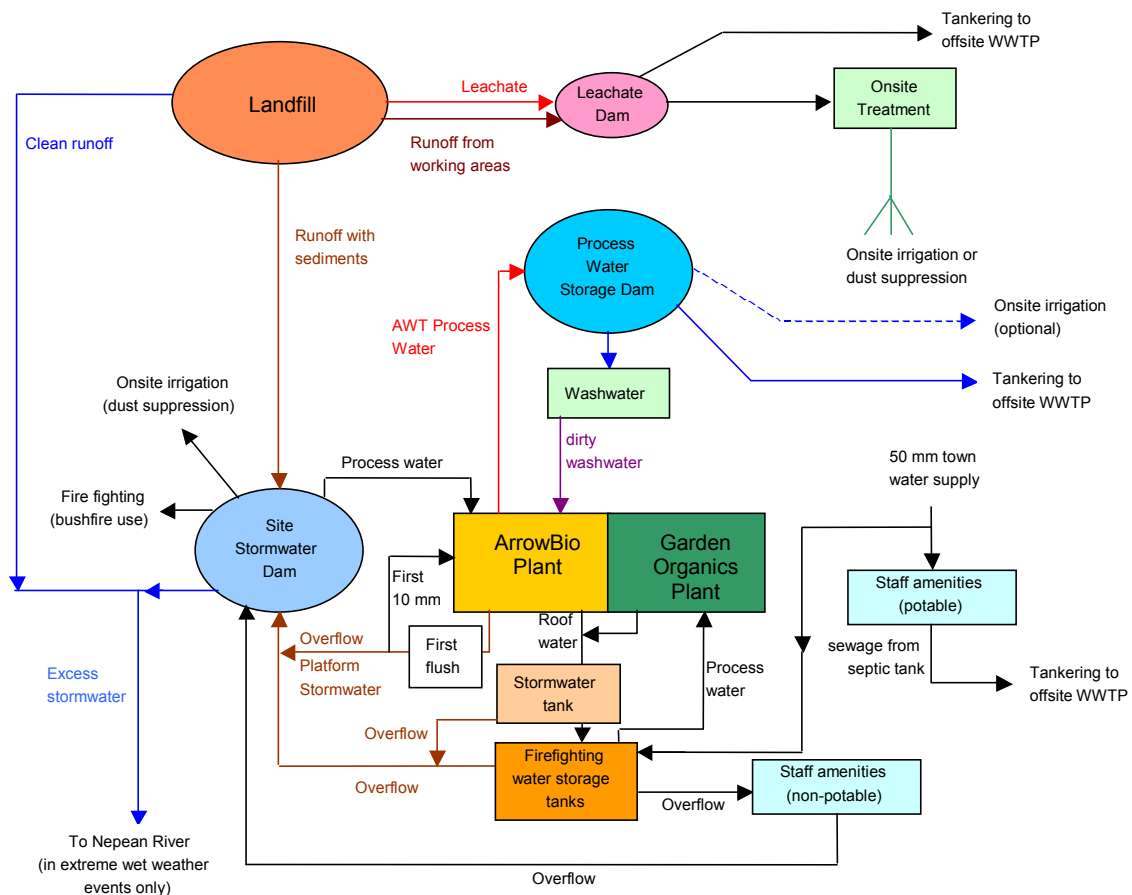
The Jacks Gully WRC landfilling operation currently receives 210,000 tpa of putrescible waste and 160,000 tpa of dry and other waste. The proposed development will reduce landfilling on the site from 210,000 tpa to approximately 30,000 tpa, as only the residuals from the AWT and other facilities will be disposed of to landfill.

The remaining capacity of the Jacks Gully landfill should accommodate the AWT residuals, over the design life of the facility.

5.9 Water Management System

5.9.1 Overview of System

Establishing the proposed AWT Facility provides an opportunity to improve the current water management system on the Jacks Gully WRC site, by increasing the overall level of water re-use. The proposed water management system (subject to final design requirements) is



described below and illustrated in Figure 5-21.

Figure 5-21 Proposed Water Management System

The ArrowBio process would produce a net volume of surplus water of up to 40 kL/day, as a result of capture of the moisture contained in the incoming waste, and the water produced from biological processes. This water would be used to satisfy the needs of the plant in terms of water for processing waste, as well as for washing of equipment and floors. Stormwater collected from the site would also be able to be used for industrial processes.

Rainwater collected from the roofs of the site buildings would be used for washdown and site amenities use (non-potable), and potable water would be imported to the site via a new water main laid along the western boundary of the Jacks Gully WRC from the current connection near

the existing gate. The estimated quantity of potable water required for 40 employees is 2.4 kL/day.

The contractor will ensure the water supply system is designed, installed, and maintained in accordance with Sydney Water standards.

No device or system that may cause contamination of the water supply will be connected directly or indirectly to any part of the water service without appropriate cross-connection or backflow prevention control.

The requirements for backflow prevention devices will be determined by identifying individual hazard(s) on-site as defined in Clause 4.3 of AS/NZS 3500.1:2003. Working upstream from each hazard, the water would be regarded as non-drinking until a backflow prevention device suitable for the hazard is installed. Any backflow prevention devices will comply with AS/NZS 2845.1 and provided in accordance with the requirements of Table 4.1 and Clause 4.3 of AS/NZS 3500.1:2003.

5.9.2 ArrowBio Plant process water

As mentioned above, up to 40 kL/day of process water would be discharged from the ArrowBio Plant. This water would be collected in a process water storage reservoir (approximate capacity 400 m³), and kept separate from stormwater from the Jacks Gully WRC site.

Some of this water would be used as wash-down water with the wastewater from these activities treated in the ArrowBio wastewater treatment plant. Depending upon the quality of the process water, it may require disinfection before re-use for washing purposes.

The rest of the process water may be able to be used for on-site for irrigation of revegetated areas, and dust suppression, within licence conditions. Excess process water would be disposed of to sewer, or tankered off-site to a suitable wastewater treatment plant at one of WSN's other sites (Lucas Heights, Eastern Creek or Belrose).

At present, there is no discharge from the Jacks Gully WRC site to a Sydney Water sewer. Any commercial or industrial business that wishes to discharge to sewer needs written permission from Sydney Water in accordance with its Trade Waste Policy. Under the policy, there are acceptance standards that must be met by all discharges, that are dependent on the receiving treatment plant.

For the Jacks Gully WRC site, any wastewater discharged to sewer is likely to be received at the West Camden Sewage Treatment Plant, which is a tertiary level treatment plant. Discharge from this plant is to Matahill Creek and then the Nepean River.

WSN has provided an indicative water quality data for the proposed AWT Facility based on the ArrowBio Facility in Israel. A summary of wastewater characteristics and a comparison with Sydney Water trade waste acceptance standards is provided in Table 5-5.

Table 5-5 ArrowBio process water characteristics

	Characteristics (mg/L except for pH)	Sydney Water trade waste acceptance criteria (mg/L except for pH)
pH	7.7	7-10
COD	618	
BOD	66	
General oil	< 5	
Mineral oil	< 10	
Sulphides	1	5
Suspended Solids	5	600
Boron (B)	0.1	2
Chromates	< 0.05	
Cyanides	< 0.1	1
Silver (Ag)	< 0.05	5
Aluminium (Al)	0.2	100
Arsenic (As)	< 0.1	1
Barium (Ba)	0.6	100
Beryllium	< 0.01	
Calcium (Ca)	226	
Cadmium (Cd)	< 0.01	1
Cobalt (Co)	0.02	5
Chromium (Cr)	0.01	3
Copper (Cu)	< 0.05	5
Iron (Fe)	1	50
Mercury (Hg)	< 0.05	0.03
Potassium (K)	144	
Lithium (Li)	< 0.05	10
Manganese (Mn)	0.2	10
Molybdenum (Mo)	< 0.05	100
Nickel (Ni)	< 0.05	3
Phosphorus (P)	10	
Lead (Pb)	< 0.1	2

	Characteristics (mg/L except for pH)	Sydney Water trade waste acceptance criteria (mg/L except for pH)
Sulphur (S)	11	
Selenium (Se)	< 0.05	5
Strontium (Sr)	0.8	
Titanium (Ti)	0.02	
Vanadium (V)	0.01	
Zinc (Zn)	< 0.05	5
Ammonia	< 30	50
Grease	< 30	110
Sulphite	< 20	30
Petroleum hydrocarbons (non-flammable)	None	30
Petroleum hydrocarbons (flammable)	None	10
Phenolic compounds (non- chlorinated)	<< 10	10
Polynuclear Aromatic Hydrocarbons	<< 5	5
Volatile Halocarbons (chlorinated hydrocarbons)	none	2
TSS	5	mg/L
TDS	<500	mg/L

While there are a number of potential future off-site reuse options including municipal irrigation (e.g. golf course or public spaces) and agricultural / industrial uses, they have not been assessed in detail in this EA.

Any off-site reuse option carries a degree of risk as it allows for exposure by third parties. Therefore, in addition to any treatment required to meet the applicable discharge / reuse criteria, the water may require specific treatment to minimise risks.

Until the characteristics of the wastewater are better understood, any excess process water that could not be re-used on-site (especially during wet weather periods) would initially be discharged to sewer or tankered off-site to a suitable wastewater treatment plant, such as those at one of WSN's other sites (Lucas Heights, Eastern Creek or Belrose).

Criteria for beneficial reuse are provided in Table 5-6.

Table 5-6 Relevant Wastewater and Effluent Re-use Criteria

Parameter	Beneficial Reuse – recreational ¹ (controlled access)	Residential Reuse (non-potable)
	mg/L	
pH	6.5 – 8.5	6.5 – 8.5
BOD	20 <40 (is classified as a low strength effluent)	
TSS	30	
TDS	Note 2 (<500 is classified as a low strength effluent. For effluents >1500 only salt tolerant plants can be irrigated).	
Total Phosphorous	Note 2 (<10 is classified as a low strength effluent)	
Total Nitrogen	Note 2 (<50 is classified as a low strength effluent)	
Level of treatment required	Secondary plus pathogen reduction	Tertiary and pathogen reduction (1 mg/L Cl ₂ residual after 30 min or equivalent)
1	Includes consideration of : NSW Guidelines for Urban and Residential use of Reclaimed Water, National Water Quality Management Strategy, Guidelines for Sewerage Systems, Reclaimed Water, NSW Health Department	
2	Generally dependent on-site specific conditions or determined through nutrient balances etc.	

5.9.3 Sewerage

Sewage collected from the AWT Facility “domestic” sources (i.e. workers sinks, showers and toilets, etc) would be pumped through a new on-site sewer pipe to the public sewer system, or treated on-site in a septic system and tankered off-site for appropriate disposal. If a sewer is installed, it would be laid along the western boundary of the site and be connected to the sewerage system in the nearby residential development of Spring Farm.

From the 40 workers at the AWT Facility, the estimated domestic wastewater produced would be approximately the same as the potable water demand, which is estimated at 2.4 kL/day.

5.9.4 Stormwater

The first 10 mm of stormwater falling on the paved areas of the proposed AWT Facility and platform would be collected in a first flush system. Excess stormwater would overflow into the site stormwater detention dam and re-used on-site. The contents of the first flush tank would be reused as process water in the ArrowBio Plant. Excess water would be discharged to sewer, or tankered off-site to a wastewater treatment plant at one of WSN's other sites (Lucas Heights, Eastern Creek or Belrose).

The AWT Facility would utilise the existing stormwater infrastructure at the Jacks Gully WRC wherever possible. Minimal additional infrastructure would be required to collect stormwater runoff from the plant and transfer the first 10mm of rain to the, storage tanks for first flush stormwater, and the rest of the stormwater to either the site stormwater retention dam (surface runoff), or the fire-fighting water tanks (roof water), or staff amenities water storage tank (roof water), for non-potable use.

5.10 Site bunding

The AWT Facility includes various outdoor tanks containing liquids in various stages of biological treatment, as well as vats and tanks within the main processing building. These have the potential to leak or rupture and such events must be allowed for in terms of bunding of specific areas that present the highest risk.

The MSW processing building floor will be marginally above road level. Any leakage from the vessels in the building will be captured by the floor drainage system, which drains to local sumps within the building. Water from these sumps will be pumped into the ArrowBio Plant. Any catastrophic failure of a vessel in the building would be captured by the site's first flush system, which has a capacity of approximately 175 m³.

As mentioned previously, surface rainwater from the first flush (10mm) would be pumped into the ArrowBio Plant. This return pumping would occur over a two day period. Rainwater from the AWT Process Building roof would be captured in a stormwater tank and reused as process and washdown water at the site. Some of this water would be used to fill the AWT Facility fire fighting tanks. Surface rainwater in excess of the first flush volume would drain directly to the site stormwater dam via gravity, for re-use elsewhere on the Jacks Gully WRC site.

To contain a tank spill, a mini bunded area at the Bio Treatment Plant would be constructed using rollover kerbs. This would be connected to the Jacks Gully WRC leachate pond, which would provide the necessary containment volume. Normal light rain would soak into the ground at the AWT Facility site.

5.11 Fire fighting system

There is a dedicated fire fighting system for the AWT Facility, which comprises two dedicated fire water only storage tanks (300m³ total volume), an electric fire pump and a diesel fire pump, and a fire hydrant main covering the whole site, hose reels and fire engine connection point as required.

Water top up is from the roof stormwater tank. The fire water tanks provide 4 hours of water storage for fire fighting to satisfy the Australian Standard. Potable water from the town main would be used to top up this tank as needed. The system satisfies AS2419.1 "Fire Hydrant Installations", AS2941 "Fixed Fire Protection installations – Pumpset Systems" and the Building Code of Australia.

There would be two fire pumps - an electric fire pump and another diesel powered pump that can be used in the event of a power failure (due to a bushfire for example).

5.12 Electrical infrastructure requirements

To determine the requirements for connection of the generators to the Integral Energy network WSN submitted an application for connection of load to Integral Energy, which was based on the best information available at the time.

As of the date of issue of this EA, Integral Energy has not officially replied to the application, however it has advised that:

- ▶ An 11 kV feeder exists at the entry to the site and is used to export power from the existing landfill gas generation plant, and this would be typically capable of transferring 4 MW of power;

- ▶ Based on the maximum export from the proposed Jacks Gully site of 2 MW, and the projected future requirements of the landfill gas facility, there should be no need to augment the existing network at the entry to the site. This would of course be subject to a proper study; and
- ▶ The installation to connect to the Integral Energy network would be an air break switch, known as the Network Connection Point, an 11 kV pole mounted metering unit, an overhead line to the generation site, a pole mounted recloser near the site, an 11 kV / 415 V transformer for the site load and a step up transformer for the generator.

5.13 Construction of the facility

5.13.1 Project delivery method

WSN initiated a tendering process in August 2005 to select an Engineering Procurement and Construction Management (EPCM) Contractor to manage the overall delivery of the Alternative Waste Technology (AWT) Facility. The overall project has a number of specific elements, which are listed as follows:

- ▶ Engineered fill platform;
- ▶ Buildings and foundations;
- ▶ Municipal solid waste processing plant (of capacity 90,000 tonnes/yr);
- ▶ Garden organics processing plant (of capacity 30,000 tonnes/yr);
- ▶ Gas power plant;
- ▶ External infrastructure to site; and
- ▶ Internal infrastructure within site.

The main role of the EPCM contractor will be to coordinate and manage the delivery of all of the above-mentioned items. The two technology suppliers will provide specialist plant items, while the EPCM contractor will provide civil engineering, earthworks, mechanical and electrical and building services, and install and commission the plant items.

The proposed works will meet OHS requirements and conform with all building codes and relevant Australian standards. External infrastructure (sewer, water and power) will be provided by semi-government organizations such as Integral Energy and Landcom, but the EPCM contractor will coordinate this.

WSN operations staff will undertake some site works, such as excavation of the existing platform area (where necessary) and construction of non-critical infrastructure.

5.13.2 Construction program

A 15 month construction program is envisaged, involving approximately 6 months of earthworks to prepare the site and build the engineered platform, and another 9 months of building, equipment installation and commissioning.

The preliminary key dates and timeframes are as follows:

- ▶ Contract Award to EPCM Contractor March 2006
- ▶ Mobilisation engineering Immediately following contract award

- Mobilisation on-site August 2006 subject to Environmental Approval
- Completion August 2007

This timetable is dependent upon the timing of environmental planning approval processes and other factors.

5.13.3 Plant construction activities

Construction of the AWT Facility would generally involve the following construction activities and sequence:

- Preparation of a construction environmental management plan (EMP);
- Pre-construction identification and marking of sensitive areas as identified in the environmental assessment and in the construction EMP;
- Implementation of the construction communication plan, including the construction hotline;
- Installation of temporary and permanent noise mitigation measures;
- Establishment of permanent and temporary fencing, work compounds and access;
- Construction and line marking of construction roads and installation of traffic controls;
- Installation of temporary erosion, sediment and water quality controls;
- Clearing of vegetation;
- Stripping, stockpiling and management of topsoil;
- Utilities provision (electricity, water, sewerage);
- Bulk earthworks and platform construction;
- Installation of permanent drainage lines;
- Subgrade preparation and pavement works on the platform;
- Building and tank farm construction;
- Installation of mechanical equipment and wiring; and
- Commissioning of equipment.

In parallel with installation and commissioning of equipment, other site works would be undertaken including:

- Landscaping of site;
- Completion of site access road;
- Linemarking and signposting of road and facility;
- Installation of lighting; and
- Finishing works.

The exact construction methods would be determined by the Contractor at the time of construction, but would generally follow the sequence outlined above. All works would be undertaken in accordance with the following:

- WSN General and Technical Specifications for Waste Management Centres/Facilities;
- The environmental controls presented in this EA; and

- ▶ The Contractor's Environmental Management Plan (CEMP).

5.13.4 Equipment used

Equipment used during construction would include the items listed below.

- ▶ Bulldozers
- ▶ Concrete mixers
- ▶ Compactors
- ▶ Backhoes
- ▶ Excavators
- ▶ Mobile cranes
- ▶ Loader
- ▶ Paving machine
- ▶ Grader
- ▶ Water trucks
- ▶ Concrete trucks
- ▶ Dump trucks

5.13.5 Construction hours

In accordance with the Noise Control Manual produced by the NSW Department of Environment and Conservation (former Environment Protection Authority) (NSW DEC), construction activities would be restricted to between 7.00 am and 6.00 pm Mondays to Fridays and 7.00 am to 1.00 pm on Saturdays. No construction work would be undertaken on Sundays or public holidays.

Construction work may be permitted outside of the hours specified above, however, this would be subject to consultation with the NSW DEC and Camden Council.

The local community would be informed of the commencement of work through a newsletter drop with additional notification through local newspaper advertisements. It is not likely that significant on-site construction noise will impact surrounding residential areas, given the distance of the AWT platform from the existing residential properties release areas.

5.13.6 Construction workforce

For a project of this size, it is anticipated that the peak construction workforce on the site is likely to be approximately 50 persons. The average size of the workforce over the construction period is expected to be about 30 people. The ultimate workforce size, however, would be determined by the EPCM contractor and would depend ultimately on the way in which work is scheduled and staged.

5.13.7 Sources of construction materials

All construction materials would be sourced locally where possible from commercial suppliers and manufactures from within the Sydney/Macarthur Region.

5.13.8 Construction facilities

In addition to the physical "footprint" of the permanent works, the construction Contractor would require the use of land adjacent to the permanent works for a range of construction related activities such as a site compound and storage areas. A description of the various ancillary construction facilities that could be required is described below.

5.13.9 Site compounds and work areas

The contractor would require a site compound and work area for offices, plant, maintenance and storage of mobile plant and construction materials. The compound and work area would need to be fenced for safety and security, and would include ablution and toilet facilities, hard-stand areas for plant and vehicles as well as material storage.

Liquid and solid waste would be removed by tanker or trucks and disposed of off-site at an approved facility. Fuel and chemical storage areas would be bunded and protected in accordance with DEC requirements. A works compound site would be established near the AWT Facility site.

5.13.10 Stockpile areas

Stockpile sites would be located within the Jacks Gully WRC site. Stockpiles will be protected from erosion by mulching stockpile surfaces, erecting erosion and sedimentation fencing around the base of each stockpile, etc.

5.13.11 Spoil disposal areas

Balancing of cut and fill would avoid the need to establish large designated disposal areas. However, disposal of material that is determined unsuitable for use in embankments, as landscaping material or is in excess of required fill volumes would be required to be disposed of either on-site or off-site. According to preliminary geotechnical investigations most materials excavated would be reusable.

5.13.12 Water quality during construction

Control of erosion and sedimentation would be required during the construction period, including temporary works. This includes erosion and sediment controls to prevent sediments from being carried into the stormwater systems, including cut-off drains, silt fences and other erosion controls. A site sediment and erosion control plan would be prepared, in accordance with requirements of the Blue Book (Managing Stormwater: Urban Soils and Construction, Department of Housing). These controls would be implemented before any construction commences.

A 90th percentile 5 day rainfall duration would be used to determine the volumes of the temporary sediment dams, along with an upper limit of 50mg/L for total suspended solids in any pumped discharge of stormwater.

The Project Environmental Management Plan (PEMP) and contract documents would address the requirements based on controls and mitigation measures described in Chapter 27.

6. Need and Justification

This chapter provides a strategic overview of the environment, the current sources of waste in the region and typical waste composition for the region. The waste management and resource objectives and requirements of the Macarthur Region are also outlined.

6.1 Strategic Overview of Waste Management Objectives

The *Waste Avoidance and Resource Recovery Act 2001* and the *Waste Avoidance and Resource Recovery Strategy 2003*, provide broad objectives for waste management in NSW.

6.1.1 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* ('the Act') governs the strategic direction for waste management and resource recovery in NSW. The main objectives of the Act are:

- (a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,
- (b) to ensure that resource management options are considered in accordance with the following hierarchical order:
 - (i) avoidance of unnecessary resource consumption,
 - (ii) resource recovery (including reuse, reprocessing, recycling and energy recovery), or
 - (iii) disposal,
- (c) to provide for the continual reduction in waste generation,
- (d) to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,
- (e) to ensure that industry shares with the community the responsibility for reducing and dealing with waste,
- (f) to ensure the efficient funding of waste and resource management planning, programs and service delivery,
- (g) to achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,
- (h) to assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997*.

6.1.2 NSW Waste Avoidance and Resource Recovery Strategy 2003

The Act provides the legislative framework for the former Resource NSW (now incorporated into the Department of Environment and Conservation's Sustainability Branch) to develop a state-wide strategy for waste avoidance and resource recovery. The first *Waste Avoidance and Resource Recovery Strategy* ('the Strategy') was released by the NSW Government to provide a framework and that set targets for all sectors of the community to reduce waste and to increase the recovery of resources from waste.

The Strategy identifies four key areas where outcomes must be achieved. These are:

- ▶ Avoiding and preventing waste;
- ▶ Increased use of renewable and recovered materials;
- ▶ Reducing toxicity in products and materials; and
- ▶ Reducing litter and illegal dumping.

A series of broad targets were proposed for each outcome area, as outlined in Table 6-1.

Table 6-1 Broad targets from the Waste Avoidance and Resource Recovery Strategy

Outcome area	Target
Preventing and avoiding waste	To hold constant the total waste generated for the next 5 years
Increasing recovery and use of secondary resources	By 2014, to: <i>Increase recovery and utilisation of materials from the municipal sector from the current 26% to 66%</i> Increase recovery and utilisation of materials from the commercial & industrial sector from the current 28% to 63% Increase recovery and utilisation of materials from the construction & demolition sector from the current 65% to 76%
Reducing toxic substances in products and materials	By 2014, or earlier: To phase out priority substances in identified products as a first choice or if not possible to achieve maximum recovery for re-use and; Where identified products containing these priority substances require disposal as a last resort, the permitted "leachability" of the substances will be reduced to the levels that are permitted for inert waste.
Reducing litter and illegal dumping	Reduce total volume and tonnages of litter reported annually. Reduce the total tonnages of illegally dumped material reported by regulatory agencies and RID squads annually.

The targets adopted from the Strategy (as outlined in Table 6-1) are those proposed as Aggressive Resource Recovery targets by Wright (2000) in the Independent Public Assessment – Landfill Capacity and Demand. The target for resource recovery from municipal waste is 66% by 2014, up from 26%.

WSN is committed to the principles of waste avoidance and resource recovery. The proposed AWT Facility will enable councils in the local area to achieve the objectives of the Act and the

66% resource recovery target for the municipal waste proposed in the *Waste Avoidance and Resource Recovery Strategy 2003*.

6.1.3 WSN's Role in Meeting State Targets

WSN is committed to the principles of waste avoidance and resource recovery. The development of alternate treatment plants that treat waste as a resource is a key strategy of WSN as discussed in Section 6.7.

The proposed AWT Facility development and the Eastern Creek AWT Facility deliver outcomes consistent with the factors that are driving state strategies for sustainable waste management, by exceeding the 66% municipal waste diversion from landfill target.

6.2 The South West Sydney Regional Waste Strategy

In June 2005, a tender was called by South West Sydney Councils (Camden, Campbelltown City, Wingecaribee Shire and Wollondilly Shire) for the receipt and processing of all domestic waste streams, under the South West Sydney Councils Resource Recovery Project.

The Project is for a contract period of 15 years.

The urgency of the project has been driven by two main factors:

- ▶ The impending end to the disposal of putrescible material at the existing Jacks Gully Class 1 Landfill in 2007;
- ▶ The Council's desire to achieve a more sustainable waste management solution that prioritises resource recovery and places the participating councils on a path of waste management that is in line with the objectives outlined in the NSW State Government's Waste Avoidance and Resource Recovery Strategy.

The overarching objectives of the Project are:

- ▶ To ensure that South West Sydney Councils have secure processing and disposal solutions for the Mixed Solid Waste, Recyclables and Organics generated in their LGAs;
- ▶ The opportunity to maximise the recovery of resources from the Input Streams; and
- ▶ To strive towards meeting the NSW State Targets for resource recovery.

The South West Sydney Councils have intended through the project, to move from disposal of most waste generated in the region to sustainable resource management. It is expected this will be achieved through the increased recovery and beneficial reuse of resources using appropriate technologies.

6.2.1 Compatibility of the Proposal with State and Regional Waste Strategies

The proposed AWT Facility delivers outcomes consistent with the factors that are driving both regional and state strategies for sustainable waste management.

As well as State targets for waste management, WSN forecasts that community expectations will shift to demand ongoing improvement in waste management, and higher standards of environmental performance, sustainability and resource recovery. The proposed development also satisfies community expectations for improved waste management practices.

The Facility is compatible with the regional strategy of maximising the recovery of resources. The proposed AWT Facility will recover resources at the highest resource value state, delivering a higher landfill diversion rate and recovering more valuable recyclable material.

The proposed development also exceeds NSW State Targets for resource recovery. Less than 25% by volume of stabilised material will be disposed in landfill.

6.3 Type of Facility Required

The proposed AWT Facility has been designed to accept a wide variety of waste inputs. To ensure that the Facility is fully capable of processing the range of possible waste types encountered in the area, WSN has conducted waste characterisation studies in the Macarthur Region. The results of the studies have indicated that the waste from the audited areas will be acceptable to the Facility.

The type of waste facilities needed in the region is highly dependent upon the composition of waste generated. An audit of residential, commercial and small vehicle waste at Jacks Gully Landfill was conducted in 2004, involving the sampling of contents of vehicles arriving at the site, including Council vehicles, small vehicles and commercial vehicles.

This audit, however, did not include vehicles bringing in virgin excavated natural materials (also known as “VENM”, used as daily cover from landfilling operations), growing medium, MRF waste or vehicles delivering recyclables to the MRF. Table 6-2 summarises the audit results from the residential data.

Table 6-2 Waste audit data for Jacks Gully

Data	Jacks Gully Residential (proportion by weight)
Recyclable containers	4.8%
Recyclable paper/cardboard	10.2%
Vegetation	7.1%
Food waste	29.6%
Other	48.3% ¹

source: A Prince Consulting (2004), *Audit of Residential, Commercial and Small Vehicle Waste at Jack's Gully Landfill for Waste Service NSW* apart from Note 1. where the “other” classification has been adjusted to make it add up to 100%

The compositional breakdown of the residential waste stream received at the Jacks Gully Landfill is also shown diagrammatically in Figure 1-1. The aggregated grouping of audit data was compared with other data from past studies in various metropolitan areas within Australia. It was found that:

- ▶ Food waste forms the largest proportion of the garbage stream;
- ▶ Recyclable containers generally form a smaller proportion than recyclable paper and cardboard; and
- ▶ There was a higher proportion of garden organics in the historic data.

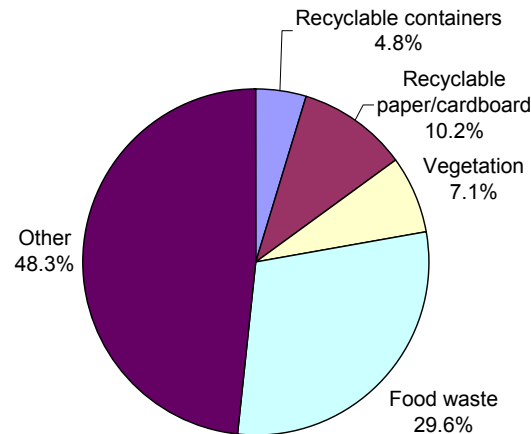


Figure 6-1 Composition of residential waste stream at Jacks Gully WRC

(source: data obtained from A Prince Consulting (2004))

Figures 6-2 shows the compositional breakdown of the commercial and industrial (C&I) waste stream.

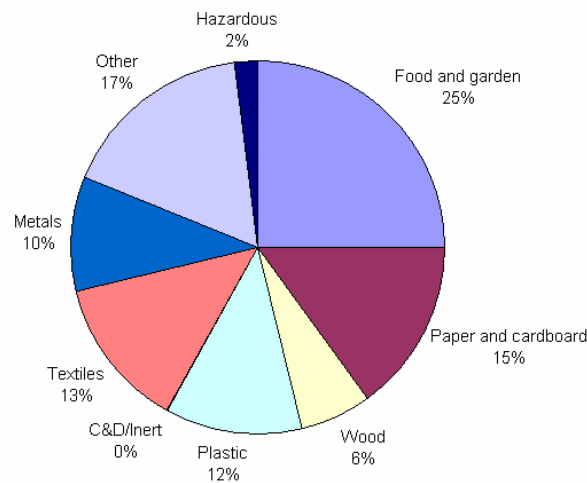


Figure 6-2 Composition of the C&I waste stream at Jacks Gully

(source: data obtained from A Prince Consulting (2004))

6.4 The South West Sydney Region

The Macarthur Region has one of the higher population growth rates in NSW. This is mainly due to the region's rapid change from a predominantly rural and industrial area to an area dominated by urban development and expansion. These rapid urban developments are part of a recently nominated land release area as part of the NSW Government's Metropolitan Development Plan (MDP).

The rural and extractive resource industries of the Camden LGA and broader Macarthur Region will continue to experience pressures from land releases at Spring Farm, Mount Annan South, Bringelly and Menangle.

The Macarthur Region experienced a population increase of 13.4% since 1996 and it is predicted to increase by 41% to approximately 350,000 people by 2021.

6.5 Future Waste Volumes

Provides a summary of predicted population levels and the most recent statistics for amounts of waste generated, which would be available for collection and processing at the proposed AWT Facility. It includes figures provided by the four Macarthur Region councils, these being Camden, Campbelltown City, Wingecarribee Shire and Wollondilly Shire Councils.

Analysis of future waste trends indicates that waste volumes will rise proportionately with population increases. By 2022, mixed waste volumes are forecast to be approximately 90,000 tonnes and garden organics volumes are forecast to increase to 33,000 tonnes.

Table 6-3 Summary of waste statistics for 1 July 2004 – 30 June 2005

	Camden Council	Campbelltown City Council	Wingecarribee Shire Council	Wollondilly Shire Council
Predicted Populations:				
► 2006	54,610	154,310	46,050	42,170
► 2016	83,020	179,240	51,730	47,810
► 2026	120,040	181,880	57,400	52,210
Mixed Solid Waste collected at kerbside (tonnes)	10,892 [#]	30,370 [#]	5,368 [#]	8,406 [#]
Mixed Solid Waste delivered to Transfer Station	N/A	N/A	1,751 [^]	N/A
Mixed Solid Waste from Public place litter bins (tonnes)	N/A	364	§	N/A
Mixed Solid Waste from Council operated commercial collection (tonnes)	557	N/A	§	N/A
Recyclables collected kerbside (tonnes)	4,767	14,463	2,951 [#]	2194 [#]
Garden organics collected kerbside (tonnes)	5,249	13,641	N/A	N/A
Non-putrescible MSW from clean-up service (tonnes)	919	2,937 ^{*#}	N/A	570 [#]
Illegally dumped material (tonnes)	895	2,500 [#]	N/A	N/A
Street sweepings	453	2,000 [#]	N/A	N/A
TOTALS[#] (tonnes/year)	23,732	66,275	10,070	11,170

[#] Estimate only

^{*} Excludes scrap metal

[^] putrescible only, inert waste transferred to local landfill

§ Included in figure for landfill/transfer station

Table 6-3 shows that there is an ongoing need for waste management receival facilities in the Macarthur and surrounding region when putrescible waste can no longer be landfilled at Jacks Gully WRC after mid 2007.

6.6 Need for the Facility

The proposed AWT Facility is being developed to meet the requirements of Councils, guaranteeing the provision of sustainable waste management practices for domestic waste until at least 2022.

The development of the facility aligns with Council's forecast waste requirements for the period of the contract and as covered in Section 6.5, the proposed AWT Facility will specifically meet the feedstock volume specifications presented by Councils.

This application is proceeding in anticipation that WSN will secure a contract for the receipt and processing of domestic waste streams from the four Councils of Camden, Campbelltown City, Wollondilly Shire and Wingecaribee Shire, as part of the South West Sydney Resource Recovery Project.

6.7 Justification for the proposed AWT Facility

The proposed operation of the AWT Facility, comprising the MSW treatment plant and garden organics composting plant is considered to be justified in that it delivers outcomes consistent with the factors that are driving both regional and state waste management strategies.

The AWT Facility aligns with the philosophy of viewing waste as a resource – and recovering resources in their highest net resource value state. The recovery of resources in this manner decreases pressure on virgin resources and creates value from the waste stream.

The proposal to establish the AWT Facility at the Jacks Gully WRC has been developed to meet the requirements of the South West Sydney Councils for the receipt, treatment and processing of mixed solid waste and garden organics, while at the same time maximising the diversion of waste from landfill.

The AWT Facility achieves the following benefits:

- ▶ Maximum recovery of the major elements of the waste stream, thereby maximising energy and resource recovery;
- ▶ Significant reduction in Greenhouse Gas (GHG) emissions through:
 - The capture of 100% of Biogas, produced through the organic component of the waste stream;
 - Recovering (for recycling) homogenous streams of plastic, metal and glass; and
 - Avoiding emissions from otherwise landfilled material.
- ▶ Generation of Green Electricity;
- ▶ Reduction in disposal to landfill of potential resources. The MSW treatment plant will divert in excess of 75% and the composting plant in excess of 96%;
- ▶ Produces marketable compost from garden organics as an organic replacement for artificial fertilisers in the agricultural and horticultural markets; and
- ▶ Containment of odour, noise and dust impacts by the enclosed nature of the facility, minimising impacts on the local residential community.

The proposed development will also provide benefits to the Macarthur Region including:

- ▶ Development of a new industry and new employment opportunities in the South West Region of Sydney;

- ▶ A single, local site that aligns with the principles of Ecologically Sustainable Development. It allows for waste generated within the Macarthur Region to be treated and recovered within the region. Management of waste locally avoids the need to transport unprocessed materials to another region; and
- ▶ A local facility that reduces environmental impacts. This can come from minimising the transport of waste, and consequent generation of greenhouse gas emissions, road congestion and maintenance costs, as well as significant impacts on other communities outside the region.

6.8 Do nothing option

If the proposed AWT Facility at Jacks Gully did not proceed, putrescible waste from Camden, Campbelltown, Wingecarribee and Wollondilly Councils, which is currently landfilled at Jacks Gully WRC, would have to be sent to other waste treatment facilities within or beyond the Macarthur region, after 2007, when putrescible landfilling will no longer take place at Jacks Gully. Alternate waste management facilities elsewhere in the region may have a range of adverse environmental impacts.

This application is proceeding on the basis that the contract for the South West Sydney Councils Resource Recovery Project will be awarded to WSN. The evaluation process is based upon weightings of economic, social, environmental and commercial criteria. If WSN is successful in being awarded the contract, it confirms that the proposal is considered favourable to alternative facilities available.

If the proposed AWT Facility did not precede, this would prove detrimental to the sustainable development of the region. An alternative waste treatment facility would have to be used that fails to achieve comparable performance in areas of resource recovery, waste reduction, diversion from landfill, production of marketable products as well as social considerations including employment opportunities.

7. Alternatives to the Proposal

This chapter outlines the possible alternatives to this proposal. It gives an overview of the available technologies and details the reasoning behind choosing the particular technology group (biological processing of municipal solid waste and enclosed composting of garden organics) as part of the AWT Facility. An overview of the available site locations for the AWT Facility at the Jacks Gully WRC is presented and justification for choosing the specific site is provided.

7.1 Waste Treatment Technologies

As the world searches for an alternative to landfill disposal of municipal solid waste (MSW), several technologies have emerged for its effective management and ultimate disposal. Traditionally these have included resource recovery systems (such as recycling and recovery of directly re-useable material, composting of organic materials and the anaerobic digestion of biodegradable wastes) and various “waste-to-energy” technologies, such as incineration, pyrolysis and gasification. Sustainable alternatives to landfilling need to be technically feasible, financially viable and must address environmental and social concerns.

7.1.1 Technology selection

Since 2000, when WSN conducted a world wide review of available waste processing technologies and entered discussions with GRL, WSN’s partner in the UR-3R Facility at Eastern Creek, other proven technologies have become commercially available.

A thorough review of comparative strengths and weaknesses of the various technologies for possible use at the Jacks Gully WRC site was conducted. Factors considered included:

- Technology feasibility;
- Land requirements;
- Relative environmental footprint size;
- Market demand for resources produced by the technology; and
- Relative affordability of the technology for the region.

WSN selected the ArrowBio Process, developed by Arrow Ecology.

The ArrowBio Process is a mechanical biological treatment system which:

- Recovers a high proportion of recyclable material;
- Has a landfill diversion rate in excess of 75%;
- Has low odour emissions;
- Produces approximately 22.7 MWhr of green electricity per 100t of waste processed;
- Maximises reduction in greenhouse gases;
- Is a net producer of water; and
- Has a small physical footprint (less than 2 ha).

In terms of the garden organics composting plant, WSN opted for an enclosed, environmentally controlled, biodegradation system to minimise any future residential impacts and proactively address odour management concerns of the community.

With a number of technology solutions available on the market that provided an in-vessel composting solution for garden organics, WSN's selection process focused on identifying a technology that:

- ▶ Was simple, delivering improved reliability;
- ▶ Has demonstrated, proven performance under Australian conditions;
- ▶ Has a proven track record of “no odour impact” performance;
- ▶ Produces a premium product; and
- ▶ Requires minimal capital infrastructure and low maintenance.

This evaluation process identified that the system deployed at the Port Macquarie composting plant (operated by Remondis), delivered on these requirements. This facility is recognised in the industry as setting the standard for local processing.

7.1.2 ArrowBio process

The ArrowBio process is a patented technology using a wet process, where municipal solid waste is immersed in water. Water contained in the waste and other recycled process water, aids the separation of recyclables from the waste and extraction of organic material for biological processing/gas production.

The ArrowBio process avoids any energy intensive drying stage, which is a normal feature of many mechanical biological treatment processes. Plastics and light fractions such as paper are separated using an air separator. The heavier components sink to the bottom of the water vats and magnets and eddy currents are used to recover the ferrous and non-ferrous metals. The organic suspension is pumped to a two-stage anaerobic digestion process, to produce methane for energy production. A more detailed description of this technology is provided in Chapter 5.

7.1.3 Tunnel composting of garden organics

Tunnel composting involves decomposition of organics through microbial activity under enclosed, aerobic conditions for up to 4 weeks. This system controls the atmosphere and moisture to improve the speed and temperature of composting. This process produces advanced maturity compost, which needs little further processing.

A more detailed description of this technology is provided in Chapter 5.

7.2 -Siting Options

7.2.1 AWT Siting Study

In November 2003, GHD undertook a siting study on four potential sites for locating an AWT Facility at or near the Jacks Gully WRC. The sites included:

- ▶ Site Option 1 – Materials Recycling Facility (MRF) area within the WSN Jacks Gully WRC;
- ▶ Site Option 2 – Landfill gully area within the WSN Jacks Gully WRC;
- ▶ Site Option 3 – WSN land site; and
- ▶ Site Option 4 – Camden Soil Mix (CSM) site.

These sites are illustrated on Figure 7-1.

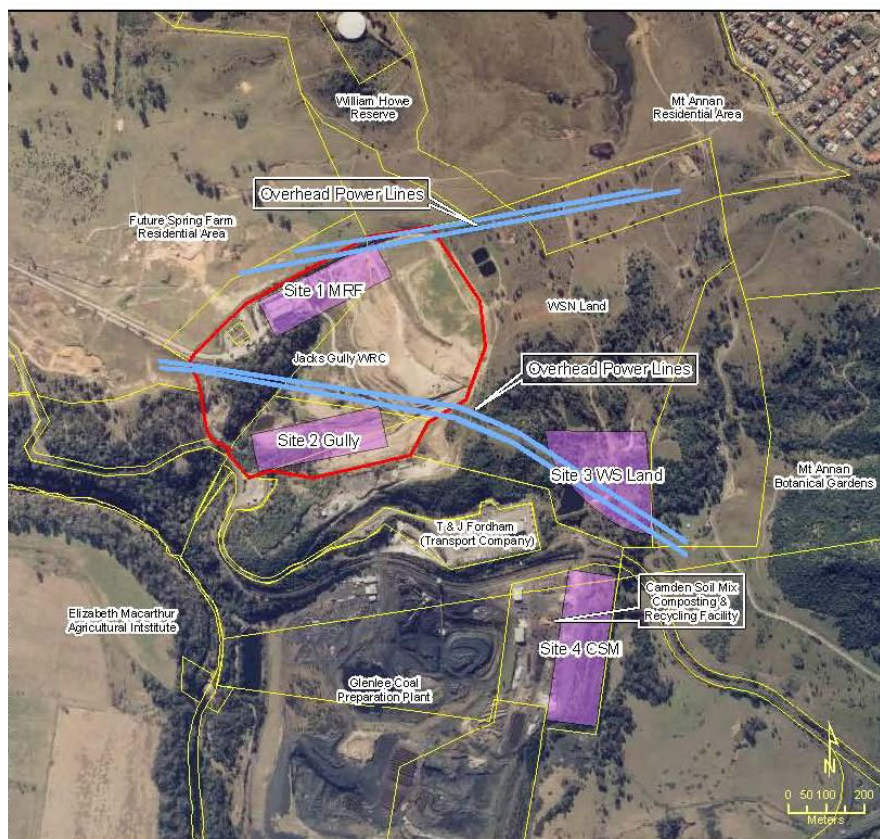


Figure 7-1 Sites selected for evaluation

A range of criteria were used during the site assessment process to identify any potentially 'fatal flaws' associated with the four (4) site options and to make recommendations for further investigation of each option. The criteria used is provided below:

- ▶ Physical (topography, access and infrastructure requirements);
- ▶ Potential environmental impacts of the proposed AWT;
- ▶ Zoning (existing and required); and

- ▶ Commercial considerations such as potential closure of the MRF area, (loss of future landfill capacity, land value etc).

The above issues were also assessed through:

- ▶ Reviewing existing documentation provided by WSN;
- ▶ Physically inspecting all of the four (4) possible sites;
- ▶ Preliminary engineering design layouts to establish whether a building platform of more than four hectares (based on the UR-3R plant) could be established at each site, and the physical earthworks required;
- ▶ Reviewing the principles for site selection for composting proposals against the *EIS Guideline for Composting and Related Facilities, DIPNR, September 1996*; and
- ▶ Assessing the existing infrastructure, and potential costs of providing necessary infrastructure, particularly for incoming supply and export of electricity generated on-site.

The site assessment was based upon the environmental impacts and physical requirements of the existing UR-3R plant at Eastern Creek, since no technology had been selected for Jacks Gully at that stage. A matrix scoring system was used to provide a semi-quantitative assessment/comparison of the four site options. The results of the site options assessment are summarised in Table 7-1.

The following scores were obtained:

- ▶ Site Option 1 – Materials Recycling Facility area (Score = 34 out of 56);
- ▶ Site Option 2 – Landfill gully area (Score = 45 out of 56);
- ▶ Site Option 3 – WSN land site (Score = 36 out of 56); and
- ▶ Site Option 4 – Camden Soil Mix (CSM) site (Score = 44 out of 56).

The site that scored most highly was Site 2, located within the gully area at Jacks Gully WRC. This was based on:

- ▶ Minimal engineering, environmental and planning constraints;
- ▶ Available service infrastructure;
- ▶ Land ownership; and
- ▶ Existing knowledge of the site and related environmental management aspects.

The detailed analysis for its selection is outlined below.

7.2.2 Assessment of Site Option 2

WSN has been operating the Jacks Gully WRC site since 1974. The proposed site of the AWT Facility has been heavily disturbed by landfilling operations and recycling operations and therefore has potential for the location of the proposed AWT.

The site contains a significantly modified environment and has little environmental or heritage value. Further, the site is covered by a site specific Environmental Planning Instrument (EPI) (Camden LEP No.104), which establishes the permissibility for waste facilities and no additional planning approvals, other than the EA. The Jacks Gully WRC site has available water and electrical service infrastructure and road access that would reduce establishment costs for the

proposed AWT Facility, and allow the development of an efficient and environmentally sensitive facility.

Furthermore, the locality has a long association with recycling activities and resource extraction industries such as the Jacks Gully WRC, the Glenlee Coal Preparation Plant and the CSM Soil Composting and Recycling facility. However, the release of land for housing at Spring Farm and Mount Annan South provides a constraint for the proposed AWT Facility, requiring that noise and odour impacts from the proposed technologies need to be minimised.

The EA assessment process has identified mitigation measures to reduce potential impacts from the AWT related to odour, water quality, noise and traffic impacts. This will ensure minimal impact on the amenity of existing and future residents.

7.2.3 Assessment of Site Option 1

Site option 1 was rejected mainly because of its proximity to existing and future residential areas, and the potential costs associated with relocating the existing materials recycling facility. It was also limited in size and the significance of the civil engineering works required to create a level platform. These outweighed its other good features, such as existing infrastructure, accessibility and correct zoning for waste related activities.

7.2.4 Assessment of Site Option 3

Site option 3 is located on rural buffer land to the east of the Jacks Gully WRC site and is not a suitable location for the proposed AWT due to a number of engineering, environmental and planning constraints. The proposed site contains vegetation and an undisturbed landform, which is likely to result in significant environmental impact due to land clearing for the establishment of a building platform for the proposed AWT Facility.

The site is zoned 1(a) Rural under the Camden LEP No.48, which does not allow waste management facilities; hence a rezoning amendment is required to establish permissibility of the proposed AWT. It is located in an area visible by residents/other stakeholders and can be seen from Mount Annan Botanic Gardens.

The site is located above an existing detention pond, which acts as a detention basin in the area and could create potential stormwater management issues if removed. There is no available road access and water and electrical services, which increases establishment costs.

Importantly, existing transmission lines traverse the site and would pose an operating constraint to the siting of an AWT Facility. A proposed future arterial road corridor also passes through this area.

7.2.5 Assessment of Site Option 4

Site option 4 involved siting of the AWT Facility on land that is currently used by CSM for a soil composting and recycling facility. It came close to being selected as first, since the CSM site has been operating since the early 1990's and has little environmental or heritage value due to past soil composting and recycling facility activities. Compared to other sites, the CSM site is located further away from the Spring Farm and Mount Annan South residential land release areas but closer to the Menangle Park release area to the south east. It is serviced with road, water and electrical infrastructure, which would reduce establishment costs for the proposed AWT Facility.

Therefore it was considered that the CSM site would provide a viable location for the proposed AWT, however it would require WSN to reach a commercial agreement on purchasing or leasing the site from the current owner. This idea was explored, but negotiations did not progress sufficiently to permit this site to be considered as a viable option.

7.2.6 Summary – Preferred Site Option

Site Option 2 within the Jacks Gully WRC site provides the most appropriate location for the proposed AWT to provide for the recycling and waste disposal needs of the Macarthur Region. The matrix assessment undertaken on each of the four options concluded that Site Option 2 scored the highest based on the assessment criteria.

The site contains minimal engineering, environmental and planning constraints. The available service infrastructure will allow the development of a cost efficient and environmentally sensitive AWT. Furthermore, WSN owns the site and has a good knowledge of the site and surrounding area to reduce operation environmental impacts.

The EA process provides the appropriate mitigation measures to ensure greater land use context with proposed future land release areas and reduce community concern from existing and future residential areas with the AWT Facility. Assessment is also required to manage the potential water quality and catchment impacts from the site.

Site planning of the AWT is discussed in Chapter 5 of this report, which outlines building layout, landscaping and urban design measures to improve the environmental appearance of the proposed AWT Facility.

Table 7-1 Score results of assessment of site options

Attributes	Site 1 – MRF		Site 2 – Gully		Site 3 – WSN land		Site 4 – CSM	
Proximity to residential areas/potential odour issues	0	Less than 100 m to north	3	500 m to north	3	500 m to north east	4	1.1 km to north, 500m to south east
Constraints due to power lines across site	4	None	3	Little	3	Powerlines need to be relocated	4	None
Access to site for delivery trucks	4	Existing roadway	4	Existing entrance plus short section of new road within landfill site	2	From new road inside WSN land or from private road	2	From new road inside WSN land or from private road
Engineering works required to prepare site/topography	1	2 level site / filling	3	Filling and removal of waste	2	Major filling	4	None
Foundation conditions (Geotechnical)	3	Cut/fill required	3	Cut/fill required	3	Cut/fill required	2	Filled with coal wash
Services – water/sewer	2	Existing site dams in gully area could be utilised	2	Depending upon area required, existing dams may be able to be used	2	Remote from existing services but adjacent to existing dam	2	Pipeline to existing dam on WSN land would need to be constructed
Flora / Fauna	2	May need to destroy trees south of site	4	Little existing vegetation	1	Riparian forest potentially on-site	4	Site developed – no impacts
Disruption to future operations	2	Require relocation of existing facilities	3	Little impact as raised above gully floor	4	No impact as remote from existing operations	4	No impact as on different site than existing operations
Zoning / Land use	4	Existing waste related uses	4	Existing waste related uses	1	Rezoning needed followed by DA	3	LEP should permit use for AWT
Availability of grid connection for electricity export	3	11 kV power lines nearby	2	11 kV power lines nearby	2	11 kV power lines nearby	1	11 kV more distant
Topography / visual impact on nearby residential areas	2	Site fairly visible	4	Site below ground level	2	Site visible and elevated	3	Site visible but can be lowered
Ability to expand site operations in future	1	Little space available	2	Can be expanded	2	Can be expanded	4	Could have up to 8 ha if required
Ownership	4	Owned by WSN	4	Owned by WSN	4	Owned by WSN	1	Needs to be purchased or leased
Access to rail line (for future delivery of waste or transport of products or residuals)	1	Nearby but not convenient	2	Possible but would require new roadway	2	Adjacent but owned by SADA	2	Adjacent but owned by SADA
TOTAL	33	FOURTH	43	FIRST	33	THIRD	40	SECOND

7.3 Assessment of the “Do Nothing” Option

As discussed in Chapter 6, landfilling of putrescible wastes at Jacks Gully will cease in 2007 and no economically, socially or environmentally acceptable alternatives exist within the region. South West Sydney Councils have called for a sustainable waste management solution as part of their tender process. The implications of not establishing the Jacks Gully AWT Facility would therefore include:

- ▶ No recovery of the major elements of the regions’ waste stream, within the region from where it originated (which is critically important to achieving sustainable waste management);
- ▶ No recycling of putrescible waste into renewable energy and organic compost within the region from where it originated; and
- ▶ No development of new industry and employment opportunities within the region.

Waste generated in the Macarthur Region should be treated and recovered within the region, minimising any adverse environmental impacts.

As stated in Chapter 6, if WSN’s AWT proposal at Jacks Gully did not proceed then the Macarthur region’s putrescible waste would need to be sent to an alternate processing facility either within the region or outside the region. This could include, a sorting and /or disposal facility located within another region, a waste transfer station located within the region, which would consolidate the material and transport it outside the region to a remote landfill, or an alternate Waste Treatment Facility at another site within the region (should such a site be available).

Transporting unprocessed materials outside the region has significant social, environmental and economic impacts, as well as the sustainability issues associated with disposal of that waste in a region where it has not originally been generated.

PART D

Environmental Assessment

8. Land Use, Zoning and Property

This Chapter describes the existing environment as it relates to land use and zoning. It also assesses how the proposed development will impact on these factors, particularly in relation to adjoining property, and recommends mitigation measures to minimise these impacts.

8.1 The Region

The Macarthur Region covers an area of 5,777 km² and traditionally has had a long association with rural industries and with the extraction of natural resources, serving the Sydney Metropolitan Region and broader areas. Land uses in the Macarthur Region include agriculture, residential, recreation, commercial, viticulture, dairying, industrial and mining activities.

8.2 Existing Site Operations and Land Use

8.2.1 Site operations

In 2004 WSN Environmental Solutions conducted a Review of Environmental Factors (under Section 110 of the EP&A Act) and subsequently increased the amount of putrescible waste landfilled at Jacks Gully WRC from 140,000 tonnes/year to 210,000 tonnes/year. Putrescible waste landfilling will cease at Jacks Gully WRC in 2007, in accordance with an agreement between WSN and Landcom.

The Jacks Gully WRC currently receives approximately 140,000 tonnes/year of putrescible waste per annum from LGAs including Camden, Wollondilly Shire, Campbelltown City and Wingecarribee Shire, and Liverpool, as well as approximately 70,000 tonnes/year of putrescible waste from other WSN facilities in the Sydney Region.

The site also receives commercial and industrial (C&I) and construction and demolition (C&D) wastes from the Macarthur region and from Liverpool City LGA. A Materials Recovery Facility operates in the north-east end of the site, and a small vehicle drop-off facility is located on the site. The total amount of waste landfilled on the site is currently in the order of 250,000 tonnes/year. All vehicles entering and leaving the site are weighed at the site weighbridge. The existing layout of the site is shown in Figure 8-1.



Figure 8-1 Layout of existing site

8.2.2 Surrounding land uses

Much of the land immediately surrounding the Jacks Gully WRC is presently open space with minimal scattered vegetation. The closest residential area (Mount Annan) is located approximately 1 km to the northeast of the site boundary although a further area to the west (Spring Farm) is planned for residential use. This proposed residential area will be located just over 70m to the north east of the site boundary. A new residential area of Narellan Vale is located approximately 1 km to the north of the site.

The area in the immediate vicinity of the site is used for a variety of land uses including:

- Electricity substation;
- Chicken hatchery and poultry production;
- Organic waste composting;
- Truck centre;
- Coal washery and storage operations;
- Sand mining and gravel quarrying;

- Freight haulage operations;
- Agricultural research centre;
- Botanic gardens;
- Winery;
- Open space reserves; and
- Residential purposes.

8.2.3 Residential areas

As mentioned, land to the north of the Jacks Gully WRC includes Spring Farm, which is presently used for extensive agricultural uses but will be released for urban land (3,900 dwellings) in accordance with Draft Camden LEP No.121.

Land to the north of the site includes the residential area of Narellan Vale and Mount Annan South (Garden Gates), which will provide an additional 670 dwellings in the next five (5) years. Land to the east includes land owned by WSN, which is zoned for rural purposes and also the Mount Annan Botanic Gardens, which is a regional recreation reserve.

Land to the south of the Jacks Gully WRC includes the Glenlee Coal Preparation Plant, the Fordham transport company and the Camden Soil Mix (CSM) Composting and Recycling Facility. 1.1km south of Jacks Gully WRC is the proposed urban land release of Menangle Park, which will provide 4,000 dwellings in the next 10 years.

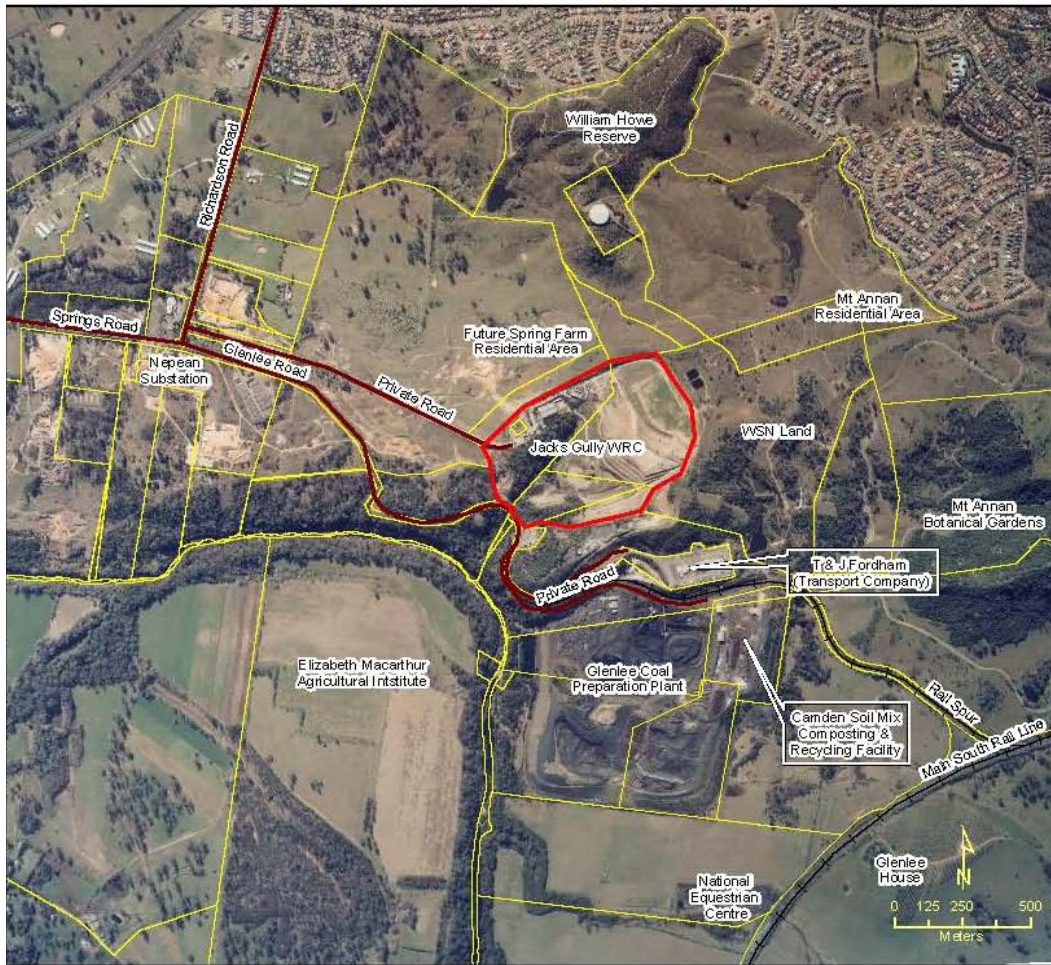


Figure 8-2 Surrounding land uses

8.2.4 Current Zoning and Property Descriptions

The Jacks Gully WRC site is described as Lots 2, 3 and 4 in Deposited Plan 250033, and Lots 1 and 2 in Deposited Plan 1076817, in the Camden Local Government Area. The platform access road will impact on Lots 2 and 3 in DP250033 and Lot 2 in DP1076817.

WSN also controls the adjacent parcel of land to the east of the WRC site, which is described as Lot 11 in Deposited Plan 1081753. This is not currently used for waste related activities, nor has it been in the past, to the Proponents' knowledge. This land is zoned as 1(a) Rural under the Camden LEP No.48.

The current zoning of the Jacks Gully WRC site is 5(a) Special Uses Waste Management Centre under the Camden LEP No. 48. This LEP allows a waste management centre and disposal and recycling activities.

Surrounding zones include 1(a), (b), (c) and (v) Rural to the east, 2(a) and 2(d) Residential under Camden LEP No.48. Land to the north is covered by Camden LEP No.47 and is zoned 2(d) Residential.

The Mount Annan Botanic Gardens is zoned 5(c) Special Uses (Botanic Gardens) under Camden LEP No.48. This zone provides a regional recreational and educational resource.

Land to the south in the Campbelltown City LGA is zoned for resource extraction pursuant to Interim Development Order No.15 and soil and composting recycling facilities as part of Campbelltown LEP No.202. Further south future land release is proposed at Menangle, which is currently zoned for rural uses.

Camden LEP No.121 provides land for residential land release by zoning land at Spring Farm as 2(d) Residential.



Figure 8-3 Current land use and zoning

8.2.5 Future property descriptions

As DEC requires that the proposed AWT Facility be located on a subdivided lot – separate from the rest of the WRC and also to allow for efficient site layout, WSN intends to subdivide the existing Lots 3 and 4 in DP 250033 into two new lots. These will be known as Lots 33 and 34. Lot 34 will comprise the AWT Facility platform, while Lot 33 will comprise the rest of the current Jacks Gully WRC site. This is illustrated on Figure 8-4

In order to accommodate the space requirements of the AWT Facility, WSN intends to purchase approximately 1912m² of adjoining land within Lot 1101 on DP883495 from the existing land-owner. This area (shown in blue on Figure 8-4) would form part of Lot 34. It would need to be

rezoned to accommodate the proposed end use as part of the AWT Facility platform. The existing Lot 1101 on DP883495 would be renamed Lot 36.

A Statement of Environmental Effects (SEE) is currently being prepared to support this rezoning of the small section of land that is being purchased, and this will be lodged with Camden Council and the Department of Planning, concurrently with the EA lodgement.



Figure 8-4 Proposed property boundary changes

8.3 Impact Assessment

The proposed AWT site is located within the southwestern corner of the Jacks Gully WRC and covers an area of approximately 2.7 hectares.

8.3.1 Regional impacts

The broader locality covering Glenlee has a long established history of industrial and resource recovery industries; including the Fordham's and Tripodi transport operation sites, a coal preparation plant (GCPP) and the CSM soil and composting recycling facility. The proposed

AWT Facility is consistent with this resource recovery classification. Socio-economic impacts on the region are discussed in Chapter 19.

8.3.2 Impacts on surrounding land uses

The Jacks Gully WRC site is currently being encroached by residential development, mainly from the north and northwest. An agreement between WSN and Landcom means that landfilling of putrescible waste will cease on the site in 2007.

Providing an AWT Facility with low environmental impacts would address the necessity for local facilities for waste management, whilst protecting the amenity of nearby existing and future residential areas. The proposed inclusion of land use buffers, between the Jacks Gully WRC and surrounding future residential development, will ensure residential amenity.

The Jacks Gully WRC site contains sufficient land for the proposed AWT, which would be located in a discrete area, with little visibility from surrounding locations. Rural land to the east, which is owned by WSN and the Mount Annan Botanic Gardens, would provide a landscaped and rural buffer from existing urban areas to the east. The proposed AWT would not impact on the Fordham transport operations site, the GCPP and the CSM soil and composting recycling facility.

The proposed AWT site is an appropriate location, in terms of reducing potential environmental impacts on residential areas to the north. The land is situated below ground level and is over 500 metres from future residential development. In addition, the site has little environmental or heritage value, having been used for supply of daily cover material for the landfilling operations.

The Mount Annan Botanic Gardens and surrounding rural lands add considerably to the strong natural character of the Menangle Park area. The proposed development does not have any significant potential impacts on nearby rural and recreation land, and minimises environmental impacts on adjoining land uses in the Camden LGA. The proposed development does not have any potential impacts on residential areas to the south (Menangle Park) due to the topography of the land. The location of the facility is behind a 35 metre embankment, which maintains visual aesthetics.

It should be noted that LEP No.121 allows the urban land release of land at Spring Farm, which lies immediately north of the Jacks Gully WRC. This LEP allows residential, rural, special uses (electricity substation), an arterial road reservation and environmentally sensitive land.

An odour buffer is nominated within the LEP to protect the amenity of future residents from potential odour impacts from the Jacks Gully WRC. While this is likely to be sufficient to minimise odour impacts from the proposed future activities on the site (non-putrescible waste landfilling and operation of the AWT Facility), mitigation measures are in place to minimise any impacts on future residents. These measures are discussed in more detail in Chapter 13.

The proposed resource recovery, composting and energy production activities undertaken at the AWT Facility are consistent with the objectives of the Special Uses zone under Camden LEP 48, and permissible with development consent. Therefore no rezoning amendment is required.

The proposed AWT site does not require any property acquisitions or further expansion of the current building footprint of the Jacks Gully WRC onto rural land owned by WSN. However, WSN plans to subdivide the existing Jacks Gully WRC site, to create a separate lot for the AWT Facility.

Included in the new subdivision lot would be an easement of approximately 30 m width along the western boundary of the existing Jacks Gully WRC, from the existing gate, to the AWT platform. This easement would be necessary to allow power, water, sewer and telecommunications to be provided to the AWT site, and green power to be exported from the site to the grid.

8.4 Mitigation Measures

Minimal impacts are associated with construction and operation of the proposed AWT Facility. These impacts will be managed through the preparation and implementation of Construction and Operational Environmental Management Plans. The content of these plans are described in Chapter 28.

9. Topography, Geology and Soils

This chapter describes the existing site topography and underlying geology, examining the suitability of the proposed development given existing site features, and the potential impacts on the local environment.

9.1 Existing Environment

9.1.1 Topography

The topography of the area around the Jacks Gully AWT site ranges between steeply sloping (10-20%) flat-topped hills, to more gently sloping foot slopes (1-5%) and an extensive network of intermittent watercourses associated with the Narellan Creek and the Nepean River.

Figure 9-1 shows the location of the proposed AWT Facility in relation to the existing site topography.

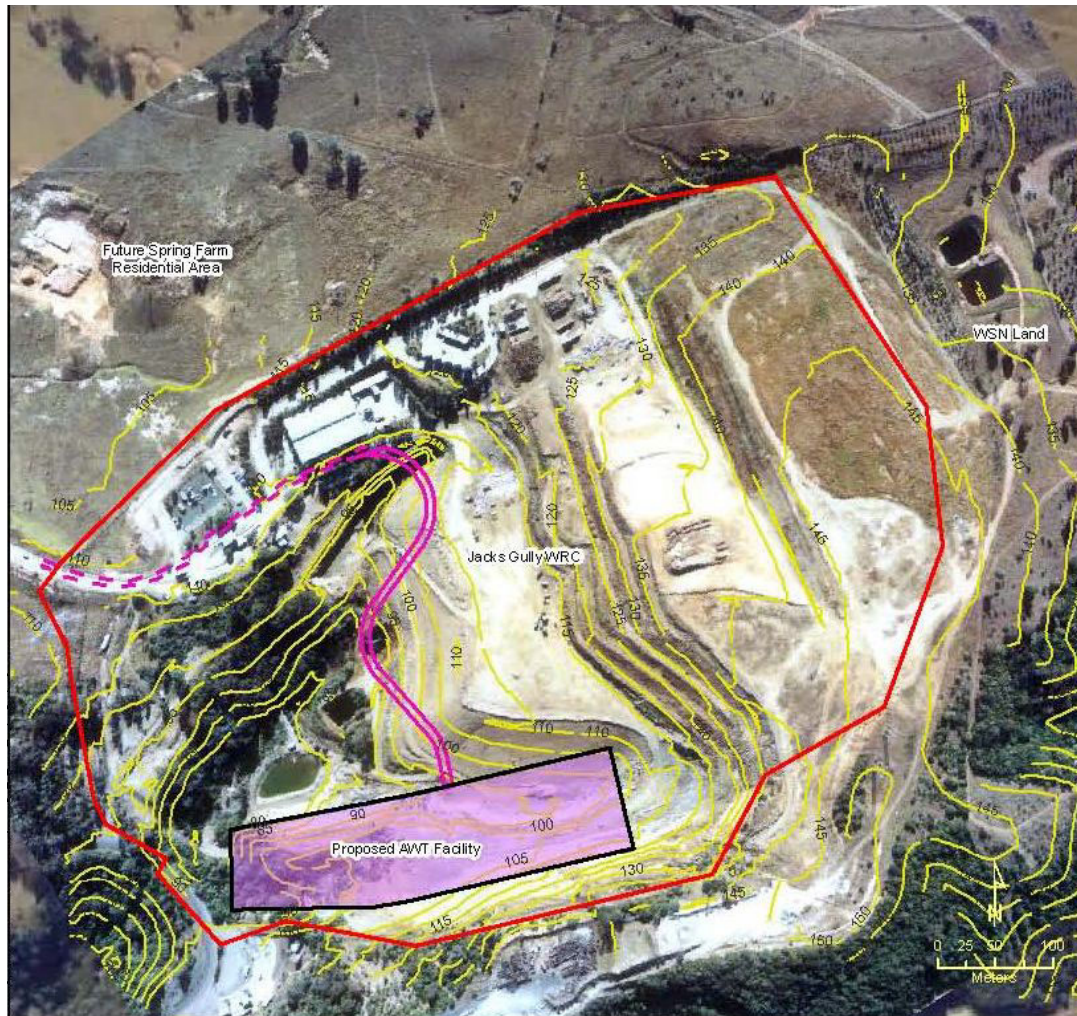


Figure 9-1 Site Topography

The AWT site is located in the upper catchment of a natural valley (Jacks Gully). The highest point (approximately 152 m AHD) of the catchment is at the eastern end of the site and lowest (around 76 m AHD) is at the south-western end of the site. Slopes of the gully sides are approximately 10-20% or steeper.

9.1.2 Geology

Regional Geology

The site is located in the Cumberland Basin, part of the Sydney Basin, and is underlain by rocks belonging to the Bringelly member of the Wianamatta Group (the most widespread formation within the sub-basin). The group, of Middle Triassic age, is the top-most Mesozoic unit in the Sydney Basin and is composed of three major units including Ashfield Shale, Minchinbury Sandstone and Bringelly Shale. Douglas Partners (1999) identified Bringelly formations that consist of shale, carbonaceous claystone, laminate, mudstone, siltstone, minor fine to medium grained sandstone and coal units. This stratigraphic formation is believed to have formed in a broad, low lying coastal plain, which consisted of swamplands cut by meandering estuarine and alluvial channels.

The alignment of Jacks Gully between the southern end of the site and the Nepean River corresponds to the Narellan Lineament shown on the Wollongong-Port Hacking 1:100 000 Geological Series Sheet. This lineament has a general north-south alignment and is mapped over a length of approximately 57 km. However due to a surface modification (filling and construction) and masking by Aeolian sand, the lineament is not evident on-site, or immediately to the north of the site.

Local Geology

Subsurface investigations conducted on the site by Douglas Partners (1997) describe the bedrock on the site as consisting of relatively flat lying, high strength and slightly fractured shales and fine grained sandstones, typical of those encountered regionally within the Bringelly Shale. A thin cover of soils, re-worked material and tertiary sediments overlies the area. The Bringelly Shale is predominantly composed of fine-grained sediment, such as claystone, siltstone and laminite, but layers of fine to medium grained sandstone are present throughout and become thicker towards the top of the formation.

The rocks of the Bringelly Shale are overlain by Aeolian sands of Tertiary age (Tertiary alluvium) along the western and north-western boundary and extending approximately 150 m into the site area (Douglas Partners, 1996). The Tertiary alluvium comprises mostly clayey sands of white to orange-red colour with a common thickness of around 13 m. These sediments are commonly located between the 80 and 100 m above sea level contours, but may have been substantially eroded from the slopes of Jacks Gully.

9.1.3 Soils

Douglas Partners (1997) describe the soils in the area as generally not being very fertile and lacking in nitrogen and phosphorous. The soils tend to be hard setting, with low water holding capacity and acidic, with high aluminium toxicity. Soil materials have moderate erodability. The erosion hazard for non-concentrated flows is slight to moderate and for concentrated flows is moderate to high.

High level deposits (at contours around 100 m) of sand and clayey sands with an average thickness of 13m have formed terraces near to the Nepean River. It has been suggested that these deposits may be Aeolian, having formed as westerly winds piled sand against the western slopes of the hills in the area. The north-western margin to the site is overlain by Aeolian sands of Tertiary age of approximately 9 m in depth.

The distribution of soils in the region is closely related to lithology and geological units, although the boundaries are not necessarily the same. The past operations of Jacks Gully WRC and associated excavations and filling activities have resulted in the modification of the original soils within the site.

The main recognisable units on the site are:

Crests, Upper slopes. Soils derived from the Tertiary high-level alluvium and Red Podzolic Soils, which are deep, friable and duplex, and Yellow Podzolic Soils, which are deep and hard-setting, with high erosion potential. Soils derived from the Wianamatta Group Bringelly Shale are commonly massive earthy clays and a Red Podzolic hard-setting, pale loam, with blocky red clay subsoil. Yellow Podzolic subsoil is present in areas of poor drainage.

Lower Sideslopes. The dominant soil group in these areas of the site is derived from the weathering of the Bringelly Shale and is a Yellow Podzolic Soil. Brownish black loam overlies brown clay loam and a 40 to 100 cm thick horizon of strongly pedal, brown mottled light clay. Below these horizons, light grey, plastic, mottled clays are common. Soils of this type are of moderate erodibility.

Existing salinity

Salinity is not known to be a problem in the area surrounding the AWT site. The former NSW Department of Land and Water Conservation has previously indicated that some sites in the Cawdor area (to the west of the Jacks Gully WRC site) are affected by salinity, according to the *State of the Environment Report*, 1997 (EPA, 1997).

Existing soil contamination

The site for the proposed AWT Facility is a rock platform on the southern side of the gully, within the Jacks Gully WRC. This platform is very unlikely to be contaminated as it was the main source of VENM for daily cover.

9.2 Impact Assessment

The proposed AWT construction works will impact on landform, geology and soils.

9.2.1 Topography

Topography of the existing site is affected by the proposed AWT Facility, since the engineered platform is an extension of an existing rock platform, which extends into the current landfilling area. However over a period of time, the site will be landfilled and the platform will eventually blend into the new topography created by the final landform of the landfill. The visual impact of the proposal is discussed in Chapter 16.

9.2.2 Geology

Geology of the site is compatible with the proposed construction of the AWT platform. The underlying material is geotechnically stable and with proper engineering design and supervision,

the proposed use of either VENM (virgin excavated natural materials), or coal washery rejects for creating the platform, will result in a geologically and geotechnically stable engineered structure.

There are no potential issues with geological faults or land slippages in the area of the platform. Engineering measures will be used to stabilise the slope above the platform and ensure the safety of the facility in the long term.

9.2.3 Soils

Soil disturbance

Creation of a platform on the project site would require filling of the southwestern portion of the site, and excavation of other areas, including the slope behind the current rock platform. This would result in insignificant disturbance to the natural soil cover. Platform construction would also require insignificant volumes of soil filling, as it would mainly be composed of VENM and coal washery reject material brought to the site.

During the process of excavating soils, there is a potential for erosion to occur during rainfall events. Erosion and sedimentation would be controlled during the construction period by measures such as cut-off drains, silt fences and other erosion controls.

Soil contamination

The existing rock platform needs to be extended further north and west to create sufficient area for the proposed facilities. Excavation of some waste materials may be required to provide a solid foundation for the platform batter. If so, this material will be relocated to another area of the same landfill.

Since the site has been used for landfilling of putrescible waste, rather than potentially hazardous waste, it is unlikely that the underlying soil has become contaminated from contact with hazardous materials or substances.

Even if the underlying rock and soil has been slightly contaminated by the waste material above, it would still be suitable for its intended purpose, which is to provide a foundation for the rock platform. The proposal has been considered in terms of SEPP 55 and there is little possibility of any contaminants migrating from this area, as they would be covered with engineering fill, and would be above the water table.

Salinity

Since salinity is not known to be a problem in the area surrounding the AWT site, it is unlikely to affect the proposed facility.

9.3 Mitigation Measures

Erosion protection measures will be implemented to minimise the potential for erosion of soils from the proposed development. Provided these measures are adequately implemented it is unlikely that any erosion will occur following excavation of soils.

A site sediment and erosion control plan would be prepared, in accordance with requirements of the Blue Book (Managing Stormwater: Urban Soils and Construction, Department of Housing). These controls would be implemented before any construction commences.

A 90th percentile 5 day rainfall duration would be used to determine the volumes of the temporary sediment dams, along with an upper limit of 50mg/L for total suspended solids in any pumped discharge of stormwater.

The Project Environmental Management Plan (PEMP) and contract documents would address the requirements based on controls and mitigation measures described in Chapter 28.

These would include:

- ▶ Constructing erosion and sediment control measures on the site before any works commence and ensuring that these measures are monitored and maintained appropriately and according to the PEMP;
- ▶ Restricting traffic to defined roads where possible;
- ▶ Minimising the areas disturbed by excavation;
- ▶ Construction of silt fences around stockpiles of topsoil and cover materials to prevent the migration of sediments;
- ▶ Applying water to active excavation areas and stockpiles where necessary to reduce dust; and
- ▶ If excess fugitive dust is observed, ceasing work or phasing it down, while the source is being actively investigated and suppression measures implemented.

10. Climate

This chapter outlines the climatic considerations of the Jacks Gully region that may affect the management of the proposed development. Factors to be considered include the likelihood of extreme weather conditions including rain, fog and wind. This chapter also discusses the climatic conditions that affect the transmission of odour, dust and noise from the site.

10.1 Existing Environment

The climate in the Macarthur Region is similar to that of the broader Sydney metropolitan region with warm to hot summers and cool to mild winters.

10.1.1 Rainfall

According to meteorological data collected at Camden Airport, the average rainfall in the region is 828 mm (Bureau of Meteorology). Average monthly rainfall ranges from between 43 mm and 100 mm and the driest months are in winter and early spring, with the higher rainfalls experienced between November and March.

Evaporation data is not available for Camden, but data from the nearest available Bureau of Meteorology site with this data is at Badgery's Creek (approximately 20 km north of Camden) shows average evaporation exceeds rainfall in each month of the year except for May and June, and that the annual average evaporation (1,496 mm) is nearly twice that of the annual average rainfall (828 mm).

The Camden area experiences significant diurnal and seasonal variations in meteorological conditions.

10.1.2 Wind direction and wind speed

For much of the year, winds are of light to moderate strength, increasing in strength in the afternoons. The winds are generally stronger during winter and spring (14.7 kph) and lighter during summer and autumn (8.6 kph).

Figure 10-1 presents the 2000-2001 annual wind rose produced from recorded meteorological data, from the on-site automatic weather station, located at the weighbridge adjacent to the landfill area (operated by WSN). The annual average winds at the site are predominantly from the south, with local wind channelling, directing the specific southerly component flow direction.

This is due to wind channelling along the axis of the Blue Mountains to the northwest (on a regional scale) and along the axis of the Nepean River which lies in lower level terrain between Razorback ridge to the west and another minor ridgeline to the east (comprising in part Mt Annan).

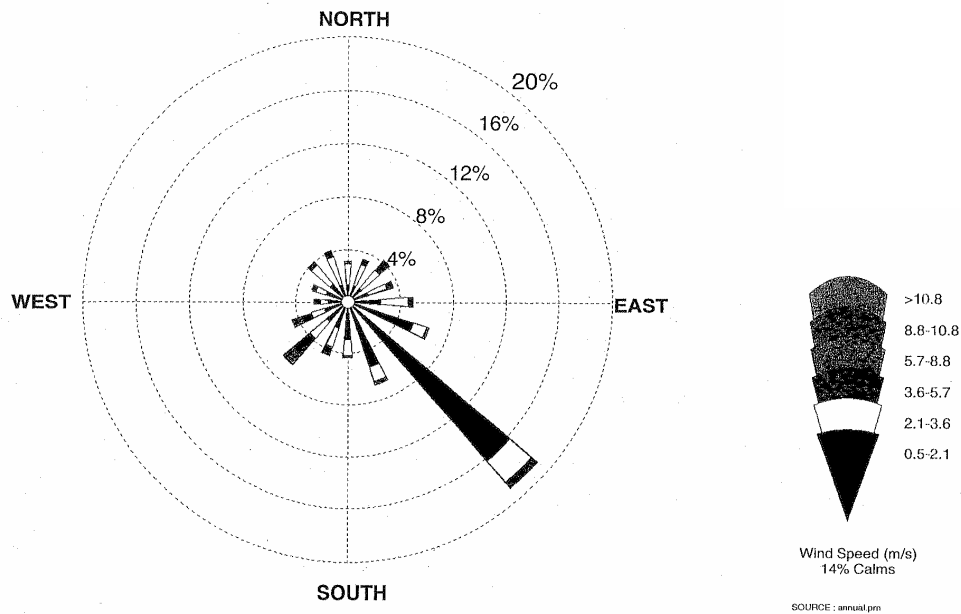


Figure 10-1 Annual Wind Rose, Jacks Gully 2000-2001 data

(source: adapted from report to Waste Service NSW
"Jacks Gully Waste Management Centre Odour Audit", July 2001, URS Pty Ltd)

Figure 10-2 shows the summer and winter wind roses also from recorded data from the on-site weather station highlighting seasonal wind variations. It shows stronger easterly components and reduced westerly components during the summer months.

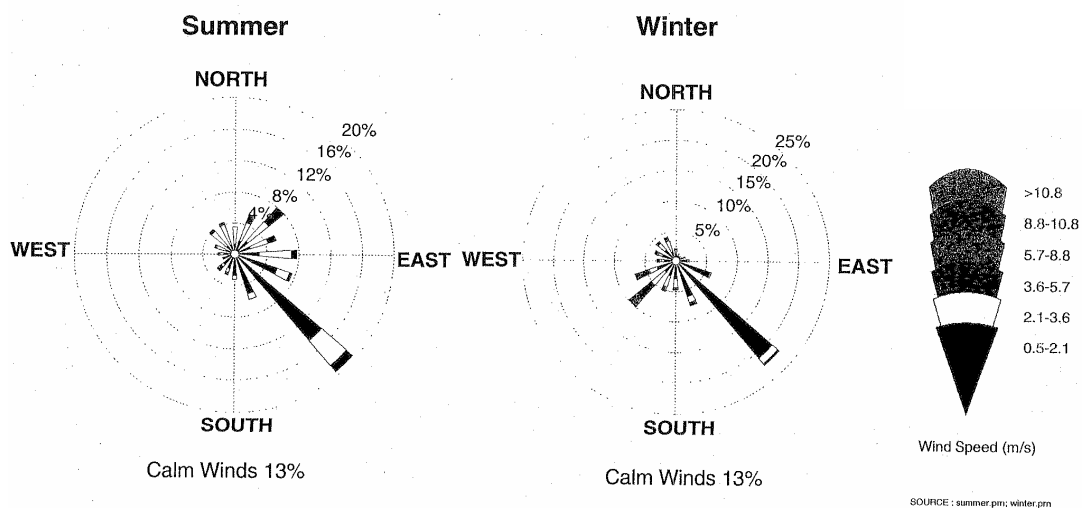


Figure 10-2 Summer and Winter Wind Roses, Jacks Gully 2000-2001 data

(source: adapted from report to Waste Service NSW
"Jacks Gully Waste Management Centre Odour Audit", July 2001, URS Pty Ltd)

10.1.3 Temperature

The mean daily maximum temperatures range from 29°C in summer to 17°C in winter and the mean daily minimum temperatures range from 16.6°C in summer to 2.8°C in winter. Figure 10-3 and Figure 10-4 show the monthly average minimum and maximum ambient temperatures respectively from Bureau of Meteorology recorded data from 1943 to 2004 at the Camden Airport Automatic Weather Station (AWS).

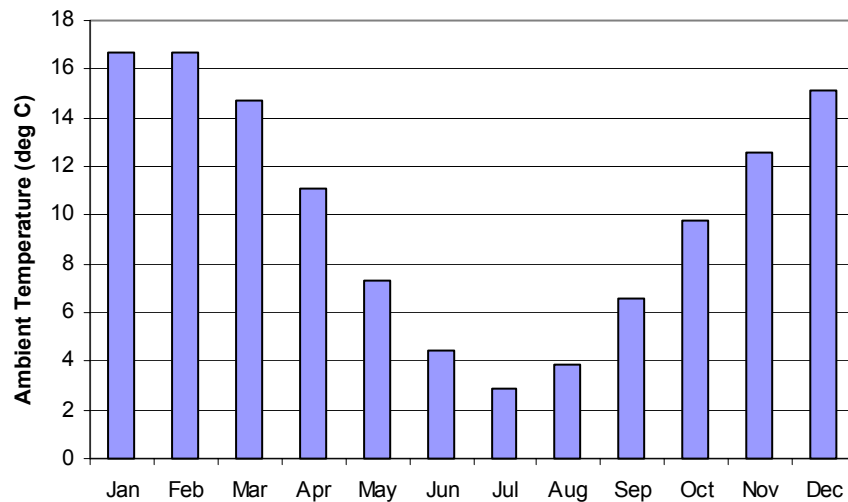


Figure 10-3 Minimum monthly average ambient temperature, Camden Airport AWS

(source: Climate Averages Camden Airport AWS [online], available: http://www.bom.gov.au/climate/averages/tables/cw_068192.shtml)

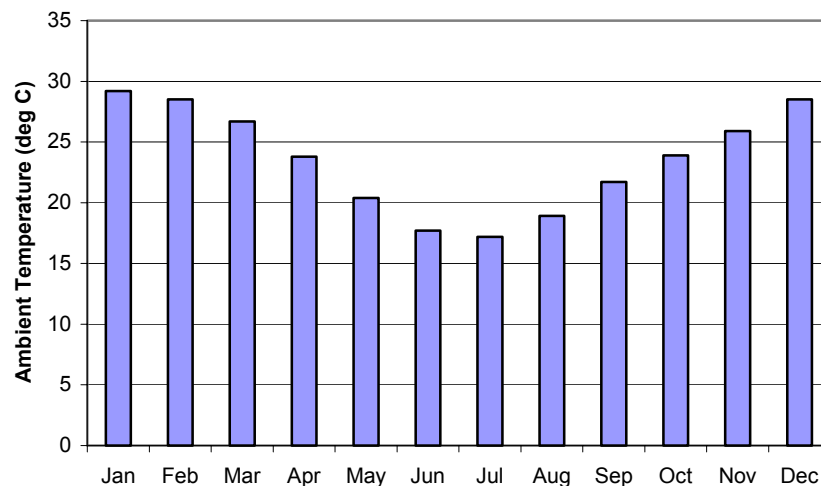


Figure 10-4 Maximum monthly average ambient temperature, Camden Airport AWS

(source: Climate Averages Camden Airport AWS [online], available: http://www.bom.gov.au/climate/averages/tables/cw_068192.shtml)

10.2 Impacts on Construction

While the weather conditions of the area are not extreme, periods of excessive rain could inhibit site works, especially during construction of the engineered platform when a number of vehicles will be working on the existing landfill area. Excessive rain would make the landfill area, and other unsealed areas (such as the platform itself) potentially slippery. It would also slow down outside work such as concrete slab construction, building erection and tank fabrication and piping.

However, once the platform is constructed, and temporary roads are in place (covered with gravel) and concrete slabs are in place, excessive rainfall would have less impact on construction activities. The Jacks Gully area is occasionally affected by high winds, which may generate airborne dust following exposure of the land surface and also increase the risk of bushfires, which are a potential hazard to the construction works. The bushfire assessment for the proposed Jacks Gully AWT Facility is discussed in Chapter 22.

During winter, there is some potential for formation of fog and ice, as the area is subject to low temperatures. At these times, construction traffic flow would be restricted. Traffic speeds would be reduced and road operations subject to changed arrangements, due to reduced visibility and manoeuvrability. Fogs are also an occupational health and safety issue for construction workers, as they increase local concentrations of vehicle emissions.

Climatic conditions also have the potential to impact on construction of the proposed development by affecting when some materials can be laid. Some construction materials cannot be laid in low temperatures without risking premature failing. Low temperatures also reduce evaporation rates, which increase the length of time required for soils to dry out.

This affects accessibility of exposed areas and increases the length of time that soils are exposed and subject to erosive processes. The potential impact of rainfall events on the proposed development in terms of soil erosion and sedimentation are considered in Chapter 9.

Overall, the potential impacts of climate on construction of the proposed development are considered to be manageable, as WSN has considerable experience with the climatic conditions of the Macarthur Region, especially at the Jacks Gully WRC site.

10.3 Impacts on Operation of the AWT Facility

10.3.1 Inclement weather

Inclement weather (such as rain) would not have any major impacts on the operation of the AWT Facility, since the site would be mainly sealed, with concrete pavements for high traffic areas, asphaltic concrete for roadways and gravel for all other areas, apart from those where landscaping would be provided. All processing operations requiring operator attendance in both the MSW plant and the garden organics composting plant would take place inside buildings.

Sensor activated roller doors will ensure that waste deliveries are shielded from rainfall, and the receival hall floor where waste is unloaded will also be below the surrounding ground level, reducing the possibility of windblown litter on high wind days.

10.3.2 Incidence of Stable Conditions

The main impacts of climate on operation of the proposed AWT Facility relate to the dispersion of air pollutants (primarily odour and dust) and noise transmission, through factors such as wind direction, wind speed, temperature and stability.

Stability reflects the atmospheric mixing of pollutants due to mechanical turbulence and thermal effects, which can lead to poor atmospheric mixing and dispersion through night-time thermal inversions, where the ground is cooler than the air above. Thus a layer of cooler, denser air can be trapped by warmer air above it.

Potential off-site odour and noise impacts are maximised when the atmosphere is stable. For the landfill site, this typically occurs during the early evening, night-time, or early morning when the winds are light and there is not much cloud cover. Conditions are most stable when a high-pressure system is over the area.

The meteorological simulations undertaken by GHD for this EA, and discussed in Chapter 13 indicated that these stable conditions occur for approximately 40% of the time at the Jacks Gully WRC, with the light flows experienced there. The flows are predicted to be stronger in areas of elevated terrain nearer to the residential zones, and hence the proportion of stable flows in these locations is reduced.

During the periods of worst case dispersion the local and regional scale cool air drainage (katabatic) flows dominate the transport and dispersion of emissions to air from the site. The landfill site lies in a depressed area near the Nepean River. The Blue Mountains are the predominant regional source of katabatic flows in the area, producing stable drainage flows generally from the west heading east, whilst more local (but lesser) features such as Razorback ridge to the west, would be more minor sources of these flows.

The effect of the local terrain features is not so much to act as a source of these stable katabatic flows, but rather to channel those katabatic flows that run off the Blue Mountains. This local channelling produces the predominant northerly flow field which, for light wind stable flow conditions, tends to veer eastwards again when forced over the locally elevated terrain. It is this terrain where the existing and proposed residential areas are predominantly located.

Consequently, for worst case dispersion conditions, any odours arising from the existing landfill and proposed AWT Facilities would be initially channelled northwards and then veer eastwards as they reach the elevated terrain to the north, beyond which (to the north) lies the residential area of Narellan Vale. The flows would then move towards the residential area of Mt Annan, but having traveled further, would be slightly more dispersed, and thus generate a lower odour impact.

However the air quality modelling undertaken for this EA has concluded that the potential odour impacts of the proposed AWT Facility on future residential areas are not significant. The modelling results are discussed in Chapter 13. It should also be noted that the Jacks Gully WRC is not the only potential source of odour in the local area, with the nearby Camden Soil Mix site being currently subject to a pollution reduction program from NSW EPA, due to odour complaints from residents. WSN has over the previous five years, substantially changed landfilling practices in order to reduce potential odour impacts on surrounding areas.

Stable meteorological conditions could increase potential noise impacts associated with the construction and operation of the proposed AWT Facility, which are discussed in Chapter 14. However the noise assessment has concluded that the new facility would not have a significant noise impact, as existing residential areas are currently quite distant from the facility.

10.4 Mitigation measures

10.4.1 Construction

The following measures would minimise the potential impacts of adverse or extreme weather conditions on construction:

- ▶ If possible, excavation and other works which have the potential to be impacted by erosion and sedimentation would be undertaken during low rainfall periods;
- ▶ Mitigation measures to address the potential impact of rainfall events are provided in Chapter 9, which examines erosion and sedimentation;
- ▶ A Traffic Management Plan would be developed, which would detail measures to minimise the potential impacts of adverse weather conditions such as fog and dust. This is discussed in Chapter 12; and
- ▶ The Construction EMP will outline mitigation measures to manage the potential impacts associated with extreme climate such as excessive rainfall, wind gusts, heat or cold.

10.4.2 Operation

Measures to minimise the impacts of climate on the site on odour, dust and noise emissions are outlined in Chapters 13 and 14 of the EA respectively.

11. Water and Groundwater

This chapter outlines the existing water quality/quantity, drainage and groundwater monitoring and management systems, assesses the potential impacts of the proposed development on the local groundwater and surface water quality and outlines mitigation measures for the identified impacts.

11.1 Existing water management system

11.1.1 Stormwater and drainage

Due to the topography of the Jacks Gully WRC, the site receives very little run-on of surface water from areas outside its boundaries. Uncontaminated stormwater (i.e. stormwater that does not come into contact with waste) across the whole Jacks Gully WRC site is collected via surface and subsurface drains, sumps and open drains and is channelled to the main stormwater collection dam, which is located at a low point in the south-western portion of the site. This dam is shown in Figure 11-1.



Figure 11-1 Existing stormwater dam

Stormwater is generally re-used on-site for dust suppression, so that discharge off-site is usually not required. However any excess water (that meets the discharge limits, as determined by monitoring) is discharged into a wetland area and then off-site into a drainage channel, which eventually drains into the Nepean River. This water is tested after settlement and must meet environmental criteria set out in the site environmental protection licence.

Stormwater that has come into contact with waste is normally considered as leachate and is collected in a leachate pond on the site. It is treated using a simple on-site treatment system to reduce biological content and is then used for irrigating vegetation on the site. Figure 11-2 summarises the existing water management system on-site.

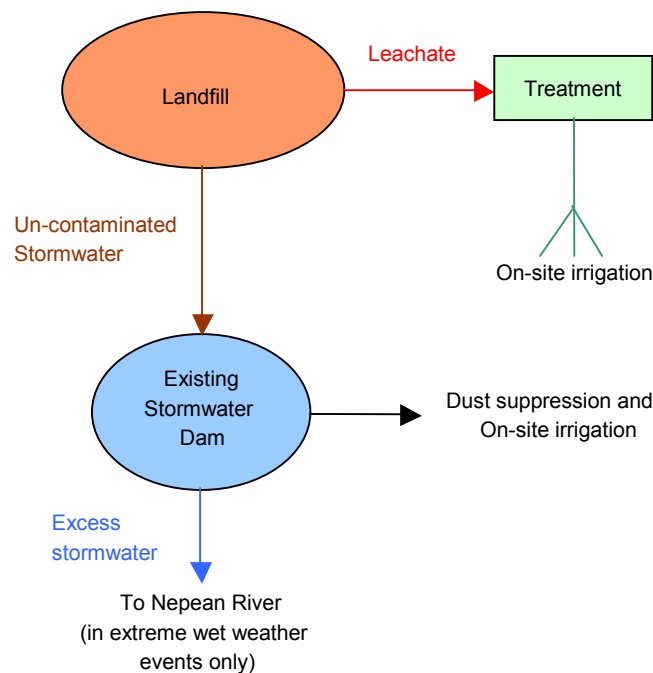


Figure 11-2 Existing water management system

11.1.2 Groundwater

The groundwater system at the Jacks Gully WRC is complex, according to Douglas Partners (1999). Tertiary sand and Bringelly Shale are the two major soil types present at the site. High terrace Aeolian Tertiary sands are located in the northwestern portion of the site and form a shallow aquifer, which is perched above the extensive underlying Bringelly Shale. Bringelly Shale is a rockmass of low hydraulic conductivity.

Water level measurements suggest that there is no hydraulic connection between the surface sand horizons and the Bringelly Shale. Hence, recharge to groundwater from direct rainfall infiltration is also limited at the proposed AWT Facility site. Groundwater gradients vary over the site, however, the average gradient in the northern part of the site is greater than 5% but flattens to around 3%.

Groundwater velocities are estimated to be approximately 1m/year, although local differences could be experienced as a result of structural factors. At this rate, groundwater would take decades to reach the Nepean River, even without the leachate and groundwater controls installed at the site. Evidence of the low rate of groundwater recharge is further provided by the generally high salinity of the groundwater.

11.1.3 Leachate

The current leachate collection system at Jacks Gully WRC is a gravity system consisting of a series of subsurface pipes. The collected leachate is fed into a leachate dam, where it is partially treated by aeration/oxygenation. Partially treated leachate then overflows by gravity to a treatment dam and from there it is then piped into a series of tanks for alternating stages of aeration and settling.

This alternating process helps to treat the leachate by reducing nitrogen (ammonia) concentrations. The treated leachate is then pumped (often mixed with retained stormwater) to the revegetation area and used for irrigation.

11.1.4 Domestic wastewater

There is no existing sewer connection and all sewage from toilets and bathrooms (at the materials recycling facility) is treated in a package sewage treatment plant and later re-used on-site for irrigation or dust suppression. This is discussed in more detail in Chapter 5.

11.2 Existing water quality

11.2.1 Groundwater

Table 11-1 shows the results from the most recent round of groundwater monitoring conducted in May 2005.

Table 11-1 Quarterly groundwater monitoring results May 2005

Analysis	Groundwater monitoring points							
	MB002	MB003	MB005	MB011	MB012	MB013	MB016	MB017
pH	6.64	7.65	7.03	7.22	8.23	8.02	7.08	7.23
Electrical Conductivity (µS/cm)	15140	2370	764	5650	1057	4070	15740	7490
Total Suspended Solids (mg/L)	16	45	1	5	2	29	48	450
Total Dissolved Solids (mg/L)	9670	1560	510	3840	700	2620	9790	4240
Sodium (mg/L)	2340	360	90	640	215	920	2780	1830
Potassium (mg/L)	24	6.8	70	11	3.4	8.8	28	12
Calcium (mg/L)	403	70	7.2	311	5.6	15	215	34
Magnesium (mg/L)	501	49	8.5	148	7.8	20	529	11
Total Alkalinity (mg/L)	690	540	130	760	330	550	1160	1540
Chloride (mg/L)	4790	420	77	1500	110	960	4680	1580
Fluoride (mg/L)	<0.1	0.3	0.05	-	0.4	0.5	0.1	0.3
Sulfate (mg/L)	250	36	28	114	10	32	480	90
Total Phosphorous (mg/L)	<0.05	0.12	0.08	<0.01	0.06	0.05	0.07	0.39
Nitrate N (mg/L)	0.01	0.05	13.1	0.005	0.005	0.19	0.02	0.03
Nitrite N (mg/L)	<0.01	<0.01	0.69	0.005	0.005	0.01	0.005	0.005
Ammonia N (mg/L)	0.8	0.69	0.07	0.998	0.46	1.7	3.3	3
TKN (mg/L)	1.3	1.2	0.3	1.3	0.7	2.2	4.2	3.9

The chemical composition of the groundwater is similar to that of seawater, with a salinity ranging from brackish (over 1000 mg/L) to saline (over 10,000 mg/L). The highest salinity values have been recorded around the periphery of the site. The lower values have been recorded towards the southern end of the site.

Figure 11-3 shows locations of the existing surface water and drainage system components at the Jacks Gully WRC site, including the locations of the groundwater monitoring points.



Figure 11-3 Surface water system components and groundwater monitoring points

Elevated levels of ammonia have been measured in many of the groundwater samples. Ammonia is generally considered to be a good indicator of landfill contamination, however the recorded ammonia concentrations at the subject site are considered to be comparable with naturally occurring background values within the Wianamatta Group of geological formations within the Sydney Basin.

The Bringelly Shale formation is one of the major components of this. It is therefore considered that the observed concentrations are not directly attributable to contamination from the leachate generated within the landfill.

Figure 11-4 and Figure 11-5 show the groundwater monitoring results measured quarterly over the period September 2002 – May 2005 for salinity and ammonia respectively.

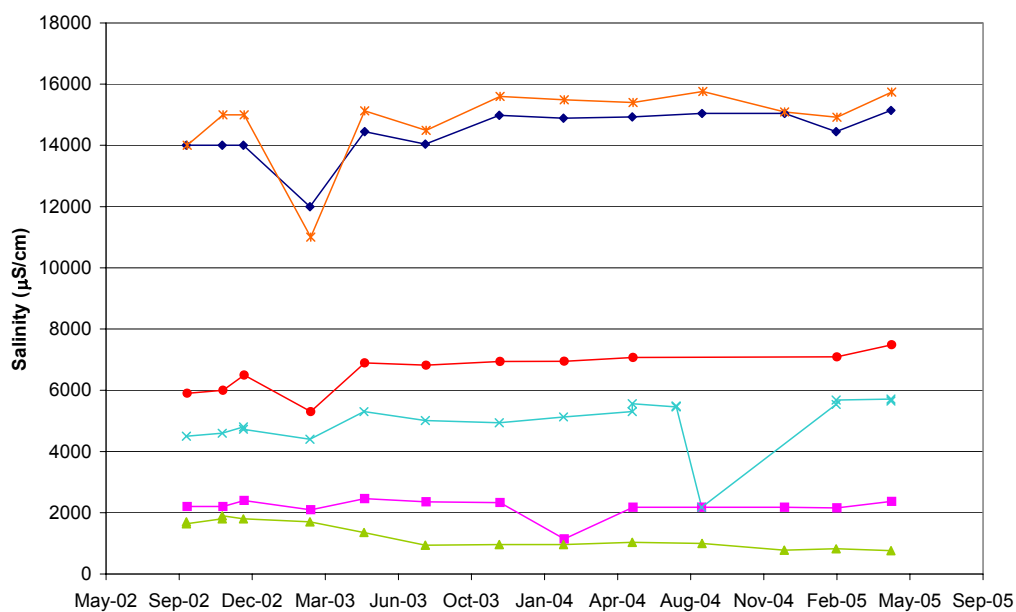


Figure 11-4 Groundwater monitoring results Sept 02 – May 05, Salinity

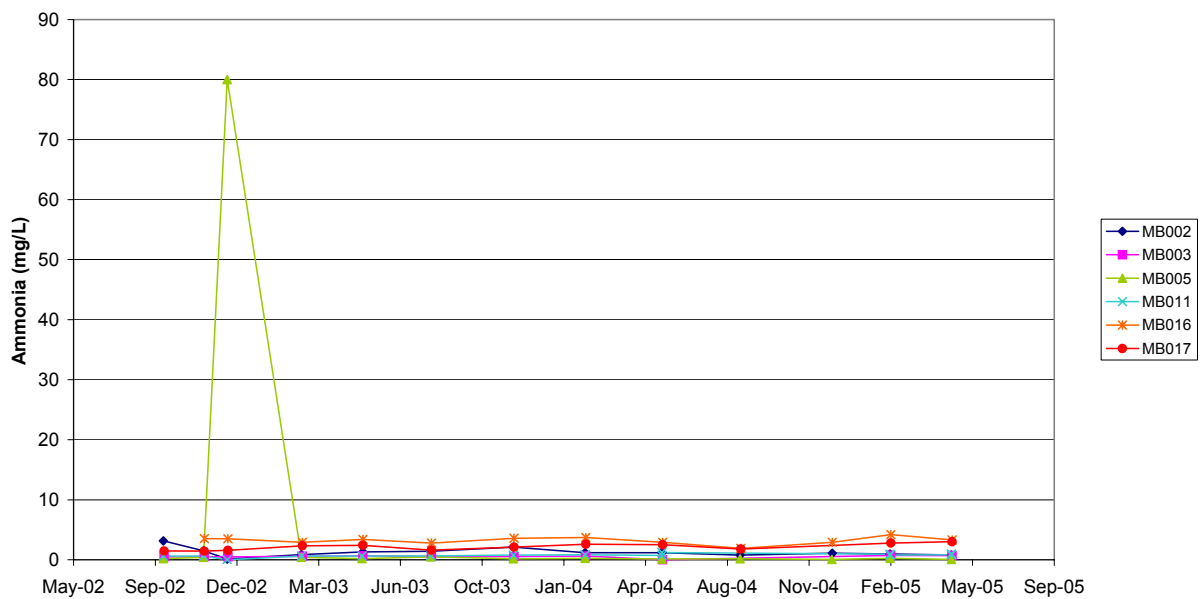


Figure 11-5 Groundwater monitoring results Sept 02 – May 05, Ammonia

11.2.2 Surface water quality

The primary concerns with respect to surface water quality at a waste management facility typically include possible contamination by leachate and suspended sediment due to existing landfilling operations. Leachate contamination at the Jacks Gully site would therefore be indicated by elevated levels of ammonia, BOD₅, TOC and salinity in surface water samples. Heavy metals and potential pathogens may also be present in the leachate.

CES Ltd and the Sustainability and Assurance Division of WSN conduct surface water quality monitoring in accordance with the DEC's *Environmental Guidelines: Solid Waste Landfills*. Water samples are collected regularly from a number of sampling locations including:

- ▶ Within the existing site; and
- ▶ Along the creek (that discharges to the Nepean River).

The monitoring results indicate that during dry weather the Jacks Gully WRC does not have an impact on the water quality of the Nepean River. During extreme wet weather conditions, temporary overflow of the sedimentation dam, into the Nepean River, can occur. These temporary discharges are tested and the EPA is notified as required by the EPA Licence. There has not been an overflow event during the last two years.

Results from the latest round of surface water and leachate monitoring are shown in Table 11-2.

Table 11-2 Quarterly surface water and leachate monitoring results May 2005

Analysis	Surface Water				Leachate	
	SD003	SW001	SW007	M1004	LD001	LD002
pH	8.1	8.09	7.63	NS	8.42	8.87
Electrical Conductivity (µS/cm)	6980	3920	4140	NS	18320	14430
BOD ₅ (mg/L)	9	0.5	4	NS	2760	1400
Chemical Oxygen Demand (mg/L)	300	200	140	NS	3200	3020
Total Suspended Solids (mg/L)	28	39	31	NS	38	160
Total Dissolved Solids (mg/L)	4390	2600	2650	NS	9950	9350
Sodium (mg/L)	940	451	793	NS	2570	2550
Potassium (mg/L)	20	18	19	NS	853	768
Calcium (mg/L)	152	150	150	NS	60	45
Magnesium (mg/L)	226	116	121	NS	178	237
Total Alkalinity (mg/L)	530	380	430	NS	5200	3720
Chloride (mg/L)	2010	1000	1060	NS	3380	2980
Fluoride (mg/L)	0.3	0.4	0.3	NS	<0.1	0.9
Sulfate (mg/L)	53	57	54	NS	350	190
Total Phosphorous (mg/L)	0.22	0.07	0.34	NS	6.8	3.9
Nitrate N (mg/L)	0.51	0.02	0.02	NS	21.3	0.05
Nitrite N (mg/L)	0.13	<0.01	<0.01	NS	49.2	<0.01
Ammonia N (mg/L)	1.2	0.07	0.21	NS	864	345
TKN (mg/L)	5.8	2	1.6	NS	1070	490

NS = no sample

Ammonia concentrations measured in surface water, quarterly over the period September 2002 – May 2005 are shown in Figure 11-6.

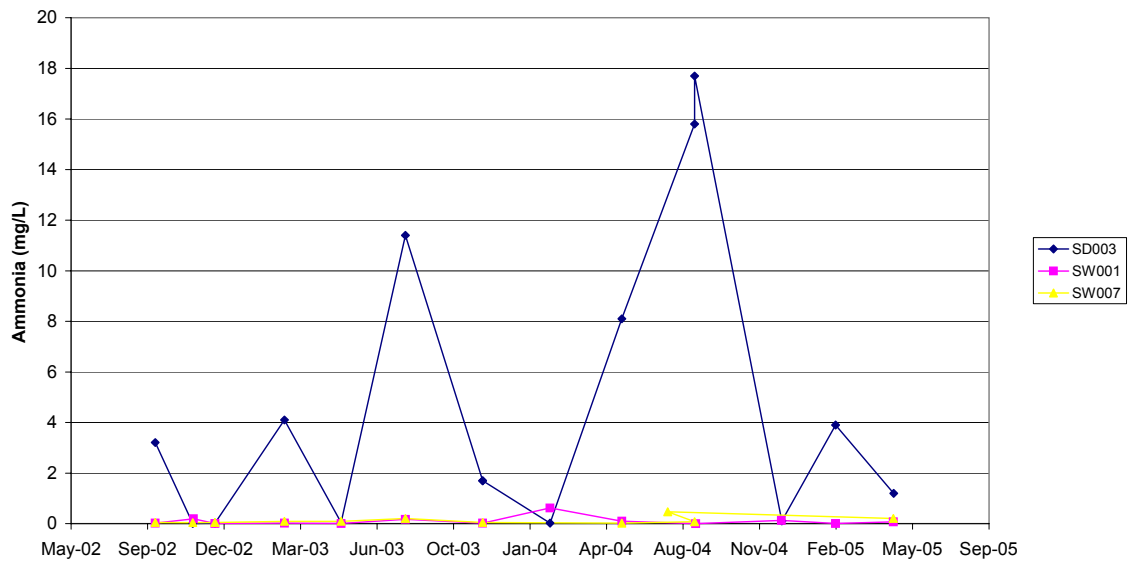


Figure 11-6 Quarterly surface water monitoring results Sept 02 – May 05, Ammonia

Quarterly surface water monitoring results for salinity over the period September 2002 – May 2005 are shown in Figure 11-7.

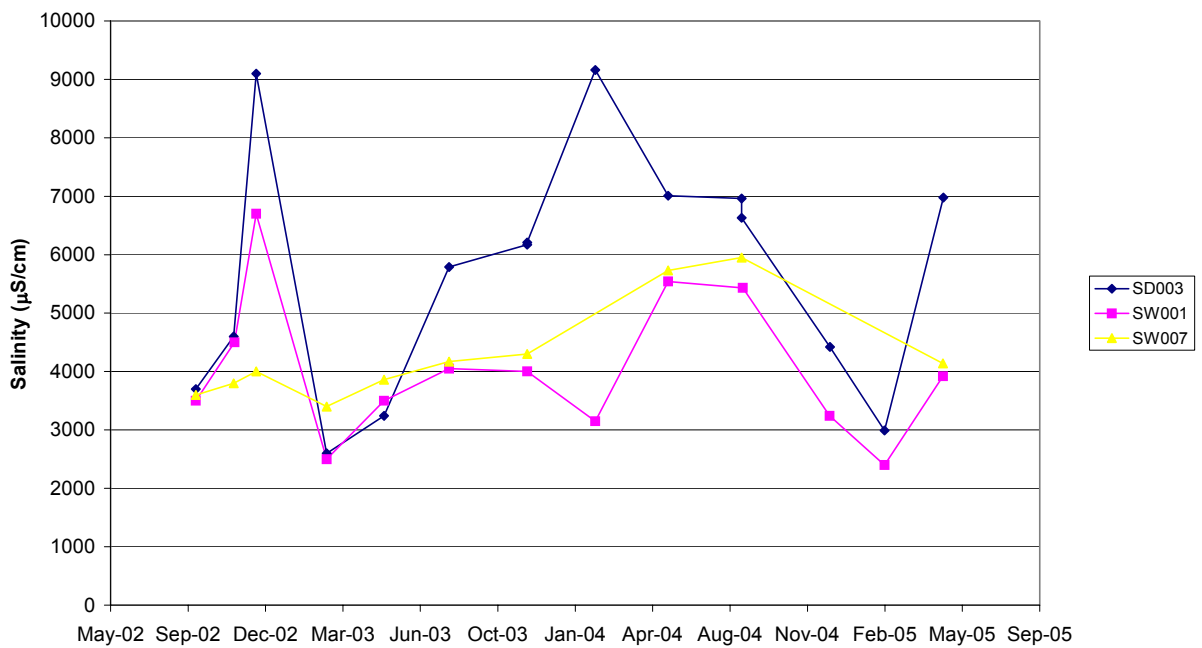


Figure 11-7 Quarterly surface water monitoring results Sept 02 – May 05, Salinity

11.3 Construction Impacts

11.3.1 Stormwater

The proposed AWT site lies almost exclusively within the drainage basin of Jacks Gully WRC, except for land along the north-western boundary of the site (i.e. outside the landfilled areas), which drains into westerly trending gullies. Construction of the AWT Facility will be managed so that there are minimal impacts on stormwater quality.

During construction of the platform, stormwater runoff will be collected in temporary sedimentation ponds and treated if necessary to reduce its sediment content. Silt fences and other devices will be used to minimise sedimentation load to the stormwater.

There will be no construction phase stormwater impacts on Mount Annan Lagoon.

11.3.2 Groundwater

Groundwater monitoring undertaken by Douglas Partners (1999) indicates that the existing landfill has not had an impact on groundwater quality. Construction of the AWT Facility will not increase this likelihood.

11.3.3 Hydrology and flooding

Drainage controls on-site include stormwater diversion drains, catch drains and sediment ponds. The sediment ponds are checked after each major storm to ensure satisfactory performance. Presently, all runoff from disturbed areas is directed to an interim sedimentation dam in the southwest corner of the site.

The Jacks Gully WRC site and access road is located more than 30 m above the Nepean River and is not subject to flooding. During the extreme August 1998 floods, the water level of the Nepean River did not inundate the site or access road.

The potential for flooding from high rainfall events will remain unchanged, since the engineered platform is simply an extension of an existing rock platform. Most elements of the current stormwater management system will remain in place, although the current stormwater pond will be relocated, due to platform construction.

11.4 Operational Impacts

11.4.1 Stormwater quality

Operation of the AWT Facility will have a negligible or positive impact on stormwater quality leaving the Jacks Gully WRC, since rainwater falling on the platform will likely be re-used on the overall site for operational purposes, such as dust suppression and irrigation. There will be no operational stormwater impacts upon the nearby Mount Annan Lagoon.

11.4.2 Groundwater

Only non-putrescible waste will be landfilled at the Jacks Gully WRC site in future. Although this waste does not pose the same degree of risk to groundwater as putrescible waste, potential issues arising from previous landfilling activities will need to be managed through regular monitoring of groundwater wells.

11.4.3 Hydrology and flooding

Operation of the AWT Facility itself will have a negligible effect on-site hydrology. There will be an increase in runoff quantities from the platform area due to the reduction in recharge area, but this water would be able to be re-used on-site for operational purposes.

The AWT Facility platform intrudes on part of the current stormwater dam servicing most of the Jacks Gully WRC, which will need to be relocated prior to construction. This does not have a major impact on hydrology on the site.

Development of the platform and facilities will cause an increase in the volume of stormwater generated on-site due to the increased proportion of impervious area and correspondingly lower recharge area. The stormwater collection and disposal system will be resized to allow for this slight increase. Chapter 5 contains a detailed explanation of the proposed water management system for the site.

11.4.4 AWT Facility process water

There will be no discharge of process water to the Nepean River during operation of the proposed facility. Excess process water will be reused on the Jacks Gully WRC site for operational purposes (see Chapter 5 for more detail), and discharged to sewer, or tankered off-site to a suitable treatment facility during periods when on-site use is not possible.

12. Traffic, Transport and Access

This chapter outlines the existing traffic conditions surrounding the Jacks Gully WRC and the potential impact on traffic due to the construction and operation of the proposed development. The discussion presented in this chapter is based on a technical evaluation of potential traffic impacts carried out by GHD Pty Ltd. The technical assessment is included in Appendix E of this EA.

12.1 Existing traffic conditions

In 2004, WSN Environmental Solutions conducted a Review of Environmental Factors (under Section 110 of the EP&A Act) and subsequently increased the amount of putrescible waste landfilled at the Jacks Gully WRC from 140,000 tonnes/year to 210,000 tonnes/year, an increase of 70,000 tonnes/year. This was justified on the basis that additional traffic would only occur until putrescible waste landfilling ceased in 2007. Traffic counts were undertaken by GHD at the time to provide an appreciation of the existing operations of the WRC under regular conditions.

Traffic data figures from 2004 have therefore been used in the traffic assessment for this EA, and adjusted for the additional heavy vehicle traffic generated by the 70,000 tonnes/year increase in putrescible waste received at the site post 2004.

12.1.1 Access road network characteristics

The classification of roads on the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The Roads and Traffic Authority (RTA) has developed a set of road hierarchy classifications detailed in Table 12-1 indicating typical nominal volumes expressed in terms of average annual daily traffic (AADT) and vehicles per hour (vph) served by various classes of roads.

Table 12-1 RTA Functional Classification of Roads

Type of Road	Traffic Volume (AADT)	Peak Hour Volume (vph)
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 – 20,000	500 – 2,000
Collector Road	2,000 – 10,000	250 – 1,000
Local Road	<2,000	0 – 250

The three main access roads to Jacks Gully WRC, Springs Road, Macarthur Road and Richardson Road, have all been classified according to this system as collector roads and are designated B-double routes. Figure 12-1 shows the current access road network servicing the site.

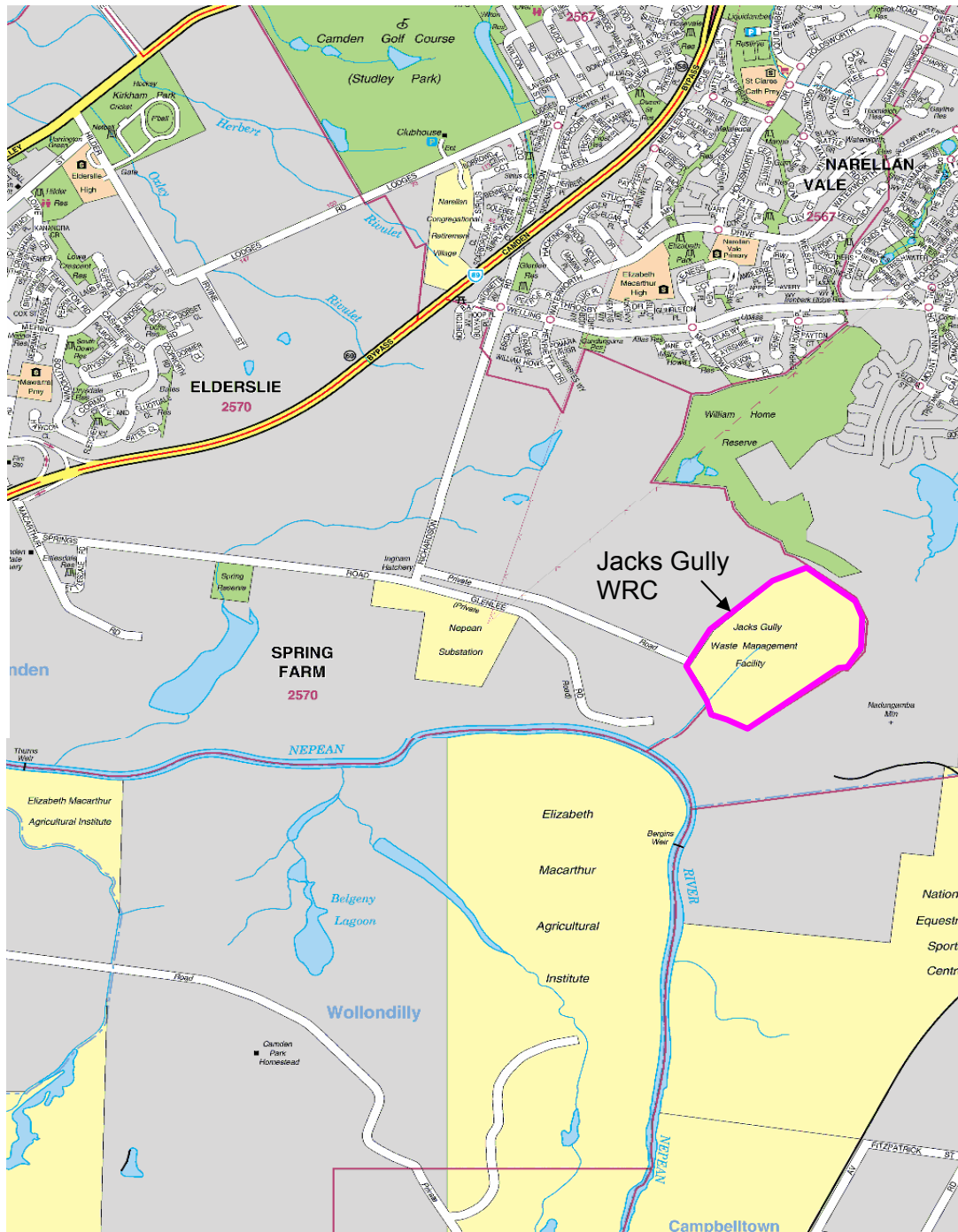


Figure 12-1 Map showing access road network servicing Jacks Gully WRC

12.1.2 Existing traffic volumes

Existing daily traffic volumes

An indication of the traffic conditions in the vicinity of the subject site is available in terms of annual daily traffic volumes compiled by the RTA¹. The average annual daily traffic movements as provided by the RTA for the Camden Bypass is 19,078 vehicles per day (vpd).

Existing traffic volume data is also available from Camden Council in the form of a traffic count for Springs Road compiled over a two-week period in July 2002. The average daily traffic (ADT) data for this period is summarised in Table 12-2 below.

Table 12-2 Average Daily Flows, Springs Road (04/07/02 – 16/07/02)

	Weekday Average			Weekday Peak			Daily Average		
	WB	EB	Total	WB	EB	Total	WB	EB	Total
AM Peak	104	99	203	118	118	236	106	100	206
PM Peak	137	135	272	170	142	312	129	126	254
Daily Total	1,413	1,367	2,780	1,542	1,487	3,029	1,345	1,111	2,456
% HV	26.9%			14.4%			20.7%		

Notes: EB = Eastbound; WB = Westbound, HV = Heavy Vehicles.

As the traffic count was undertaken in 2002, the additional heavy vehicle traffic generated by the 70,000 tonnes/year increase in putrescible waste received at the site which occurred in 2004 is not included.

Traffic volumes have increased due to the additional heavy vehicle movements as shown in Table 12-3. It is assumed that the vehicles transporting the additional 70,000 tonnes/year of putrescible waste to the site comprised waste transfer vehicles (20 tonne capacity)

Therefore the estimated additional heavy vehicle movements generated by the increase in waste received at the site is shown in Table 12-3.

Table 12-3 Additional Heavy Vehicle Movements at Jacks Gully WRC

	Total waste transported (tonnes/yr)	Total Heavy Vehicles/ year	Total Heavy Vehicles/ month	Total Heavy Vehicles/ week	Total Heavy Vehicles/ day
Waste transfer vehicles (20 tonnes capacity)	70,000	3,500	292	67	10

¹ Roads and Traffic Authority of NSW "Traffic Volume Data for the Sydney Region" - 2002

Average daily flows for additional vehicle movements were determined by adopting a traffic assignment based on the existing directional traffic flows along Springs Road and Richardson Road as follows:

- ▶ 75% of heavy vehicles using Springs Road and Macarthur Road (quickest route to the Camden Bypass): and
- ▶ 25% of heavy vehicles using Richardson Road (predominant route for Council trucks).

The traffic volumes along Springs Road with the additional traffic generated by the increase in waste received at the site are shown in Table 12-4.

Table 12-4 Average Daily Flows, Springs Road (adjusted for additional heavy vehicles post 2004)

	Weekday Average			Weekday Peak			Daily Average		
	WB	EB	Total	WB	EB	Total	WB	EB	Total
AM Peak	107	100	206	120	119	239	108	101	209
PM Peak	139	136	275	172	143	315	131	127	257
Daily Total	1,428	1,382	2,810	1,557	1,502	3,059	1,360	1,126	2,486
% HV			27.7%			15.3%			21.6%

Notes: EB = Eastbound; WB = Westbound, HV = Heavy Vehicles.

The existing daily traffic flow on Springs Road is 2,486 vpd, with 21.6% heavy vehicles. This indicates that the road is lightly trafficked and attracts a high usage by commercial type vehicles. Comparing the nominal traffic volumes for collector roads in Table 12-1 with the existing average daily traffic volumes in Table 12-4, it is evident that Springs Road operates well below the design volume capacity for a collector road.

The existing traffic flow along Richardson Road² is 8,310 vpd, with 7% heavy vehicles. This shows Richardson Road is moderately trafficked. Comparing the existing traffic flow along Richardson Road with the nominal traffic volumes for collector roads in Table 12-1, it is evident that Richardson Road operates below the design volume capacity of a collector road.

Existing Peak Hour Volumes

A review of existing peak hour traffic flows on the surrounding road network was conducted to ascertain whether the level of traffic activity on the roads within the study area are carrying acceptable levels of traffic during these peak periods. The intersection of Glenlee Road / Springs Road / Richardson Road is considered a critical intersection which is in close proximity to the existing development site.

A peak hour traffic count was conducted at this intersection between 7.00 am – 9.00 am and 4:00pm and 6:00pm on Thursday 20 March 2003.

² Masson/Wilson/Twiney, Traffic and Transport Report prepared for the Spring Farm Urban Release Master Plan, 2002

Table 12-5 Peak Hour Intersection Counts

Location	AM Peak (8-9 am)		Total	PM Peak (4.30-5.30 pm)		Total
	Volume/Direction			Volume/Direction		
Springs Road	166 (EB)	107 (WB)	273	144(EB)	177(WB)	321
Richardson Road	172 (NB)	118 (SB)	290	153(NB)	160(SB)	313
Glenlee Road	16 (EB)	11 (WB)	27	11 (EB)	37 (WB)	48

Notes: NB = Northbound; EB = Eastbound; SB = Southbound; WB = Westbound

As the traffic counts were undertaken in 2003, they do not include the additional heavy vehicle traffic generated by the 70,000 tonnes/year increase in putrescible waste received at the site. Therefore the traffic volumes have been increased by the volumes shown in Table 12-3 to include the additional heavy vehicle movements.

Adopting the existing traffic generation patterns described above, the estimated additional daily traffic volumes on the road network due to the increase in waste received at the site is as follows:

- Additional two-way traffic flows generated by the increase in waste received at the site on Springs Road during the AM and PM periods are in the order of 3 heavy vehicles per hour; and
- Additional two-way traffic flows generated by the increase in waste received at the site on Richardson Road during the AM and PM periods are in the order of 1 heavy vehicle per hour.

The traffic volumes at the intersection of Glenlee Road / Springs Road / Richardson Road during the AM and PM peak periods with the additional traffic generated by the increase in waste received at the site is shown in Table 12-6.

Table 12-6 Peak Hour Intersection Counts (adjusted for additional heavy vehicles post 2004)

Location	AM Peak (8-9 am)		Total	PM Peak (4.30-5.30 pm)		Total
	Volume/Direction			Volume/Direction		
Springs Road	168 (EB)	108 (WB)	276	141(EB)	179(WB)	324
Richardson Road	173 (NB)	118 (SB)	291	153 (NB)	161(SB)	314
Glenlee Road	16 (EB)	11 (WB)	27	11 (EB)	37 (WB)	48

Notes: NB = Northbound; EB = Eastbound; SB = Southbound; WB = Westbound

The traffic volumes on Springs Road, Richardson Road and Glenlee Road are within acceptable traffic volumes and the roads are operating below their design capacity objective.

Environmental capacity performance standards

Analysis of the peak hour flow environmental goal for collector roads (included in full in Appendix E) indicates that the traffic demands on the road network in the vicinity of the Jacks Gully WRC during the peak periods are within an acceptable range with regard to environmental capacity.

Existing intersection operation

The performance of the existing road network is largely dependent on the operating performance of key intersections which are critical capacity control points on the road network. The SIDRA³ traffic model was used to assess the existing peak hour operating performance for the Glenlee Road / Springs Road / Richardson Road intersection.

Criteria for evaluating the operational performance of intersections is provided by the RTA Guidelines to Traffic Generating Developments⁴. Performances of the subject intersections within the study area during the morning and afternoon peak periods resulting from the SIDRA analysis are presented in Table 12-7.

Table 12-7 Existing Intersection Performance

Intersection	Peak Period	Average Delay (Seconds)	Level of Service (LOS)	Degree of Saturation (DS)	Comments
		(a)	(b)	(c)	
Glenlee Road / Springs Road / Richardson Road	AM	13.3	A	0.10	All movements satisfactory
	PM	12.3	A	0.10	

Notes:

- a) The average delay for priority-controlled intersections is selected from the movement on the approach with the highest average delay.
- b) The level of service for priority-controlled intersections is based on the highest average delay per vehicle for the most critical movement.
- c) The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The analysis indicates that the existing intersection at Glenlee Road / Springs Road / Richardson Road currently operates at a satisfactory level of service during both the AM and PM peak periods.

12.1.3 Existing pavement condition

Existing pavement conditions were assessed in a site inspection on 11 March 2004 to determine whether the access roads are suitable for the anticipated number and type of vehicles generated by the proposal. The assessment indicated that public access roads near the development site are of a reasonably high standard for a fringe urban / rural area and dedicated B-Double route and generally, road conditions improved closer to the Camden Bypass and urban areas.

³ SIDRA2.0 – Computer modelling package which analyses the operation of intersections controlled by traffic signals, roundabouts and priority signs.

⁴ Roads and Traffic Authority of NSW. (October 2002) *Guide to Traffic Generating Developments*.

Pavement conditions on Springs Road vary between more recently sealed and linemarked sections and older pavement that appeared to be in good order. Some areas were found to have localised cracking, in particular near the intersection of Springs Road and Richardson Road. Faded linemarking was evident in other sections of Springs Road. Richardson Road was found to be similar in standard and condition to Springs Road.

Conditions on the private access road to the WRC are that the pavement is old with no line marking. The area of road at the intersection with Richardson Road is of a low standard, with cracking, rutting and potholes.

12.1.4 Existing road safety

Five-year accident data provided by Camden City Council (for the period between 1 January 1996 and 31 March 2002) was examined for the following locations:

- Springs Road;
- Macarthur Road (between Springs Road and just north of Camden Bypass ramps); and;
- Richardson Road (between Springs Road and Welling Drive).

No data is available for accidents on the private access road.

The accident statistics are presented in Table 12-8 and show a relatively minor traffic accident history along these roads. Approximately 41% of accidents occurred at intersections and 32% of accidents involved heavy vehicles.

Table 12-8 Historical Accident Data (01/01/96 – 31/03/02)

Location	Reported Accidents	Fatal Accidents	Admitted Injury	Tow-Away	Involving a Heavy Vehicle
Spring Rd	11	0	6	5	6
Macarthur Rd	4	0	3	1	1
Richardson Rd	12	0	4	8	2

The accident statistics and the crash types presented do not reveal any impediments to the proposed development at the Jacks Gully WRC site.

It is worth noting however that overall 46% of all accidents involved vehicles travelling off the road, whether on bends or straight sections of road.

12.1.5 Existing traffic at the Jacks Gully WRC

Existing Employee Traffic Generation

The maximum number of staff on the site at any one time is in the order of 18 persons per day with a typical car driver rate of 100% (i.e. each employee driving a car) – traffic generation is in the order of 36 vehicle trips per day (two-way). The majority of the existing workforce arrive between 6.30 am and 7.00 am and depart generally between 4.00 pm and 4.30 pm. Thus it is likely that the employee traffic generation peak periods will occur outside the existing road network AM and PM peak hour periods.

It has been estimated that the proportion of employee traffic generated on the existing road network during the AM and PM peak hour will be of the order of 70% of daily movements. Given

that the peak hour traffic flows on the existing road network occur between 8.00 am - 9.00 am and 4.30 pm – 5.30 pm for the AM and PM peak periods respectively. This assumption is conservative. Workforce traffic movements are likely to be distributed based on a 100 / 0 split between arrivals and departures, during the AM peak period, and the reverse during the PM peak period.

Based on these assumptions, peak traffic generation from the site during a weekday is in the order of 13 vehicle trips per hour, comprising 13 In / 0 Out during the AM period and 0 In / 13 Out during the PM peak period.

Existing Traffic Generation of the Jacks Gully WRC

Vehicle traffic generation on an average day for the site under existing operations are shown in Table 12-9.

Table 12-9 Vehicle movements at Jacks Gully WRC (pre 2004)

	Total Heavy Vehicles	Total Light Vehicles	Grand Total
Average Daily	137	128	265
Average Weekly	958	894	1,852
Average Monthly	4,160	3,882	8,042

Further to the vehicle movements shown in Table 12-9, there are additional heavy vehicles accessing the site due to the increase in waste, under the current operations as shown in Table 12-3. Therefore the total number of vehicles accessing the site on an average day under current operating conditions is shown in Table 12-10.

Table 12-10 Vehicle movements at Jacks Gully WRC (adjusted for additional heavy vehicles post 2004)

	Total Heavy Vehicles	Total Light Vehicles	Grand Total
Average Daily	157	128	285
Average Weekly	1,056	894	1,950
Average Monthly	4,600	3,882	8,482

The daily distribution of customers arriving at the site is shown in Figure 12-2 Daily
Distribution of Vehicles Arriving at Jacks Gully WRC

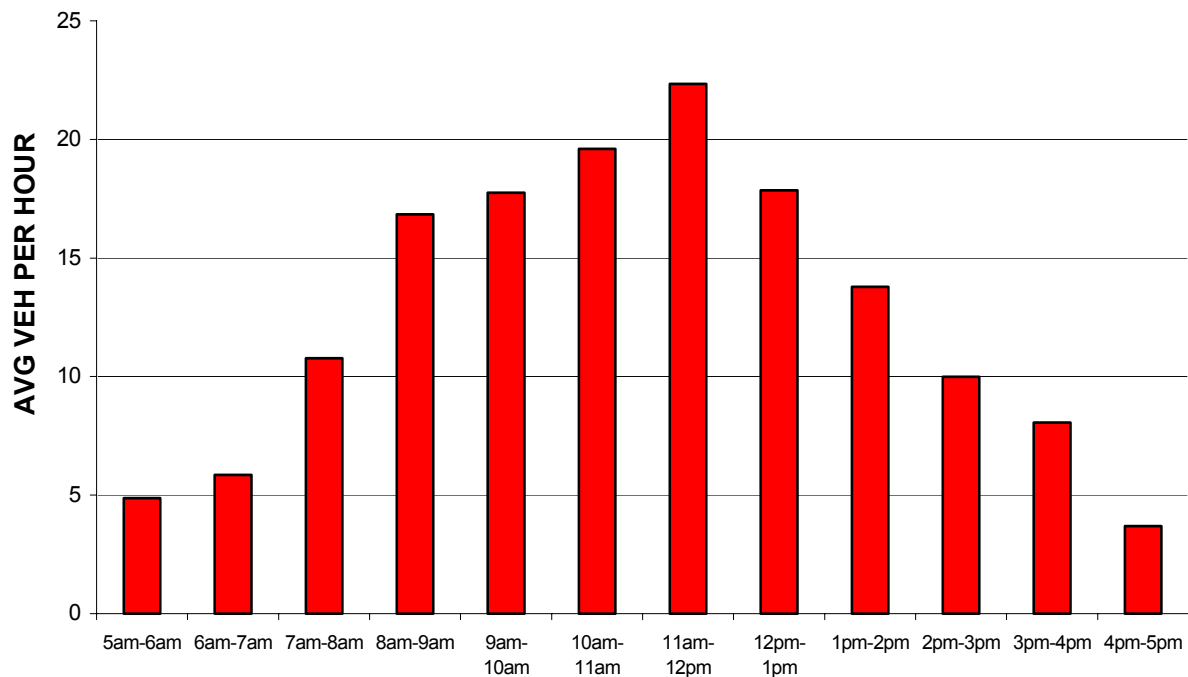


Figure 12-2 Daily Distribution of Vehicles Arriving at Jacks Gully WRC⁵

Existing Light Vehicle Traffic Generation of the Jacks Gully WRC

Based on the existing light vehicle traffic profile, it has been assumed that 10% of all customer vehicle movements (Table 12-9) will occur during the AM and PM peak periods. Hence during the weekday AM and PM peak periods there are 13 customer vehicles accessing the site, generating a total of 26 vehicle trips per hour.

Existing Heavy Vehicle Traffic Generation of the Jacks Gully WRC

Heavy vehicle movements are likely to be concentrated in the middle of the day, with a peak period between 11 am to 12 pm when 15% total daily vehicles arrive at the site.

On average there are 17 trucks accessing the site per hour, with a maximum of 24 heavy vehicles accessing the site per hour in the peak period, from 11 am to 12 pm.

Based on the existing heavy vehicle traffic profile, it has been assumed that 10% of all daily heavy vehicle movements, as shown in Table 12-10, will occur during the AM and PM peak periods. Based on this assumption, during the weekday AM and PM peak periods there are 16 trucks accessing the site, generating a total of 32 heavy vehicle trips, per hour comprising 16 In and 16 Out.

12.1.6 Total Existing Traffic Generation

The daily peak hour traffic generation of the existing WRC site is set out in Table 12-11.

⁵ This data only include customers who have an account with Waste NSW and excludes cash customers

Table 12-11 Total Existing Traffic Generation (Weekday)

Component	AM Peak (vtph)	PM Peak (vtph)	Daily Trips (vtpd)
Employee Traffic	13	13	36
Heavy Vehicle Traffic	32	32	570
Customer Vehicle Traffic	26	26	
Total	71	71	606

12.2 Impact assessment

The projected traffic generation of the proposed development is determined by the car usage rate of employees and the number of heavy vehicles likely to access the site.

12.2.1 Construction traffic generation

Additional traffic to and from the Jacks Gully WRC during construction of the AWT Facility will be limited to movements of construction staff and delivery of construction materials.

Parking for construction staff and required plant would be provided on the WRC site. Therefore there will be no loss of parking or access for people wishing to visit businesses located along the surrounding roads.

Heavy vehicles accessing the site would be dump trucks, concrete trucks and water trucks. Additionally, a small number of deliveries to the site would be required.

Workforce traffic generation

The proposed construction period is for a 12-month duration. During this period the construction hours will be as follows:

- ▶ Monday to Friday: 7:00 am – 6:00 pm;
- ▶ Saturday: 7:00 am – 1:00 pm; and
- ▶ Sunday: no work.

During most of the construction period, it is likely there will be 30 construction staff accessing the site daily, with a maximum of 50 construction staff on the construction site at any one time, such as during concrete pouring. It is assumed that there will be a typical car driver rate of 100% (i.e. each employee driving a car).

Application of the 100% car driver rate to the daily workforce yields a traffic generation of the order of 60 vtpd, for the duration of the construction period. It is assumed the majority of the existing workforce will arrive between 6.30 am and 7.00 am and depart generally between 6.00 pm and 6.30 pm.

Peak traffic generation periods of the site during the construction period will occur outside the peak period on the local road network surrounding the site. In order to undertake a worst case assessment of the impacts it has been conservatively estimated that the proportion of the proposed construction worker traffic generated on the existing road network during the AM and PM peak hour will be of the order of 80% of daily movements. The workforce traffic movements

are likely to be distributed based on a 100 / 0 split between arrivals and departures, during the AM peak period, and the reverse during the afternoon peak period.

Using these assumptions, the light vehicle traffic generation during the weekday peak periods is in the order of 24 vehicle trips per hour, comprising 24 In / 10 Out during the AM period and 0 In / 24 Out during the PM peak period.

Heavy vehicle traffic generation

The construction program and staging is yet to be determined. However it is assumed that the heavy vehicle traffic generation during the construction period will primarily consist of delivery trucks, water trucks, dump trucks and concrete trucks. To allow a worst case scenario assessment, in terms of traffic generation to be undertaken, the maximum number of heavy vehicles generated by the site has been assumed to be 100 vehicles per day, due to the importation of spoil or other materials for construction of the engineered platform.

Based on this worst case scenario heavy vehicle traffic generation during a typical weekday is in the order of 200 vehicle trips per day, comprising 100 In / 100 Out. The proportion of these movements occurring during the AM and PM peak periods has been conservatively estimated at approximately 20%, with a split between arrivals and departures of 50 / 50. Therefore the heavy vehicle traffic generation during the AM and PM peak periods is 40 vehicle trips per hour, comprising 20 In and 20 Out.

Total traffic generation during the construction period

The additional traffic generation for the construction period at the site is shown in Table 12-12.

Table 12-12 Additional Traffic Generation During Construction

Component	AM Peak (vtph)	PM Peak (vtph)	Daily Trips (vtpd)
Employee Traffic	24	24	60
Heavy Vehicle Traffic	40	40	200
Total	64	64	260

Future traffic flows during construction

For the purposes of this assessment the construction period is assumed to occur during the closure of Springs Road. Therefore it has been assumed 100% of heavy vehicles and employee traffic approach/ depart the site on Richardson Road.

Given the above assumptions, the estimated additional traffic volumes on the road network during the AM and PM peak periods are shown in Table 12-13. The additional traffic demand on the road network serving the site is minor, with the following expected traffic increases, based on the worst-case scenario:

Table 12-13 Peak Hour Traffic Volumes During Construction

Location	All movements (vph) AM Weekday Peak Period	All movements (vph) PM Weekday Peak Period
Richardson Road	355	378

It is evident from Table 12-13 that the construction period peak hour traffic volumes on Richardson Road are within the acceptable traffic volumes for a collector road and the road will be operating below its design capacity.

Environmental capacity performance standards

The RTA guidelines described in Section 12.1, were applied to the construction peak hour flows on the road network surrounding the WRC to determine whether this street is meeting its environmental capacity, for the construction traffic demands.

It was found that the construction traffic demands on the road network in the vicinity of the site during the peak periods is within an acceptable range with regard to environmental capacity.

Future intersection performance

Springs Road is likely to be closed during the construction period, and as part of this work the intersection of Richardson Road, Springs Road and Glenlee Road will also be closed. Therefore analysis of the subject intersection is not required.

12.2.2 Post development traffic generation of the WRC

Future Light Vehicle Traffic Generation

The proposed AWT Facility will require an additional 40 employees at the site, increasing the number of fulltime employees to 58. The projected workforce traffic generation of the proposed development yields a maximum additional traffic generation in the order of 80 vehicles per day (two-way).

Based on the existing employee traffic generation profile, it has been estimated that 70% of all daily light vehicle movements will occur during the AM and PM peak periods, i.e. 28 additional vehicles.

The projected daily peak hour employee traffic generation potential of the proposed development is set out in Table 12-14.

Table 12-14 Future Employee Traffic Generation

Component	Existing AM and PM Peak (vtph)	Additional traffic AM and PM Peak (vtph)	Total Future AM and PM Peak (vtph)
Employee Traffic	13	28	41

Future Heavy Vehicle Traffic Generation

When the AWT Facility is fully operational, it will receive 130,000 tonnes and process 90,000 tonnes of municipal solid waste annually. There will therefore be a reduction in the amount of

municipal solid waste received at the site of approximately 80,000 tonnes annually. In addition, the landfilling of 40,000 tpa of dry and other wastes will cease. There will be an increase in garden organics and biosolids imported to the site of 30,000 tonnes per year.

In addition, there will be additional heavy vehicle movements associated with removing recyclables and compost products from the site, as follows:

- ▶ Recyclables from ArrowBio Plant – 19,200 tonnes/year;
- ▶ Stabilised sludge from ArrowBio Plant – 17,400 tonnes/year; and
- ▶ Compost from garden organics Plant – 18,300 tonnes/year.

A comparison of the net existing and future heavy vehicle traffic generation rates associated with activities that will change as a result of the operation of the AWT Facility is shown in Table 12-15.

Table 12-15 Comparison of Heavy Vehicle Traffic Generation*

Type of Waste	Amount transported (tonnes/yr)	Truck Capacity (assumed)	Trucks/yr
Existing			
Municipal solid waste received (pre 2004) from Council collections	140,000	100% - 7.5 tonnes	18,700
Additional municipal solid waste transferred in (mid 2004 onwards)	70,000	100% - 20 tonnes	3,500
Dry & other wastes received and landfilled	40,000	100% - 5 tonnes	8,000
VENM *	150,000	100% - 20 tonnes	7,500
Recyclables received & processed at MRF & transported off-site	49,000	100% - 6 tonnes	8,200
Total	449,000		45,900
Future			
Municipal solid waste received from council and commercial collections	130,000	100% - 7.5 tonnes	17,340
Municipal solid waste transported off-site	40,000	100% - 20 tonnes	2,000
Garden organics and biosolids received	30,000	100% - 5 tonnes	6,000
Recyclables exported	19,200	100% - 20 tonnes	960
Compost exported	18,300	100% - 20 tonnes	920
Stabilised sludge exported	17,400	100% - 10 tonnes	1,740
Dry & other wastes received / processed / landfilled / transported off-site	20,000	100% - 5 tonnes	4,000
VENM*	25,000	100% - 20 tonnes	1,250
Recyclables received & processed at MRF & transported off-site	49,000	100% - 6 tonnes	8,200
Total	348,900		42,410
Difference	-100,100		-3,490

* VENM (virgin excavated natural material)

Once the AWT Facility is operational, there will therefore be a net reduction in the amount of waste received at the site, including the delivery of waste to the site and the removal of treated waste, of 100,100 tonnes annually.

This will result in approximately 3,490 fewer trucks accessing the site annually, and a reduction in the number of heavy vehicles accessing the site daily (based on a 5 day collection week, 52 weeks per year) of about 13 trucks/day.

Based on the existing heavy vehicle traffic generation profile, it has been estimated that 10% of all daily heavy vehicle movements will occur during the AM and PM peak periods. Based on this assumption, the reduction in heavy vehicle movements during the weekday AM and PM peak periods is 2 heavy vtpd, comprising 1 In / 1 Out.

The existing heavy vehicle peak hour traffic generation of the site is in the order of 32 vtpd comprising 16 In / 16 Out during the AM peak period, with the reverse split in the PM peak period.

Therefore the total peak hour traffic generation including the reduction in heavy vehicles accessing the site would be in the order of 30 vtpd comprising 15 In / 15 Out during the AM and PM peak periods.

The projected daily peak hour heavy vehicle traffic generation potential of the proposed development is set out in Table 12-16.

Table 12-16 Heavy Vehicle Traffic Generation Post Development

Component	Existing AM and PM Peak (vtpd)	Reduction in traffic AM and PM Peak (vtpd)	Total Future AM and PM Peak (vtpd)
Heavy Vehicle Traffic	32	2	30

Future Private Customer demand

The future customer demand at the proposed AWT Facility is not likely to increase, compared to the existing customer demand. Therefore the proposed development is not likely to generate any additional private customer demand on the surrounding road network.

Total Future Traffic Generation Post Development

The projected daily peak hour traffic generation potential of the proposed development when it is operational is set out in Table 12-17.

Table 12-17 Total Traffic Generation Post Development

Component	Existing AM and PM Peak (vtpd)	Additional traffic AM and PM peak (vtpd)	Future AM and PM Peak (vtpd)	Future Daily Trips (vtpd)	Number of Vehicles/day
Employee Traffic	13	28	41	116	58
Customer Traffic	26	0	26	256	128
Heavy Vehicle Traffic	32	-2	30	288	144
Total	71	26	97	660	330

12.2.3 Assignment

There is no reliable way to assign the projected traffic generation of the proposed development to the existing road network serving the site without accurate origin-destination information. For the purposes of this assessment the future assignment, of traffic generated by the proposed redevelopment has been predicted largely from the existing directional traffic flows along Springs Road and Richardson Road.

Initial Operation of the AWT Facility

The existing access arrangement to the WRC will remain in place during the initial operation of the AWT. Therefore the following traffic assignment has been adopted:

- ▶ 75% of heavy vehicles using Springs Road and Macarthur Road (quickest route to the Camden Bypass) and 25% using Richardson Road (predominant route for Council trucks); and
- ▶ 50% of employee traffic approach / depart the site on Springs Road and 50% use Richardson Road.

Adopting the existing traffic generation patterns described above, the total maximum peak hour traffic volumes, after consideration of additional transfer vehicle movements on the road network surrounding the site post-development are shown in Table 12-18.

Table 12-18 Peak Hour Traffic Volumes Post Development (Initial Operation)

Location	All movements (vph) AM Weekday Peak Period	All movements (vph) PM Weekday Peak Period
Spring Road	288	336
Richardson Road	305	328

It is evident from Table 12-18 that the post development peak hour traffic volumes on Springs Road and Richardson Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity.

Long Term Operation of the AWT Facility

Long-term access to the AWT Facility is likely to be via an access road connected to the proposed arterial road, west of the site. The proposed arterial road directly links the Camden Bypass via Spring Farm to Menangle Road in the Campbelltown City LGA. Therefore the following traffic assignment has been adopted:

- ▶ 100% of heavy vehicles use the proposed arterial road linking Spring Farm to the Camden Bypass.
- ▶ 50% of employee traffic approach/depart the site on Springs Road and 50% use Richardson Road; and
- ▶ Traffic generated by the proposed development is distributed on the external road network in accordance to the existing peak hour traffic flows.

Adopting the existing traffic generation patterns described above, the total maximum peak hour traffic volumes on the road network surrounding the site post-development, is shown in Table 12-19.

Table 12-19 Peak Hour Traffic Volumes Post Development (Long Term Operation)

Location	All movements (vph) AM Weekday Peak Period	All movements (vph) PM Weekday Peak Period
Springs Road	267	315
Richardson Road	297	320

It is evident from Table 12-19 that the post development peak hour traffic volumes on Springs Road and Richardson Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity.

Environmental capacity performance standards

The RTA guidelines described in Section 12.1, were applied to the post development peak hour flows on the road network surrounding the WRC to determine whether the roads are meeting their environmental capacity, for the post development traffic demands. The traffic volumes under the initial operation of the site have been considered, as these are slightly higher than the traffic volumes under the long-term operation of the site and therefore represent the worst case.

It was found that construction traffic demands on the road network in the vicinity of the site, during the peak periods, are within an acceptable range with regard to environmental capacity.

Future intersection performance

The main traffic impact concerns the effect of the additional construction vehicles on the operational performance of key intersections. An intersection modelling model, the SIDRA model has been used to assess the operational performance of the intersection of Glenlee Road, Springs Road and Richardson Road. The results of the analysis are contained in Table 12-20.

Table 12-20 Future Intersection Performance Post Development

Intersection	Peak Period	Average Delay (Seconds)	Level of Service (LOS)	Degree of Saturation (DS)	Comments
Glenlee Road / Springs Road / Richardson Road	AM	12.9	0.11	A	All movements satisfactory
	PM	13.4	0.10	A	All movements satisfactory

The results of the SIDRA analysis indicate that the subject intersection will operate satisfactorily under the projected post development traffic demand, with a minor increase in delay during the AM and PM peak periods compared to the existing situation. It also shows that the intersection would operate at a Level of Service A during the both the AM and PM peak periods.

12.3 Conclusions

The following conclusions are made based on the above investigations:

- ▶ The operation of the proposed development will result in approximately 3,490 fewer trucks accessing the site annually, or about 13 fewer trucks per day, compared to existing operations.
- ▶ The worst case in terms of traffic generation is during the construction of the proposed development. However, the impact of the additional traffic demand on the road network surrounding the site will be short term covering the construction period. The construction period is likely to span a 12-month period.
- ▶ The existing road conditions along Springs Road, Macarthur Road and Richardson Road are generally considered satisfactory to accommodate the additional number and type of vehicles likely to be generated by the construction and (reduced number and type of vehicles likely to be generated by the) operation of the proposed development, based on a worst case assessment.
- ▶ The worst-case assessment of the additional traffic demand on Springs Road, Macarthur Road and Richardson Road as a consequence of the construction of the proposed development concludes that it has minimal impact the current network operations, and is therefore considered acceptable. There will be reduced traffic demand during the operational stage.
- ▶ The worst case assessment also concluded that increases in traffic generated during the construction period of the proposed development would be modest when distributed on the surrounding road network, and would not result in any adverse effects on the operational performance of the key intersection. The reduced operational traffic will also not result in any adverse effects on the operational performance of the key intersections.
- ▶ Traffic demand on Springs Road, Macarthur Road and Richardson Road as a consequence of the construction of the proposed development is considered acceptable and does not increase the level of traffic activity on these roads to an unacceptable level. The projected traffic demand on these roads, due to construction and operation of the proposed development, is within the limits specified by the RTA Guidelines for collector roads.
- ▶ Future traffic levels along the road network in the vicinity of the site, which includes travel levels during the operational and construction stages of the proposed development, during daily peak periods, are within an acceptable range with regard to environmental capacity.

12.4 Mitigation measures

Since the roads and intersections would operate within their acceptable limits during the construction of the AWT Facility, and this is only for a 12 month period, no specific mitigation measures are recommended. However, a traffic management plan would be prepared prior to construction to minimise the impact of heavy vehicle movements during the period when spoil is being imported to the site for construction of the engineered platform.

During operation of the facility, nearby roads and intersections would also operate within their acceptable limits. The impact on the road network surrounding the site is likely to be reduced in the long term, through the construction of the proposed arterial road linking Spring Farm to the



Camden Bypass, which will reduce the amount of heavy vehicles using Springs Road, Richardson Road and Macarthur Road.

13. Air Quality and Odour

The information presented in this chapter is based on the findings of an Air Quality Assessment conducted jointly by GHD and Holmes Air Sciences. The report by Holmes Air Sciences is included in Appendix F of this EA. The Air Quality Assessment was prepared in accordance with the NSW EPA's, "Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales", August 2001. It focuses mainly on odour and dust impacts, although other potential pollutants mentioned in the Director General's Requirements for this EA are also assessed. These include particulates, oxides of nitrogen, oxides of sulphur and volatile organic compounds (VOCs).

13.1 Existing Environment

13.1.1 Odour

Various odour assessments have been undertaken in the vicinity of the Jacks Gully site in the past. These are documented in the Environmental Impact Statement (EIS) for *Expansion of the Jacks Gully Waste Management Centre* (Woodward Clyde, 1999) and in an odour audit (URS, 2001). In these assessments, it was concluded that existing mitigation measures to minimise odours were sufficient to minimise adverse impacts on surrounding residents.

There are two other operations in the vicinity of Jacks Gully WRC, namely Camden Soil Mix (CSM) / Glenlee Composting Operation to the southeast and Collins Greenwaste to the west. Both operations emit odour with some similarity to the proposed AWT Facility and there is some potential for cumulative impacts. The CSM open windrow garden organics composting facility has reportedly had significant odour impacts on the surrounding area, and it is currently subject to a pollution reduction program (PRP) as part of its EPA licence.

Australian Water Technologies undertook an odour evaluation of the Glenlee Composting Operation in March 2001 (AWT, 2001). This study was based on conservative odour modelling of the composting emissions with the 2 OU contour extending into Mt Annan and Narellan Vale.

As demonstrated in this EA, the contribution of the proposed Jacks Gully AWT Facility to odour levels in the region is substantially smaller than this predicted impact and would not be discernable above the level of odour predicted by Australian Water Technologies in its modelling. Because of this, no additional odour modelling has been undertaken to include this source but rather the most stringent criteria of 2 OU has been applied for the Jacks Gully AWT Facility.

No information is available on the odour impacts of the Collins Greenwaste facility and again, a similar approach has been adopted in terms of the cumulative assessment, that is, a requirement for the Jacks Gully AWT facility to meet the most stringent air quality goals (2 OU).

13.1.2 Site Meteorological Conditions

The complex terrain in the vicinity of the Jacks Gully WRC results in spatially complex atmospheric flows.

Air quality impacts from odorous emissions from the landfill are influenced by phenomena such as:

- ▶ Night-time cool air drainage (katabatic) flows off the local scale terrain (eg. hills, saddles, ridgelines, etc. such as Razorback Range to the south-west) and off the regional scale terrain (eg. the Blue Mountains which are the predominant terrain feature to the east);
- ▶ Wind channelling over and around the local terrain in the area of the landfill site and nearby sensitive sites (i.e. the undulating terrain to the east through to the north of the site in the area around Mt Annan Botanic Gardens); and
- ▶ Penetration of sea breezes into the area in the afternoon from the coast to the east.

Locally recorded meteorological data consists of an automatic weather station (AWS) at Camden airport to the north-west of the site (administered by the Bureau of Meteorology) and an on-site AWS, located at the weighbridge, adjacent to the landfill area (administered by WSN), as shown on Figure 13-1. The data recorded includes hourly recordings of wind speed, wind direction, temperature, and relative humidity.



Figure 13-1 Locations of on-site AWS and dust monitoring stations

This data, on its own, is insufficient to be used to characterise the transport and dispersion of the odorous emissions from the landfill, in this complex geographical area with its spatially varying flows, particularly for light-wind nocturnal periods when the dispersion of odorous emissions from the site are very poor and worst case impacts are likely to be predicted to occur.

The on-site data is likely to be representative of a very local area around the landfill, and not representative of the off-site areas to where odorous emissions to air would be transported, particularly near the outlying current and future residential areas to the east, north and west of the site.

As a consequence of this lack of recorded data, state-of-the-art three-dimensional (3D) models were used in the odour assessment, to simulate these processes instead and, where possible, this recorded data was used to calibrate these models to ensure their adequate configuration. The modelling system used consisted of a regional-scale prognostic meteorological model, which was used to pass a year of hourly broad-scale wind information to a local-scale diagnostic meteorological model. This model, in turn, produced hourly site-representative winds and micrometeorological information.

13.1.3 Dust

The effects of dust are twofold; it can have an impact on the amenity of a region through dust deposition (aesthetic impacts such as reduction in visibility and general nuisance), and it can impact on health through particle concentrations in the air being inhaled.

Total suspended particulates (TSP) of dust can be generated by a range of activities including motor vehicles, fuel heaters, earthworks, industry, bushfires and pollens. Of particular concern is small particulate matter, generally less than 10 μm , which is small enough to be inhaled into the respiratory system. Particulate matter can contribute to cardiovascular and respiratory disease, and reduce lung function.

There are a number of activities surrounding the proposed AWT site that contribute to dust generation in the area. These include the following:

- ▶ Glenlee Composting Operation (Camden Soil Mix) to the southeast;
- ▶ Agricultural activities to the south west, and
- ▶ A coal preparation plant to the south.

In addition, there are a number of future industrial areas proposed to the south and south east of the site, although it is not possible to predict if these will contribute to dust generation in the area.

Dust deposition is monitored monthly at three locations at the Jacks Gully site as a due diligence requirement. The locations of these dust deposition gauges are shown on Figure 13-1 (on page 13-2). Recent measured dust deposition rates are summarised in Table 13-1. Dust deposition in the area of the Jacks Gully landfill is generally well within the EPA guideline limit of 4 $\text{g/m}^2\text{month}$ with average dust deposition rates of less than the guideline limit at all three gauges.

Table 13-1 Measured dust deposition rates (g/m²/month)

	Dust Gauge JGD1	Dust Gauge JGD2	Dust Gauge JGD3
Sampling Dates	Oct 03 - Mar 05	Oct 03 - Mar 05	Oct 03 - Mar 05
Average (g/m ² /month)	2.8	1.0	1.4
Maximum	7.6	2.5	5.5
Minimum	1.0	0.2	0.4

While there have been occasional exceedances at the gauges during the nominated period (one exceedance each at Gauges JGD1 and JGD3), these may be due to unusual occurrences during hot and dry conditions. In general, it is considered that the site achieves good compliance with the EPA dust goals.

Table 13-2 gives a summary of the most recent, available 1-hour average ambient concentrations of PM₁₀ particulates measured at the DEC air quality monitoring station at the University of Western Sydney, Campbelltown Campus, some 4 – 5 km east of the site.

Table 13-2 Recent concentrations of PM₁₀^{6,2}

	Particulates, PM ₁₀ ³ (µg/m ³)
NSW EPA "Action for Air" Interim Goal	50 (24 hr average)
NSW EPA "Action for Air" Long term reporting Goal	30 (Annual)
Monthly Average	24
Monthly average maxima	55
90-percentile value maxima	94
Maximum 1-hour value	171
No. of exceedances of standard level (for two month period)	1

Notes:

1 The above figures are values averaged over November and December 2004.

2 Average 1-hour clock ambient values

3 By Tapered Element Oscillating Microbalance (TEOM-PM10) under 10µm in size

While there was a single exceedance of the 50 (µg/m³) PM₁₀ goal, for most of the time the existing air quality with respect to TSP and PM₁₀ can be described as good. Overall, despite the large number of dust generating activities in the area, the current level of dust generation from the site (measured as dust deposition) appears to be low.

⁶ Information extracted from the DEC (2004) *Quarterly Air Quality Monitoring Report 4 :October – November – December*

13.1.4 Other potential pollutants

Other potential pollutants that were considered as part of this EA include:

- ▶ Oxides of nitrogen, (which are typically generated from combustion processes such as motor vehicles and industry, particularly the power industry). These can impact on the respiratory system as well as being a precursor to ozone (another pollutant which results in respiratory impacts and impairs the body's immune system);
- ▶ Oxides of sulphur, (with the major sources resulting from the combustion of fossil fuels, power stations and oil refineries). Sulphur dioxide can irritate the respiratory system and contribute to diseases such as bronchitis; and
- ▶ Volatile organic compounds (VOCs) (arising from unburnt or evaporative losses due to vehicle emissions, solvents used in commercial activities, emissions from vegetation).

Oxides of Nitrogen and Sulphur and Ozone

This section provides background information on concentrations of nitrogen dioxide and ozone in the area. This information has been provided to assess the cumulative effect of the emissions of NO_x from the Jacks Gully site. Existing levels of nitrogen dioxide can be used as background concentrations. Levels of ozone provide a measure of the potential for emissions of oxides of nitrogen to be converted to nitrogen dioxide.

The DEC's Camden monitoring station measures ozone (O_3) and nitrogen dioxide (NO_2) concentrations as well as NO and NO_x . The site is an industry site operated by Pilkington (Australia) Ltd and located at Camden aerodrome. This site is situated to the south of the Hawkesbury basin in a residential/semi-rural area within the EPA's south-west Sydney region. The DEC ceased monitoring of NO_2 at the Camden monitoring site in September 2004. Ozone data is available from the site up to December 2001.

The highest 1-hour maximum O_3 concentration measured at the Camden monitoring station was 15.8 pphm which is above the DEC criteria of 10 pphm. The highest 1-hour maximum NO_2 concentration was $115 \mu\text{g}/\text{m}^3$ which is within the DEC criteria of $246 \mu\text{g}/\text{m}^3$.

The nearest station that monitors sulphur dioxide is at Ramsay Rd, Bringelly, approximately 16 km north of the site (although given the distance and the variation in local activities, this data is not considered particularly relevant).

The DEC also has a monitoring site at Campbelltown, located off Farrow Street in an industry site operated by Pilkington (Australia) Ltd. since 1990. This site is situated in the south-west of the Sydney basin in a residential area. The monitoring station measures O_3 and NO_2 , as well as NO, NO_x , and measured PM_{10} until 2004.

The highest 1-hour maximum O_3 concentration at the Campbelltown monitoring station was 18.3 pphm which is above the DEC criteria of 10 pphm. The highest 1-hour maximum NO_2 concentration was $207 \mu\text{g}/\text{m}^3$ which is within the DEC criteria of $246 \mu\text{g}/\text{m}^3$.

The DEC's Macarthur air quality monitoring site is located in the grounds of UWS Campbelltown Campus. This site is situated to the south of the Hawkesbury basin in a residential/semi-rural area within the EPA's south-west Sydney region. The Macarthur site was commissioned in October 2004. The monitoring station measures O_3 , CO, SO_2 , NO, NO_2 & NO_x , and fine particles.

The highest 1-hour maximum O₃ concentration at the Campbelltown monitoring station was 14.2 µg/m³ which is above the DEC criteria of 10 ppm. The highest 4-hour maximum O₃ concentration was 12.6 ppm which is above the DEC criteria of 8 ppm. The highest 1-hour maximum NO₂ concentration was 121 µg/m³ which is within the DEC criteria of 246 µg/m³.

Volatile organic compounds

VOCs are emitted during handling of municipal solid waste and landfilling operations. However, the amount of VOCs released during operation of the AWT Facility would be less than existing levels emitted by current landfilling operations, due to immersion of the waste in water, which occurs early in the process. In addition, the biofilter servicing the AWT Receiving Hall and Processing Building will further minimise VOC related odour impacts.

13.2 Odour Assessment

13.2.1 Criteria

Detectability of an odour is a sensory perception relating to a theoretical minimum concentration that produces an olfactometry response. This point is the odour threshold and by definition is 1 odour unit (1 OU). Measurement of odour is quantified using odour units.

It is well known that odour can be recognised between 2 – 5 OU's (cut grass has an odour concentration of 30 OU's). However, olfactometry testing is not able to pick up levels of 1 – 2 OU's. In addition whether the odour is a nuisance, is dependent on several factors including background levels of other odours, type and mix of compounds from the sources, source characteristics (whether from a point or diffuse source), etc. Consequently, theoretical modelling is used to indicate whether or not, and where, sources might potentially impinge on surrounding areas.

The NSW EPA released a Draft Policy for the *Assessment and Management of Odour from Stationary Sources in NSW*, in January 2001. This policy outlines a range of odour performance criteria depending on population density that should be applied at the nearest off-site sensitive receptor, as outlined in Table 13-3.

Table 13-3 NSW EPA Odour Criteria

Population of affected community	Odour Criteria*(OU/m ³)
Urban (≥~2000)	2
500 – 2000	3
125 – 500	4
30 – 125	5
10 – 30	6
Single Residence (≤~2)	7

Note:* Nose response time average, 99th percentile, Draft Australian and European CEN standards

As noted previously, the proposed AWT Facility is located in a commercial / industrial area with residential areas located to the north. The residences are currently approximately 1km to the north west of the proposed AWT Facility (600 m from the site boundary), it is understood that future development of the Spring Farm area may mean that residences will be located 70 m to the north of the site boundary, about 500m from the proposed facility.

An odour criterion which reflects the large number of residences within close proximity to the site is considered appropriate. Therefore an odour criterion of 2 OU/m³ has been adopted for this assessment.

13.2.2 Odour Assessment Methodology

In undertaking an assessment of odour impacts the following components of work were undertaken:

- ▶ Compilation of a quantified emissions inventory for identified activities that are likely to result in the emission of significant sources of odour to the air environment;
- ▶ Regional scale calibrated three-dimensional (3D) prognostic meteorological modelling using the CALMET model;
- ▶ Local scale diagnostic meteorological modelling in the complex geographical area surrounding the Jacks Gully site; and
- ▶ 3D dispersion modelling of the significant sources of odour and generation of appropriate statistical output using the CALPUFF model.

13.2.3 Potential Odour Sources

Construction

Construction of the pre-treatment facility may involve disturbing a portion of the old landfilled waste although generally the works are to be located on a new platform adjoining an existing rock shelf. Any exposed waste will quickly be appropriately stabilised (filled and compacted where required) and capped to prevent erosion. This will reduce the potential for odour emissions within the excavated area.

Operation

The major sources of odour from operation of the proposed AWT Facility have been identified as follows:

- ▶ MSW Receival Hall and MSW Processing Building (both vented through a biofilter);
- ▶ External (to the processing building) sources for the MSW processing including the solids filter press and digested solids storage bins. Other sources such as water treatment and digesters (via emergency relief valves, gas venting, etc) are considered minor or not likely to result in emissions and have therefore not been considered further;
- ▶ Garden organics processing building. Contributing odour sources within this building include the garden organics delivery area, biosolids delivery, conveyor and product storage; and
- ▶ Biofilter for the Garden organics tunnel composting facilities. As noted, air from the tunnel composting facility will be treated via a biofilter. Even though a biofilter is an odour treatment unit, the biofilter itself is an odour source, but with a different type of odour than waste materials.

The existing landfilling operation will continue to contribute to odour levels via the following:

- Temporary leachate ponds;
- Permanent leachate ponds;
- Active landfilling area (200 m²).

Once the proposed AWT Facilities are operational, landfilling of putrescible waste will cease. Since much smaller quantities of inert materials will be landfilled than currently, this will no longer be considered a significant odour source. The landfill gas collection system will effectively manage any landfill gas emissions from completed areas.

13.2.4 Emission Rates

Waste pre-treatment or alternative waste technology facilities and intensive / enclosed composting facilities are relatively new in Australia, hence typical odour emission rate data from operating facilities does not readily exist. A similar type of composting facility is being operated by Remondis (formerly Rethmans) at Port Macquarie.

The odour impact assessment for this facility adopted literature sources for odour factors (emission rates) which were typically based on Rethmann's Operations in Germany (ERM, 1997). As local data is limited or not existent, a number of these odour factors are also considered relevant for the proposed facility at Jacks Gully, although local or site-specific data has been adopted where available.

No odour emission sources are available for the ArrowBio Plant, however, as much of the process involves a high strength organic fraction within a water stream, then it could be considered to be the same as similar types of wastewater treatment processes. Hence the adopted emission rates and relative emissions for each of the odour sources are outlined in Table 13-4. The AWT Receival Hall and processing building are under negative pressure and the air from these buildings will be vented through a purpose built biofilter, of approximate area 60 m². This has been allowed for in the modelling.

Table 13-4 Odour Sources and Emissions (OU/s)

Odour Source	Emission Rate (OUm ³ /m ² .s)	Source / Comments
Existing Site Sources		
Temporary Leachate Pond (Existing)	0.054	JACKS GULLY WRC, Odour Audit, July 2001 - Average
Leachate Pond 1 (Existing)	0.108	JACKS GULLY WRC, Odour Audit, July 2001 - Average
Leachate Pond 2 (Existing)	0.108	JACKS GULLY WRC, Odour Audit, July 2001 - Average
Active landfilling area	5	Holmes Air Sciences (2006)
MSW Sources		
Biofilter serving MSW Receival Hall and Processing Building	150 OUV	Area of biofilter 60m ² , Airflow 0.59 m ³ /s – refer Holmes Air Sciences (2006)
External (non building) MSW Sources		

Odour Source	Emission Rate (OUm ³ /m ² .s)	Source / Comments
Solids filter press	0.4	Based on GHD emission factors for sludge thickener at an STP
Storage Bins	0.4	Based on GHD emission factors for biosolids stockpiles (maximum figure adopted) at STP
Garden Organics Processing Sources		
Garden Organics delivery bays	0.1 (0.2 worst case)	EIS for Garden organics and MSW Processing Facility, ERM 2000
Garden organics pre-treatment (conveyors, shredding)	0.1 (0.2 worst case)	EIS for Garden organics and MSW Processing Facility, ERM 2000
Biosolids Delivery (biosolids pit enclosed)	0.043	Based on GHD emission factors for biosolids stockpiles at Cronulla STP
Product Storage	0.018 (0.036 worst case)	EIS for Garden organics and MSW Processing Facility, ERM 2000
Biofilter	(150 OUV volumetric concentration)	Area of biofilter 440m ² , Airflow 8.3 m ³ /s – refer Holmes Air Sciences (2006)

13.2.5 Odour Modelling Methodology

The CALPUFF model was used to assess the impacts of odour emissions during operation of the proposed AWT Facility. The CALMET model was used in conjunction with the constant geophysical information used in that model, to characterise the transport and dispersion of the emissions.

CALPUFF⁷ ver 5.7 is a three-dimensional non-steady state Gaussian puff model which is particularly suited for near-field impact assessments in complex geographical locations where there are spatially varying flows.

Odour emissions were assumed to be constant, emitting 24 hours per day, 7 days per week.

13.2.6 Modelling Results

It can be seen that the 2 OU goal contour is contained within the site boundary to the north, but extends into the industrial area to the south and what is currently vacant land to the southwest. There are no exceedances of the 2 OU goal in any existing or proposed residential areas.

The results of the modelling are shown in Figure 13-2.

⁷ Scire J.S., D.G. Strimaitis, R.J. Yamartino and X. Zhang, 1995: A User's Guide for the CALPUFF Dispersion Model. Report prepared for the USDA Forest Service by EARTH TECH, Concord, MA. See: <http://www.src.com/calpuff/calpuff1.htm>

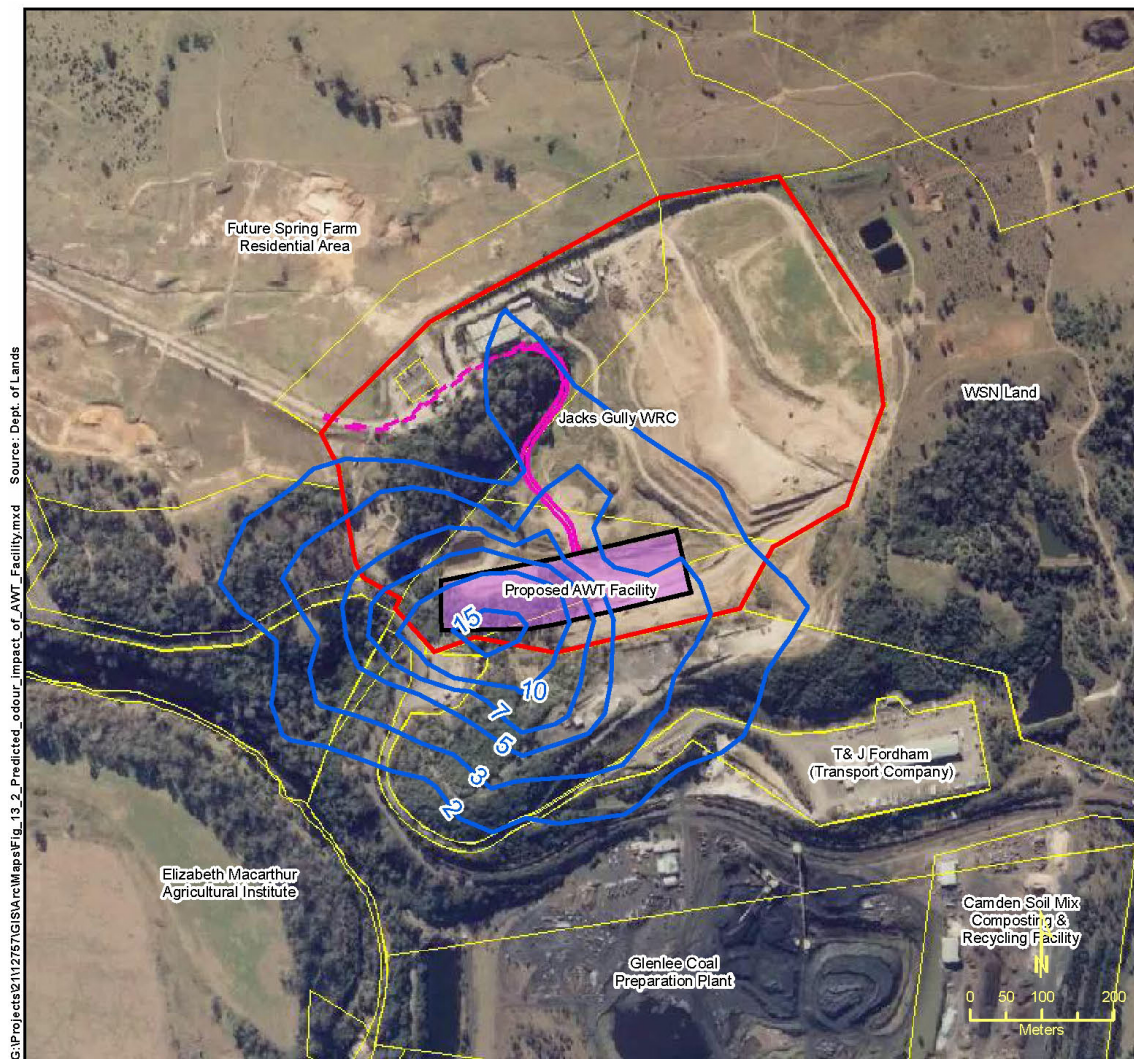


Figure 13-2 Predicted Odour (OU, 99th percentile) from Jacks Gully AWT Facility

As discussed previously, there is the potential for cumulative impacts of odour from the Camden Soil Mix operation to the southeast and the Collins Greenwaste operation to the west. The potential for cumulative impacts has been addressed by requiring that the AWT Facility meet the most stringent odour criteria of 2 OU at the boundary adjacent to residential areas.

This is because the contribution of the proposed Jacks Gully AWT Facility to odour levels in the region is substantially smaller than this predicted impact and would not be discernable above the level of odour predicted in previous modelling undertaken by Australian Water Technologies (AWT, 2001).

At this stage there are no DEC odour goals specifically for industrial areas. In residential areas, there is a potential for individuals to have 24-hour exposure to odour but this would not apply in industrial areas. Therefore it is reasonable to assume that a less stringent goal would apply.

As discussed above, the current DEC goals (applied mainly to residential areas) assume that 7 OU at the 99th percentile would be acceptable to the average person. Therefore a level of 7 OU at offices should be acceptable in industrial areas where there is less opportunity for exposure. The predicted odour levels at the main operations buildings at the T & J Fordham site and the SADA site to the south of Jacks Gully WRC meets the 2 OU goal.

There is the potential for cumulative impacts of odour from the Camden Soil Mix operation to the southeast and the Collins Greenwaste operation to the west. This potential for cumulative impacts has been addressed by requiring that the AWT Facility meet the most stringent odour criteria of 2 OU at the boundary adjacent to residential areas.

The cumulative impact of the AWT Facility and other on-site sources such as the active tipping face on the landfill is shown on Figure 13-3. Again the 2 OU contour is largely contained within the facility site to the north, but extends into the industrial area to the south and what is currently vacant land to the southwest. The 7 OU criteria would be met at all office buildings in the industrial area to the south. (Note that there are some minor differences in the predicted odour impacts close to the AWT site, due to the fact that the cumulative modelling was undertaken with a coarser grid spacing than the modelling for the AWT alone).

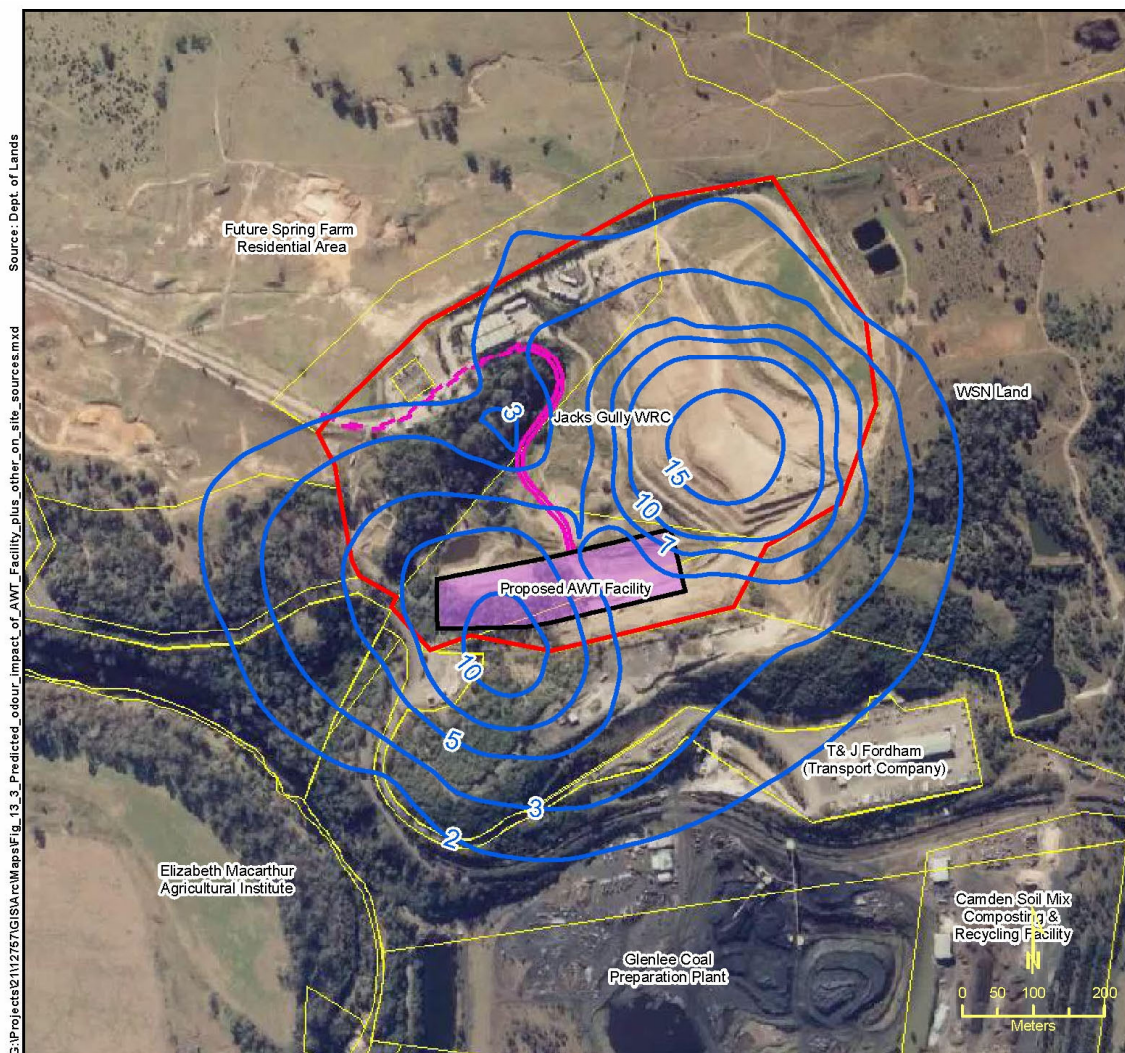


Figure 13-3 Predicted Odour (OU, 99th percentile) from Jacks Gully AWT Facility and on-site sources – cumulative impacts

This modelling confirms that future residential areas to the north of the site are unlikely to experience odours from the proposed AWT Facility at levels greater than NSW EPA criteria of 2 OU for residential areas.

13.2.7 Odour Reduction Agreement, Deed of Variation and Supplementary Agreement

WSN is in close consultation with Landcom in relation to meeting the requirements of the Jacks Gully Odour Reduction Agreement, Deed of Variation and Supplementary Agreement. The main requirement relating to odour is that the site ceases to landfill putrescible waste in 2007, and that any landfilled material should meet the requirements outlined in these documents.

13.3 Dust Assessment

13.3.1 Criteria

The EPA has specified, as a guideline, the maximum dust concentrations or total suspended particulates (TSP) of $90 \mu\text{g}/\text{m}^3$ on an annual average. An additional guideline of $50 \mu\text{g}/\text{m}^3$ (24 hour average) and $30 \mu\text{g}/\text{m}^3$ (annual average) for particulates smaller than 10 microns (PM_{10}) is also specified.

The EPA goals for dust deposition are based on an incremental approach, in which acceptable increases in dust deposition depend on the background level up to a specified maximum. The criteria are summarised in Table 13-5.

Table 13-5 NSW EPA Impact Assessment Criteria for Dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	$2 \text{ g}/\text{m}^2/\text{month}$	$4 \text{ g}/\text{m}^2/\text{month}$

13.3.2 Potential Dust Sources

Existing landfilling operations

The potential sources of dust generation from existing operations of the landfill (being the most significant source of dust) have been identified, to provide a comparison with the potential impacts of the AWT Facility. These are as follows:

- ▶ Earthworks, including stripping of topsoil and vegetation to obtain daily cover material for landfilling. Typical equipment used includes bulldozers, graders, dump truck, excavator and water cart;
- ▶ Waste compaction within the landfill;
- ▶ Traffic movement on the landfill itself;
- ▶ Wind erosion from disturbed/unsealed areas of the site, including temporary roads; and
- ▶ Travel of the water cart along unsealed roads during dust suppression activities.

Estimated dust emissions from existing landfilling operations are summarised in Table 13-6.

Table 13-6 Dust emission estimates for existing landfilling activities

Source	Factor	Source	Basis/Assumptions	Dust emissions (kg/year)
Bulldozer	1.8 kg/h	SPCC	2 bulldozers operating 365 days/year,	5,256

Source	Factor		Source	Basis/Assumptions	Dust emissions (kg/year)
			(1983)	4 hours/day	
Graders / scrapers	4.1	kg/km	USEPA	Average operating speed is 5 km/h over the working time. 2 graders operating 365 days/year, 4 hours/day	59,860
Dumping of materials	0.02	kg/t material	SPCC (1983)	360,000 t/year of waste material is placed in the landfill	7,200
Water cart	1.0	kg/km	SPCC (1983)	Water cart operates with dust suppression, making on average 8 trips/day at 400m per trip on unsealed roads	1,168
Waste compaction	1.8	kg/h	SPCC (1983)	1 compactor operating 365 days/year for 4 hours/day	2,628
Traffic movement	1.0	kg/km	SPCC (1983)	360,000 tonnes per year at 5 tonnes per truck and 500m per trip on unsealed roads	36,000
Wind erosion	0.4	kg/ha/h	SPCC (1983)	1.2 ha is exposed to erosion at any time erosion occurs for wind speeds greater than 5.4 m/s occurring approximately 5% of the time	210
TOTAL existing dust emissions (kg/year)					112,322

Construction

Construction of the facility will involve significant earthworks (particularly in construction of a level pad with earthen batters) and result in dust generating activities. Dust generated by these activities has the potential to pass to the surrounding environs and impact on nearby sensitive receptors, under particular weather conditions, unless it is well managed.

Since construction of the AWT Facility will be occurring at the same time as the landfill is operating (at reduced rates), the dust emissions during this period would be additive.

The potential sources of dust generation from the construction of the facility have been identified and classified into various operations / activities as follows:

- ▀ Earthworks. This will occur during the initial phase only and will involve the stripping of vegetation and topsoil, foundation excavation, backfilling and road construction. Typical equipment to be used will include a bulldozer, grader, dump truck, excavator and water cart;
- ▀ Trucks delivering materials to the construction site along an unsealed road;
- ▀ Traffic movement on the construction site itself. This dust source will be continuous throughout the construction process, until trafficable areas are fully sealed;
- ▀ Wind erosion from disturbed/unsealed areas of the site, including temporary roads; and
- ▀ Travel of the water cart along unsealed roads during dust suppression activities.

Estimated dust emissions for the construction activities are shown in Table 13-8.

Table 13-7 Dust emission estimates for various construction activities

Source	Factor	Source	Basis/Assumptions	Dust emissions (kg/6 months)
Bulldozer	1.8 kg/h	SPCC (1983)	3 bulldozers operating 5.5 days/week, 4 hours/day	3,089
Grader	4.1 kg/km	USEPA	Average operating speed is 5 km/h over the working time. 2 graders operating 5.5 days/week, 4 hours/day	23,452
Compactor	1.8 kg/h	SPCC (1983)	2 compactors operating 5.5 days/week, 4 hours/day	2,059
Vibratory roller	1.8 kg/km	SPCC (1983)	2 vibratory rollers operating 5.5 days/week, 4 hours/day	2,059
Scraper	4.1 kg/km	USEPA	Average operating speed is 5 km/h over the working time. 2 scrapers operating 5.5 days/week, 4 hours/day	23,452
Water cart	1.0 kg/km	SPCC (1983)	Water cart operates with dust suppression, making on average 8 trips/day at 600m per trip on unsealed roads	686
Truck movement	1.0 kg/km	SPCC (1983)	100 trucks movements per day at 500m per day on unsealed roads	7,150
Wind erosion	0.4 kg/ha/h	SPCC (1983)	4 ha is exposed to erosion at any time and that erosion occurs for wind speeds greater than 5.4 m/s occurring approximately 5% of the time	350
TOTAL dust emissions from construction (kg over 6 months)				62,298

During the construction of the proposed facility, the total dust emissions (during the earthworks stage) are likely to increase significantly, particularly when undertaken in conjunction with the (reduced) landfilling operations. While the total dust generated at the site is likely to increase (approximately double during the 6 month period) during the earthworks stage it is again noted that the existing dust deposition rates measured at the three dust gauges (refer Section 13.1.3, Table 13-1) show that they are well below the EPA Guideline of 4 g/m²/month.

Furthermore average concentrations of PM₁₀ (refer Table 13-2) are also less than half the EPA guideline value. Hence, dust emissions (TSP, PM₁₀ and dust deposition) are likely to be still be within guidelines limits during the construction period, even though a short-term increase will be noted.

During the construction period, a number of control measures will be implemented which will assist in greatly reducing dust impacts to help ensure the dust generated from the construction activities do not cause excessive nuisance. These measures have been outlined in Section 13.5.2.

Operation

Jacks Gully currently receives a total of approximately 210,000 tonnes of putrescible waste per annum, which is currently landfilled. Once the AWT Facility is operational, the potential for dust generation will be significantly reduced. It will receive and process 90,000 tonnes of municipal solid waste and 30,000 tonnes of garden organics and biosolids annually.

The vehicles delivering putrescible waste, garden organics and biosolids to the AWT Facility will all travel on a sealed road (unlike at present) and empty their loads within designated, partially enclosed buildings.

In addition, future landfilling operations on the site would be scaled down to approximately 30,000 tonnes per year from their current levels of approximately 250,000 tonnes per year, since only residuals from the AWT Facility and other on-site facilities would be landfilled on-site.

The potential sources of dust generation from the operation of the AWT Facility have been identified and classified into various operations / activities as follows:

- ▶ Earthworks, including stripping of topsoil and vegetation to obtain daily cover material for landfilling. Typical equipment used includes bulldozers, graders, dump truck, excavator and water cart;
- ▶ Waste compaction within the landfill;
- ▶ Traffic movement on the landfill itself;
- ▶ Wind erosion from disturbed/unsealed areas of the site, including temporary roads; and
- ▶ Travel of the water cart along unsealed roads during dust suppression activities.

Unloading of MSW, garden organics and shredding of the garden organics will occur indoors; hence no significant dust will be generated from these activities.

Predicted dust emission estimates for when the AWT Facility is operational are summarised in Table 13-8.

Table 13-8 Dust emission estimates for various operational activities

Source	Factor		Source	Assumptions	Dust emissions (kg/year)
Bulldozer	1.8	kg/h	SPCC (1983)	See note	368
Grader	4.1	kg/km	USEPA	See note	4,190
Dump truck	0.02	kg/t material	SPCC (1983)	See note	500
Water cart	1	kg/km	SPCC (1983)	Water cart operates with dust suppression, making on average 8 trips/day at 400m/trip on unsealed roads	1,168
Waste compaction	1.8	kg/h	SPCC (1983)	See note	184
Traffic movement	1	kg/km	SPCC (1983)	See note	2,520
Wind erosion	0.4	kg/ha/h	SPCC (1983)	1.2 ha is exposed to erosion at any time and that erosion occurs for wind speeds greater than 5.4 m/s occurring approximately 5% of the time	210
TOTAL predicted dust emissions during operation (kg/year)					9,140

Note The total amount of waste that will be landfilled once the proposed AWT Facility is operational is expected to be reduced to 30,000 tonnes/year (less than 10% of existing) and restricted to the residuals from the AWT plant. Hence dust emissions from these sources are expected to be reduced less than 10% of existing levels.

Landfilling volumes will be significantly reduced once the AWT Facility is operational. This will result in less dust generating activities than those currently associated with dumping, compacting and covering of waste. Relative to the existing landfilling operations, the proposed development will result in significantly lower (over 90% reduction) dust emissions from the site.

13.4 Air Quality Impacts from Power Generation Plant

Emissions from the combustion of gas generated from the digestion processes in the AWT Facility are predominantly carbon dioxide and water vapour. Small quantities of other gases may be formed in the process; notably oxides of nitrogen, oxides of sulphur and carbon monoxide.

13.4.1 Modelling Methodology

The CALPUFF model was used to assess the impacts of oxides of nitrogen emissions from the existing landfill gas engine and the proposed biogas engines during operation of the proposed AWT Facility. The CALMET model was used in conjunction with the constant geophysical information used in that model, to characterise the transport and dispersion of the emissions.

CALPUFF⁸ ver 5.7 is a three-dimensional non-steady state Gaussian puff model which is particularly suited for near-field impact assessments in complex geographical locations where there are spatially varying flows. Emissions were assumed to be constant, emitting 24 hours per day, 7 days per week.

13.4.2 Modelling Results

The CALPUFF model produced contours of predicted maximum 1-hour average concentrations of total oxides of nitrogen due to cumulative emissions of the existing power generation plant and the proposed 2 MW units associated with the AWT Facility. These contours are shown in the report by Holmes Air Sciences (2006) in Appendix F, Volume 2.

Maximum off-site concentrations are of the order of 50 $\mu\text{g}/\text{m}^3$ for total NO_x compared to the goal of 246 $\mu\text{g}/\text{m}^3$ for nitrogen dioxide. At the point of emission, the percentage of NO_2 in total NO_x is typically 5-10%. The remaining 90-95% nitric oxide (NO) is converted to NO_2 in the presence of oxidants such as ozone.

If it is assumed conservatively that all of the NO_x is converted to NO_2 (in reality at locations close to the stack the conversion rate is more likely to be 20%) and this concentration is added to recent data monitored at either the DEC Camden, Campbelltown or Macarthur site where the maximum concentration since 2000 is 154 $\mu\text{g}/\text{m}^3$, the goal would still not be exceeded.

The CALPUFF model was also used to produce contours of the annual average NO_x concentrations due to cumulative emissions of the existing power generation plant and the proposed 2 MW units associated with the AWT Facility. These contours are shown in the report by Holmes Air Sciences (2006), in Appendix F, Volume 2.

The maximum off-site concentration is predicted to be 4 $\mu\text{g}/\text{m}^3$ compared with the annual goal of 60 $\mu\text{g}/\text{m}^3$. The annual average NO_2 concentrations in the area are typically less than 20 $\mu\text{g}/\text{m}^3$. The annual goal is therefore not likely to be exceeded. It should also be noted that emissions from the existing power generator would add to the existing background concentration of NO_2 .

As described in Chapter 21, the power generation plant on-site will result in a net decrease in greenhouse gases of approximately 17,707 tonnes of CO_2 equivalents each year. This large net benefit more than offsets the small quantities of emissions released due to the operation of the power generation plant.

13.5 Mitigation Measures

13.5.1 Odour

Construction

The possibility of exposing waste is believed to be small and measures will be put in place to quickly cover the material. Therefore any impact is expected to be minimal.

Operation

To minimise the impact of generated odours on the nearby sensitive receptors during operation of the facility, a number of control measures are proposed:

⁸ Scire J.S., D.G. Strimaitis, R.J. Yamartino and X. Zhang, 1995: A User's Guide for the CALPUFF Dispersion Model. Report prepared for the USDA Forest Service by EARTH TECH, Concord, MA. See: <http://www.src.com/calpuff/calpuff1.htm>

- ▶ All loads of waste entering the facility (i.e. garbage trucks) will be in enclosed containers;
- ▶ The MSW Receival Hall and Processing Building will be fully enclosed and maintained under negative pressure to prevent egress of odours. Air will be extracted by exhaust fans and vented through biofilters for the removal of any odours, prior to release to the atmosphere.
- ▶ Wastes will not be left unprocessed / exposed for significant periods of time (e.g. overnight or on weekends). This will minimise the generation of odorous compounds, which are released during the decomposition process;
- ▶ Floors in the MSW Receival Hall and Processing Building will be washed clean daily; and
- ▶ Air from the garden organics composting process (tunnels only) will be collected and treated via a biofilter unit.

13.5.2 Dust

Construction

A number of control measures are proposed to minimise dust emissions during construction:

- ▶ Extensive watering of disturbed and unsealed areas, particularly roads but also working and stockpile areas;
- ▶ Maintaining grass cover wherever possible including revegetation of disturbed areas as soon as possible;
- ▶ Undertaking excavation works during periods where meteorological conditions (wind, temperature) are likely to reduce potential off-site air quality impacts. For example earthworks will not be undertaken during high wind speeds (>20 km/h) and directly towards the nearby residents; and
- ▶ Use of dust suppressant chemicals, if required.

Furthermore, stopping works during unfavourable meteorological conditions (such as excessively windy days) where practicable, will also assist in reducing potential dust impacts.

Operation

A number of control measures are proposed to limit the potential for dust generation during operation of the AWT Facility. These include:

- ▶ All site access roads will be sealed / paved (asphalt or concrete);
- ▶ All waste receival occurs within enclosed buildings;
- ▶ All waste received will be in enclosed compactor trucks;
- ▶ All processing operations occur within the proposed buildings with much of it occurring within a water stream; and
- ▶ All pre-treated waste materials removed from the site will be transported off-site in trucks with enclosed containers.

13.6 Proposed Monitoring

13.6.1 Odour

The presence of odours will be assessed regularly during site operations (on-site and off-site) to assess the effectiveness of the odour control measures being implemented. All complaints will be logged on the complaints register, which will also document the corrective actions (at implementation and completion) to rectify the cause of the complaint. Weather conditions experienced at the site, will be correlated to the time of the complaint to assist in pinpointing the source of any odour emission, as they are presently.

13.6.2 Dust

The existing dust gauges will confirm the adequacy of dust control procedures used on-site. Where a significant dust impact is found to be occurring, measures outlined above will be undertaken to reduce these impacts.

13.7 Conclusions

13.7.1 Odour and Oxides of Nitrogen

The air quality impacts of the proposed AWT Facility at Jacks Gully WRC have been assessed using the CALPUFF model combined with representative emissions data of odour and oxides of nitrogen. The 2 OU contour is largely contained within the site boundaries to the north and the 7 OU is met at all office buildings in the industrial area to the south.

It is concluded that the facility will have minimum impact on the surrounding area and will not cause exceedances of either the DEC 's amenity criteria for odour or the health based criteria for nitrogen dioxide.

13.7.2 Dust

Earthworks associated with construction of the facility will result in the generation and emission of dust to atmosphere. This will be undertaken over a short time frame (less than 12 months) therefore any impacts from construction will also be short term.

Furthermore, a number of control measures are proposed which will assist in greatly reducing dust impacts. These include dust suppression techniques and undertaking works during favourable weather conditions. Existing site features such as surrounding vegetation will also further reduce the potential for dust impacts on sensitive receptors.

Dust impacts arising during operation of the waste treatment and garden organics plant are considered to be significantly lower than those associated with current operations. This is due to the reduction in dust generating activities such as landfilling.

Furthermore, traffic movements will predominantly occur within sealed areas of the site. As the current dust gauge results indicate that dust deposition is within EPA criteria, it is expected that following construction of the facility, these results will remain within this criteria.

14. Noise

A noise impact assessment has been undertaken as part of this EA to predict the likely noise impacts to nearby sensitive noise receivers during the construction and operational phases of the proposal. Heggies Australia Pty Ltd, a specialist noise subconsultant, undertook the noise impact assessment on behalf of GHD. A full copy of the noise impact assessment report is included in Appendix G of the EA.

14.1 Existing Environment

14.1.1 Residential areas

Mount Annan is the closest residential area to the Jacks Gully WRC. It is located approximately 1 km to the northeast of the site boundary. A new residential area of Narellan Vale is located approximately 1 km to the north of the site. Spring Farm, slightly to the west, is the next suburb planned for the area. The edge of this suburb will be approximately 70 m to the north-west of the Jacks Gully WRC boundary.

Isolated residences are located along Springs Road to the west. At the northern end of Richardson Road is an established residential area. See Figure 14-1.

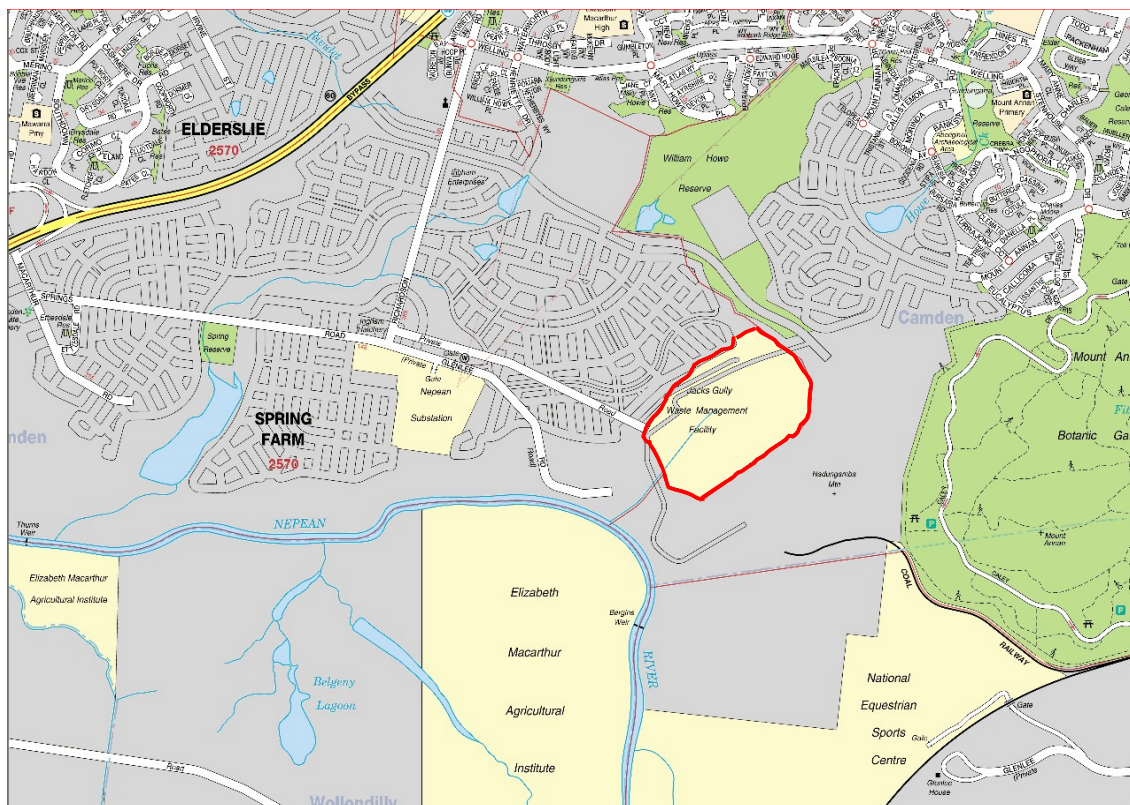


Figure 14-1 Site location - existing and future residential areas

14.1.2 Industrial areas

Immediately to the south of the site is a truck maintenance facility, a coal washery and a composting facility for garden organics. To the east is the recreational area of Mount Annan Botanical Gardens.

14.1.3 New arterial road

A new arterial road is planned along the north, east and west of the Jacks Gully WRC site (see Figure 14-2). It will pass through the 70 m wide buffer zone that separates the planned suburb of Spring Farm from the northern boundary of the Jacks Gully WRC. There is potential for this new road to significantly affect the noise impacts associated with the existing and future Jacks Gully WRC, because the new road is likely to increase the ambient background sound level at the potentially affected residences.

This will potentially reduce the relative noise impact of the subject site. No details are yet available for the new road, such as possible traffic numbers, etc., therefore it is not possible to take it into account for this assessment.

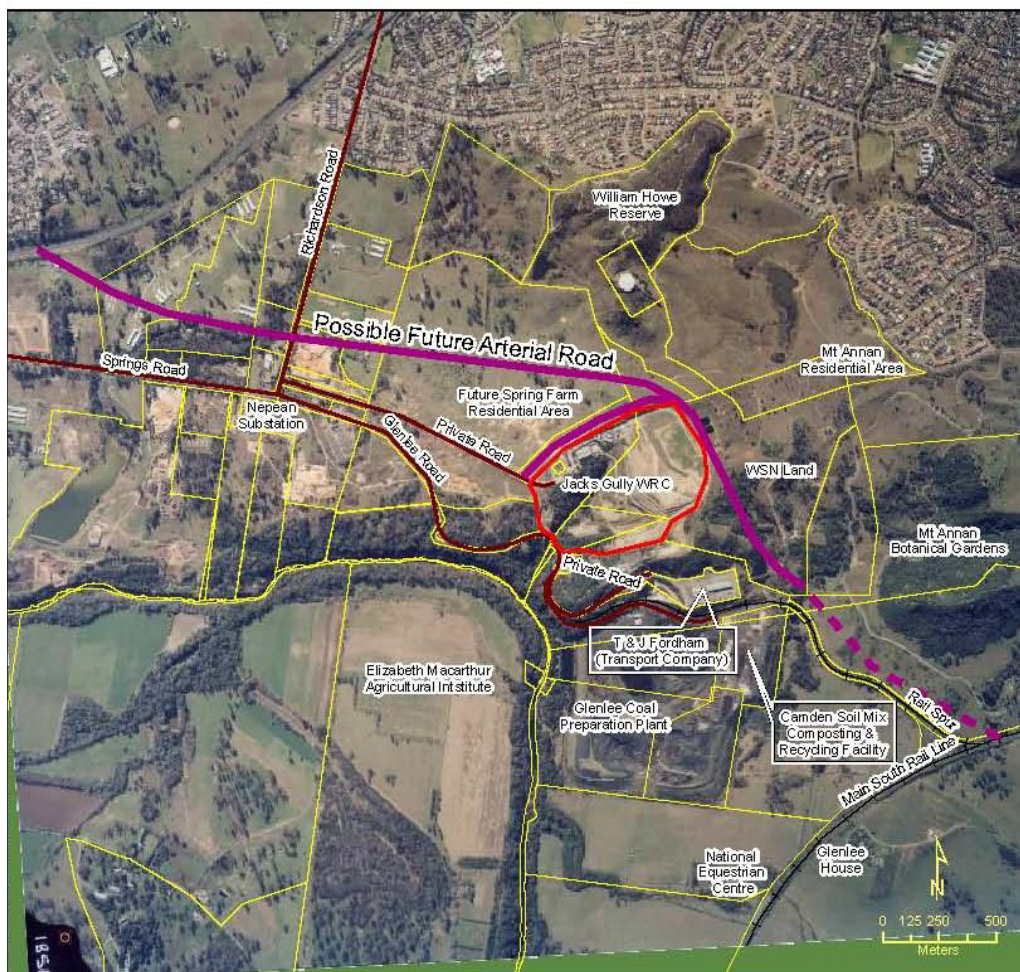


Figure 14-2 Site location showing new arterial road

14.1.4 Ambient (existing) noise levels

Heggies Australia carried out ambient noise measurements at residential locations near the site using unattended and operator-attended techniques. These were carried out over a one week period between Tuesday 22 February and Thursday 2 March 2006 to establish existing ambient noise levels at the nearest residences.

Attended noise monitoring was also carried out at residential locations no.2 and 3, as well as the southern end of Henrietta Drive, Narellan Vale. In addition, attended measurements were conducted approximately 300 m from the coal washery to estimate its influence on the ambient noise environment.

The results for the attended ambient noise levels are shown in Table 14-1.

Table 14-1 Measured Ambient Noise Levels

Location		Noise Level – dBA re 20 μ Pa					
		Daytime 0700 - 1800		Evening 1800 - 2200		Night 2200 - 0700	
		RBL ¹	LAeq ²	RBL ¹	LAeq ²	RBL ¹	LAeq ²
No. 1	176 Richardson Road	42	55	42	56	38	50
No. 2	8 Tea Tree Place	34	52	35	50	38	45
No. 3	Glenlee House	38	52	39	52	38	52
No. 4	Mt Annan Gardens	35	45	43	49	41	47

Notes

1. The Rated Background Level (RBL) is representative of the typical minimum background sound level. By definition the RBL is the lowest 10 percent value of the 15 minute background noise level measurements taken over the assessment period.
2. The LAeq is the logarithmic average of the 15 minute sample in each assessment period.

With the exception of Location 1, evening/night-time RBL's were generally higher than the daytime levels. As confirmed by attended measurements, night-time RBLs are influenced by crickets, which are seasonal and cannot be taken to be part of the prevailing ambient noise environment.

Reference to AS 1055 indicates a typical LA90 background noise levels of 40 dBA, 35 dBA and 30 dBA for day, evening and night-time periods respectively, corresponding to a rural area exposed to negligible transportation. With reference to this and Heggies' experience in similar rural areas, a background noise level of 30 dBA is considered by Heggies to be representative of the night-time noise environment.

In light of the above, for the purpose of setting intrusive noise goals at residences to the north and north-west of the facility, a daytime RBL of 34 dBA, and evening/night-time RBL of 30 dBA is considered appropriate. The attended noise measurements were conducted between 11 pm and 1 am on the 23 February 2006 and 24 February 2006. During the survey, there was negligible wind and light cloud cover. The results of the attended measurements are presented in Table 14-2.

Table 14-2 Attended Ambient Noise Survey Results

Location	Noise Level in dBA				Comments
	LAeq	LA1	LA10	LA90	
Glenlee House	43	48	44	40	crickets + Hume Hwy traffic, coal washery just audible during lulls in traffic
Tea Tree Place	40	43	41	39	crickets + Hume Hwy traffic. Traffic peaks 40 dBA to 42 dBA.
Henrietta Drive	40	44	41	37	crickets + distant Hume Hwy traffic.
Coal Washery @ 280 m	51	52	51	50	constant mechanical drone.

14.2 Construction Noise Assessment

14.2.1 Construction noise criteria / goals

The assessment of construction noise is dependent on the duration of construction in the vicinity of the potentially affected residential receiver. The EPA in the *Environmental Noise Control Manual (ENCM)* suggests the following noise control guidelines.

The following time restrictions apply:

- ▶ Monday – Friday 7.00 am – 6.00 pm
- ▶ Saturday 7.00 am – 1.00 pm if inaudible at residential premises, otherwise
8.00 am – 1.00 pm

The following noise level restrictions apply:

- ▶ Construction periods of less than 4 weeks. The LA10 level in any 15 minute period must not exceed the background LA90 level by more than 20 dBA.
- ▶ Construction periods of between 4 and 26 weeks. The LA10 level in any 15 minute period must not exceed background LA90 level by more than 10 dBA.
- ▶ Construction periods of more than 26 weeks. The LA10 level in any 15 minute period must not exceed background LA90 level by more than 5 dBA.

As the construction period for the total project will exceed 26 weeks the 'intrusive noise' design criteria for long term continuous noise applies. Hence, the design goal or criterion for construction noise is **39 dBA**.

This goal applies for the following time periods:

- ▶ Monday to Friday, 7:00 am to 6:00 pm.
- ▶ Saturday, 7:00 am to 1:00 pm if inaudible on residential premises, otherwise: 8:00 am to 1:00 pm.

Operation outside these time restrictions would require an ‘inaudibility’ criterion. The definition of ‘inaudibility’ is not accurately defined, however noise from the works would need to be well below the night-time typical minimum LA90 noise level of **34 dBA**, to be inaudible.

14.2.2 Construction noise impact assessment

Since the construction of the AWT will occur before residences are located at the proposed Spring Farm development, noise levels were calculated at existing residences. Noise levels have also been calculated at the proposed new residential areas of Mt Annan to the north of the site. Predicted LA10(15 minute) noise levels range from 18 dBA at existing Mt Annan residences to 23 dBA at proposed Mount Annan residences, and 32 dBA at existing Henrietta drive residences. These levels comply with the 39 dBA criterion.

In addition noise level results from activities associated with the building fit out and commissioning are expected to be significantly below those of the major earthworks. The resultant noise levels would be expected to be significantly below night-time LA90 noise levels and potentially “inaudible” at the existing residences.

Section 14.4 discusses predicted traffic noise impacts relating mainly to construction activities.

14.3 Operational Noise Impact Assessment

14.3.1 Operational noise criteria / goals

Industrial Noise Policy

The NSW Industrial Noise Policy (INP) recommends two criteria, “Intrusiveness” and “Amenity”, both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and dominates the noise assessment. The criteria are based on the LAeq descriptor, which is explained in Appendix G, Volume 2.

Intrusiveness Criterion

An intrusiveness criterion applies for residential receivers only. In setting an “Intrusive” noise goal, the ambient (background) LA90 noise level, termed the Rating Background Level (RBL), needs to be established at the nearest sensitive receivers, in the absence of the subject noise source.

An “RBL plus 5 dBA” criterion is then applied to the 15-minute LAeq noise emission of the noise source in question at the receivers of interest (normally at the property boundary).

Amenity Criterion

The INP based “Amenity” noise goal seeks to limit industrial noise emissions based on industrial noise levels deemed acceptable for various land use categories, i.e. rural, suburban, urban, etc.

The resulting amenity criterion placed upon noise emissions of a new facility then depends upon whether existing industrial/commercial-related LAeq(period) levels are lower or higher than the recommended amenity noise level.

In areas where existing industrial/commercial-related noise levels are already high, the amenity noise goal acts to limit new industrial noise emissions so that the cumulative impact of all industrial/commercial noise emissions does not increase.

Conversely, in areas where there is no existing industrial/commercial noise, the amenity noise goal would be set at a level which allows new industrial/commercial noise emissions up to recommended amenity levels for the area.

The INP recommends acceptable noise levels for residents located in “Rural”, “Suburban”, “Urban” and “Urban/Industrial” areas. Consistent with the INP and for the purpose of this assessment, residences in the general “residential” areas more distant to and proposed near the site are considered to fall within the Suburban category. The isolated Glenlee House is considered to fall into the Rural category. The recommended amenity noise levels are presented in Table 14-3.

Table 14-3 Amenity Criteria - Recommended LAeq Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended LAeq Noise Level	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50 dBA	55 dBA
		Evening	45 dBA	50 dBA
		Night	40 dBA	45 dBA
	Suburban	Day	55 dBA	60 dBA
		Evening	45 dBA	50 dBA
		Night	40 dBA	45 dBA
	Urban	Day	60 dBA	65 dBA
		Evening	50 dBA	55 dBA
		Night	45 dBA	50 dBA
	Urban/Industrial Interface - for existing situations only	Day	65 dBA	70 dBA
		Evening	55 dBA	60 dBA
		Night	50 dBA	55 dBA

Notes: For Monday to Saturday, Daytime 0700 hours- 1800 hours; Evening 1800 hours - 2200 hours; Night-time 2200 hours - 0700 hours.
On Sundays and Public Holidays, Daytime 0800 hours - 1800 hours; Evening 1800 hours - 2200 hours; Night-time 2200 hours - 0800 hours.
The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

For the night-time period, in a ‘Suburban’ area, the INP recommended acceptable noise level is **40 dBA**. For daytime, the acceptable level is **55 dBA**. For “Rural”, the night-time level is **40 dBA** and daytime **50 dBA**.

The overall noise criterion for noise emissions from the site is the lower of the intrusive and amenity criteria. The intrusive criterion is applicable over any 15 minute period whereas the amenity level is applicable over the whole daytime, evening or night-time period, as appropriate.

Project Specific Objectives

The intrusive and amenity criteria for the potentially affected residences adjacent to the facility have been determined. The facility operation comprises 24 hour operation of the gas engines and AWT plant, operation of the MRF and landfill from 7:00 am to 4:30 pm, and truck deliveries from 5:00 am to nominally 4:30 pm. To simplify the development of criteria and assessment, operations have been considered as either daytime or night-time.

Project Specific Noise Criteria

In consideration of the ambient survey and potential cumulative noise impacts the project specific goals are:

► Existing Residences and Proposed Residences

Design criteria is based on the Tea Tree Place survey results, and assuming night-time levels will be at or below 30 dBA in the absence of cricket noise. The resultant design goals are **35 dBA** night-time and **39 dBA** daytime.

► Glenlee House

Daytime criteria is based on the Glenlee House results, with the intrusive goal lower than the amenity goal. However the night-time RBL in the absence of crickets is likely to be higher than 30 dBA, from the coal washery and potentially Hume Hwy traffic. The noise level from the coal washery has been predicted to be 32 dBA under night-time neutral conditions, and the intrusive goal has been based on this level. The resultant design goals are **37 dBA** night-time and **43 dBA** daytime.

14.3.2 Wind and Temperature Inversions

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the noise source towards the receiver. As the strength of the wind increases the noise produced by the wind will often obscure noise from most industrial and transport sources. Similarly, temperature inversions occurring within the lowest 50 m to 100 m of atmosphere have the potential to increase the noise produced by focusing (effectively increasing the source directivity) sound wave propagation at a single point.

Wind and temperature inversion effects need to be considered when these are features of the area under consideration. Where the source to the receiver wind component is at speeds of up to 3 m/s for 30% or more of the time in any seasonal period (i.e. day, evening or night), then wind is considered to be a feature of the area for that season and time period. Similarly when a temperature inversion occurs for 30% of the nights in winter then inversion effects need to be considered.

The DEC INP states:

“Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time or more in any assessment period in any season.”

“Where inversion conditions are predicted for at least 30% (or approximately 2 nights per week) of the total time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment.”

Wind

An assessment of the prevailing wind conditions was prepared from on-site meteorological data for the period March 2005 to March 2006.

The prevailing winds as defined in the INP (i.e. less than or equal to 3 m/s, with a frequency of occurrence greater than or equal to 30%) are presented in Table 14-4.

Table 14-4 Prevailing Winds at the Jacks Gully Weather Station

Season	Winds $\pm 45^\circ \leq 3\text{m/s}$ with Frequency of Occurrence $\geq 30\%$		
	Daytime	Evening	Night-time
Annual	Nil	Nil	SE 41%, SSE 48%, S 50%, SSW 36%
Summer	Nil	ENE 32%, E 31%	SE 44, SSE 51%, S 52%, SSW 38%
Autumn	Nil	SSE 37%, S 43%, SSW 39%	SE 48, SSE 58%, S 63%, SSW 47%
Winter	Nil	SSE 30%, S 33%	SE 34, SSE 38%, S 38.8%
Spring	Nil	Nil	SE 39, SSE 44%, S 46%, SSW 32%

The meteorological data shows that low wind speeds from the south are a particular feature of the area, particularly at night. During the day, there are no prevailing winds.

For the purpose of noise assessment, the results of Table 14-4 can be summarised as follows:

- ▶ easterly winds occur during summer evenings; and
- ▶ southerly winds occur throughout the year at night.

14.3.3 Noise Source Levels

Heggies conducted on-site noise measurements of major sources and operations at Jacks Gully WRC on 21 February 2006, and 2 March 2006.

In addition, noise data was collected by GHD in March 2005 from the plant currently operating in Tel Aviv, Israel. These are provided in Appendix H, Volume 2. There are two main areas of the ArrowBio plant:

- ▶ Main processing building housing large machines that separate recyclables from the waste and prepare it for digestion; and
- ▶ An outdoor tank farm consisting of reactor vessels, tanks and pumps.

The main processing area has a higher sound power output than the tank farm (approximately 106 dBA compared to 100 dBA), however it would be an enclosed building. Equipment sound power data for the garden organics plant was based on data from a similar facility at Port Macquarie (ERM, 1997).

Based on the measurements taken by Heggies and the other data collected, the following equipment source levels (sound power or SWL or noise level or SPL) were adopted for the noise assessment:

Table 14-5 Noise sources

Noise Source	Level	Noise Source	Level
Delivery truck passby SWL	105 dBA	Jacks Gully Gas Power Station Engine SWL	98 dBA
Delivery truck trailer impact noise at speed hump	109 dBA	Jacks Gully Gas Power Station Flare SWL	86 dBA
Bulldozer SWL	112 dBA	Jacks Gully Gas Power Station Impulsive Valve SWL	105 dBA
Compacter SWL	110 dBA	Reverberant Level MRF Building	85 dBA to 90 dBA
Grader SWL	105 dBA	Reverberant Level AWT Building	75 dBA to 78 dBA
Excavator SWL	107 dBA	Tank farm reactor SWL	79 dBA to 85 dBA
Haul Truck SWL	108 dBA	Tunnel Fans SWL	92 dBA
Front End Loader SWL	106 dBA	Bio Filter Fan SWL	95 dBA
Komtech Mulcher SWL	116 dBA	Hammer mill SWL	105 dBA
Screener Mulcher SWL	105 dBA	Trommel SWL	95 dBA

The compactor will not be used once the AWT Facility is in operation, and the hammer mill and trommel will be housed in an enclosed building, resulting in a reduction in noise emissions of 10 dBA for these two items of plant.

14.3.4 Operational Noise Impact Assessment

L_{Aeq}(15minute) noise levels have been calculated, under acoustically neutral, prevailing wind and temperature inversion conditions for selected receiver locations. The receivers were chosen to be indicative of current and future residences as follows:

- ▶ Henrietta Drive, Narellan Vale - is representative of existing receivers 1.5 km to the north west;
- ▶ Tea Tree Place, Mt Annan - representative of existing receivers 1.2 km to the north east;
- ▶ Cotula Place, Mt Annan - representative of elevated receivers;
- ▶ Glenlee House - is the nearest residence to the south east;
- ▶ Spring Farm Adjacent - is representative of proposed residences 70 m north west from the site boundary;

- ▶ Spring Farm Middle - is representative of proposed residences 650 m north west from the site boundary;
- ▶ Spring Farm Access Road - is representative of proposed residences closest to the private access road and distant from the Jacks Gully site; and
- ▶ Mount Annan Adjacent - is representative of proposed residences in an expansion of Mt Annan, approximately 500 m to the north east of the Jacks Gully site.

Modelling results are summarised in Table 14-6 through Table 14-9.

Table 14-6 Environmental Noise Emissions – All Plant Operating Daytime during Acoustically Neutral Conditions

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)						
		Comparison			Future components			
		Total Existing	Total future with AWT	Trucks on-site	Landfill	MRF	Land Fill Gas Engine	AWT + Bio Gas Engines
1. Henrietta Drive	39	34	32	24	29	18	21	22
2. Tea Tree Place	39	27	23	14	20	17	11	<10
3. Cotula Place	39	29	22	15	19	16	13	<10
3. Glenlee House	43	20	18	11	14	13	<10	<10
4. Spring Farm Adjacent 1	39	52 to 59	48 to 52	39 to 46	43 to 52	39 to 41	36 to 47	27 to 30
5. Spring Farm Middle	39	42	40	35	37	27	31	29
6. Spring Farm Access Rd	39	49	49	48	35	25	43	28
7. Mount Annan Adjacent	39	33	26	14	24	21	13	12

Notes 1. The "Spring Farm Adjacent is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.

Table 14-7 Environmental Noise Emissions – All Plant Operating Night-time during Acoustically Neutral Conditions

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)						
		Comparison			Future components			
		Total Existing	Total future with AWT	Trucks on-site	Landfill	MRF	Land Fill Gas Engine	AWT + Bio Gas Engines
1. Henrietta Drive	35	20	22	20	-	-	14	15
2. Tea Tree Place	35	11	11	10	-	-	<10	<10
3. Cotula Place	35	14	14	10	-	-	11	<10
3. Glenlee House	37	<10	<10	<10	-	-	<10	<10
4. Spring Farm Adjacent ¹	35	36 to 47	36 to 47	31 to 40	-	-	35 to 46	23 to 25
5. Spring Farm Middle	35	31	32	30	-	-	25	23
6. Spring Farm Access Rd	35	43	43	43	-	-	23	19
7. Mount Annan Adjacent	35	11	13	<10	-	-	<10	<10

Notes 1. The "Spring Farm Adjacent is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.

It can be seen from Table 14-6 that there is a reduction in daytime receiver noise level due to the proposed operations (existing plus AWT) is negligible compared with the existing operations. During daytime the change is less than 1 dBA, and at night for neutral conditions is 1 dBA or less, except at distant receivers where a 2 dBA change is predicted. At these distance receivers levels are well below the design goal.

Predicted daytime noise levels comply with the design goals at existing residences. Compliance is also predicted at the proposed future Mt Annan residences 500 m to the northwest. However at the proposed future residential areas of Spring Farm, exceedances range from 3 dBA at a typical receiver in the middle of the development (650 m from the site) to 10 dBA adjacent to the private access road to 20 dBA adjacent to and 70 m north west of the site. These exceedances result from on-site trucks and landfill operations.

Predicted night-time neutral noise levels (refer Table 14-7) comply with the design goals at existing residences. Compliance is also predicted at the proposed future Mt Annan residences 500 m to the northwest, and in the middle of Spring Farm.

However an 8 dBA exceedance is predicted at the proposed future residential areas of Spring Farm adjacent to the private access road, and at residences adjacent to and exceedances of 1 to 12 dBA are predicted 70 m north west of the site. These exceedances result from on-site trucks and the existing landfill gas engine.

Less favourable meteorological conditions do not markedly change the modelling results, as illustrated in Table 14-8 and Table 14-9.

Table 14-8 Environmental Noise Emissions – All Plant Operating Night-time under a 3 m/s Southerly Wind

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)					
		Total	Trucks on-site	Landfill	MRF	Land Fill Gas Engine	AWT + Bio Gas Engines
1. Henrietta Drive	35	26	24	-	-	18	21
2. Tea Tree Place	35	15	14	-	-	<10	<10
3. Cotula Place	35	18	15	-	-	15	<10
3. Glenlee House	37	<10	<10	-	-	<10	<10
4. Spring Farm Adjacent ¹	35	39 to 47	34 to 41	-	-	36 to 46	25 to 28
5. Spring Farm Middle	35	36	34	-	-	28	27
6. Spring Farm Access Rd	35	44	44	-	-	26	23
7. Mount Annan Adjacent	35	16	12	-	-	12	12

Notes 1. The "Spring Farm Adjacent is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.

Table 14-9 Environmental Noise Emissions – All Plant Operating Night-time under Temperature Inversion Conditions

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)					
		Total	Trucks on-site	Landfill	MRF	Land Fill Gas Engine	AWT + Bio Gas Engines
1. Henrietta Drive	35	26	24	-	-	18	15
2. Tea Tree Place	35	16	15	-	-	<10	<10
3. Cotula Place	35	19	15	-	-	16	<10
3. Glenlee House	37	13	12	-	-	<10	<10
4. Spring Farm Adjacent ¹	35	39 to 48	34 to 42	-	-	36 to 46	23 to 25
5. Spring Farm Middle	35	36	34	-	-	28	23
6. Spring Farm Access	35	44	44	-	-	26	19

Rd							
7. Mount Annan Adjacent	35	17	12	-	-	12	<10
Notes	1. The "Spring Farm Adjacent" is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.						

Information on predicted operational traffic noise impacts is contained in Section 14.4.

14.3.5 Cumulative Operational Noise Impacts

The coal washery is located south-east of Jacks Gully, however significant shielding is provided by topography to the existing residential areas of Narellan Vale, and Mt Annan, and the future Springs Farm development. Based on night-time measurements of the washery, noise modelling was used to estimate the noise levels at these residences. Modelling indicates levels ranging from up to 22 dBA at Mt Annan, to 11 dBA at proposed Spring Farm residences.

The coal washery however, is expected to be a feature of the ambient noise environment at Glenlee House. The noise level from the coal washery has been predicted to be 32 dBA under night-time neutral meteorological conditions at this location.

14.4 Traffic Noise Impact Assessment

14.4.1 Traffic noise criteria / goals

The DEC ECTRN represents the NSW Government's noise design goals for the assessment of traffic noise. The relevant criteria relating to new residential land use developments affected by 'collector' road traffic noise (Richardson Road and Springs / Macarthur Roads) is summarised in Table 14-10.

Table 14-10 DEC's Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria Day (7 am-10 pm)	Criteria Night (10 pm-7 am)	Where Criteria are Already Exceeded
New residential land use developments affected by collector traffic noise	LAeq(1hr) 60 dBA	LAeq(1hr) 55 dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
Land use developments with potential to create additional traffic on collector road	LAeq(1hr) 60 sBA	LAeq(1hr) 55 dBA	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria by judicious design and construction of the development. In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2 dB.
Definitions:	New residential development affected by traffic noise – addresses the acceptable level of road traffic noise impact for new residential developments. Land use developments with potential to create additional traffic – addresses the acceptable level of traffic noise impact for existing residences		

The ECRTN also recommends that the assessment of sleep disturbance should include a consideration of the maximum noise level exceedances occurring during the night-time period and the emergence of these exceedances above the ambient noise level.

14.4.2 Traffic noise impact assessment

Existing and future noise levels at Richardson Road and Springs Road were predicted for construction and future operation of the AWT. Peak hourly day and night-time traffic volumes were based on the Traffic and Access assessment, and with a kerb to facade distance of 15 m and 2.5 dBA facade reflection. It is noted an alternative route to the site may exist in the future via the proposed arterial road. However as the route is not known this scenario was not included in the assessment.

The results of the traffic noise assessment are presented in Table 14-11.

Table 14-11 Existing and Future Traffic Noise Levels at Existing Receivers

Receiver	Daytime LAeq(1hr) Noise Levels			Night-time LAeq(1hr) Noise Levels		
	Existing	Construction	Future AWT Operation	Existing	Construction	Future AWT Operation
Receiver 1 Richardson Road	65 dBA	65 dBA	65 dBA	60 dBA	60 dBA	60 dBA
Receiver 2 Springs Road	65 dBA	-	65 dBA	60 dBA	-	60 dBA

Notes

1. The average maximum hourly value over the time period is shown.
2. The predicted levels include a 2.5 dBA facade correction
3. Springs Road is assumed to be closed during construction.

To assess the potential for sleep disturbance, L_{max} noise levels were also predicted for a truck passby at 15 m, with the level 78 dBA. This level is 13 dBA above the 65 dBA criterion, based on an internal level of 55 dBA plus a 10 dBA reduction outside to inside with open windows. However there will be no noticeable change in L_{max} noise levels as a result of the development.

The predicted LAeq(1hour) results indicate that existing traffic noise levels at residences on the collector roads that currently provide site access exceed the ECRTN by the order of 5 dBA during daytime and night-time. However during both construction of and operation of the proposed AWT Facility, no significant change in traffic noise is predicted, with increases less than 1 dBA.

14.5 Mitigation Measures

A number of noise control measures were investigated and were incorporated into the modelling. These are discussed as follows with the modelling results presented in Table 14-12:

- Provision of a high performance muffler to the existing landfill gas engine; and

- Increasing the height of the north-western bund wall from 4m to 6m, and the provision of a 3m noise wall along the private access road.

Table 14-12 Environmental Noise Emissions – Daytime and Night-time with Control Measures during Acoustically Neutral Meteorological Conditions

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)	
	Day/Night	Total Daytime	Total Nighttime
1. Henrietta Drive	39/35	31	22
2. Tea Tree Place	39/35	22	<10
3. Cotula Place	39/35	22	12
4. Glenlee House	43/37	18	<10
5. Spring Farm Adjacent ¹	39/35	44 to 49	33 to 39
6. Spring Farm Middle	39/35	39	30
7. Spring Farm Access Rd	39/35	44	38
8. Mount Annan Adjacent	39/35	26	13

Notes 1. The "Spring Farm Adjacent is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.

The modelling indicates that the above listed noise control measures would result in a 2 dBA to 4 dBA reduction in daytime levels at the nearest residences, and a reduction in night-time exceedances to 3 dBA to 4 dBA.

Further reductions in the daytime level could potentially be achieved by controls to the landfill operations, and compliance with the night-time goal by restricting truck access to after 7 am. The potential for noise control also exists by increasing the buffer zones between the site and the proposed Spring Farm residential development and/or the use dwelling treatments, such as localised bund walls and mechanical ventilation.

The need for these additional measures will be determined once the AWT Facility is operating and noise measurements can be taken in the potentially affected areas.

15. Flora and Fauna

The main issues and findings of the ecological impact assessment are summarised in this chapter. A copy of the Eco Logical subconsultant report is provided in Appendix I and GHD's Supplementary Report is provided in Appendix J of the EA.

15.1 Introduction

This chapter describes the existing habitats on the site and in the surrounding areas. It then evaluates potential impacts to the following:

- ▶ On-site flora and fauna from the proposed works;
- ▶ Threatened species, populations and ecological communities listed under the New South Wales *Threatened Species Conservation Act, 1995* (TSC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- ▶ Koala habitat under State Environment Protection Policy No. 44 (SEPP 44).

This chapter also assesses the need for additional ecological investigations under Commonwealth and State legislation, including whether there is any requirement for:

- ▶ A referral to Environment Australia regarding issues of National Environmental Significance under the EPBC Act; and
- ▶ Species Impact Statements under the TSC Act based on the eight factors listed in Section 5A of the *Environmental Planning and Assessment Act 1979* (the so-called eight part test).

15.2 Methodology

Flora and fauna consultants from Eco Logical Australia Pty Ltd and GHD undertook assessments of the potential impacts of the proposal on flora and fauna observed and likely to occur at the site. Eco Logical Australia assessed potential impacts based on the building footprint of the facility identified at the time. Subsequently GHD assessed impacts on an additional 0.4 hectare (ha) area associated with the final proposed footprint design. A copy of reports from these assessments is provided in full in Appendix I of the EA.

Potential and existing flora and fauna at the site were identified by undertaking a literature review and a field work program. These activities are described below.

15.2.1 Literature and Database Review

Searches of both the EPBC Act Protected Matters and Atlas of NSW Wildlife (threatened species) databases were performed by Eco Logical staff on 3 June 2004. Searches were conducted within a 10 kilometre radius from a centre point of 34.0767° latitude, 150.7448° longitude. Results from these searches were combined to produce a list of threatened and migratory species for consideration. NSW National Parks and Wildlife Service (NPWS) (now Department of Environment and Conservation – DEC) vegetation mapping was also reviewed. Species lists are provided in the report by Eco Logical Australia in Appendix I of the EA.

15.2.2 Field assessment

Eco Logical Australia conducted a reconnaissance survey of the proposed building area and surrounds at Jacks Gully WRC on 9 June 2004. The survey effort was in excess of seven person hours in total. Weather conditions were fine and mild with almost no wind.

GHD conducted a field visit to the proposed area on 6 July 2005 during which the findings of the previous report were ground-verified and confirmed, and additional areas were assessed.

Effort was focused on confirming vegetation communities and condition in the western portion of the building envelope and the area immediately adjacent to the site that contains remnant vegetation; assessing habitat for fauna; and recording opportunistic fauna sightings. Due to the highly disturbed nature of the proposed building footprint no other formal survey methodology was undertaken.

15.3 Findings

15.3.1 Vegetation condition

The majority of the proposed building envelope contains no vegetation. The area of the proposed building envelope containing vegetation is heavily weed-infested. The dominant species are African Olive (*Olea africanum*) on the upper and lower slopes, Broad-leaved Privet (*Ligustrum lucidum*) and Lantana (*Lantana camara*). Other common weed species include Windmill Grass (*Chloris gayana*), Kikuyu (*Pennisetum clandestinum*) and Purple Top (*Verbena bonariensis*). Erosion is also a common feature of the area of the proposed batter slope.

15.3.2 Vegetation communities

One Endangered Ecological Community (EEC), Cumberland Plain Woodland (mapped by NSW NPWS, 2002 as Shale Hills Woodland) listed under both the TSC Act and EPBC Act, occurs immediately to the west of the building envelope. Impacts on this EEC are considered through an 8-part test.

A total of five vegetation communities are mapped by NSW NPWS as occurring in the vicinity of the study site (within 400m of the study site). These communities are shown in Figure 15-1 (from the EcoLogical report) and their status given in Table 15-1.

Table 15-1 Legal status of vegetation communities in the vicinity of the study site

Mapped as:	Endangered Ecological Community (EEC) listed under TSC Act as:	Listed Under EPBC ACT
Shale Hills Woodland	Cumberland Plain Woodland	Yes
Shale Plains Woodland	Cumberland Plain Woodland	Yes
Alluvial Woodland	Sydney Coastal River Flat Forest	No
Riparian Forest	Sydney Coastal River Flat Forest	No
Moist Shale Woodland	Moist Shale Woodland	No

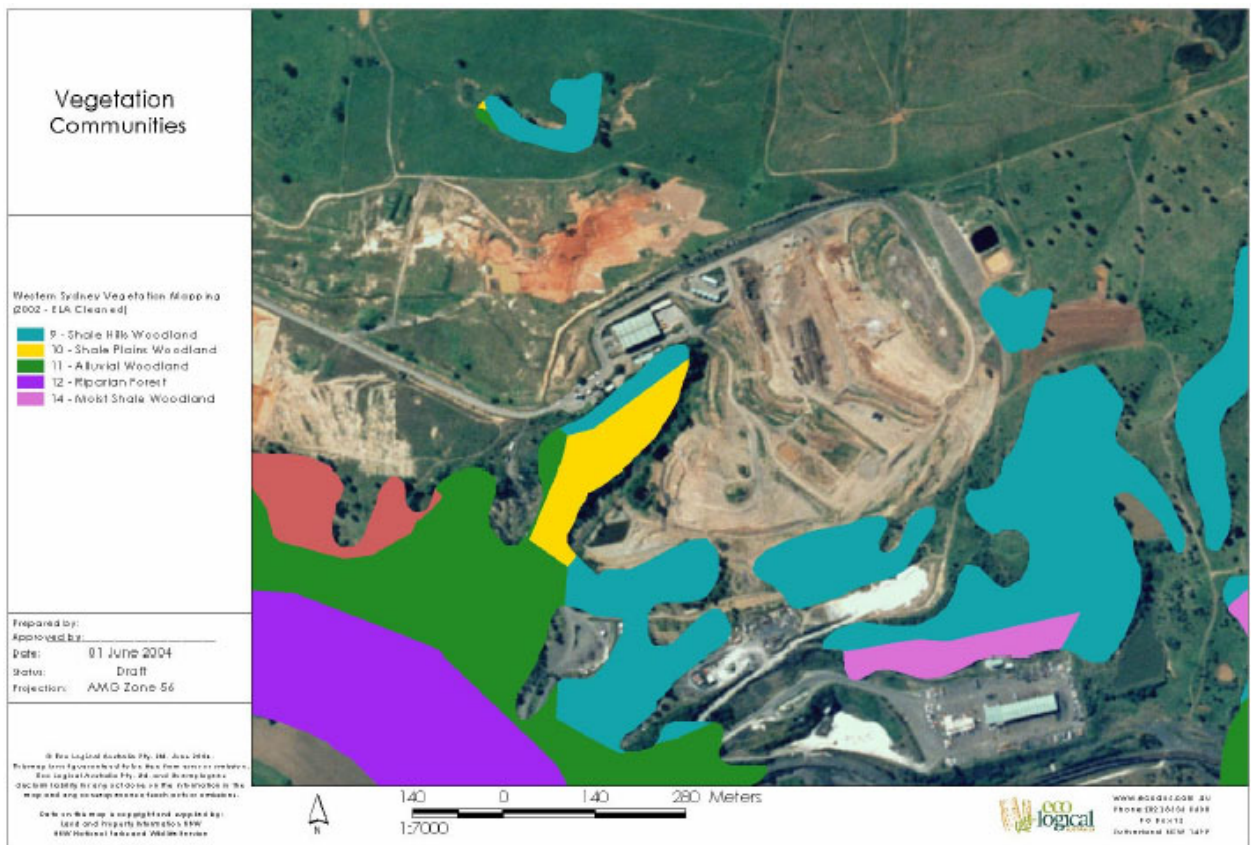


Figure 15-1 Mapped vegetation communities

15.3.3 Cumberland Plain Woodland

An area of degraded regrowth Cumberland Plain Woodland (CPW) (Shale Hills Woodland) exists in the area of the proposed batter slope immediately to the west of the existing building platform. This community is listed as endangered under the TSC Act and the EPBC Act and would be removed as a part of this proposal. The majority of the vegetation present within this community is comprised of weed species and the Broad-leaved Privet is particularly common.

There are several small trees characteristic of the CPW (eg. Forest Red Gum (*Eucalyptus tereticornis*)) none of which could be considered remnant, indicating that this area had previously been cleared. Native understorey species were almost completely absent, although there were scattered examples, including Sydney Green Wattle (*Acacia parramattensis*), Blackthorn (*Bursaria spinosa*) and Maidenhair Fern (*Adiantum aethiopicum*).

15.3.4 Fauna Survey

A total of 23 bird species, one amphibian species and one invertebrate were recorded during the field reconnaissance (see Appendix I). Evidence of the invertebrate species Cumberland Plain Land Snail (*Meridolum corneovirens*) was found (shell). This species is listed as endangered on the TSC Act. An impact assessment for this species (8-part test) was conducted. A brief inspection found very little habitat currently available to this species on the site as there was little understorey, leaf litter or other debris. Scouring of the area through sheeting erosion has also modified potential habitat to such an extent as to be currently non-existent.

The area would potentially provide foraging habitat for a number of mobile species including microchiropteran bats and numerous common bird species. Habitat assessment in the field determined that a total of eight fauna species listed under the TSC Act or EPBC Act may occur in bushland adjacent to the construction envelope.

Table 15-2 Fauna species likely to occur on or adjacent to the construction envelope

Common Name	Scientific Name	TSC Status	EPBC Status
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	Endangered	-
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>	Vulnerable	-
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	Vulnerable	-
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	Vulnerable	-
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	Vulnerable	-
Large-eared Pied Bat	<i>Chollnolobus dwyeri</i>	Vulnerable	Vulnerable
Large-footed Myotis	<i>Myotis adversus</i>	Vulnerable	-
Swift Parrot	<i>Lathamus discolor</i>	Endangered	Endangered

15.3.5 Flora

A total of 18 native flora species and 26 weed species were recorded during the field reconnaissance on or adjacent to the proposed building envelope. No native species were located on cleared areas, but some weed species were observed in these areas. None of these species are listed as threatened on either the State or Commonwealth threatened species legislation.

Two of the weed species recorded are declared as noxious; blackberry (*Rubus fruticosus* complex) and broad-leaved privet (*Ligustrum lucidum*). There are obligations to control these species under the *Noxious Weeds Act 1993*. Habitat assessment in the field determined that a total of two flora species (Table 15-3) listed under the TSC Act or EPBC Act could potentially occur in bushland adjacent to the construction envelope. Neither species was recorded on the site nor is potential habitat likely to occur.

Table 15-3 Flora species likely to occur on or adjacent to the construction envelope

Common Name	Scientific Name	TSC Status	EPBC Status
Rufous Pomaderris	<i>Pomaderris brunnea</i>	Vulnerable	Vulnerable
White-flowered Wax Plant	<i>Cynanchum elegans</i>	Endangered	Endangered

15.3.6 Connectivity

The CPW is part of a larger patch of vegetation considered to be Cumberland Plain Woodland to the north-west grading into Sydney Coastal River Flat Forest in the south-west. The area of

CPW to the north-west is progressively being cleared through infilling of the cells during land filling at the site and only the vegetation to the south-west of the site will remain. Consequently, this proposal will not further reduce connectivity.

15.4 Impact Assessment

The impact area is within the boundary of the Jacks Gully Waste Management Centre. As a consequence of this proposal almost 0.4 ha of Cumberland Plain Woodland will be removed. This community is an endangered ecological community under the TSC Act and EPBC Act and would currently provide habitat for a number of fauna species, the vast majority of which could be considered common.

It also provides potential habitat for the Cumberland Land Snail which is an endangered species listed under the TSC Act. The degraded nature of the site is such that little remains of the understorey species and it is extremely unlikely that any threatened fauna and flora remains within this woodland area. Indirect impacts of this proposal could be increased erosion and spread of weeds during construction and operation.

However, management measures would be implemented to prevent such impacts.

15.4.1 Assessments under the EP&A Act

Part 5A assessment

Part 5A Assessments under the EP&A Act were undertaken to assess the significance of impacts on the Cumberland Plain Woodland, the Cumberland Land Snail and Rufous Pomaderris (Table 15-4). These tests concluded that this proposal would be unlikely to have significant impacts on the endangered ecological community, the Cumberland Land Snail due to the highly degraded and modified nature of the site, or Rufous Pomaderris which is unlikely to occur on the site.

Vegetation to the north-west of the proposal area is currently being removed through infilling of the land fill cells and removal of vegetation under the proposal would not isolate this area. Consequently it is considered that a Species Impact Statement is not required.

Table 15-4 Results of Part 5A Assessments under the EP&A Act (Eight Part Test)

Part	Eight Part Test clause	Vegetation – Cumberland Plain Woodland	Fauna – Cumberland Plain land snail	Flora – <i>Pomaderris brunnea</i>
1	“In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction”.	The Cumberland Plain Woodland is listed as an Endangered Ecological Community, not as a threatened species.	The Cumberland Plain land snail is listed as an endangered species. No Cumberland Plain land snails were found on the proposal site, however, a shell was found adjacent to the proposal site in Cumberland Plain Woodland. They are typically found in areas of dense litter, under logs or debris around the bases of trees in Cumberland Plain Woodland and on the fringes of River Flat Forest. The proposal would not result in the clearance of likely Cumberland Plain land snail habitat as this area is badly degraded through the absence of understorey and leaf litter. Appropriate management of adjacent habitat should ensure the long-term survival of the species in the area.	<i>Pomaderris brunnea</i> is listed as a vulnerable species. None were found on the proposal site, however, potential habitat occurs in Cumberland Plain Woodland along drainage lines east and north east of the proposal site. The species is usually found in moist forests and creek lines, although uncommon throughout its range. On the study site such habitat is weed infested and eroded, and may be too degraded to support the species. The proposal would not result in the clearance of suitable habitat; however, adequate measures should be employed to ensure bank stability along the proposal site and appropriate treatment of runoff. By adopting these measures, indirect impacts on suitable habitat for this species would be avoided.

Part	Eight Part Test clause	Vegetation – Cumberland Plain Woodland	Fauna – Cumberland Plain land snail	Flora – <i>Pomaderris brunnea</i>
2	“In the case of an endangered population whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised”.	The Cumberland Plain Woodland is listed as an Endangered Ecological Community, not an endangered population.	The Cumberland Plain land snail is listed as an endangered species and ineligible for listing as an endangered population.	<i>Pomaderris brunnea</i> is not listed as an endangered population.
3	“In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed”.	The proposal would not result in native vegetation clearance or modification. Potential indirect impacts should be addressed through revegetation of the embankment and appropriate stormwater management.	A significant area of suitable habitat for Cumberland Plain land snail would not be removed or modified by the proposal.	A significant area of suitable habitat for <i>Pomaderris brunnea</i> would not be removed or modified by the proposal.
4	“Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community”.	The proposal would not isolate Cumberland Plain Woodland from currently connected patches.	The proposal would not isolate potential habitat for Cumberland Plain Land Snail from currently connected patches.	The proposal would not isolate potential habitat for <i>Pomaderris brunnea</i> from currently connected patches.
5	“Whether critical habitat would be affected”.	No critical habitat listed under the TSC Act was recorded on or immediately adjacent to the site.	No critical habitat listed under the TSC Act was recorded on or immediately adjacent to the site.	No critical habitat listed under the TSC Act was recorded on or immediately adjacent to the site.

Part	Eight Part Test clause	Vegetation – Cumberland Plain Woodland	Fauna – Cumberland Plain land snail	Flora – <i>Pomaderris brunnea</i>
6	“Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas in the region)”.	Cumberland Plain Woodland has been subject to clearing for over 200 years causing it to be significantly reduced in distribution and extent. The community is not well represented in conservation reserves.	The habitat of the Cumberland Plain land snail has been subject to clearing for over 200 years causing it to be significantly reduced in distribution and extent. The Cumberland Plain land snail is not well represented in conservation reserves.	<i>Pomaderris brunnea</i> is not well represented in conservation reserves.
7	“Whether the action proposed is of a class of action that is recognised as a threatening process”.	Clearing of Native Vegetation is listed as a key threatening process. The vegetation to be removed is badly degraded through previous clearing, weed infestation and erosion.	Clearing of Native Vegetation is listed as a key threatening process. The vegetation to be removed is badly degraded through previous clearing, weed infestation and erosion.	Clearing of Native Vegetation is listed as a key threatening process. The vegetation to be removed is badly degraded through previous clearing, weed infestation and erosion.
8	“Whether any threatened species or ecological community is at the limit of its known distribution”.	Cumberland Plain Woodland is restricted to the Sydney Basin. The study area is not at the limit of its range.	Cumberland Plain land snail is restricted to the Sydney Basin, but is not at the limit of its range at the study site.	<i>Pomaderris brunnea</i> is not at the limit of its range at the study site.

Part 3A assessment

For completeness of assessment *Step 5: Key Thresholds* of the Draft *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) under Part 3A is also considered for this proposal and this is detailed below.

- ▶ Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

Removal of around 0.3 ha of Cumberland Plain Woodland will be unavoidable and this area has some potential to provide marginal habitat for the Cumberland Land Snail. It is currently weed infested and highly eroded in sections. Maintenance of this area in its current format would provide little value for overall biodiversity although clearing would remove some potential foraging habitat for common bird species.

Revegetation works on, or adjacent to, the waste management area is planned to provide visual amenity and increase suitable areas of habitat for flora and fauna. This would be undertaken with species that are locally native including those representative of Cumberland Plain Woodland. Removal of weed species and revegetation on and around the waste management area is likely to improve overall biodiversity values.

- ▶ Whether or not the proposal, is likely to reduce the long-term viability of a local population of the species, population or ecological community.

There are approximately 28,175 ha of CPW remaining in western Sydney. The proposed works will impact on a small patch of highly degraded and modified CPW (approximately 0.3 ha). Additional CPW to the north-west of this study site is progressively being removed during landfilling activities associated with the current landuse. The understorey has undergone extensive disturbance including invasion by exotic species. In relation to the regional distribution of CPW, removal of this small, low quality patch is unlikely to reduce the long-term viability of this local endangered ecological community.

The shell of one Cumberland Land Snail has been recorded at the site. The proposal will result in the removal of 0.3 ha of degraded potential habitat for this species. However, additional areas of CPW are available to the south and east of this proposal area. The degraded nature of the site means that this area is unlikely to provide important habitat for this species and it is considered unlikely that this proposal will reduce the long-term viability of a local population of this species.

- ▶ Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

The proposal involves removal of 0.3 ha of Cumberland Plain Woodland which is currently highly degraded and modified. Removal of this area is unlikely to further accelerate the extinction of either CPW or Cumberland Land Snail as it is currently highly degraded and modified and its removal will not isolate interconnecting areas of habitat.

- ▶ Whether or not the proposal will adversely affect critical habitat.

No critical habitat for the Cumberland Plain Woodland or Cumberland Land Snail has been listed in the Register of Critical Habitat kept by the Director General of Department of Environment and Conservation.

15.4.2 Assessment under the EPBC Act

The Cumberland Plain Woodland is listed as an endangered ecological community under the EPBC Act. This community was considered under the Part 5A assessment undertaken in accordance with the EP&A Act. Six of the eight criteria provided under the EPBC Act *Administrative Guidelines for Significance* are similar to criteria used for assessment under the EP&A Act. Hence it is not considered that the proposal would:

- ▶ Lead to long-term decrease in the size of a population;
- ▶ Reduce the area of occupancy of species;
- ▶ Fragment an existing population into two or more populations;
- ▶ Adversely affect habitat critical to the survival of a species;
- ▶ Disrupt the breeding cycle of the population; or
- ▶ Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline.

Additional significant impact criteria include:

- ▶ Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat; or
- ▶ Interfere with the recovery of a species.

This area is currently weed infested. Measures would be implemented to reduce the risk of invasive species becoming established after the area is cleared due to activities associated with the construction and operation of the waste management facility.

The recovery of the CPW and Cumberland Land Snail would not be impeded by this proposal. The area is highly modified and invasive weed species are abundant and it is unlikely to provide important habitat for the Cumberland Land Snail. Consequently, removal of the 0.3 ha area is unlikely to interfere with the recovery of the CPW or Cumberland Land Snail within the locality.

15.5 Recommendations

To limit any potential indirect impacts on adjacent flora, vegetation communities and fauna habitat the following recommendations are proposed:

- ▶ Weeds should be controlled throughout the site to minimise their spread to adjacent areas;
- ▶ Stabilisation of steep banks and bare earth areas should be undertaken as soon as possible after construction or removal of vegetation to limit gully and sheet erosion which could affect adjacent vegetation communities and watercourses;
- ▶ Any revegetation works on, or adjacent to, the waste management area should be undertaken with species that are locally native including those representative of the Cumberland Plain Woodland.

16. Visual Quality

This chapter provides information on the existing landscape and visual quality of the area affected by the proposal. The potential impacts of the proposed development are assessed, and recommended mitigation measures are provided.

The information in this chapter is taken from the findings of a visual impact assessment prepared by Bryant Associates (2005), which is included in Appendix L.

16.1 Study Area

The study area for the assessment was defined by the visual catchment of the proposed development and is shown in Figure 16-1.

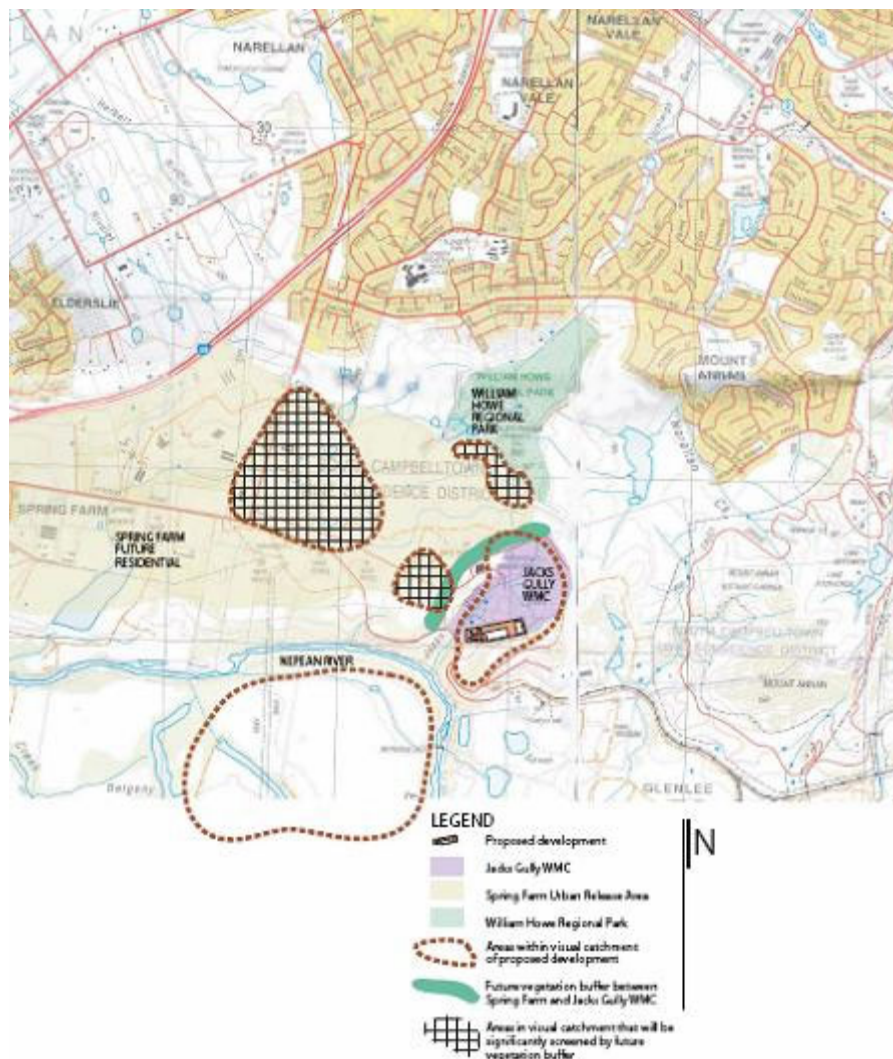


Figure 16-1 Location plan and visual catchment

16.2 Existing Environment

16.2.1 Existing character of surrounding landscape

Numerous residential suburbs have developed in the last 30 years to the north and east of the study area, as shown in Figure 16-2. However, the elevated topography of Mount Annan and other hills to the north, east and south of the site mean that none of these suburbs are within the visual catchment of the proposed development. Mount Annan Botanic Gardens is also screened from the site by the topography to the east of the site.



Figure 16-2 View of Cumberland Plain landscape with Narellan Vale residential area beyond.



Figure 16-3 View of Cumberland Plain rural landscape surrounding Jacks Gully.

Further suburban expansion is currently planned to the northwest in Spring Farm, which will be within the visual catchment of the site in the short term. However, in the long term this will be

screened by a 70 m wide southern perimeter zone of vegetation proposed as part of the Spring Farm Draft Master Plan.

Areas to the west and south remain relatively undeveloped, with rural uses and remnant forests dominant as illustrated in Figure 16-3. Many of these areas are screened from the site by the vegetated ridge to the west of Jacks Gully. Some areas to the southwest near Nepean River may have distant views (>2 km) of the roofs of the proposed buildings.

Camden, a highly significant residential area and heritage estate, is about 3 km from the site, but is screened by intervening vegetation. It is therefore beyond the visual catchment of the site.

There are three distinctive landscape types in the visual catchment:

- ▶ Remnant Grey Box - Forest Red Gum woodland, with an understorey of grasses, is dominant to the north, with remnants to the west. Weed infestations of African olive are common in these areas.
- ▶ Undulating hills to the northwest have been cleared for agricultural purposes and now contain both non-native and native grasses.
- ▶ The waste and recycling centre (WRC) is a distinctive landscape type, having been predominantly cleared of vegetation and subject to major earthworks. This is common in the vicinity, for example in adjoining quarries.

The site for the proposed development is located in the cleared area on the southern perimeter of the existing WRC. It predominantly faces north and west. Within the Jacks Gully WRC, expansive flat topography and steep slopes have been artificially formed in an otherwise undulating landscape. The WRC is predominantly cleared of vegetation and is dominated by heavy earth-moving activities with extensive hardstand areas for stockpiling. It is surrounded by high ridges along the eastern, south-eastern and north-eastern boundaries. A number of industrial-style buildings are clustered at the northern and western end of the WRC.

The site for the proposed building development sits on the north facing side slope of a steep embankment that rises to the south and the east, and falls to the west and the north as illustrated in Figure 16-4.

Some existing endemic vegetation occurs at the top of the embankment to the south of the site. To the west, within Jacks Gully, large and dense vegetation occurs within the creek line.



Figure 16-4 Embankment on east and south of site of proposed development.

16.2.2 Summary of the significance of the existing visual quality of the study area

The proposed development entails earthworks to form a large flat platform on the north facing sideslope of the existing hill. The platform would be approximately 350 m x 100 m. The platform for the proposed development will have a local elevation of about RL 100 and would be all hardstand, with the following new and extensive industrial type buildings:

- ▶ Main Building that would house the recieval hall and the process areas of Separation and Primary Refining, which would have a footprint of 130 m x 46 m and height of 15 m.
- ▶ Tank Farm comprised of approximately 11 tanks including digester tanks, water tanks and a biogas storage tank;
- ▶ Biogas Power Station with generators, transformers and switchrooms; and
- ▶ Tunnel composting plant, which would have a footprint of 70m x 60m and a height of 10m.

When landfilling is complete, most of the proposed built form would be surrounded on three sides by ridge landforms that will be higher than the proposed development.

The proposed land use would not alter the existing industrial landscape type on the site. The form of the development would entail re-use of large areas of hardstand for stockpiling and vehicle movements. The existing access road through the Jacks Gully WRC will be extended to provide the main access to the AWT Facility.

16.2.3 Views to the site

The visual catchment is dominated by natural landscape and rolling hills, with an absence of urban form. This is considered to be of high visual value. View corridors occur throughout the catchment, interrupted only by the undulating hills. The most significant views of the site are considered to be from Spring Farm to the north-west, from William Howe Regional Park to the north of the site, and from the Nepean River area to the south-west.

In considering these view corridors:

- Distant, upward or flat viewing angles tend to render a development less conspicuous, except when development breaks the skyline; and
- Close (<1 km) or downward viewing angles tend to have greater potential impact.

Spring Farm

Spring Farm has views to the southwest, which includes views of the waste management facility. It has the potential to be screened by boundary vegetation. The Spring Farm area currently has very few affected visual receivers. Although future residential subdivision will introduce many highly sensitive receivers, the proposed development would be screened by the planting of the vegetation corridor proposed in the Draft Master Plan for Spring Farm.

William Howe Regional Park

The proposed development would not be visible from the main formal paths within William Howe Regional Park. It would also be screened by topography from the main lookout on Mount Annan. It will be seen only by a few off-track park users, and would be seen in the context of the existing WRC and other quarries. These receivers will be few in number but highly sensitive.

The proposed Spring Farm vegetation corridor will mostly screen this low number of receivers, with only fragments of roofs visible. Therefore, any visual impact would be of low significance. The embankments to the south of the proposed facility should be planted with vegetation to ensure that if roofs are seen, they would have a backdrop of greenery.

Nepean River

The proposed development would be visible in fragments from clearings near the River. Screening by vegetation would mean that it would be unlikely that any highly used areas would be exposed to significant views. If seen, only parts of the proposed buildings would be seen below the ridge line behind, and would thus not be prominent. The low user numbers will be significantly screened from the proposed facility with a visual impact of low significance.

16.3 Impact assessment

The most significant adverse impact of the proposed development would be on views from the north, northwest and southwest. The composition of views over the existing site activities would be sustained with the proposed development. The impact is considered to be low because:

- All views to the site are currently distinguished by the existing earthmoving activities and industrial buildings of the site and the adjoining sites, which would be sustained;
- The proposed development of Spring Farm would, in the long term, be accompanied by significant screen planting, which would screen the proposed development from Spring Farm views;
- In time, the future landfilling operations of the WRC would screen some of the views from most of William Howe Regional Park; and
- Views from the Nepean River have very few sensitive receivers, and view compositions will be altered in very minor manner.

Both in the short term, and in the long term, the proposed development would have minimal impact on sensitive receivers.

16.4 Mitigation measures

16.4.1 During Construction

Construction activities would entail large earthmoving works. Drainage and hydrological impacts would be contained by effective construction practices. The landscape impacts need to be managed so that the existing buffers around the site are kept in place and the new landscape treatments are undertaken as soon as possible. The period would entail no additional adverse impact, as the whole of the WRC is operational with heavy plant and earthmoving equipment.

16.4.2 During operation

The proposed development is considered to be acceptable in terms of visual impact. Some strategic tree planting could enhance its visual quality.

A variety of canopy heights will ensure the proposed development is seen amongst a backdrop of natural vegetation from William Howe Regional Park. This vegetation should follow the southern boundary of the waste and recycling centre and provide a visual, physical and ecological link between Mount Annan and the Nepean River. Controls should define the floral mix to ensure endemic systems are promoted. The embankment should meander like existing topography, rather than following a consistently engineered alignment.

16.4.3 Cumulative Impacts

Landscape and visual impacts are not generally quantifiable, so it is not possible to assess the cumulative impacts in anything but a qualitative manner. As the development is specifically restricted to land that is already cleared, and as the development will be undertaken in land that is already used for waste management, it is unlikely that the proposed development will form a precedent for further development or extension of the waste management facility.

16.5 Conclusion

The existing uses of the existing site contrast with the high visual quality of the natural landscape areas of the Cumberland plain. The potential impact of the proposed development would be insignificant on vistas from within the catchment. The most important views affected are those from Spring Farm, William Howe Regional Park and agricultural areas beside the Nepean River. However, these views will, irrespective of the proposed development, be marred by waste facility activities and quarrying on adjoining sites.

The future development of Spring Farm will include a 70 m wide buffer zone, which will screen most of the proposed development from north and north-west views. The final landform of the landfill to the north of the proposed development, will also add further screening from William Howe Regional Park. The topography limits the visibility of the site from sensitive receivers to the east and south.

17. Heritage Issues

This chapter provides an assessment of the indigenous and non-indigenous heritage issues associated with the existing Jacks Gully WRC and the potential impact on indigenous and non-indigenous heritage items due to the proposed development.

Information provided in this section is based on the outcomes of a Cultural Heritage Impact Assessment carried out by Waters Historical Consultancy (Waters, 2004), and History Works Consulting Services (History Works, 2004), presented in Appendices M and N respectively.

17.1 Indigenous heritage assessment

17.1.1 Objectives

The indigenous heritage assessment examines the impact of the proposed Jacks Gully AWT Facility on the indigenous heritage qualities of the local environment and on any Aboriginal cultural heritage sites. It considers the methods provided under the *National Parks and Wildlife Act, 1974* for the protection of Aboriginal relics or “sites” and has the following assessment objectives:

- ▶ To carry out background research of relevant material and to review registers;
- ▶ Consider the results of previous consultation with the Tharawal Local Aboriginal Land Council (TLALC) conducted to ascertain Aboriginal views relevant to any proposal to further develop the subject land;
- ▶ To identify whether any aboriginal or historic sites are likely to exist within the area of land which would be affected by the proposed AWT Facility; and
- ▶ To provide appropriate management recommendations for the site.

17.1.2 Site history

The Dharawal (or Tharawal) Aboriginal people were the occupants of the area at the time that Europeans first arrived. They recorded, on the walls of a sandstone shelter nearby, the cattle that had escaped from the first British settlement in 1788, bred and established themselves on the good grazing ground in the district.

When the first squatters arrived in the district after 1800 there was no initial conflict with the local Aboriginal people, however the acceleration of the process of land grants produced increasing tension between the settlers and Aboriginal people, culminating in the Appin Massacre of 1816. Gradually thereafter the number of Aborigines diminished through disease and alienation of their traditional hunting grounds.⁹

The earliest use of the Mount Annan district by European farmers was for cattle grazing. By 1810 John Macarthur held 7000 acres at Camden Park, on the west side of the Nepean River and in 1818 Governor Macquarie granted 3000 acres on the eastern side of the river to William Howe, a Scottish free settler. By 1824, Howe had expanded his operations and occupied Glenlee House (which is still extant, located east of the Main Southern Railway).

⁹ Spackman and Mossop, *Mount Annan Botanic Garden Site Master Plan*, 2000. Vol. 1, pp. 13-19.

The Jacks Gully area was part of the rural lands of the Glenlee estate until it was purchased by the State Planning Authority in 1968. After this, it is understood that the land within Jacks Gully was sold to Clutha Development Pty. Ltd. who quarried the land for sand and shale. In April 1975, the Metropolitan Waste Disposal Authority commenced operation of the Jacks Gully WRC, following several years of negotiations with Camden Council.

The WRC land was leased from Clutha until 1995 when it was purchased by the Authority's successor, the Waste Recycling and Processing Corporation (now operating as WSN).¹⁰ In recent years the former Glenlee estate lands to the north of Jacks Gully have been progressively released for residential development.

17.1.3 Impact assessment

Whilst there is little documentary evidence relating to the Indigenous heritage of the study area after the mid nineteenth century, it is still clear that the Tharawal people continue to express a cultural connection to the general area up to the present day.

The site has existed as an industrial area since the 1950's (as a coal facility) and has since been used as a landfill site for over 25 years. Waters (2004) found that the "the site is highly disturbed and as a result there is little likelihood of the existence of any material cultural heritage traces relating to the period predating its development as a coal facility."

Waters (2004) concludes that "there are no indications of cultural heritage constraints on the proposed expansion works within the Jacks Gully Waste Management Centre" and makes the recommendations outlined below.

17.1.4 Mitigation measures

Waters (2004) made the following recommendations:

- ▶ That the community consultation process, on both material cultural heritage and environmental issues, include representatives of the Aboriginal community including the following groups: Tharawal Local Aboriginal Land Council (LALC), Cubbitch Barta Native Title Claimants Aboriginal Corporation, Winga Myamly, Dharawal Education Centre; and
- ▶ In the event if previously undiscovered Aboriginal sites or relics being located during the proposed works, work in the vicinity would be halted and all potential sites fenced off and reported to (the Department of Environment and Conservation - DEC) for its investigation and to the Tharawal LALC. Such investigation and assessment would result in the development of protection measures appropriate to the assessed significance. This must take place under the National Parks and Wildlife Act, 1974, (Section 90). Work should cease immediately and await advice on appropriate action from the relevant (DEC) staff.

WSN would adhere to all the above recommendations, to ensure that indigenous issues are adequately addressed by the proposal.

¹⁰ Information supplied by WSN .

17.2 Non-indigenous heritage assessment

17.2.1 Scope of assessment

This assessment examines the impact of the proposed Jacks Gully WRC on the heritage qualities of its environment and on any European cultural heritage items nearby. The report follows the standard NSW Heritage Office methodology of examining site history and physical evidence, establishing significance and making recommendations for the mitigation of adverse impacts on heritage significance.

17.2.2 Impact assessment

In the context of the Glenlee-Camden Park cultural landscape the visibility of the Jacks Gully WRC is quite effectively hidden. It should also be noted that the AWT Facility site is highly disturbed and would have virtually no European archaeological potential in itself.

The cultural landscapes associated with the Glenlee and Camden Park estates give the area underlying heritage significance, however Jacks Gully is not an integral component of that significance, provided that the screening effect currently provided by the vegetation in the lower part of the gully is maintained.

Apart from this, there are no items of European heritage in the immediate vicinity of the Jacks Gully WRC identified on the NSW Heritage Office's State Heritage Inventory or the Register of the National Estate.

It is thus concluded that Jacks Gully does not have any "individual" heritage significance. Its lower, vegetated areas are, however, a component of a cultural and natural landscape of exceptional, wider significance and which also includes elements of Aboriginal heritage significance, association with early influential settlers and the exceptional compositions of the architecture and settings of Glenlee House and Camden Park House.¹¹

Given the enclosed nature of Jacks Gully and the lack of site-specific heritage qualities within the WRC it was concluded in the heritage assessment that the proposal will have no adverse heritage impact on the site itself. The consultant (History Works) recommended that vegetation in the lower part of the gully would be used to screen the proposed work from the Glenlee-Camden Park cultural landscape and therefore should be retained. However, landfilling activities will mean that all vegetation in the lower gully will eventually be removed. Once landfilling is completed it will be revegetated.

17.2.3 Mitigation Measures

History Works recommended that appropriate plantings be introduced at the western end of the proposed facility to screen any possible views of the facility from the Nepean River and Camden Park.

WSN would adhere to the recommended mitigation measures, to ensure that heritage conservation issues are adequately addressed by the proposal.

¹¹ Humphreys, *op. cit.* State Heritage Register and Register of the National Estate listings for Glenlee House. Colleen Morris and Geoffrey Britton, *Colonial Landscapes of the Cumberland Plain and Camden, NSW*. Draft final report for the National Trust (NSW), 2000. Criteria used are those for the NSW State Heritage Inventory.

18. Bushfire Assessment

This chapter provides an assessment of the bushfire risk associated with the proposed AWT Facility. An overview of relevant legislation and the proposed fire management measures are also provided.

Much of the information in this chapter is taken from the findings of a bushfire risk assessment prepared by GHD Pty Ltd, which is included in Appendix K of this EA. Information about proposed management measures was provided by WSN.

18.1 Bushfire prone land

A designated Bushfire Prone Land map has been prepared for the Campbelltown LGA. The entire study area has been mapped as supporting Bushfire Prone Land, as shown in Figure 18-1. Therefore it is recommended that the proposed development complies where possible and appropriate with the bushfire provisions within *Planning for Bushfire Protection* (hereafter referred to as 'PBP') (PlanningNSW 2001).

Fire Management Strategies for the site that comply with PBP are described in Section 18.4.

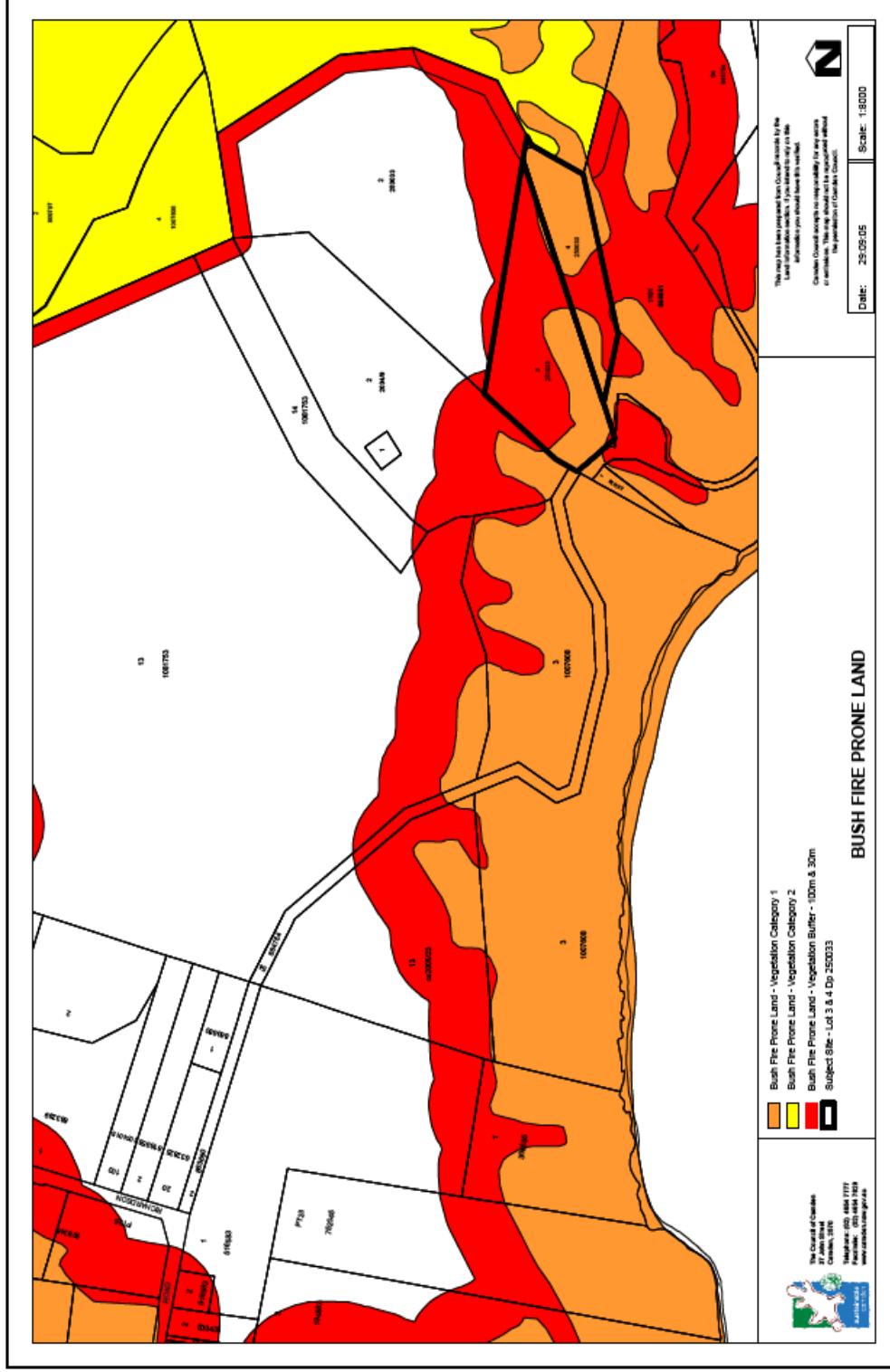


Figure 18-1 Bushfire prone land

Proposed Alternative Waste Technology Facility at Jacks Gully WRC
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18.2 Relevant legislation

18.2.1 NSW Environmental Planning and Assessment Act 1979 and Rural Fire Services Act 1997

The proposal does not require referral to the NSW Rural Fire Service under section 79C of the *Environmental Planning and Assessment Act 1979* (EP&A Act) nor section 100B of the *Rural Fires Act 1997* (RF Act) as neither residential nor rural residential development are proposed for the study area.

Under section 100B of the *Rural Fire Act 1997* authorisation is required for the subdivision of bushfire prone land that could lawfully be used for residential or rural residential purposes or development of land for special fire protection purposes.

However in accordance with section 79C of the EP&A Act, the Department of Planning may choose to refer the application to the Rural Fire Service.

18.2.2 Planning For Bushfire Protection 2001

Whilst the proposed development is not required to comply with the Planning for Bushfire Protection (PBP), it is recommended that the principles of this document be applied to the proposal in order to reduce the threat of fires to both the proposed waste management facility and adjacent lands and property. Principles considered within the document include:

- ▶ setbacks and asset protection zones;
- ▶ siting and access;
- ▶ water supply;
- ▶ vegetation management; and
- ▶ building construction requirements.

18.2.3 Special Protection Developments

There are several classes of development that are constrained by the presence of “high bushfire hazard,” including developments such as aged care facilities, disabled people care facilities, schools and institutions for the mentally disabled. Specific fire-safety requirements are associated with such developments and these need to be considered by a consent authority when assessing development applications.

State Environmental Planning Policies (eg. SEPP 5 Seniors Living, SEPP 9 Group Homes) have been introduced to allow councils to disallow such developments on land that has a “high bushfire hazard.” Given that the site is proposed for industrial development these provisions would not apply.

18.3 Bushfire Assessment

The following Sections describe the potential bushfire risks for the proposed AWT Facility site, based on the guidelines for bushfire risk assessment, as set out in PBP.

18.3.1 Vegetation Communities

Vegetation typically provides the principal source of fuel for bushfires. As vegetation types vary in their ability to provide fuel, PBP provides a number of vegetation type descriptions, each of which is linked to particular hazard ratings. The vegetation of the site and surrounding areas was classed on the basis of an assessment of the vegetation structure based on PBP.

No vegetation exists at the proposed location of the AWT Facility, which is currently an earthen platform that has been created by excavating for landfill cover material. A steep embankment varying from approximately 15m to 30 m in height abuts the construction platform to the south. Some patchy vegetation occurs on top of this embankment and in sections it has been mapped as Shale Hills Woodland.

From the north extending to the east is a steep slope devoid of vegetation, which is a part of the current landfilling operations. The current rock shelf platform slopes down steeply to a stormwater dam, around which Shale Plains Woodland has been mapped.

Approximately 0.4 ha of this Shale Plains vegetation will be removed as part of constructing the engineered platform. Most of the remaining vegetation within the gully will be removed as landfilling progresses.

Vegetation Classes

The corresponding PBP vegetation groups for each of these communities are listed in Table 18-1.

Table 18-1 PBP Vegetation Groups

Area / Vegetation Community	PBP Vegetation Group	PBP Group Number
Construction pad	No vegetation	-
Shale Hills Woodland	Dry Sclerophyll Forest	1
Shale Plains Woodland	Dry Sclerophyll Forest	1

Note: PBP = Planning for Bushfire Protection 2001

18.3.2 Slope

Slopes affect the speed and intensity of bushfires, with steep upslopes carrying a greater hazard than flatter slopes or downslopes. Land on the site has been classified into slope classes (as per PBP) on the basis of its angle over a distance of 140 m. The gradient considered to be the most likely to influence fire behaviour has been used to assess the bushfire risks.

The proposed construction platform is relatively flat. The steep embankment along the southern side of the existing rock ledge has a slope greater than 60°, after which the land plateaus to a slope less than 5°. The existing rock shelf slopes steeply downward towards the northwest and west.

The northern and eastern sides of the proposed engineered platform are more than 100 m from the current vegetation due to landfilling activities and are therefore at limited risk from bushfire. As part of the proposal, the existing platform will be extended and a batter slope constructed on three sides (north, west and southeast).

This will require removal of a small area of the existing vegetation and result in a slope of approximately 45°, which will be devoid of vegetation. The northern and western batters will be covered with landfilled waste material, after vegetation is removed from the gully. This will reduce bushfire risk for the AWT Facility in the longer term.

18.4 Recommended Fire Management Measures

Recommended and required fire management measures are outlined below, including the provision of adequate Asset Protection Zones (APZs), site access and water sources.

18.4.1 Asset Protection Zones

Asset Protection Zones act as a buffer between the development and the hazard and are the principal protection mechanism. APZs reduce the vulnerability to fires through construction and maintenance of an Outer Protection Area (OPA) and an Inner Protection Area (IPA) (PlanningNSW 2001).

Vegetation types (e.g. woodland or forest) present different levels of fire hazard. The level of fire hazard also varies with slope and aspect. Those recommended for this project are listed in Table 18-2.

Table 18-2 Recommended APZs for AWT Facility site.

Location	Required APZ
South of proposed facility	20 m from edge of structure – 20 m IPA & 0 m OPA
North and east of proposed facility	70 m from edge of structure – 60 m IPA & 10 m OPA
West of proposed facility	70 m from edge of structure – 60 m IPA & 10 m OPA

Note: IPA = inner protection zone, OPA = outer protection zone

The construction envelope is a bare earthen platform, which slopes down steeply to the existing landfill area to the north and west. These slopes are devoid of vegetation as is the landfill area. These areas would already exceed the requirements for APZs and so no further provisions need apply.

An embankment rises steeply behind the proposed facility at a slope greater than 60° over a distance of more than 20 m. It then flattens out at the top to a slope less than 5°. This area is vegetated with regenerating Shale Hills Woodland. The proposed AWT Facility will be situated more than 20 m from the existing vegetation on top of the embankment and consequently will meet APZ requirements.

The remaining vegetation at the base of the downward sloping batter would be approximately 60 m down an earthen slope devoid of vegetation and the platform would be well above the canopy level of any remaining trees. This would meet the requirements for the IPA. An

additional 10 m of under-scrubbed area at the base of the batter slopes would need to be incorporated into the APZ as an OPA to meet requirements for this section of the site.

The purpose of the OPA is to decrease the fuel level to reduce the intensity of a fire and restrict fire to canopy fuels. This reduces the level of direct flame, radiant heat and ember attack on the IPA. In the absence of any other policy, the recommended fuel level is 8 tonnes/hectare (PlanningNSW 2001).

The OPA at any site should be 10 m wide and be located adjacent to the hazard which begins at the vegetated areas. Any trees and shrubs in the OPA should be maintained in a manner that ensures that the vegetation/fuel load is not continuous. Fuel should be manually removed from the OPA to be piled and burned in a cleared area during low fire danger conditions.

18.4.2 Site Access

The main access to the site for fire fighting vehicles would be through the existing site entrance gate, then along a newly constructed roadway adjacent to the landfill. Fire vehicle access to the AWT Facility would also be possible through a private road in the southwestern corner of the Jacks Gully WRC site. Both roads would meet the following standards:

- ▶ A minimum trafficable width of 4m with an additional 1m wide strip on each side of the road kept clear of bushes and long grass;
- ▶ A passing bay about every 200m where possible, which would be 20m long by 3m wide, making a minimum trafficable width of 7m at the passing bay;
- ▶ The capacity of road will be sufficient to carry fully loaded fire fighting vehicles (approximately 28 tonnes or 9 tonnes per axle);
- ▶ A minimum vertical clearance of 6 m to any overhanging obstructions, including tree branches;
- ▶ Curves will have a minimum inner radius of 6m and be minimal in number to allow for rapid access and escape;
- ▶ The minimum distance between inner and outer curves would be 6m;
- ▶ Maximum grades would not exceed 15° and would preferably not be more than 10°;
- ▶ Roads would provide sufficient width to allow fire fighting vehicle crews to work with fire fighting equipment around the vehicle.

The second vehicular access road to the site (for fire fighting and emergency evacuation purposes only) would ensure that there are two access roads to the AWT Facility that are unlikely to be cut by a fire simultaneously and therefore ensure there is at least one safe evacuation route. This second road would only be suitable for bushfire access i.e. not of a standard to suit for waste delivery vehicles, and would meet the requirements outlined above.

18.4.3 Water Supply

The dedicated fire fighting system for the AWT Facility comprises two dedicated fire water only storage tanks (300m³ total volume), an electric fire pump and a diesel fire pump, and a fire hydrant main covering the whole site, hose reels and fire engine connection point as required.

Water top up is from the roof stormwater tank. The fire water tanks provide 4 hours of water storage for fire fighting, which would satisfy the Australian Standard. Potable water from the town main would be used to top up this tank as needed. The system would also satisfies

AS2419.1 "Fire Hydrant Installations", AS2941 "Fixed Fire Protection installations – Pumpset Systems" and the Building Code of Australia.

There would be two fire pumps - an electric fire pump and another diesel powered pump that can be used in the event of a power failure due to a bushfire.

18.4.4 Building Design, Materials and Construction Standards

PBP provides guidelines for construction standards for bushfire protection (Australian Standard 3959 – 1999). These guidelines are designed to reduce the risk of property damage from burning debris and radiant heat. Based on the vegetation type present adjacent to the proposed platform, the Category of Bushfire Attack would be high and therefore Level 2 (AS 3959 – 1999) Construction Standards would normally apply.

Given that the proposed development does not involve construction of a dwelling or residential building some of these provisions are not applicable. However, most importantly, combustible materials likely to be impacted by radiant heat would not be used in construction of the facility. Given that the facility will be constructed from metal sheeting and that all storage, equipment and working areas would be contained within large metal buildings, this requirement would be met.

18.5 Additional Recommendations

A Bushfire Management Procedure document exists for the Jacks Gully WRC (CO-PCD-023a). This document would be updated to reflect changes to the landuse on the site including updating evacuation procedures for personnel located at the proposed AWT Facility.

19. Socio-Economics

This chapter describes the existing socio-economic environment of the Jacks Gully WRC site including the existing demographic, socio-economic and employment profiles. It also describes the potential socio-economic impacts from the proposed development and relevant mitigation measures.

19.1 Existing Environment

19.1.1 Land Use and Property

The Jacks Gully WRC site is an industrial site that receives commercial, industrial, demolition and putrescible waste. The site is adjoined by the proposed Spring Farm urban release area to the west; the Mount Annan urban release area to the north; rural (buffer land) to the east and the Fordham Transport company to the south.

Future residential areas such as Spring Farm will be relatively close to the northern boundary of the site. This will require that environmental impacts associated with the proposed development are successfully mitigated through careful design and the implementation of best practice technologies.

Although the urban development around the Jacks Gully site is increasing, the area is still largely a rural setting with low-density housing. The Jacks Gully WRC is located in an area that has had a long association with resource extraction, waste management, and rural industries.

However, the area is likely to experience significant land use change due to land release as part of the Metropolitan Development Plan (MDP). This will occur in the next 10 years at Mount Annan South with 690 dwellings (current), Spring Farm with a potential 3,900 dwellings and Menangle Park with a potential 4,000 dwellings.

The locality covering Spring Farm, Mount Annan, Menangle Park and Camden South includes agriculture, residential, recreation, commercial, viticulture, dairying, industrial and mining activities. The key facilities in the area are:

- | | |
|---|---|
| ▶ Jacks Gully WRC (WSN); | ▶ National Equestrian Centre; |
| ▶ Glenlee Coal Preparation Plant (Sada); | ▶ Mount Annan Botanic Gardens; |
| ▶ Soil Composting and Recycling Facility (CSM); | ▶ Rural uses including poultry farms at Spring Farm (Mixed Owners); |
| ▶ Fordham Transport Company (Fordham); | ▶ Camden Estate Winery; |
| ▶ Elizabeth Macarthur Agricultural Institute; | ▶ Nepean Substation (Integral Energy); and |
| ▶ Recreational uses at Gundungarra Reserve; | ▶ Residential subdivision. |

There are no major commercial centres in the area. Narellan Vale has a small shopping centre.

19.1.2 Population Characteristics

The proposed development is located in the Camden LGA, which is part of the Macarthur Region. Demographic information for the Camden LGA, Macarthur Region (including Camden, Campbelltown Wollondilly and Wingecarribee LGAs) and Sydney Statistical District (SD) has been collected from the 1996 and 2001 Australian Bureau of Statistics census data and other sources. The information is summarized in Table 19-1 below.

In 2001, the population of Camden LGA was 43,945 people, representing 18.5% of the Macarthur region population (237,425 people). The population of Camden LGA increased from 32,109 people, representing a significant growth rate of 95.5% between 1996 and 2001. Camden LGA was also the fastest growing LGA in the state between 1996 and 2001. Overall, the Macarthur Region also experienced a population increase of 13.4% since 1996, which is also above that of the Sydney SD of 6.8% between this period. These increases are likely to be influenced by urban release areas and increasing residential development in the region.

Table 19-1 Population Figures

Location	Macarthur Region	Camden	Sydney SD
1996	209,295	32,109	3,741,290
2001	237,425	43,945	3,997,321
1996-2001% change	13.4%	36.8%	6.8%

Source: ABS, 1996-2001

The population growth for the Macarthur Region is predicted to increase by 41% to approximately 350,000 people by 2021.

19.1.3 Economic and employment characteristics

Employment opportunities across the region appear to be unevenly distributed, with job opportunities concentrated in particular areas such as Campbelltown. Availability of direct road links via Campbelltown to the south, as well as the planned direct Goods Train link at Minto are positive employment prospects for the region.

The Macarthur region has a high proportion of high income earners, with 38% of the population earning over \$1,200 per week and 59% earning over \$800 per week. The Macarthur Region also has a lower proportion of low income earners compared to the state and national averages (MACROC, 2003). However, in the 2005 March quarter, the unemployment rate for the Macarthur Region was at 8%, higher than the Sydney average of 5.9%.

Table 19-2 compares the labour force statistics of Camden LGA, the Macarthur Region and Sydney Statistical Division (SD).

Table 19-2 Labour force characteristics in Macarthur Region

Characteristic	Macarthur region	Sydney SD
Labour force participation rate	64.7	61.4
Employed full time	62.8	63.5
Employed part time	27	27.5

The Macarthur Region displays a growing diversity of its employment base with a high proportion of people employed in manufacturing and retail sectors. In 2001, the main industries of employment in the Macarthur Region were manufacturing, retail trade, property and business services, construction and health and community services. Camden LGA also demonstrated a similar economic base.

Whilst the manufacturing industry was the main employment base in 2001 for both Camden LGA and Macarthur Region, employment in this industry increased in Camden LGA, albeit decreasing across the region as a whole. Key employment shifts in the region between 1991 and 2001 were:

- ▶ The proportion of people employed in the manufacturing sector declined from 17.2% to 16.4%;
- ▶ The proportion of people employed in the retail trade increased from 12.9% to 15%;
- ▶ The proportion of people employed in the property and business services increased from 6.3% to 9.1%.
- ▶ The proportion of people employed in construction increased from 6.7% to 8.4%; and
- ▶ The proportion of people employed in health and community services increased from 6.5% to 8.17%.

These changes are evidence that the industrial base of the region is diversifying and increasing numbers of people are employed in services industries such as property, retail and community services. This slight broadening of the industrial base increases the range of employment opportunities for residents in the region and makes it less susceptible to downturns in any particular industry. In addition, the productivity in the Smithfield-Wetherill Park industrial corridor has remained constant, whilst the new industrial complex at Minto-Ingleburn continues to develop.

The most common occupations of people in the Macarthur Region are clerical, sales and service workers (19.4%), followed by tradespersons and related workers (14.6%) and professionals (12.7%). Camden LGA also demonstrates a major proportion of its workforce in these occupations.

Literacy/numeracy and integrated vocational language learning across all industries remain critical training issues, as well as the development of apprenticeships and traineeships (with sustained literacy & personal development support), which are key features of the youth unemployment problem.

19.2 Assessment of socio-economic impacts

The proposal has the potential to give rise to both positive and negative socio-economic impacts. Negative impacts on the local community would generally be restricted to the

construction phase and would be related to the traffic generation, which could impact on the amenity of the environment. These potential impacts would be associated with noise, air, and odour. These issues and proposed mitigation measures are addressed in the specific chapters within this EA.

Potential positive impacts include:

- ▶ Generation of 30-50 jobs in the short term related to construction activities;
- ▶ Generation of 40 jobs in the long term to operate the facilities;
- ▶ Stimulation of the economy through the flow-on effect of investment related to construction activities and ongoing operation of the AWT Facility; and
- ▶ Long term environmental benefits for the broader community due to the proposed alternative waste management practices and elimination of putrescible waste landfilling on the Jacks Gully WRC site after 2007.

19.2.1 Population growth and community structure

As indicated above, the population of the Macarthur Region has experienced a higher than average growth rate, with the Camden LGA population increasing significantly by 36% between 1996 and 2001. The proposal would assist in catering for this growth and enhancing community structure by providing employment opportunities for the local and regional workforce both in the short and long term.

There has emerged a broad based and growing community desire to stop landfilling and promote more ecologically sound waste management practices such as recycling. The proposal will build upon this desire by providing an AWT Facility and will aim to minimise environmental impacts on nearby future residential areas.

19.2.2 Amenity

The long term use of the site for the proposed AWT Facility will need to be in accordance within a strict regulatory environment to ensure that the amenity of nearby future residents is not compromised.

The release of land adjacent to the Jacks Gully WRC creates the potential for community concerns about noise, odour, traffic and visual impacts associated with the AWT Facility, due to the close proximity of residences to the WRC site.

There is unlikely to be any significant construction impacts on the local residential amenity of the area, as construction of the proposed AWT Facility will occur prior to the occupancy of proposed residential lots, in the Spring Farm and Mount Annan South release areas. Implementation of the Construction EMP would ensure that environmental impacts are minimised during the construction stage of the AWT Facility.

19.2.3 Access

The proposed AWT site has a private road access that links with Richardson Road, Springs Road and the Camden Bypass, which is a major collector road in the Macarthur Region. According to the traffic assessment in Chapter 12, there will be additional traffic demands on the intersections of Glenlee, Springs Road and Richardson Road during construction (12 months). This may create some short-term inconvenience for residents in the new land release areas.

There will be a reduced number of trucks and a slightly increased number of private vehicles (employees) accessing the site during operation. The impact on the road network surrounding the site is likely to be further reduced in the long term, by the construction of the proposed arterial road linking Spring Farm to Camden Bypass. This will reduce the number of heavy vehicles using Springs Road, Richardson Road and Macarthur Road and the subsequent impacts on accessibility and amenity for nearby residential areas. The date for completion of this road is not known.

It is recognised that there is no public transport access for employees working at the proposed facility. However, this is the case for many remote workplaces. This could be partly overcome by encouraging workers to car pool, or if sufficient demand exists, operating a shuttle bus service from the nearest railway station.

19.2.4 Community facilities and recreation areas

The key recreation facility within close proximity of the site is the Mount Annan Botanic Gardens. A buffer zone located between the site and the gardens could mitigate any potential amenity impacts on this area. Accessibility to this area would not be impacted by the proposed development.

19.2.5 Public health

The potential health risks to the public associated with the operation of the AWT Facility are minimal as the general public will not have access to the facility, unless on organised tours under WSN supervision. Implementation of correct operating and control procedures would minimise the potential health risks to site workers, who are members of the wider community. Public health risks associated with the proposal are addressed in Chapter 23.

19.2.6 Employment

Currently about 18 employees operate from the site. When the AWT Facility is fully operational, it is likely to employ an additional 40 full time workers. Therefore the proposed development provides limited but suitable employment opportunities.

It is anticipated that the contractor appointed by WSN to build the AWT Facility would use a combination of labour sourced from the local area and from the wider Sydney Region to undertake the proposed construction of the AWT Facility.

There would be employment opportunities (30-50 jobs in the short term) during the estimated 12 month period of construction of the facility. Positions available would include:

- ▶ Construction machinery operators;
- ▶ Truck drivers;
- ▶ Site foremen and labourers;
- ▶ Crane operators;
- ▶ Building erectors;
- ▶ Concreters; and
- ▶ Electrical and mechanical tradesmen and assistants; and
- ▶ Operational staff.

Employment opportunities within the local area during operation of the facility would include:

- ▶ Supervisory staff;
- ▶ Office staff;
- ▶ Machinery and forklift operators;
- ▶ Truck drivers;
- ▶ Electrical and mechanical tradesmen and assistants; and
- ▶ Operational staff (pickers and labourers).

19.3 Mitigation Measures

Specific mitigation measures to minimise potential impacts on the local community associated with land use, traffic and access, landscape and visual, odours and noise are detailed in the relevant Chapters of this EA.

A consultation and communication plan would be developed covering the local residents and wider community. The plan would detail activities to be implemented in the lead up to, and during implementation of the proposal. This is discussed in Chapter 4.

20. Waste Minimisation and Management

This chapter describes the waste management procedures associated with the proposed development including disposal requirements, measures to prevent the generation of wastes and/or measures to reduce, re-use or recycle wastes where possible.

20.1 Construction

Waste generated during construction would include the following:

- ▶ Soil and vegetation;
- ▶ Construction materials; and
- ▶ General waste and recyclables from construction workers.

20.1.1 Soil and Vegetation

Since approximately 212,000 m³ of fill is required for construction of the engineered platform, any soil and rock excavated on-site would be utilised on the site for filling purposes. Vegetation cleared from the site would be diverted to the existing garden organics processing area at Jacks Gully WRC, where it would be mulched for on-site landscaping uses.

Topsoil excavated from the site would be segregated from underlying clays and less fertile soils, and would be stockpiled for use in landscaping and noise mitigation bunds.

20.1.2 Concrete

Waste concrete generated by construction activities or unearthed during excavations would be stockpiled on-site for campaign crushing and conversion into road-base and other building products.

20.1.3 General Waste and Recyclables

General waste generated by construction workers would be disposed of in the adjacent landfill. Paper and cardboard packaging from construction administration activities would be separately collected for recycling. Recyclable food and beverage containers such as aluminium, plastic and glass would be transported to the relevant existing bins in the small vehicle area on the site.

20.2 Operation

Waste generated during the operation of the proposed development would include:

- ▶ General waste and recyclables from site personnel;
- ▶ Residual waste from the ArrowBio Plant; and
- ▶ Residual waste from the Garden Organics Plant.

20.2.1 General Waste and Recyclables

The estimated 40 site operational personnel would not produce general waste in significant quantities. Garbage and recycling bins would be provided at various locations around the ArrowBio Plant, the Garden Organics Plant and generally around the site.

Garbage bins would be emptied into the MSW receival hall, for processing through the plant. The small amount of general mixed waste unable to be processed by the ArrowBio Plant would be disposed of in the adjacent landfill. Recyclable food and beverage containers such as aluminium, plastic and glass would also be collected separately, and transported to the existing MRF on the site.

20.2.2 Residual Wastes from the ArrowBio Plant

The proposed AWT Facility is designed to process up to 90,000 tonnes of mixed solid waste per annum, including approximately 34,000 tonnes of commercial waste initially. With expected population growth in the Macarthur region, the amount of commercial waste is expected to decrease, and be displaced by residential waste.

More than 75% of the total incoming waste stream would be recovered and diverted from landfill. This represents a significantly high proportion of total incoming mixed solid waste being diverted from landfill.

Approximately 19,170 tonnes of recyclables would be recovered from the waste stream by the ArrowBio Plant each year and sent to the existing MRF on-site, and the residuals would be disposed of in the adjacent landfill. Approximately 22,440 tonnes of residuals and rejects would be landfilled on-site.

20.2.3 Residual Wastes from the Garden Organics Plant

Garden organics sourced from kerbside collection, drop-off facilities or commercial sources will contain some level of physical/visual contamination, which needs to be removed. These contaminants will be manually removed and placed into bins.

After the tunnel composting process, the resulting product will be screened to remove any remaining physical and visual contamination as well as any light items such as plastic film and non-decomposed fibre.

Any recyclable items removed such as metal pieces or glass bottles will be sent to the existing MRF on the site. Other non-recyclable contaminants will be sent to the adjacent landfill for disposal. This is estimated to be of the order of 1,200 tonnes/annum.

20.2.4 Proposed landfilling rates and landfill life

Jacks Gully WRC landfill currently receives 210,000tpa of putrescible waste and 40,000tpa of dry and other wastes, totalling 250,000tpa. The proposed development will reduce landfilling to approximately 30,00tpa (residuals and other wastes).

At this reduced landfilling rate, the remaining capacity of Jacks Gully will accommodate residual wastes for the next 15 years.

20.3 Impact Assessment

20.3.1 Construction

The majority of construction waste would be reused on-site, disposed of at the adjacent landfill, or transported from the site to nearby re-processors and recyclers.

Construction activities at the site are not expected to impact significantly on the waste management operations and waste minimisation goals of the region.

20.3.2 Operation

Waste generated during the operation of the proposed development will be reused and recycled where possible. The remaining waste would be disposed of at the adjacent landfill.

Both the ArrowBio Plant and the Garden Organics Plant will provide high levels of resource recovery and diversion of waste from landfill. The operation of the AWT Facility is expected to assist the participating Councils in reaching the resource recovery and waste minimisation goals of the region.

20.4 Recommended Safeguards

A detailed waste management plan would be prepared for the proposed development as part of the EMP's for both construction and operational phases.

21. Demand on Resources

This Chapter describes the potential resource consumption associated with construction and operation of the AWT Facility, focussing specifically on fossil fuel consumption and electricity demand.

21.1 Resource Consumption

The demand on resources through the operation of the AWT Facility is decreased. Firstly, the waste is redirected away from landfilling and is processed for a higher resource value. The waste is essentially used for electricity production, which means there is a significant savings on non-renewable resources, such as coal, that would otherwise have had to be used to produce this electricity.

The consumption of other resources such as steel, concrete and other engineering materials has not been estimated at this stage.

21.2 Resource Consumption during Construction

Resources consumed during construction of the AWT Facility include fuel and building materials, such as concrete, steel and soil or other material used for construction of the engineered platform. This assessment focuses on energy consumption in the form of fossil fuels and electricity, which is mainly produced from fossil fuels.

21.2.1 Fossil fuels

The major earthworks construction activity associated with this project is the construction of an engineered fill platform from either VENM (virgin excavated natural material, required for daily cover material for landfilling activities), or coal washery reject material or a combination of the two materials, subject to engineering design considerations, availability and cost.

VENM would be sourced from on-site excavation work carried out for the platform, plus material delivered to site by contractors. If daily cover material is required for the landfill, WSN normally permits VENM to be disposed of to the site for a nominal charge, to attract sufficient material for its operational needs.

The heavy equipment required during the construction and operation of the AWT platform would consume significant amounts of fuel and hence release greenhouse gases.

Estimated diesel consumption for mobile plant during the AWT plant construction phase is presented in Table 21-1.

Table 21-1 Construction phase mobile plant fuel consumption

Mobile plant	Diesel fuel consumption (Litres)
3 Bulldozers	171,600
2 Graders	137,300
2 Compactors	114,400
2 Vibratory rollers	114,400
2 Scrapers	137,300
Water cart	44,600
Truck movements	22,300
Total fuel consumption – construction	741,900

(source: based on fuel consumption data for Caterpillar Earthmoving Plant at Newmont Waihi Gold – Martha Mine [online], available: <http://www.newmont.com/en/operations/australianz/wahigold/mining/vehicles/index.asp>).

21.2.2 Electricity demand

The demand for electricity during the construction of the AWT Facility is unlikely to be significant, until plant is installed and it begins to be commissioned. For construction purposes, a diesel generator would provide on-site needs for welding and site facilities. Commissioning of the plant would be undertaken once the permanent external electricity connection to the site is made.

21.3 Resource Consumption during Operation

21.3.1 ArrowBio Plant

Electricity Demand

The ArrowBio Plant would produce about 2 MW of electricity, of which about 1 MW would be used for powering the entire plant during the day and 0.5 MW at night, when only the tank farm is operating. Therefore it would be a net exporter of energy, exporting 50% of the energy it produces during the day, and 75% at night.

According to information provided by Arrow Ecology, the ArrowBio Plant will generate approximately 9.5 million m³ of biogas annually from 90,000 tonnes of waste. As described above, the biogas would be used to generate green electricity, resulting in a net export of energy from the facility.

Table 21-2 presents the expected annual energy balance from the ArrowBio Plant.

Table 21-2 Energy balance per year from the ArrowBio Plant

Plant green energy production	22,300 MWh
Plant (imported) energy consumption	5,500 MWh
Net green energy exported	16,800 MWh

Fossil fuel consumption

Some diesel-powered mobile plant is necessary for operating the ArrowBio Plant, to shift waste within the receival hall, and load the remaining waste onto the sorting conveyors. There would also be an excavator with a grab arrangement to remove the large items before the front-end loader puts the remaining material onto the sorting conveyors.

Table 21-3 shows the expected annual diesel consumption for this plant, based on information provided by Arrow Ecology.

Table 21-3 ArrowBio Plant mobile plant fuel consumption

Mobile plant	Annual diesel fuel consumption (Litres)
2 front end loaders	99,000
1 grabber	23,760
TOTAL	122,760

(Note: information provided by Arrow Ecology)

21.3.2 Garden Organics Plant

Electricity demand

The total power demand of the plant has been estimated to be approximately 0.45 MW, with the tunnel composting aeration system having an estimated electrical demand of 0.3 MW.

While the tunnel composting system operates for 24 hours per day, seven days per week, the blowers run at less than 50% load on average. Further power requirements are due to conveyors, the mixer, pumps and other minor standard consumers such as lighting.

The total electricity consumption has been estimated to be approximately 800,000 kWh per year, equivalent to 13.5 kWh per tonne of garden organics processed.

The Garden Organics Plant would consume approximately 0.45 MW of electricity during the day, and approximately 0.3 MW at night, when only the tunnels are operating.

Fossil fuel consumption

The following mobile equipment will be employed for the operation of the Garden Organics Plant:

- ▶ Shredder (diesel driven)
- ▶ Compost Screen (diesel driven)
- ▶ Front End loader (2, diesel driven)

The total diesel consumption is estimated to be approximately 70,000 litres per year (based on information provided by AP Consulting, the designer of the Garden Organics Plant).

21.4 Resource conservation measures

Fossil fuels would be conserved where practicable during construction and operation of the AWT Facility. During construction, this would take the form of:

- ▶ Selecting appropriate equipment for the job;
- ▶ Throttling down or turning off idle equipment;
- ▶ Regular maintenance of heavy equipment; and
- ▶ Electricity would be conserved during operation of the AWT Facility by designing buildings to be as energy efficient as possible, incorporating natural lighting and ventilation wherever practical. Efficiency of equipment, such as pumps used in the plant, would be an important consideration in its selection, in order to reduce the equipment's life time consumption of electricity.

22. Hazard and Risk

The proposed development has the potential to generate risks and hazards to the surrounding environment, nearby residents and WRC personnel. This chapter identifies these risks and measures to minimize these risks and hazards.

22.1 SEPP 33 Overview and Risk Framework

State Environmental Planning Policy No. 33 - Potentially Hazardous or Offensive Developments (SEPP 33) aims to ensure that appropriate measures are employed to minimise the impacts of developments that are deemed to be either 'hazardous' or 'offensive'. SEPP 33 also outlines matters to be considered by the Consent Authority when assessing hazardous and offensive development proposals and requires that applications be advertised in the same manner as is required by 'designated' developments.

Under SEPP 33, the proposed development is considered as potentially offensive because waste related activities could potentially impact on the surrounding locality, even after measures are taken to reduce or minimise the potential impacts.

However, the development is not considered hazardous, as environmental management controls proposed for the development would limit the potential health risk to workers and surrounding residents and risk to the biophysical environment. Mitigation measures for these risks are outlined in detail later in this chapter.

SEPP 33 requires that potentially hazardous or offensive developments are publicly advertised under the same requirements as for designated developments. As the proposed development is already classified as a designated development, statutory and community consultation has been carried out as per the requirements of the EP&A Act. Consultation activities that will be undertaken for the proposed development are described in Chapter 4.

Matters to be considered by the Consent Authority are contained in Part 3(13) of SEPP 33. These matters are listed in Table 22-1, along with the Chapter of this EA where each issue is addressed.

Table 22-1 Issues for Consideration by Consent Authority

Issue to be considered by Consent Authority in accordance with requirements of SEPP 33	Reference in EA
Current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development.	Chapter 2
Consultation of relevant public authorities concerning environment and land use safety requirements	Chapter 4
Preliminary hazard analysis – for potentially hazardous industries	NA – development is not considered a potentially hazardous industry
Alternatives to the development and justification for the development (including justification of site location)	Chapter 7
Likely future land use surrounding development	Chapter 8

22.2 Impact Assessment

22.2.1 Construction

General Safety Hazards

Safety hazards from the proposed works include operation of heavy equipment for the construction of the platform and management facilities, ground instability due to the excavation and stockpiling of soil and common construction hazards such as heights, stockpiled building materials and mechanical equipment.

The continued operation of the waste management facility during the construction period presents further hazards through waste collection vehicle movements and other hazards such as exposure to landfill gas and pathogenic materials.

Dust

Construction of the proposed platform would result in increased generation of dust around the work areas. Dust may irritate the eyes, nose and throat of construction workers, waste management personnel and visitors to the site.

Noise

Earth moving equipment and other heavy equipment would be used in the earthworks for the proposed platform, and for the construction of the waste management facilities. Health impacts associated with occupational noise are discussed in Chapter 23, and environmental noise impacts are described in Chapter 14. Mitigation measures are also outlined in these chapters.

Traffic

There would be an increased number of heavy and light vehicle movements during the construction of the platform and waste management facilities, as outlined in Chapter 12. This could also increase the likelihood of accidents on surrounding roads.

The dynamic nature of construction sites prevents the establishment of permanent traffic and non-traffic routes and areas, and as work progresses, new vehicle types and work areas will be introduced to the construction environment. Potential hazards associated with traffic will be mitigated via procedures outlined in the construction management plan.

Bushfires

The entire Jacks Gully WRC site is in a bushfire zone, and appropriate precautions will be taken during construction to minimise risks posed by potential bushfires. A bushfire assessment is provided in Chapter 18.

Landfill Gas

The location of the proposed AWT Facility is in close proximity to the existing Jacks Gully landfill site, and consequently there is a potential risk that construction of the facilities on the site could be adversely affected by the lateral migration of landfill gas from the landfill. Although there is the potential for landfill gas migration, WSN currently utilises international best practice techniques for landfill technical design and landfill gas collection and processing. This ensures that all available landfill gas generated from landfill is being effectively managed.

WSN has been actively collecting and managing landfill gas from the Jacks Gully landfill for the past few years. Several of the existing odour/gas management initiatives include: -

- ▶ Effective gas monitoring program (routine surface and sub surface gas monitoring);
- ▶ Gas Accumulation Monitoring within adjacent buildings;
- ▶ Odour Monitoring program – on and off-site odour patrols;
- ▶ Long term contract (25 years) with Energy Developments (EDL) to operate and maintain gas management system. EDL is also responsible for installation of new gas infrastructure in accordance with site filling plans;
- ▶ Active gas extraction and collection system - series of vertical gas wells at depth of 20metres within landfill areas (typically 50m spacing);
- ▶ Gas processing system – one (1) power generation module used to process all landfill gas collected from site. A gas flare is also installed on-site to deal with excess landfill gas and also acts as contingency in event of power station problems. (This ensures virtually no downtime on active gas collection system).

The primary hazards (to human health) presented by landfill gas are ignition / explosion / fire and asphyxiation. Landfill gas typically comprises 40 – 60% methane, which is flammable when in air at concentrations between 5% and 15 % (v/v). Landfill gas also typically contains 40 – 50% carbon dioxide and little or no oxygen. Consequently, should landfill gas accumulate within an enclosed structure, displacing the atmospheric air, the atmosphere within the enclosed structure can present a hazard in regard to asphyxiation.

Landfill gas can travel long distances, through soils and rock fractures, and could potentially enter the strata beneath the AWT Facility, once waste materials are landfilled alongside the platform. However there is currently very little landfilled material alongside the platform, except at its eastern end. This is where the risk would be greatest at present.

An assessment of the risks presented by landfill gas to the construction of the proposed Jack Gullys AWT Facility has been undertaken following the process outlined in the Australian Standard AS4360:2004 Risk Management, HB436: 2004 Risk Management Guidelines, and HB203:2006 Environmental Risk Management Principles and Process.

The risk assessment process and results are described in Appendix O, in Volume 2 of the EA. Proposed mitigation measures are outlined in Section 22.3.1. These recognises the importance and effectiveness of the landfill gas management systems that currently exist on-site, but are designed to provide an additional level of hazard reduction as a contingency measure.

22.2.2 Operation

Flammable Gas Storage and Conveyance

The AWT Facility will generate biogas from waste delivered to the site, and this will be stored in an inflatable gas holder. This gas will be burned in a power generation plant, to generate electricity. LPG gas will be used to heat the digesters in plant start up mode. Areas of the site in close proximity to gas storage are potentially hazardous.

Rupture or leaks from these systems poses risk of oxygen deficiency, fire and explosion. The risk of oxygen deficiency is present in confined areas or areas below ground where there is limited airflow and dispersion. Oxygen deficiency can result in impaired attention, judgement and coordination, and in some cases can cause brain damage, heart damage, unconsciousness and, in extreme cases, death.

LPG and biogas are flammable and therefore also present risks associated with fires and explosions. Fires and explosions could potentially occur where there is an ignition source in a flammable or explosive environment. Ignition sources on the site could include sparks from equipment or power lines and cigarettes.

Potential hazards associated with fires and explosions include:

- ▶ Intense heat and open flames;
- ▶ Generation of smoke and toxic fumes; and
- ▶ Propelled objects.

The above hazards can potentially harm human health and cause damage to site equipment and facilities. There is also the associated risk of fire spreading to the surrounding bushland and starting a bushfire.

Water Hazards

The proposed waste management facility includes large water vats for the conveyance of waste through the recovery processes. Employees or visitors could drown in these vats.

Mechanical Equipment

Mechanical equipment in the proposed waste management facility presents a number of potential hazards to employees and visitors, including:

- ▶ Moving parts;
- ▶ Hot surfaces; and
- ▶ Failure of equipment.

Traffic

Site operations require a high level of waste collection, plant and private vehicle movements. Trucks will regularly deposit waste at the facility, which will require them to enter, manoeuvre and leave. Site operations will require regular and irregular forklift and loader movements at most site areas. Employees and any occasional visitors will use private vehicles to travel to the facility.

Bushfires

The entire Jacks Gully WRC site is in a bushfire zone, and appropriate precautions will be taken during operation of the AWT Facility to minimise risks posed by potential bushfires. A bushfire assessment is provided in Chapter 18.

Landfill gas

The potential risks posed by landfill gas during operation of the AWT Facility are similar to those that will exist during construction, although they would occur over a longer time period. During operation of the Facility, non-putrescible material such as residuals from the AWT Facility will be placed into the landfill adjacent to the platform. This will gradually increase the level of risk associated with landfill gas migration, as it will provide a more direct pathway from putrescible waste that has been placed into the landfill previously, and the platform.

An assessment of the risks presented by landfill gas to the operation of the proposed Jack Gully AWT Facility has been undertaken following the process outlined in the Australian Standard

AS4360:2004 Risk Management, HB436: 2004 Risk Management Guidelines, and HB203:2006 Environmental Risk Management Principles and Process.

The risk assessment process and results are described in Appendix O, in Volume 2 of the EA. Proposed mitigation measures are outlined in Section 22.3.2. These recognises the importance and effectiveness of the landfill gas management systems that currently exist on-site, but are designed to provide an additional level of hazard reduction as a contingency measure.

22.3 Mitigation Measures

22.3.1 Construction

General safety hazards

The risk of injury from safety hazards would be reduced by:

- ▶ Providing safety training and site inductions to site personnel and contractors visiting the site;
- ▶ Ensure work carried out on the site to be conducted by qualified personnel who possess the appropriate licences;
- ▶ Erect signs indicating safety hazards at the site entrance and various locations around the site;
- ▶ Regular maintenance of site equipment and facilities;
- ▶ Ensuring appropriate PPE is available and used by staff who have been trained in its use and applicability; and
- ▶ Good housekeeping on-site including keeping access paths free from obstacles.

Dust

Mitigation measures for dust from general landfill activities are already in place at the site. Excavation works will be conducted in such a way as to minimise dust generation. Water carts will be used for dust suppression and stabilisation of stockpiles. During construction works some workers may be required to wear dust masks.

Noise

Workers operating heavy machinery should reduce the risk of injury from excessive noise by wearing earmuffs or plugs in accordance with appropriate Work Safe procedures. Exposure to excessive noise should be minimised by standing away from noise sources and limiting the use of noisy equipment wherever possible. Shrouding and acoustic barriers will be employed where practicable.

Traffic

Construction plant will be separated from waste management vehicles. All construction plant will abide by site speed limits, remain in designated trafficable areas and be fitted with reversing alarms and beacons. All plant will be maintained as required by OHS regulations. All operators, construction workers, waste management personnel and visitors will be covered by the site traffic plan.

Landfill gas

One of the mitigation measures proposed for reducing the potential risks associated with landfill gas during construction of the AWT Facility is to undertake an assessment and classification of the hazards presented by landfill gas during construction of the AWT Facility in accordance with AS2430 Classification of Hazardous Areas.

A site-specific health and safety plan would be prepared for the construction of the AWT Facility. This would include controls over activities / equipment that present a risk of ignition of landfill gas and regular monitoring for landfill gas. As mentioned previously, the risk level is greatest where material is currently landfilled alongside the platform and this only occurs at the eastern end of the platform. WSN will continue to assess the risks associated with landfilled areas along the platform and will consider all possible gas management options for this area. These include the installation of dedicated gas wells connected to existing gas processing system (power station/flare) and/or installation of suitable gas interception trench, as described in Appendix O of Volume 2.

In the event that a passive gas interception and drainage system is required between the landfill and AWT Facility site, the following system is envisaged: -

- ▶ Interception and drainage system will comprise a layer of suitable aggregate placed under the landfill liner (against the AWT Facility earth platform), and a network of slotted polyethylene pipe placed within the layer of aggregate, which vents freely to atmosphere. (The system would act as a secondary gas collection system and work in conjunction with existing gas collection system i.e. vertical gas wells and power station).
- ▶ Subsurface landfill gas monitoring wells will be located between the landfill and the AWT Facility. Regular monitoring of potential landfill gas migration towards the AWT Facility will be undertaken during the construction period, by taking gas measurements in subsurface wells.

22.3.2 Operation

Bulk Gas Storage and Conveyance

LPG and Biogas storage facilities will be designed and installed by professional consultants, positioned at the appropriate distance from sensitive areas and isolated from other site facilities.

The process design of the gas handling system will ensure that biogas is automatically diverted to the gas flare when irregular low or high pressure is sensed downstream of the blower.

Water Hazards

The risk of drowning in the water vats will be mitigated by the installation of handrails or covers, and the provision of buoyancy jackets and life rings.

Further, the operating plan and safety induction will instruct all employees and visitors how to safely approach and work near all water storages.

Mechanical Equipment

Mechanical equipment will be installed and operated to minimise risk to human health and safety. Hazards will be signposted and isolated by covers and barriers where possible. Employees will be required to wear the appropriate PPE and will be instructed on the hazards and how to approach, work near, operate and maintain all equipment.

These items would be included in the site induction and operating plan.

Traffic

Site roads will be clearly defined and signposted to direct all traffic flow and maintain separation between domestic vehicles, collection trucks and on-site plant movements. All plant will be fitted with reversing alarms and maintained in accordance with OHS regulations. Operators will be instructed on-site hazards, speed limits, designated traffic or non-traffic areas and the site operating plan.

Landfill gas migration

An assessment and classification of the hazards presented by landfill gas during operation of the AWT Facility during operation of the AWT Facility would be undertaken in accordance with AS2430 Classification of Hazardous Areas.

The site-specific health and safety plan prepared for the operation of the AWT Facility would include controls over activities / equipment that present a risk of ignition of landfill gas and regular monitoring for landfill gas.

As mentioned previously, a suitable gas management system (i.e. either dedicated gas wells along site perimeter or passive gas interception and drainage system) will be installed between the landfill and AWT Facility site. Any new gas wells would be designed (closer well spacing) to effectively manage any sub surface gas migration. The interception and drainage system will comprise a layer of suitable aggregate placed under the landfill liner (against the AWT Facility earth platform), and a network of slotted polyethylene pipe placed within the layer of aggregate, which vents freely to atmosphere.

Subsurface landfill gas monitoring wells will be located between the landfill and the AWT Facility and monitored regularly. Regular monitoring of potential landfill gas migration towards the AWT Facility will be undertaken during operation, by taking gas measurements in subsurface wells. In addition, permanent gas detectors would be installed in buildings where there is potential for landfill gas to accumulate. A Gas Accumulation monitoring program will be also be developed to measure effectiveness of the installed gas collection and processing system.

23. Health

This chapter outlines the potential health risks associated with construction and operation of the proposed AWT Facility. Mitigation measures are also discussed in this chapter.

23.1 Potential health risks

23.1.1 General public

As the AWT Facility will not be accessible to the general public, except on organised tours and under WSN supervision, the possibility of members of the public coming into contact with waste is negligible. Therefore potential health risks associated with the facility would be confined to site workers.

23.1.2 Local residents

Health risks to the surrounding residents from the operation of the proposed AWT Facility would not be increased compared with the operational landfill, as delivery and handling of waste would occur indoors, with little chance for potential airborne hazards to escape.

Health risks could potentially also arise due to changes in environmental quality of the surrounding area, due to air emissions, noise and traffic impacts. Potential impacts and proposed mitigation measures are discussed in relevant chapters of this EA:

- ▶ Traffic safety and accidents – discussed in detail in Chapter 12;
- ▶ Air quality – discussed in detail in Chapter 13; and
- ▶ Noise Assessment - discussed in detail in Chapter 14.

These chapters have not identified any significant issues that would cause negative health impacts on residents.

23.1.3 Site workers

Site workers face potential health risks if they are involved with either construction or operation of the AWT Facility. These risks are discussed in the following sections.

23.2 Potential Construction Health Risks

The main construction activities associated with the AWT Facility are: (1) building the engineered platform and access road, (2) constructing buildings and tanks, (3) installing equipment inside and outside the buildings and (4) connecting external services to the site.

All potential health risks associated with all activities that occur during the construction phase of any project would be identified in a Construction Occupational Health and Safety (OHS) Plan.

23.2.1 Biological hazards

One potentially hazardous activity on the site that is not normally associated with a construction project, and needs to be specifically addressed is the excavation of existing waste material, to provide geotechnical stability for the platform. Handling of the waste materials could lead to potential health risks.

However, this work would be undertaken by WSN site staff, who are familiar with the health risks associated with exposure to putrescible waste through their daily work at the landfill, and would therefore observe OHS and occupational hygiene procedures to minimise the potential of adverse health effects.

23.2.2 Dust

Dust minimisation measures on the site during construction would be addressed as part of the construction EMP. A water cart would be used to dampen areas of exposed soils and unsealed roads, to keep dust levels to the minimum practicable.

23.2.3 Occupational Noise

Noise from the use of heavy equipment during construction of the facility could have potential health impacts including:

- ▶ Workers being startled, annoyed, or distracted;
- ▶ Physical damage to the ear, pain, and temporary or permanent hearing loss; and
- ▶ Communication interference that may increase potential hazards due to the inability to warn or be alerted to danger.

These risks would be mitigated by use of personal protective equipment when working near noisy equipment and barricades preventing people on foot going into areas where large noisy machines are working, unless all machines are stopped.

23.3 Potential Operational Health Risks with Waste Facilities

Potential health risks to site personnel associated with the operation of the proposed AWT Facility are mainly due to possible biological and dust hazards, and occupational noise. These risks are further discussed below.

23.3.1 Biological Hazards

Biological hazards associated with the operation of waste facilities include potential exposure to:

- ▶ Pathogens – microorganisms such as bacterium, viruses, and fungus that cause disease in animals, plants or humans;
- ▶ Mutagens – agents that can induce or increase changes to the genetic DNA of cells and organisms;
- ▶ Teratogen – agent that can cause physical defects in a developing embryo; and
- ▶ Carcinogens – substances that increase the risk of cancer.

Exposure pathways for biological hazards include inhalation, ingestion, and absorption through the skin. Staff working in the AWT Facility could potentially come into contact with biological

hazards through touching waste or breathing in air containing harmful substances. However, the level of hazard would be similar to those in existing facilities operated by WSN (transfer stations and material recovery facilities), for which only limited data is available.

23.3.2 Dust

Exposure from general atmospheric dust, ground dust and dust originating from the waste (such as paper and cardboard dust) is a potential health risk to workers at waste and recycling facilities. Inhalation of dust can cause respiratory problems, particularly from prolonged exposure to fine particulate matter.

The recommended maximum exposure level for dust is 10 mg/m³ TWA (time weighted average) measured as inspirable dust, over an 8 hour day, 5 day working week (NOHSC, 1995). This level assumes that there are no specific impurities in the dust that might be toxic at lower concentrations.

Hibbs & Associates Pty Ltd conducted dust monitoring on 10 August 2005 at the existing materials recycling facility (MRF) at the Jacks Gully site. This MRF processes kerbside collected recyclables from the local area. While these materials are not the same as putrescible waste, there are common components such as paper that could generate similar levels of dust.

Two workers wore portable sampling pumps that collected dust over an 8 hour shift, on a single day. The measurements were fairly consistent between the two workers, 1.4 and 1.5 mg/m³, and well below the 10 mg/m³ criteria. The readings give some idea as to the levels of dust that a typical worker on a picking line might be exposed to in the AWT Facility.

23.3.3 Occupational Noise

Personnel working in the proposed AWT Facility would be exposed to noise from the sorting machines and other large processing machinery. The criteria for occupational noise exposure are specified in the *OHS WorkCover NSW Regulation 2001 – Division 4, Noise Management*. They are that a workplace is considered to be unsafe and a risk to health if any person is exposed to noise levels that:

- ▶ Exceed an 8 hour noise equivalent of 85 dB(A), or;
- ▶ Peak at more than 140 dB(C).

If a workplace exceeds these levels, engineering measures have to be considered to reduce such noise levels. Workers also need to wear personal protective equipment eg earmuffs or earplugs to limit their exposure.

There is very little data available on what typical noise levels are in AWT Facilities, so measurements taken at other WSN facilities have to be used to provide some guidance.

Hibbs & Associates Pty Ltd conducted noise monitoring on 10 August 2005 at the existing materials recycling facility (MRF) at the Jacks Gully site. Two workers working on the picking line wore personal noise dosimeters attached to their collars over an 8-hour shift. The measurements recorded averaged between 90 - 93 dB(A). Hibbs recommended that engineering controls be reviewed and that all workers in high noise areas should wear hearing protection devices.

These measurements suggest that one of the highest noise exposure areas is the picking line and that this should be designed with low noise machinery where possible. However since

Hibbs collected no data on noise levels in the more mechanised processing area of the MRF, this study does not provide information on what noise levels could be expected in the processing area of the AWT Facility.

23.4 Health Assessment for ArrowBio Plant

23.4.1 Biological hazards

The level of health risk would be greatest (although still quite low) for personnel working in the MSW waste delivery and sorting area, where materials are delivered from council trucks and spread out on the floor to permit large objects to be physically removed. Waste delivered to this area would contain a mixture of organic materials such as food and nappies, and non-organic materials such as plastics, metals, and other debris.

Within the receival hall, there will also be physical sorting stations where workers can remove medium sized items such as pieces of cardboard for recycling and other non recyclable items that are not compatible with the ArrowBio Plant (such as pieces of foam and garden waste) for disposal. These workers are at the greatest risk of being exposed to biological material, however they would be instructed to only remove items that are clearly non organic, and leave all other items on the conveyor for processing through the trommel screen and bag opener.

In the main processing area, there is some potential for workers to be exposed to biological material through being splashed with the slurry contained in the main vat, or from drips from conveyors carrying wet material. Good industrial hygiene is therefore of utmost importance. Workers need to wash hands before eating or smoking, and if accidentally splashed, need to wash this off themselves immediately.

There is very little risk associated with biological hazards in the tank farm, apart from accidental contact with the slurry while doing routine maintenance on tanks and pumps.

23.4.2 Dust

There is a potential for workers in the receival hall to be exposed to dust due to movement of the excavator within the receival hall, as it segregates waste and loads it onto the conveyors.

However, it should be recognised that the only people with access to this area would be trained WSN staff, and they would be equipped with dust masks. All large objects would be removed using an excavator fitted with a grab attachment, so staff would not physically touch the waste materials. This is a similar situation to what currently occurs at WSN's existing waste transfer stations.

Workers on the picking line may be exposed to dust from paper and other materials on the line. This is a similar situation to what currently exists at the Jacks Gully MRF, and dust masks should therefore be worn, even if exposure levels are likely to be below the threshold (refer previous section).

Occasionally a potentially hazardous object may appear in the waste stream, such as a car battery or a piece of fibro sheeting. This would be removed where possible using the excavator, but if it is a small piece or object, it may accidentally be put onto the picking conveyor. In this case, the workers would be instructed to stop the line and carefully remove the object, taking the necessary steps to safeguard their health as they do so.

In the processing section of the building, the risk of exposure to dust would be minimal as the material is immediately immersed in water. In the tanks farm there is extremely low risk of exposure to dust.

23.4.3 Occupational Noise

In March 2005, GHD took noise measurements at the existing ArrowBio AWT Facility in Israel. This was to gauge the level of occupational and environmental noise expected during normal operating activities and conditions at the proposed AWT Facility.

Two measurements were taken inside the building, one adjacent to a pump in most noisy part of the plant (83 dB(A)), and another near the entrance of the building (77 dB(A)), which was more typical of the noise levels experienced throughout the plant.

Three measurements were also taken near the beginning of the plant, 79, 79 and 80 dB(A). These noise levels were slightly elevated due to the operation of a major waste transfer station immediately adjacent to the ArrowBio facility.

These results suggest that occupational noise exposure due to the plant operations is well within the occupational exposure standard of 85 dB(A) for an 8-hour day. Hence the health risks to workers from occupational exposure to noise, from the proposed AWT Facility at Jacks Gully are expected to be low.

Best practice low noise emitting equipment will be specified in tender documentation and will be selected for this plant wherever possible to minimise potential occupational noise levels. It would be prudent for WSN to carry out a noise assessment once all of the equipment is installed and during commissioning. This would identify any areas where hearing protection needs to be worn, or where engineering measures can be used to reduce noise levels.

23.5 Health Assessment for Garden organics Plant

23.5.1 Biological hazards

The risk of biological hazards for site workers is considered to be relatively low for the garden organics processing facility, as it is mainly handling plant materials. However, handling and storage of biosolids that would be mixed with the garden organics to produce compost, presents a higher health risk, due to the possible presence of pathogens.

The fact that biosolids would be stored in a sealed underground tank would limit the potential for site workers to be exposed to this material. Workers are at most risk during delivery of the biosolids, when the lid of the tank is open and they are at risk of being splashed by the material as it flows into the tank. Industrial hygiene procedures would therefore need to be followed. These include washing hands before eating and smoking.

23.5.2 Dust

Dust can be generated during initial handling of the garden organics, as it contains soil and fine organic materials. If dust is a problem, dust masks may need to be worn when working in the material delivery area, or near the shredder.

23.5.3 Occupational noise

No data on occupational noise in a similar facility is available, however garden organics shredders are often noisy pieces of equipment. Therefore low noise emitting equipment would be selected for this plant to minimise potential occupational noise levels. However, it would be prudent for WSN to carry out a noise assessment once all of the equipment is installed and identify any areas where hearing protection needs to be worn, or where engineering measures can be used to reduce noise levels.

23.6 Mitigation Measures

23.6.1 Biological Hazards

Worker exposure to health risks associated with biological hazards would be minimised by following good industrial hygiene and operational practices. This includes wearing gloves when handling waste and other appropriate personal protective equipment as required, and washing hands before eating.

23.6.2 Dust

Although this potential health risk is considered low, appropriate use of dust masks would help mitigate health risks associated with potential exposure to dust, such as in the receival hall of the ArrowBio facility, and the garden organics processing plant.

23.6.3 Occupational noise

The recommendations from the *Noise and Dust Exposure Assessment Jacks Gully Waste Recycling Centre* (2005) carried out by Hibbs & Associates Pty Ltd included a number of noise control recommendations for the existing materials recycling facility. These would also apply to the proposed AWT Facility:

- ▶ A training programme should be implemented with respect to the dangers associated with excessive noise exposure, the effects of repeated unprotected short duration exposure, and the need, use and care of appropriate hearing protection;
- ▶ Wearing of Hearing Protective Devices (HPD) should be mandatory in high noise areas;
- ▶ Audiometric assessments should be performed for employees who are likely to be regularly exposed to excessive noise. This should be conducted for new employees prior to starting work in noise areas or using noise excessive tools/equipment. Repeat assessments should be conducted on an annual basis; and
- ▶ Following any changes to the plant or process that could significantly impact on noise levels, further noise exposure monitoring assessment should be conducted. Following any changes to the plant or process that could significantly impact on noise levels, a further noise exposure monitoring assessment should be conducted.

24. Greenhouse Gas Impacts

The greenhouse impacts associated with constructing and operating the AWT Facility are assessed in this chapter, taking into account the greenhouse gas credits resulting from generating up to 2 MW of “green” electricity. The net greenhouse gas emissions associated with processing 90,000 tonnes per annum of waste within the AWT Facility over a 15 year time period, and landfilling approximately 25% of the input stream on-site are then assessed.

24.1 Greenhouse Gas Effect

The (enhanced) Greenhouse Effect is caused by elevated concentrations of particular gases in the atmosphere (known as “greenhouse gases”) that cause solar radiation to be trapped within the atmosphere. Elevated greenhouse gas emissions have been linked to a general warming trend in our global climate. The two greenhouse gases that are the most relevant to greenhouse impacts in solid waste treatment are carbon dioxide (CO₂) and methane (CH₄).

Methane is considered to be 21 times more potent (in terms of solar radiation trapping potential) than carbon dioxide. Hence, comparisons of quantities of greenhouse gas emissions are normally related in terms of Carbon Dioxide Equivalents where 1 unit of methane by mass is equivalent to 21 units of carbon dioxide.

24.2 Impacts from Construction of the AWT Plant

The major potential sources of greenhouse gas generation from the construction of the AWT plant have been identified as occurring during the engineered platform construction phase, when approximately 212,000 m³ of fill material would be delivered to site and used to construct the engineered platform. The following activities have been assumed in the analysis:

- ▶ Trucks delivering materials to the construction site along an unsealed road;
- ▶ Travel of a water cart along the unsealed construction roads during dust suppression activities; and
- ▶ Stripping of vegetation and topsoil, excavation of existing rock platform, backfilling and road construction. Typical equipment used includes bulldozers, graders, dump trucks, excavators and water carts.

Table 24-1 AWT construction phase CO₂ emission estimates

Source	CO ₂ Emission Rate		Kilometres travelled	CO ₂ emissions (tonnes)
3 Bulldozers	1000	g/km	17,160	17
2 Graders	1200	g/km	5,720	7
2 Compactors	1000	g/km	11,440	11
2 Vibratory rollers	1000	g/km	5,720	6
2 Scrapers	1200	g/km	5,720	7
1 Water cart	790	g/km	686	1
Truck movements	790	g/km	14,300	11
TOTAL				60

The total emissions from all activities in the construction of the AWT plant are estimated to be approximately 60 CO₂ equivalent tonnes.

24.3 Impacts from Operation of the AWT Facility

24.3.1 Mobile plant diesel consumption in ArrowBio plant

According to the information provided by Arrow Ecology, the following mobile equipment diesel usage is expected within the ArrowBio plant.

2 front end loaders	99,000 litres/annum
1 grabber	23,760 litres/annum
Total	123,760 litres/annum

For each litre of diesel consumed, 2.7 kg/CO₂ equivalent tonnes of CO₂ are produced. Therefore consumption of 123,760 litres of diesel results in 334 CO₂ equivalent tonnes each year being emitted to the environment.

24.3.2 Mobile plant diesel consumption for residual waste movement/landfilling

Another potential source of greenhouse gas generation associated with operation of the ArrowBio plant is placement and compaction of residual waste from the AWT Facility within the landfill. This is estimated to be approximately 25% of the total plant input, or 22,440 tonnes per annum.

Greenhouse gas generation from the waste placement and compaction process is estimated below. Since the residuals are essentially inert, zero gas emissions are assumed once they are placed in the landfill.

Table 24-2 Greenhouse gas emissions from landfilling of residuals from AWT Facility

Source	CO ₂ equivalent emission rate (g/km)	Kilometres travelled	CO ₂ emissions (tonnes)
Waste placement and compaction in landfill	1000	14,600	15
TOTAL			15

24.3.3 Greenhouse gas credits associated with renewable energy export

According to the Australian Greenhouse Office (2004), the emissions resulting from each 1 MWh of electricity produced by a coal-fired power station in NSW are equal to 1.054 CO₂ equivalent tonnes per year.

According to information provided by Arrow Ecology, the annual plant energy balance for the ArrowBio plant receiving 90,000 tonnes of waste per annum is as follows:

Table 24-3 Energy and carbon dioxide equivalents balance

Source	Energy (MWh/yr)	Associated CO ₂ equivalents
Energy generation	+ 22,300	+ 23,504
Energy consumption	- 5,500	- 5,797
Net effect (energy exported)	+ 16,800	+ 17,707

The renewable energy produced by the ArrowBio plant would avoid 23,504 CO₂ equivalent tonnes of greenhouse gases being generated each year in NSW power stations. The plant would need to consume some of this renewable power it produces, or export its entire production and import 5,500 MWh of power from the NSW grid annually. This would result in 5,797 CO₂ equivalent tonnes of greenhouse being generated each year in NSW power stations.

The net energy exported is the most relevant measure of its (positive) greenhouse impact. The net renewable energy produced is 16,800 MWh/yr. This would avoid 17,707 CO₂ equivalent tonnes of greenhouse being generated each year in NSW power stations, which is equivalent to taking approximately 4300 motor vehicles (each travelling 15,000 km each year) off the roads.

24.3.4 Electricity demand from the garden organics composting plant

The total electricity consumption of the garden organics plant has been estimated to be approximately 800,000 kWh per annum, or 800 MWhr per annum.

The emissions resulting from each 1MWh of electricity produced by a coal-fired power station in NSW are equal to 1.054 CO₂ equivalent tonnes per year (Australian Greenhouse Office, 2004). Therefore operation of the garden organics plant would result in greenhouse gas emissions of 843 CO₂ equivalent tonnes of greenhouse being generated each year in NSW power stations.

24.3.5 Fossil fuel consumption within the garden organics composting plant

The total diesel consumption for the garden organics plant for fixed and moving plant is estimated to be approximately 70,000 litres per year. For each litre of diesel consumed, 2.7 kg/CO₂ equivalent tonnes of greenhouse gases are produced.

Therefore consumption of 70,000 litres of diesel would result in 189 CO₂ equivalent tonnes each year of greenhouse gases being emitted to the environment.

24.4 Overall Greenhouse Gas Balance

An overall greenhouse gas balance for the AWT Facility is summarised below:

Table 24-4 Greenhouse gas balance for AWT Facility

Item	Component	Construction (Once off impact)	Operation (Annual impacts)	Green house gas savings from power generation
		CO ₂ equivalent tonnes	CO ₂ equivalent tonnes/yr	CO ₂ equivalent tonnes/yr
ArrowBio plant	Electrical energy demand	-	5797	(23,504)
	Diesel fuel consumption	60	334	-
Garden organics plant	Electrical energy demand	-	843	-
	Diesel fuel consumption	(included above)		
Landfilling of residuals	Fuel consumption	-	15	
TOTAL		60	6,989	(23,504)
NET EMISSIONS		60	-	(16,515)

The above table shows that a total of 60 tonnes per year of CO₂ equivalents from the consumption of diesel fuel will be emitted from the construction of the AWT Facility. This table also shows that from the generation of green energy from the AWT Facility, a total of 23,504 tonnes of CO₂ equivalents will be prevented from being emitted each year during operation.

However, the diesel fuel consumption and electricity demand from operation of the ArrowBio plant, garden organics plant and landfilling of residuals offset this saving by 6,989 tonnes per year of CO₂ equivalents. Hence, the net greenhouse gas impacts of the proposed AWT Facility are as follows:

- ▶ Initial generation of 60 CO₂ equivalent tonnes of greenhouse gases during construction of the facility (on-site impacts only); and
- ▶ Annual avoidance of 16,515 CO₂ equivalent tonnes each year of greenhouse gases, due to generation of renewable energy on-site.

This is equivalent to taking approximately 4000 motor vehicles (each travelling 15,000 km each year) off the roads.

24.5 Avoided Emissions from Waste

The main source of greenhouse gas emissions from the ArrowBio process is CO₂ from the exhaust stacks of the gas power plant. The methane produced in the biological plant is converted to carbon dioxide when it is burnt in gas engines, and this is released to atmosphere, with the carbon dioxide component of the biogas (23% of the total by volume).

According to information supplied by Arrow Ecology, the average composition of the biogas is 77% methane and 23% carbon dioxide. Based on an input of 90,000 tonnes of waste per annum, the amount of biogas produced is 8.8 million m³ per annum. This would be comprised of approximately 6.8 million m³ of methane and 2.0 million m³ of carbon dioxide.

Assuming a density of 0.65 kg/m³, 6.8 million m³ per annum of methane emissions is equivalent to 4420 tonnes of methane. Since each tonne of methane released equates to 21 tonnes of carbon dioxide equivalent, the avoided greenhouse gas emissions from processing waste in the ArrowBio plant are 92,800 CO₂ equivalent tonnes per annum. This is equivalent to taking approximately 23,000 cars (each travelling 15,000 km each year) off the roads.

This means avoided emissions of 1.39 million CO₂ equivalent tonnes over the predicted 15-year life of the facility.

25. Cumulative Environmental Effects

One of the key aims of the environmental assessment is to identify and assess the potential cumulative impacts of the proposed development, and to develop mitigation and management measures to minimise potential impacts. Two types of cumulative impact are discussed in this chapter - the cumulative impacts of the proposal due to the combination of each of the impacts from different elements of the proposal, and the contribution to cumulative impacts in light of other developments within the area surrounding the Jacks Gully WRC.

25.1 General

Cumulative impacts have the potential to arise from the interaction of individual elements within a proposal, or from the combined effects of the proposed development with other external projects. The consequences that may arise from the additive effects of incremental development are usually described as “cumulative environmental impacts” in accordance with Clause 228(2) of the Environmental Planning and Assessment (EP&A) Act - Regulations 2000.

Any cumulative environmental effects of the proposed development with other existing and likely future activities must therefore be taken into account in determining the potential impacts of this proposal. It is important that the air and noise emissions, for example, are not considered in isolation. This is because the potential for cumulative impacts (that is, impacts which may not in themselves be significant, but are significant when considered in association with emissions impacts from other developments), is very important.

To adequately assess cumulative impacts, a common data set needs to be used by all separate studies. In this EA, the air and noise study were based upon the same traffic data values for construction and operations, and used the same meteorological information for modelling. This enables meaningful assessment of cumulative impacts to be made in this EA.

The cumulative impact of the proposed development on current planning for the area (local and regional planning strategies, etc) was also considered.

25.2 Cumulative Effects of the Proposed AWT Facility

Adverse cumulative impacts from the proposed AWT Facility could include:

- ▶ Air quality;
- ▶ Noise;
- ▶ Water quality; and
- ▶ Traffic.

25.2.1 Air Quality

The major other known odour source in the area is the nearby Camden Soil Mix (Glenlee Composting Facility), open windrow garden organics composting facility. This site has generated noticeable odour impacts on the surrounding area and it is currently subject to a pollution reduction program (PRP) as part of its licence under the POEO Act.

As part of the PRP, there is an obligation for Camden Soil Mix to shift its composting operations at the Glenlee Composting Facility southwards and enclose the most odorous operations. Upon

commencement of operation of the Jacks Gully AWT Facilities, there would be a significant reduction of odour associated with the Glenlee Composting Facility sources, either due to its closure (through not meeting PRP conditions), or through relocation and conversion of the facility into an enclosed composting operation, as outlined in the PRP.

Odour impacts associated with operation of the proposed AWT Facility were assessed using an air dispersion model (Calpuff). Results from the modelling show that for 99% of the time the 2 OU contour (the NSW EPA performance criteria for urban areas i.e. a population of more than 2000 persons) is contained well within the boundary of the site.

Thus there is not expected to be any significant cumulative odour impact associated with the Camden Soil Mix facility.

Landfilling volumes will be significantly reduced once the AWT Facility is operational which will result in less dust generating activities than those currently associated with dumping, compacting and covering of waste. Relative to the existing landfilling operations, the proposed development will result in significantly lower (over 90% reduction) dust emissions from the site.

25.2.2 Noise

The noise assessment for the proposed AWT Facility predicted potential noise emanating from the facility. The noise assessment took the operational noise of the existing operations into account and found that the noise emissions from existing sources - the materials recovery facility, the landfill gas power station and landfill operations may become significant once the new residential area was established 70m from the northern boundary of the Jacks Gully WRC site.

Specific measures that focus on each of these noise sources would be most effective in reducing overall noise emissions. For the landfill, this may mean that operational hours could need to be reduced or that smaller/less noisy equipment could be needed to replace the current site equipment. There are also a number of noise reduction measures that could be implemented in relation to the MRF building and the landfill gas power plant.

A new arterial road is planned along the north, east and west of the Jacks Gully WRC site (see Chapter 14). It passes through the 70 m wide buffer zone that separates the planned suburb of Spring Farm from the northern boundary of the Jacks Gully WRC. There is potential for this new road to significantly reduce the noise impacts associated with the existing and future Jacks Gully WRC, because the new road is likely to increase the background sound level at the potentially affected residences.

25.2.3 Traffic

When the AWT Facility is fully operational, it will receive up to 130,000 and process 90,000 tonnes of municipal solid waste annually. There will therefore be a reduction in the amount of municipal solid waste received at the site of approximately 80,000 tonnes annually. However this will be offset by an increase in garden organics and biosolids imported to the site of 30,000 tonnes per year.

In addition, there will be additional heavy vehicle movements associated with removing recyclables and compost products from the site, as follows:

- ▶ Recyclables from ArrowBio plant – 19,170 tonnes/year;
- ▶ Stabilised Sludge/stabilised sludge from ArrowBio plant – 17,370 tonnes/yr; and

- Compost from garden organics plant – 18,300 tonnes/year.

Once the AWT Facility is operational, there will therefore be a net reduction in the amount of waste received at the site, including the delivery of waste to the site and the removal of treated waste, of approximately 100,000 tonnes annually.

This will result in approximately 3,490 fewer trucks accessing the site annually, and a reduction in the number of heavy vehicles accessing the site daily (based on a 5 day collection week, 52 weeks per year) of approximately 13 trucks/day.

25.2.4 Water quality

The proposed AWT site lies almost exclusively within the drainage basin of Jacks Gully, except for land along the north-western boundary of the site (i.e. outside the landfilled areas), which drains into westerly trending gullies. During construction of the platform, stormwater runoff will be collected in temporary sedimentation ponds and treated if necessary to reduce its sediment content. Silt fences and other devices will be used to minimise sedimentation load to the stormwater.

Operation of the AWT Facility will have a negligible or positive impact on stormwater quality leaving the Jacks Gully WRC, since rainwater falling on the platform will likely be re-used on the overall site for operational purposes, such as dust suppression.

Groundwater monitoring indicates that the existing landfill has not had an impact on groundwater quality. Construction of the AWT Facility will not increase this likelihood, and only non-putrescible waste will be landfilled at the Jacks Gully WRC site in future, since only residuals from the AWT Facility and other non-putrescible wastes will enter the landfill.

25.2.5 Overview

Overall, the proposed AWT would result in positive cumulative environmental impacts. The proposed development is consistent with the aims of the *NSW Waste Avoidance and Resource Recovery Strategy 2003*. The proposed AWT would result in positive cumulative impacts on the biophysical, social and economic environment in the area by:

- Development of a new industry in the South West Region of Sydney;
- Creation of new employment opportunities;
- Complimenting and enhancing existing waste/energy recovery and recycling industries;
- Achievement of new benchmarks in waste reduction, recovery and recycling;
- Creation of commercial opportunities in relation to greenhouse gas related credits; and
- Enhancement and optimisation of existing recycling operations and social environment conditions.

Although there are a number of long established extractive, waste recycling and resource industries in the locality, the future development and release of residential land adjacent to the site would increase the potential for cumulative impacts associated with future operations at the Jacks Gully WRC site, including the proposed AWT Facility.

26. The Principles Of Ecologically Sustainable Development

This chapter outlines how the proposed development is aligned with the principles of Ecologically Sustainable Development, including the precautionary principle, inter-generational equity, conservation of biological diversity and ecological integrity, and improved valuation and pricing of environmental resources.

26.1 Introduction

The concept of sustainable development is a framework aimed at achieving appropriate economic and social development, whilst maintaining the long-term integrity of ecological systems. Ecologically sustainable development (ESD) is defined in the Commonwealth Government's *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia, 1992) 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.

To aid interpretation of ESD, guiding principles have been identified. Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* lists the principles of ESD as:

- ▶ The precautionary principle;
- ▶ Inter-generational equity;
- ▶ Conservation of biological diversity and ecological integrity; and
- ▶ Improved valuation, pricing and incentive mechanisms.

A discussion of the proposal in terms of the principles of ESD is provided below.

26.2 Precautionary Principle

The precautionary principle can be defined as the principle that if there are threats of serious or irreversible environmental damage then lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. Whenever applying the precautionary principle, public and private decision makers should be guided by:

- (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- (ii) An assessment of the risk-weighted consequences of various options.

This EA has assessed possible alternatives to the proposal in terms of both environmental risk and other factors such as the financial burden that they would place on either the local or the wider community. Scientific investigations have been undertaken to identify environmental risks, which may be potentially imposed by the proposal.

Investigations have addressed all reasonably anticipated risks associated with noise emissions, air quality (odour and dust emissions), water quality, flora and fauna, traffic, soils and visual amenity. In particular, the visual qualities are well understood, and the potential for adverse impacts to the visual quality of the region is minimal.

None of the risks identified during the assessment of the proposal are considered to pose a threat of serious irreversible environmental damage and wherever risks have been identified, appropriate mitigation measures have been proposed. These mitigation measures would substantially minimise the likelihood of the occurrence of these risks.

26.3 Intra-generational and Intergenerational Equity

26.3.1 Intra-generational Equity

The principle of intra-generational equity requires a “fair” distribution of assets within the members of the present generation. Another way of considering intra-generational equity is to consider the fairness of the distribution of negative environmental impacts or the possible consequences of a development. The objective of the principle requires that the costs or impacts of the proposal be fairly distributed among the population.

Local residents located close to the existing Jacks Gully WRC would be most potentially impacted by the proposal, due to the short-term generation of additional traffic on local roads during the construction period, potential generation of dust from vehicle movements on-site and the occasional risk of emission of odours from the site associated with the existing landfill.

The expected operational impacts of the AWT Facility would be significantly different from those of the current landfill. In some areas, such as odour and dust, the impacts of the AWT Facility would be significantly less than those currently associated with landfilling. Since the urban development of Spring Farm will eventually be within 70m of the Jacks Gully WRC, effective mitigation measures will need to be implemented to minimise noise impacts associated with existing noise sources.

The proposal is considered to facilitate intra-generational equity on a broader scale as it allows for waste, generated within the Macarthur Region, to be disposed of, treated or re-processed within the region. Management of waste materials locally avoids the need to transport unprocessed materials to another region and avoids the imposition of impacts on other communities that did not generate this waste.

The proposal will also reduce the financial impact of increased future landfilling charges (due to programmed increases in the Section 88 Landfill Levy) on the local community and provide it with a greater degree of control over its own future waste management practices (and costs) within the Macarthur Region, rather than an alternative solution which relies on the export of all wastes outside the local region.

26.3.2 Intergenerational Equity

The principle of intergenerational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The AWT Facility at the Jacks Gully WRC would redirect at least 75% of waste it receives from landfill into a potential use with a higher resource value. This will reduce the rate of consumption of valuable landfill space on the existing site, and will also result in material with a low resource value being landfilled instead of material with a high resource value. This reserves some of the valuable landfill space on the site for future generations.

Recovering recyclable materials from a waste stream, that would otherwise have gone to landfill, conserves raw material resources such as iron ore, bauxite and fossil fuels (used for production of steel, aluminium and plastics), and saves trees, due to recovery of paper and cardboard. This is a direct benefit to future generations.

Recycling also captures the embodied energy contained within the recyclates – significantly reducing the energy demand that would be required to manufacture using virgin materials. Generating “green” electricity from the organic component of waste also preserves fossil fuels for future generations. The AWT process is also significantly more efficient at collecting methane compared to existing landfill operations.

As mentioned, some residual product from the MSW facility and contamination extracted from the garden organics processed at the garden organics composting plant will still need to be landfilled at the site. This residual material will only be the non-recyclable residual material that the AWT process cannot utilise and will be relatively inert, resulting in the overall reduction of greenhouse gases such as methane, and landfill leachate. This will reduce the future environmental impacts of material landfilled at the site on groundwater and air quality.

Production of marketable compost by the garden organics plant and a potentially marketable stabilised sludge or soil conditioner from the MSW plant reduces the need for chemical fertilisers, which improves water quality in rivers and streams. Their use may also improve the water retention ability of soils which reduces the need to water plants. This preserves water resources for future generations.

In addition, the AWT Facility would improve local employment potential and contribute to economic growth in the region and provide an important facility with only a minor impact on the local visual environment.

26.4 Conservation of Biological Diversity and Ecological Integrity

The principle of the conservation of biological diversity and ecological integrity requires fundamental consideration in all development proposals.

The majority of the proposed building envelope for the platform currently contains no vegetation, since the area has been used for obtaining daily cover for landfilling in the past. Areas of the proposed building envelope that do contain vegetation are currently heavily weed-infested. One Endangered Ecological Community (EEC), known as Cumberland Plain Woodland occurs immediately to the west of the building envelope and the proposal requires approximately 0.3 ha of this EEC to be removed.

The Woodland provides habitat for a number of fauna species, the vast majority of which are considered common. It also provides potential habitat for the Cumberland Land Snail, which is an endangered species. This EA's ecological impact assessment (Chapter 15) concludes that the proposal would be unlikely to have significant impacts on either the EEC or the currently used habitat of the Cumberland Land Snail, due to the highly degraded and modified nature of the site as a whole.

The proposed AWT Facility will divert significant quantities of waste from potential landfilling. If waste from the Macarthur Region were not to be processed at the AWT Facility, it would need to be sent to another existing landfill outside the region or would possibly require the construction of a new landfill at another site. Construction of a new landfill may require the removal of a significantly larger quantity of vegetation and has more potential to impact on biological diversity

and ecological integrity than the construction of the proposed AWT Facility at the Jacks Gully site, the impact of which is expected to be minimal.

26.5 Improved Valuation and Pricing of Environmental Resources

The principle of improved valuation and pricing of resources requires development proponents adequately account for environmental factors in the evaluation of assets and services, with respect to the development proposal. In practice, improving the valuation and pricing of environmental resources will take account of all the following:

(i) the “polluter pays” principle - that is, those who generate pollution (including waste) should bear the cost of containment, avoidance or abatement.

The AWT proposal is consistent with the “polluter pays” principle. The majority of waste that is currently disposed of in the Jacks Gully landfill is generated within the local government area (LGA) of the four participating councils (Camden, Campbelltown City, Wingecarribee Shire and Wollondilly Shire Councils). The proposal would result in these communities, through rates paid to their respective Councils, bearing the financial cost of managing their own waste.

(ii) users of goods and services should pay prices, which are based on the full life cycle costs of providing goods and services, including the use of all natural resources and natural assets and the ultimate disposal of any waste.

The cost of ongoing management of the landfill would be borne by the four participating councils and therefore indirectly borne by all residents within the Camden, Campbelltown, Wingecarribee and Wollondilly LGAs. Fees charged for waste management in these LGAs would be set at appropriate levels that would pay for the ongoing maintenance of the AWT Facility throughout its whole life cycle.

(iii) environmental goals, having been established, should be pursued in the most cost effective way by establishing incentive structures, including appropriate market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The provision of ongoing waste management receival facilities in the Macarthur and surrounding Region has been recognised as necessary within the overall strategy to manage waste in the area. The alternative to processing and/or disposal of waste within the region is to transport this waste off-site (i.e. outside the LGAs of Camden, Campbelltown, Wingecarribee and Wollondilly).

The cost to the community of continuing to implement this solution would be ongoing and would also be subject to future fluctuations in transportation costs and the “gate fees” set by waste receival facilities within other LGAs. Also, transportation of waste outside the region would not provide the same environmental benefits available through resource recovery. Further, the production of high-grade compost and electricity from biogas as part of the AWT Facility will also help to offset the various costs associated with the operation of the AWT Facility.

27. Statement of Commitments

One of the key requirements from the Department of Planning is a draft Statement of Commitments for the project, which addresses performance criteria, maximum capacity limits, and design measures for environmental control, as well as timing of mitigation measures, monitoring and management regimes.

Maximum capacity limits for the proposed AWT Facility, performance criteria that will be achieved for air quality, noise and traffic and design measures for air and noise control are provided in Table 27-1. Specific mitigation measures and monitoring regimes are outlined in each of the chapters where environmental impacts have been identified. They are summarised in this Statement of Commitments chapter, and grouped according to their expected timing – prior to construction (Table 27-4), during construction (Table 27-5) and during operation of the proposed AWT Facility (Table 27-6).

It should be noted that detailed design and specification of all environmental safeguards and management actions are beyond the scope of this environmental assessment. These will be covered in a Project Environmental Management Plan (PEMP), which will define the procedures to be carried out prior to construction, during construction and in the operational phase of the project.

This would enable the effective management of potential environmental impacts, thereby protecting the surrounding environment. All mitigation measures and monitoring regimes described in this environmental assessment along with any additional conditions of approval specified by the Minister for Planning would be incorporated into the PEMP, which will be prepared in accordance with the requirements of AS/ISO 14001:1996.

Table 27-1 Capacity limits, environmental performance and design features

Issues	Commitments
Maximum capacity limits	The proposed alternative waste technology (AWT) Facility will receive up to 130,000 tonnes of waste per annum process up to 90,000 tonnes per annum of municipal solid waste and transfer up to 40,000 tonnes per annum of waste material off-site. The Facility will also process 30,000 tonnes per annum of separated garden organics, biosolids and other organic materials.
Air quality	Dust deposition in the surrounding area will remain within the EPA guideline limit of 4 g/m²month, measured as average dust deposition rates at all three existing gauges. There will be no exceedances of the 99th percentile 2 odour unit goal in any existing or future residential areas at a distance of more than 70m from the site. Air quality modelling (commissioned by WSN) indicated that odour levels in some parts of the industrial areas to the south west of the site are predicted to exceed the 2 OU criteria, however the main operational areas would meet this 2 OU criteria.

Traffic	There would be short-term increases in traffic and associated traffic noise along roads leading to the Jacks Gully site, mainly over the first 6 months of the construction period, when fill material is being imported to the site, to construct the engineered platform on which the AWT Facility will be located. Since the roads and intersections would operate within their acceptable limits during the construction of the AWT Facility, and the main construction activities would all occur during a 12 month period, no specific mitigation measures are recommended. However a traffic management plan would be prepared prior to construction to minimise the impact of heavy vehicle movements during the period when spoil is being imported to the site. Once the AWT Facility is operational, there would be a net reduction in the amount of waste received at the site, including the delivery of waste to the site and the removal of treated waste, of 100,100 tonnes annually. This will result in approximately 3,490 fewer trucks accessing the site annually, and a reduction in the number of heavy vehicles accessing the site daily (based on a 5 day collection week, 52 weeks per year) of about 13 trucks/day.
Noise from construction	Since the construction period exceeds 26 weeks, the LA10 level in any 15 minute period will not exceed background LA90 level by more than 5 dBA, This design goal of 39 dBA will be achieved at existing residences during the following time periods: ▶ Monday to Friday, 7:00 am to 6:00 pm. ▶ Saturday, 7:00 am to 1:00 pm if inaudible on residential premises, otherwise: 8:00 am to 1:00 pm. Since operation outside these time restrictions would require an 'inaudibility' criterion to be met, noise from construction related activities would be below the night-time typical minimum LA90 noise level of 34 dBA at existing residences.
Noise from traffic	The predicted LAeq(1hour) results indicate that existing traffic noise levels at residences on the collector roads that currently provide site access exceed the ECRTN (refer to Table 27-2) by the order of 5 dBA during daytime and night-time. During both construction and operation of the proposed AWT Facility, any traffic noise increases will be less than 1 dBA above current levels.
Noise from operations	Operational noise levels from the AWT Facility and other future site activities (landfilling, materials recovery facility and existing landfill gas engine) would be less than current noise levels during the daytime, depending upon the receptor location, but slightly higher in the early morning. The Industrial Noise Policy (INP) criteria (39 dBA) would be met at all existing residences at Mt Annan and Narellan Vale. The INP criteria would be met within approximately 650m from the site, but would be exceeded by about 5 -10 dBA at during the day, and 4 dBA at night at locations, within 70m of the northern boundary. There are currently no residences with this proximity to the site.

Design measures for air quality control	Air from the AWT receival hall and process building, and air from the garden organics composting tunnels will be exhausted through biofilters. The effectiveness of these measures will be assessed once the AWT Facility is operating, through a combination of odour measurement and modelling.
Design measures for noise control	To mitigate noise from the existing site facilities and from the proposed AWT Facility operations, the following measures will be implemented: ▶ Management of the landfill and site operations to minimise noise; ▶ Provision of a high performance muffler to the existing landfill gas engine; and ▶ Increasing the height of the north-western bund wall from 4 m to 6 m. The effectiveness of these measures in enabling noise targets to be achieved will be assessed once the AWT Facility is operating, through a combination of noise monitoring and modelling.
Construction hours	In accordance with the Noise Control Manual produced by the NSW Department of Environment and Conservation (NSW DEC), construction activities would be restricted to between 7.00 am and 6.00 pm Mondays to Fridays and 7.00 am to 1.00 pm on Saturdays. No construction work would be undertaken on Sundays or public holidays. Construction work may be permitted outside of the hours specified above, however, this would be subject to consultation with the NSW DEC and Camden Council.
Operating hours	The ArrowBio plant is a continuous process, which operates 24 hours per day, seven days per week, 52 weeks per year. The facility accepts waste seven days per week, with some waste stored in the Receival Hall prior to processing. The AWT Facility will be open 6am to 4pm Monday to Friday for receival of materials and 6am to 2pm on Public Holidays. On weekends, the AWT Facility will be open from 8am to 4pm.

Table 27-2 DEC's Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria Day (7 am-10 pm)	Criteria Night (10 pm-7 am)	Where Criteria are Already Exceeded
New residential land use developments affected by collector traffic noise	LAeq(1hr) 60 dBA	LAeq(1hr) 55 dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
Land use developments with potential to create additional traffic on collector road	LAeq(1hr) 60 dBA	LAeq(1hr) 55 dBA	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria by judicious design and construction of the development. In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2 dB.
Definitions:	New residential development affected by traffic noise – addresses the acceptable level of road traffic noise impact for new residential developments. Land use developments with potential to create additional traffic – addresses the acceptable level of traffic noise impact for existing residences		

Table 27-3 Environmental Noise Emissions – Daytime and Night-time with Control Measures during Acoustically Neutral Meteorological Conditions

Location	Criteria	Predicted LAeq(15 minute) Noise Levels (dBA)	
	Day/Night	Total Daytime	Total Nighttime
1. Henrietta Drive	39/35	31	22
2. Tea Tree Place	39/35	22	<10
3. Cotula Place	39/35	22	12
4. Glenlee House	43/37	18	<10
5. Spring Farm Adjacent ¹	39/35	44 to 49	33 to 39
6. Spring Farm Middle	39/35	39	30
7. Spring Farm Access Rd	39/35	44	38
8. Mount Annan Adjacent	39/35	26	13

Notes 1. The "Spring Farm Adjacent" is located 70 m from the site boundary, to the north west. The range of levels along the nearest row of houses is shown.

Table 27-4 Mitigation measures prior to construction

Issues	Mitigation measures
Environmental impacts on local residents	Impacts associated with construction and operation of the proposed AWT Facility will be managed through the preparation and implementation of Construction and Operational Environmental Management Plans. These plans are described in Chapter 28.
Soils and topography	Erosion will be managed by standard construction practices that will be detailed in the Project Environmental Management Plan (PEMP). All erosion and sediment control measures will be constructed on the site before any works commence.
Climate	The following measures will minimise the potential impacts of adverse or extreme weather conditions on construction: ▶ If possible, excavation and other works which have the potential to be impacted by erosion and sedimentation will be scheduled to be undertaken during low rainfall periods; ▶ A Traffic Management Plan will be developed and will detail measures to minimise the potential impacts of adverse weather conditions such as fog and dust. ▶ The Construction EMP will outline mitigation measures to manage the potential impacts associated with extreme climate such as excessive rainfall, wind gusts, heat or cold.
Water and groundwater	The stormwater collection and disposal system will be designed appropriately for any increases in stormwater volume resulting from sealing of the platform area. All sedimentation dam(s) will be designed in accordance with the Blue Book (Managing Stormwater: Urban Soils and Construction, Department of Housing) – and using the design for the 90th percentile 5 day rainfall duration to determine the settling volume of the dam(s). The criteria used for any pumped discharge of stormwater will be 50 mg/L TSS.
Odour, dust or noise complaints	A complaints recording and response program will be established prior to construction.
Impacts on indigenous heritage	Representatives of the Tharawal Local Aboriginal Land Council (LALC), Cubbitch Barta Native Title Claimants Aboriginal Corporation, Winga Myamly and Dharawal Education Centre will be contacted during the community consultation process.

Socio-economic impacts	WSN will ensure that a consultation and communication plan is developed covering the local residents and wider community. The plan will detail communication tools to be used before and during the development.
Waste minimisation and management	A detailed waste management plan will be prepared as part of the EMPs for both construction and operational phases.
Demand on resources	Buildings will be designed for energy efficiency during operation, incorporating natural lighting and ventilation wherever practical. Energy efficiency will be an important consideration in the selection of equipment.
Hazard and risk	Domestic vehicles, collection trucks and on-site plant movements will be clearly separated. LPG and Biogas storage facilities will be properly designed in accordance with Australian Standards and positioned the appropriate distance from sensitive areas and isolated from other site facilities. Biogas will be designed to be automatically diverted to the gas flare when irregular low or high pressure is sensed downstream of the blower.
Bushfire	The proposed development would be designed to comply with the principles of <i>Planning for Bushfire Protection (PBP)</i> (Planning NSW, 2001) in order to reduce the threats of fires to both the proposed waste management facility and adjacent lands and property.

Table 27-5 Mitigation measures during construction

Issues	Mitigation measures
Construction impacts	The local community will be informed of the commencement of construction work through a newsletter drop with additional notification through local newspaper advertisements.
Soils	Erosion will be managed by standard construction practices that will be detailed in the Project Environmental Management Plan (PEMP), including: ▶ Ensuring that erosion and sediment control measures are monitored and maintained appropriately and according to the EMP; ▶ Restricting traffic to defined roads where possible; ▶ Minimising the areas disturbed by excavation; ▶ Construction of silt fences around stockpiles of topsoil and cover materials to prevent the migration of sediments; ▶ Applying water to active excavation areas and stockpiles where necessary to reduce dust; and ▶ If excess fugitive dust is observed, ceasing work or phasing it down, while the source is being actively investigated and suppression measures are being implemented.

Climate	If possible, excavation and other works which have the potential to be impacted by erosion and sedimentation will be undertaken during low rainfall periods.
Water and groundwater	The following measures will minimise potential impacts on water and groundwater quality: - Construction practices will minimise impacts on stormwater quality, including the collection (and treatment, where necessary) of runoff and the installation of silt fences and other devices; and - Potential issues arising from previous landfilling activities will be managed by regular monitoring of groundwater wells. Stormwater discharges from site and ground water quality will be monitored as part of the existing monitoring program for the overall Jacks Gully WRC site.
Generation of odours during construction	During construction, the following measures will minimise odour generation if waste is excavated during construction (even though this is unlikely): - The extent of excavation and duration of exposure of excavated waste will be minimised, with cover material used where required; - Excavation works will only be undertaken when meteorological conditions are likely to reduce potential off-site odour impacts; - Deodorising agents will be used on highly odorous materials; - A complaints recording and response program will be established.
Generation of dust emissions during construction	The following measures will minimise generation of dust emissions during construction: - Disturbed and unsealed areas (roads, working/ stockpile areas) will be extensively watered; - Grass cover will be maintained wherever possible, including revegetation of disturbed areas as soon as possible; - Excavation works will only be undertaken when meteorological conditions are likely to reduce potential off-site dust impacts; - Dust suppressant chemicals will be used if required. Dust levels will continue to be monitored as part of the monitoring program for the existing landfill operations, using existing dust gauges.
Impacts on flora and fauna	The following measures will minimise indirect impacts on adjacent flora, vegetation communities and fauna habitat: - Steep banks and bare earth will be stabilised as soon as possible after construction or removal of vegetation; - Revegetation works will be predominantly undertaken with species that are locally native, including those representative of the Cumberland Plain Woodland.

Impacts on visual quality	To minimise impacts on visual quality during construction, existing buffers around the site will be kept in place and new landscape treatments will be undertaken as soon as possible.
Impacts on indigenous heritage	If previously undiscovered Aboriginal sites or relics are located during the proposed works, work in the vicinity will cease and all potential sites will be fenced off and reported to the DEC and to the Tharawal LALC. Subsequent protection measures will then be implemented as recommended by the DEC and/or Tharawal LALC.
Impacts on non-indigenous heritage	To minimise impacts on non-indigenous heritage, plantings will be introduced at the western end of the proposed facility that screen possible views of the facility from the Nepean River and Camden Park.
Socio-economic impacts	WSN will ensure that a consultation and communication plan is developed covering the local residents and wider community. The plan will detail communication tools to be used before and during the development.
Waste minimisation and management	A detailed waste management plan will be prepared as part of the planning for the construction phase.
Demand on resources	Fossil fuels will be conserved where practicable. During construction, this will be achieved by: ▶ Selecting appropriate equipment for the job; ▶ Throttling down or turning off idle equipment; and ▶ Regular maintenance of heavy equipment.
Hazard and risk	During construction, the risk of injury from general safety hazards will be reduced by: ▶ Providing safety training to site personnel and visiting contractors; ▶ Ensuring work is conducted by qualified and licensed personnel; ▶ Erecting warning signs at the site entrance and elsewhere; ▶ Regular maintenance of site equipment and facilities; ▶ Ensuring appropriate PPE is available and used by staff; and ▶ Good housekeeping on-site. During construction workers may be required to wear dust masks. Workers operating heavy machinery will wear earmuffs or plugs in accordance with appropriate Work Safe procedures. The use of noisy equipment will be limited wherever possible. Domestic vehicles, collection trucks and on-site plant movements will be clearly separated. All plant will abide by site speed limits, remain in designated trafficable areas and be fitted with reversing alarms. All plant will be maintained as required by OHS regulations.

Landfill gas	Although WSN currently utilises best practice techniques for landfill technical design and landfill gas collection and processing on the site, other precautions will be taken during construction to ensure that there is an extremely low risk associated with landfill gas. One of the mitigation measures proposed for reducing the potential risks associated with landfill gas during construction of the AWT Facility is to undertake an assessment and classification of the hazards presented by landfill gas during construction of the AWT Facility in accordance with AS2430 Classification of Hazardous Areas. A site-specific health and safety plan will be prepared for the construction of the AWT Facility. This will include controls over activities / equipment that present a risk of ignition of landfill gas and regular monitoring for landfill gas. WSN will continue to assess the risks associated with landfilled areas along the platform and will consider all possible gas management options for this area. These include the installation of dedicated gas wells connected to existing gas processing system (power station/flare) and/or installation of suitable gas interception trench. Subsurface landfill gas monitoring wells will be located between the landfill and the AWT Facility. Regular monitoring of potential landfill gas migration towards the AWT Facility will be undertaken during the construction period, by taking gas measurements in subsurface wells.
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Table 27-6 Mitigation measures during operation

Issues	Mitigation measures
Water and groundwater	The following measures will minimise potential impacts on water and groundwater quality: ▶ Wastewater from the ArrowBio processes will be collected and re-used on-site wherever possible, but excess water will either be sent to licenced wastewater treatment plants at other WSN sites (Lucas Heights, Jacks Gully, Belrose), or discharged to sewer (subject to Trade Waste Agreement with Sydney Water); ▶ Potential issues arising from previous landfilling activities will be managed by regular monitoring of groundwater wells; ▶ Runoff from the platform area will be collected and re-used for site operations. Stormwater discharges from site and ground water quality will be monitored as part of the existing monitoring program for the overall Jacks Gully WRC site.

Generation of odours during operation	The following measures will minimise odour generation during operation of the AWT Facility: • All loads of waste will enter the facility in enclosed containers; • Wastes will not be left unprocessed / exposed overnight; • Floors in the MSW Receival Hall and Processing Building will be cleaned daily; • Air from the ArrowBio Plant Receival Hall and Processing Building will be exhausted through a biofilter to minimise odour impacts; and • Air from the garden organics composting process (tunnels only) will be collected and treated via a biofilter. Odour levels will continue to be monitored at the Jacks Gully WRC boundaries as part of the overall monitoring program for the overall waste facility site.
Generation of dust emissions during operation	The following measures will minimise generation of dust emissions during operation: • All site access roads will be sealed / paved (asphalt or concrete); • All waste receival will occur within a partially enclosed building; • All loads of waste will enter the facility in enclosed containers; • All processing operations will occur within the proposed buildings; • All pre-treated waste materials removed from the site will be transported in enclosed containers. Dust levels will continue to be monitored as part of the monitoring program for the existing landfill operations, using existing dust gauges.
Impacts on flora and fauna	The following measures will minimise indirect impacts on adjacent flora, vegetation communities and fauna habitat: • Noxious weeds will be controlled throughout the site; • Steep banks and bare earth will be stabilised as soon as possible after construction or removal of vegetation; • Revegetation works will predominantly be undertaken with species that are locally native, including those representative of the Cumberland Plain Woodland.
Impacts on visual quality	To minimise impacts on visual quality during operation, strategic tree planting will be undertaken within the site, with canopy heights to be varied and controls used to define the floral mix to ensure endemic systems are promoted.

Hazard and risk	Workers operating heavy machinery will wear earmuffs or plugs in accordance with appropriate Work Safe procedures. The use of noisy equipment will be limited wherever possible. Domestic vehicles, collection trucks and on-site plant movements will be clearly separated. All plant will abide by site speed limits, remain in designated trafficable areas and be fitted with reversing alarms. All plant will be maintained as required by OHS regulations. Biogas will automatically be diverted to the gas flare when irregular low or high pressure is sensed downstream of the blower. Handrails or covers will be installed on water vats, and buoyancy jackets and life rings will be provided nearby. The Operating Plan and Safety Induction will instruct all employees and visitors on how to safely approach and work near all water storages. Mechanical equipment will be installed and operated to minimise risk to human health and safety. Hazards will be signposted and isolated by covers and barriers where possible. Employees will be required to wear the appropriate PPE and will be instructed on the hazards and how to approach, work near, operate and maintain all equipment.
Bushfire	The proposed development will comply with the principles of <i>Planning for Bushfire Protection (PBP)</i> (Planning NSW, 2001) in order to reduce the threats of fires to both the proposed waste management facility and adjacent lands and property.

Landfill gas	Although WSN currently utilises best practice techniques for landfill technical design and landfill gas collection and processing on the site, other precautions will be taken during operation to ensure that there is an extremely low risk associated with landfill gas. An assessment and classification of the hazards presented by landfill gas during operation of the AWT Facility during operation of the AWT Facility will be undertaken in accordance with AS2430 Classification of Hazardous Areas. The site-specific health and safety plan prepared for the operation of the AWT Facility will include controls over activities / equipment that present a risk of ignition of landfill gas and regular monitoring for landfill gas. As mentioned previously, a suitable gas management system (i.e. either dedicated gas wells along site perimeter or passive gas interception and drainage system) will be installed between the landfill and AWT Facility site. Any new gas wells will be designed (closer well spacing) to effectively manage any sub surface gas migration. The interception and drainage system (if constructed) will comprise a layer of suitable aggregate placed under the landfill liner (against the AWT Facility earth platform), and a network of slotted polyethylene pipe placed within the layer of aggregate, which vents freely to atmosphere. Subsurface landfill gas monitoring wells will be located between the landfill and the AWT Facility and monitored regularly. Regular monitoring of potential landfill gas migration towards the AWT Facility will be undertaken during operation, by taking gas measurements in subsurface wells. In addition, permanent gas detectors would be installed in buildings where there is potential for landfill gas to accumulate. A Gas Accumulation monitoring program will also be developed to measure effectiveness of the installed gas collection and processing system.
Adverse health impacts	Health risks associated with exposure to biological hazards will be minimised by good industrial hygiene and operational practices. Health risks associated with exposure to dust will be minimised by appropriate use of dust masks. Health risks associated with exposure to noise will be minimised by: ▶ An appropriate staff training programme; ▶ A review of engineering controls, and the sourcing of required units with relatively low noise emissions; ▶ Hearing Protective Devices (HPD) in high noise areas; ▶ Initial and repeat annual audiometric assessments of employees who are likely to be regularly exposed to excessive noise; ▶ Noise exposure monitoring assessments following any changes to the plant or process.

PART E

Environmental Management

28. Environmental Management

This chapter outlines the requirements for environmental management plans that would be part of the construction and operational phases of the proposed development.

A summary of the environmental monitoring requirements and lists of the approvals and licences required for the development are also provided.

28.1 Current environmental management

Management of activities on the Jacks Gully WRC is undertaken in accordance with the site Environmental Management Plan. This includes environmental monitoring as outlined in the site protection environmental licence EPL 5105. The current monitoring regime is outlined in Table 28-1 below.

Table 28-1 Current Operational Monitoring Procedures

Aspects	Existing monitoring requirements for site
Air Quality	Subsurface gas monitoring is carried out on 4 location on a monthly basis.
	Dust monitoring is undertaken monthly at 3 designated locations.
Water	The surface water stored in the sedimentation pond is monitored prior to its controlled discharge.
Groundwater	Groundwater monitoring is carried out on 8 separate locations on the site. Sampling is initiated quarterly and annually varying on the parameters.
Odour	Odour is constantly monitored on-site but also initiated subject to complaints being received.
Leachate	The date, duration and the estimated volume of any leachate discharged to surface water must be recorded.

28.2 Background and Structure

Environmental Management Plans (EMPs) would be produced for the proposed development, once approval from the Department of Planning has been obtained. Two separate EMPs would be produced, one for the construction phase, and one for the operational phase of the project. The general structure of each of the EMPs is outlined below.

28.2.1 Introduction and purpose

Establishes and details environmental goals and objectives.

28.2.2 Statutory requirements

Details statutory requirements including licences and approvals.

28.2.3 Environmental management procedures

Describes operational procedures for preventing environmental impacts including:

- ▶ Safeguards to be implemented;
- ▶ Lists of actions, timing and responsibilities;
- ▶ Reporting requirements;
- ▶ Specifications incorporating environmental safeguards;
- ▶ Training of personnel (proponent and contractors) in environmental awareness and Best Practice Management Systems;
- ▶ Environmental accident and incident reporting requirements;
- ▶ Process surveillance and auditing procedures;
- ▶ Environmental complaint handling procedures; and
- ▶ Site management and control procedures.

28.2.4 Monitoring requirements

Environmental monitoring would be required for noise, air quality, surface water, groundwater and flora and fauna management. A monitoring plan would be included in the EMP's, which details location, duration and frequency of monitoring and procedures to be followed.

28.2.5 Emergency response

Describes an Emergency Response Plan including procedures for fires, pollution incidents and accidents. The Plan would detail procedures to be followed, responsibilities, equipment and contact details for responsible site staff and emergency authorities. The Plan would be developed in consultation with local contingency authorities such as Fire Brigade, SES and Council.

28.2.6 Review and auditing procedures

This details procedures to:

- ▶ Audit the proposed development against the EA, EMP and any conditions, approvals and licences; and
- ▶ Review and amend the EMPs if shortcomings are found during the audits.

28.3 Construction EMP

An Environmental Management Plan (EMP) for the proposed construction works would be developed once a construction contractor has been selected. Each contractor working on the project would prepare a plan to cover their specific activities, and these plans would be reviewed and approved by WSN, which would prepare an overall Construction EMP for the project.

In accordance with the Noise Control Manual produced by the NSW Department of Environment and Conservation (former Environment Protection Authority's) (NSW DEC), construction activities would be restricted to between 7.00 am and 6.00 pm Mondays to Fridays and 7.00 am



to 1.00 pm on Saturdays. No construction work would be undertaken on Sundays or public holidays.

Construction work may be permitted outside of the hours specified above, however, this would be subject to consultation with the NSW DEC and Camden Council.

Control of erosion and sedimentation would be required during the construction period, including temporary works. This includes erosion and sediment controls to prevent sediments from being carried into the stormwater systems, including cut-off drains, silt fences and other erosion controls.

A site sediment and erosion control plan would be prepared, in accordance with requirements of the Blue Book (Managing Stormwater: Urban Soils and Construction, Department of Housing). These controls would be implemented before any construction commences.

A 90th percentile 5 day rainfall duration would be used to determine the volumes of the temporary sediment dams, along with an upper limit of 50mg/L for total suspended solids in any pumped discharge of stormwater.

The Project Environmental Management Plan (PEMP) and contract documents would address the requirements based on controls and mitigation measures.

This would include specific environmental strategies and plans for all construction activities associated with the proposed development, such as:

- ▶ Soil and water management plan – including measures to prevent erosion, control sediments, and ensure rehabilitation;
- ▶ Dust management plan – including measures to control dust from exposed areas, stockpiles, truck loads, and unsealed roads within the Jacks Gully WRC;
- ▶ Flora and Fauna management plan – including measures to protect flora and fauna during the excavation and vegetation clearing works;
- ▶ Noise and vibration management plan – including measures to control noise and vibration from excavation and other earthworks;
- ▶ Traffic and roadworks management plan – including safety and hazard signs, truck movements to the site, parking and access requirements for construction personnel;
- ▶ Waste management plan – including identification, storage, handling, minimization and disposal of all construction wastes; and
- ▶ Other environmental issues – including hazards and risks associated with the construction works, geotechnical issues, screening, and energy use.

The Project Environmental Management Plan (PEMP) would be a working tool during the detailed design of the proposed development and would form the basis for environmental specifications in any contractual agreements between the proponents and the Contractor. It would also include specific environmental strategies and plans for all construction activities associated with the proposed development.

The Contractor employed to manage and construct the proposed development would need an accredited Environmental Management System in place.

28.4 Operational EMP

The Operational EMP would include a number of specific procedures, as described below. These would be made more specific following the issue of the EA Approval Conditions and POEO Licence application process.

Specific plans include;

- Water Management Plan – Including erosion and sedimentation control, stormwater management and reuse
- Air Quality Management Plan – Including control of odours, dust and particles.
- Noise and Vibration Management Plan – Including noise control measures, monitoring, remedial measures and procedures to handle complaints about noise.
- Waste Management Plan – Including storage, handling, disposal and documentation
- Preventative Maintenance Requirements – Detailing preventative maintenance relating to the environmental protection including pollution control equipment and chemical storage.
- Other Environmental Issues – Including energy use, hazards and risks, emergency response plans, landscaping, reticulation system, rehabilitation and chemical handling.

28.5 Environmental Monitoring

Environmental monitoring procedures that are currently carried out on-site are in accordance with the monitoring requirements as stipulated in the EPL 5105. These procedures are summarised in Table 28-1

Monitoring procedures to be implemented during construction and operation are outlined in Table 28-2 and Table 28-3 respectively.

28.6 Environmental Auditing

Independent environmental audits would be carried out in accordance with the Conditions of Approval. The audit report would be made available to the Director General, Council, the DEC, and any other interested parties.

28.7 Environmental Reporting

28.7.1 Record Keeping

Full record of all environmental procedures observed would be kept including:

- Monitoring data and analysis;
- Details of quantities and types of waste removed from site;
- Environmental complaints received, including corrective action taken;
- Details of all environmental approvals and licences obtained or applied for.

Table 28-2 Monitoring Proposed During Construction

Issue	Proposed monitoring
Air Quality	Continually monitor dust generation from site (visually) to ensure that excessive dust is not being produced, and that dust mitigation measures are effective.
	Monitor dust generation from site by checking readings from existing site dust gauges (provided as part of overall site management) – on a monthly basis.
	Monitor odour levels during excavation of waste material for platform construction.
Noise	Measure noise levels at the northern boundary (closest to residences) prior to construction, at commencement of construction, and monthly during construction.
	Conduct monitoring in response to complaints from residents.
Flora and Fauna	Monitor the extent of clearing to ensure it is confined to areas identified in the EA.
	Conduct a targeted survey on-site during the appropriate time of year for any threatened flora species for relocation (if feasible) prior to construction.
Waste Disposal/Litter	Inspect waste receptacles weekly to ensure they are not being overfilled and waste is being collected regularly.
	Monitor waste recycling and disposal procedures to ensure they are being complied with.
Water	Review results from surface water sampling undertaken by WSN as part of overall site management – prior to any discharge of stormwater to Nepean River.
Groundwater	Review groundwater levels and quality sampling results from monitoring undertaken by WSN as part of overall site management.
Erosion and Sediment Control	Prior to commencement of each stage of construction, inspect site to ensure that sediment and control devices are in place.
	Inspect erosion and sediment control devices daily to ensure they are installed and operating correctly.
Traffic	Inspect trucks to ensure they are not overloaded, they adhere to speed limits, and that the trays are covered as appropriate.
	Inspect signs and hazard markers to ensure that they are used appropriately, in place, and clearly visible.

Table 28-3 Monitoring Requirements During Operation

Issue	Proposed monitoring
Air Quality	Monitor dust generation from site by checking readings from existing site dust gauges (provided as part of overall site management) – on a monthly basis.
	Monitor odour levels monthly once plant is operating.
Noise	Conduct confirmatory noise monitoring at plant and at the northern boundary during plant commissioning stage.
	Conduct monitoring in response to complaints from residents.
Waste Disposal	Inspect waste receptacles weekly to ensure they are not being overfilled and are being collected regularly.
	Monitor waste recycling and disposal procedures to ensure they are being complied with.
Water	Monitor water quality in sedimentation ponds and roofwater tanks on monthly basis.
	Review results from surface water sampling undertaken by WSN as part of overall site management – prior to any discharge of stormwater to Nepean River.
Groundwater	Review groundwater levels and quality sampling results from monitoring undertaken by WSN as part of overall site management.
Traffic	Ensure vehicles are adhering to speed limits and using defined roads.

28.7.2 Reporting

An Annual Return would be prepared for submission to the DEC. The Annual Return would include:

- ▶ A statement of Compliance with licence conditions;
- ▶ A monitoring and complaints summary; and
- ▶ Any shortcomings in site activities or environmental controls identified in the Annual Return would be identified, and the EMP would be amended accordingly.

In addition, incidents causing or threatening material harm to the environment would be reported to the DEC, in accordance to the POEO licence conditions.

From past experience with other industrial developments, it can be reasonably assumed that reporting requirements will be based on the approximate reporting timeframes detailed in Table 28-5.

Table 28-4 Reporting requirements

Item	Frequency
Annual return including statement of compliance signed by designated representative of operating licensee	Annual
Record of complaints	Annual
Notification of incident of environmental harm	Immediate notification through the pollution line Written report required within reasonable timeframe of the event occurring
Fire or explosion incident	Immediate notification through the pollution line Written report as soon as practicable
Fire report	Immediate notification through the pollution line Written report within 7 days of occurrence

29. Statutory Approvals, Licences and Permits

This chapter outlines the environmental monitoring requirements and lists the approvals and licences required for the proposed development.

29.1 Approvals and Licences

Based on the information contained in this EA, a number of environmental approvals, licences and certificates would be required, as listed in Table 29-1.

Table 29-1 Approvals required

Act	Administering Agency / Approval Authority	Approval
<i>Environmental Planning and Assessment Act 1979</i>	Department of Planning	Development Consent
<i>Protection of the Environment Operations Act 1997</i>	DEC (incorporating the former EPA)	Environment Protection Licence under Section 55

The Jacks Gully WRC is currently licensed as a Solid Waste Class 1 Landfill under NSW EPA Licence Number 5105, however it is proposed to seek a new licence from the EPA for the proposed AWT Facility, separate to the current landfilling licence.

The works contractor would also be required to comply with all the statutory requirements that relate directly to work practices such as:

- *Construction Safety Act;*
- *Occupational Health and Safety Act;* and
- *Trade Practices Act.*

29.2 Environmental Management Plans

Environmental management plans for construction of the AWT Facility and operation would be prepared for the project, as outlined in Chapter 28. This would be done once development consent has been obtained from the Department of Planning.

The EMP's would ensure that;

- Safeguards are outlined in the EA and Conditions of Approval are implemented on-site;
- Activities are carried out with due diligence; and
- All activities comply with relevant environmental legislation including Acts, Regulations, Standards and Best Management Practices

Each EMP would be specific to this project and would be prepared in accordance with NSW Government Guidelines following consultation with the DEC, Department of Land and Water, and Department of Planning, and in accordance with the POEO Act Licensing process.

PART F

Summary of EA Findings

30. Concluding Statement

This chapter presents the overall opinion of the EA Team with respect to the potential environmental impacts of the proposed development.

This Environmental Assessment (EA) addresses the requirements for environmental assessment set out by the Department of Planning and the statutory planning and legislative requirements pertaining to both this proposal (presented in Appendix A) and the subsequent submission of a Development Application for consideration of the consent authority, who in this case is the NSW Minister for Planning.

This EA also addresses all the requirements of the various State Environmental Planning Policies, Regional Environmental Plans, Local Environmental Plans and other relevant State and Commonwealth environmental and/or planning legislation.

Overall, the proposal has many positive impacts. Firstly, it fulfils a regional need for waste management and resource recovery facilities, to serve a growing population in the Macarthur Region. Availability of local waste management solutions is important, as it provides access for the local community and is a key element of sustainability. The proposal is consistent with the aims and objectives of the NSW Waste Strategy.

Positive social impacts of the proposal include an estimated 30-50 construction jobs over a 12 month period, and 40 full time positions once the plant is operating.

The proposed facility would result in diversion of more than 75% of putrescible waste from the region, from landfill. High levels of resource recovery, due to the efficiency of the water based technology in separating recyclables from other waste, would provide economic benefits to the region. Landfilling of the residual non-putrescible component of these wastes after 2007, would reduce the future potential for negative impacts on groundwater quality and reduce the potential emissions of greenhouse gases.

The effectiveness of water in dissolving the organic fraction of the wastes so that it can be converted into biogas in a two-stage process, means that the plant requires relatively low energy inputs, compared to other energy producing plants. Similarly, the tunnel composting technology selected for garden organics processing has relatively low energy inputs, because air requirements (for accelerating the decomposition of the garden organics) are minimised by the design.

The water produced by the plant (resulting from recovery of water contained in the putrescible waste, and water produced during the biological processing stage), is of suitable quality to be used in the plant as washdown water. This would permit increased levels of water re-use on the Jacks Gully WRC site.

The ArrowBio process is a low odour technology, largely due to the waste being immersed in water soon after entering the plant and the receipt and processing areas being subject to a biofilter system. The garden organics processing plant also has low odour emissions, due to air being discharged to an on-site biofilter. Closure of putrescible waste landfilling in 2007, combined with operation of the proposed AWT Facility would significantly reduce odour levels in the surrounding area.

Conservation of resources for future generations is another important positive impact of the proposal. Raw materials such as iron ore, bauxite and fossil fuels such as coal (i.e. fuels used to

produce steel and aluminium, for example) would be preserved due to high recovery rates for recyclables. In addition, the scarce landfill space on-site can be reserved for only the non-recyclable / non-recoverable wastes in the future, instead of being consumed by putrescible wastes and potentially recyclable materials, as it is currently.

There would be significant reductions in greenhouse gas emissions due to processing of putrescible wastes and production of green energy on the site. Between 50-75% of the green energy produced on-site would be exported to the grid, saving more than 20,000 tonnes of greenhouse gases being produced at NSW power stations each year. Over the estimated 15 year life of the plant, the production of more than 1.3 million tonnes of greenhouse gases from waste would be avoided.

There are, however, some potentially negative impacts associated with this proposal. They include short term increases in traffic and associated traffic noise along roads leading to the Jacks Gully site. This would occur over the first 6 months of the construction period, when fill material is being imported to the site to construct the engineered platform on which the AWT Facility will be located. A traffic management plan would be implemented to minimise impacts on local residents.

There would also be short-term increases in airborne dust emissions from the site during the first few months of construction. Dust suppression techniques will be used during construction to minimise dust impacts.

The AWT Facility is located as far as possible from existing and future residential areas, on the southern side of the gully. This reduces its visibility and also minimises potential noise and odour impacts. Future residents of the planned Spring Farm residential area may notice noise from the site, specifically associated with the existing landfill gas power station, landfilling activities and the materials recycling facility. The AWT Facility is the lowest of all of these noise sources, and mitigation measures that will be undertaken at the plant, and on the site boundary will minimise noise impacts on residents.

There would be no impacts on indigenous or non-indigenous heritage on the site or in the surrounding area. Landscaping and tree plantings will be used to soften the look of the facility, and ensure that it cannot be viewed in the context of surrounding historical areas.

Removal of 0.4 hectares of bushland within the Jacks Gully WRC site is necessary in order to build the plant. A flora and fauna assessment concluded that this proposal would be unlikely to have significant impacts on any threatened or endangered species/ecological communities.

This EA has assessed all key environmental issues and identified appropriate mitigation measures associated with construction and operation of the proposed development. Strategic mitigation measures have been developed to manage all negative impacts that have been identified in this EA. Environmental Commitments that WSN is required to make, and implement effectively over the course of the project, are provided in a draft Statement of Commitments.

It is GHD's opinion that potentially adverse effects of the proposed development can be appropriately managed by the implementation of specific mitigation measures, and by WSN adhering to the Environmental Commitments outlined in the Environmental Assessment. The proposed development should therefore be approved subject to the implementation of the mitigation measures identified in this Environmental Assessment.

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