ENVIRONMENTAL ASSESSMENT

WOODLAWN EXPANSION PROJECT

VOLUME 1 – MAIN REPORT

AUGUST 2010

URS

VEOLIA ENVIRONMENTAL SERVICES

Statement of Validity

Submission of Environmental Assessment

Prepared under Part 3A of the *Environmental Planning and Assessment Act* 1979

Environmental Assessment prepared by

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Address	URS Australia Pty Ltd Level 4 407 Pacific Highway Artarmon NSW 2064
Application No.	**MP10-0012**
In respect of	

Applicant & Land Details

Applicant	Veolia Environmental Services Level 4, 65 Pirrama Road PYRMONT NSW 2009
Subject Site	Woodlawn Bioreactor, in the Goulburn Mulwaree Local Government Area
Lot & DP	Lot 19 DP 827588, Lot 25 DP 754919, Lot 30 DP 754919, Lot 88 DP 754919, Lot 91 DP 754919, Lot 1 DP 1045652
Project Summary	increasing the volume of waste received at the Woodlawn Bioreactor from 500,000 tonnes per annum to 1.13 million tonnes per annum; increasing the volume of waste received at the Crisps Creek Intermodal Facility from 780,000 tonnes per annum to 1.18 million tonnes per annum; extending the hours of operation both at the Woodlawn Bioreactor and the Crisps Creek Intermodal Facility; and increasing the equipment, personnel and associated infrastructure.

Environmental Assessment

An Environmental Assessment is attached.

Declaration

I certify that I have prepared the contents of the Environmental Assessment in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 and Regulation and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Signature	
Name	William Barrett
Date	9th August 2010

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Notes on Text

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

If all approvals are given for the project to proceed, all “would” references should be interpreted as “will”, subject to final conditions of consent.

Abbreviations

AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
AHD	Australian Height Datum
ANEPM	National Environment Protection Measure for Ambient Air Quality
AWS	Automatic Weather Station
AWT	Alternative Waste Technology
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
DA	Development Application
DCP	Development Control Plan
DECCW	Department of Environment and Climate Change and Water
DG	Director General - Department of Planning
DGRs	Director General's Requirements
DoP	Department of Planning
DP	Deposited Plan
EA	Environmental Assessment
ECRTN	Environmental Criteria for Road Traffic Noise
EMP	Environmental Management Plan
EMS	Environmental Management Systems
ENCM	Environmental Noise Control Manual
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
g	grams
HA	Hectares
HAZID	Hazard Identification
HIPAP	Department of Planning's Hazardous Industry Planning Advisory Paper
IMF	Intermodal Facility
INP	Industrial Noise Policy (EPA, 2000)

Abbreviations

IPCC	International Panel on Climate Change
ISO	International Standards Organisation
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
M	metres
µg	micrograms
µm	microns
MSW	Municipal Solid Waste
Mtpa	Million tonnes per annum
MW	Megawatt
MWh	Megawatt hours
NA	Not Applicable
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NSW	New South Wales
OEMP	Operation Environmental Management Plan
OU	Odour Units
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
PHA	Preliminary Hazard Analysis
PM_{10}	Particles effectively less than 10µm diameter
$PM_{2.5}$	Particles effectively less than 2.5µm diameter
POEO Act	NSW *Protection of the Environment Operations Act* 1997
REP	Regional Environmental Plan
RTA	NSW Roads and Traffic Authority
SCA	Sydney Catchment Authority
SEPP	State Environmental Planning Policy
TAPM	The Air Pollution Model
TSP	Total Suspended Particulate
Veolia	Veolia Environmental Services
WARR Act	Waste Avoidance and Recovery Act 2001
WARR Strategy	Waste Avoidance and Recovery Strategy, 2003 and 2007

Glossary

acoustic	Sound and its characteristics
aerobic	In the presence of oxygen
Alternative Waste Technology	Method of waste processing that recovers resources from the waste stream and divert waste away from landfill
ambient	Surrounding environment.
amenity	An agreeable feature, facility of service which makes for a comfortable and pleasant life.
Anaerobic	In the absence of oxygen
Approved Methods	*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005)
aquifer	Rock formation containing water in recoverable quantities.
Average Recurrence Interval	The statistically calculated interval likely to be exceeded one in a given period of time. A term used in hydrology, also known as a return period.
background scatter	Aboriginal artefacts that cannot be usefully related to a place or focus of past activity.
Biogas	Gas produced by bacteria consisting of approximately 60% methane.
Bioreactor	Vessel or container in which biological reactions occur.
Catchment	The area of land from which a water body (such as rivers, lakes and ground water) receives water.
Commercial and Industrial Waste	Waste generated by business, industries, and institutions excluding construction and demolition waste, municipal waste, clinical waste and related waste and hazardous waste.
Compost	Decayed organic matter that can be used as a soil amendment or fertiliser.
CO_2-e	The carbon dioxide equivalent relates to the greenhouse warming potential (GWP) of a certain gas compared to that of carbon dioxide where carbon dioxide has a GWP of 1. For example, methane (CH_4) has a GWP of 21, meaning that a release of 100 tonnes of CH_4 would be the equivalent to releasing 2100 tonnes of CO_2 in terms of global warming.
Construction Environmental Management Plan	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
cumulative effect	Refers to the accumulation of effects over time.
Decibel dB(A)	The A-weighting has a frequency response corresponding approximately to that of human hearing. People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the "loudness" of that sound. Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).
dB(C)	The C-Weighting has a relatively flat response. C- weighting is used in evaluating annoying community noises such as low frequency sound.
Ecologically Sustainable Development	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.

Glossary

emergency response	The reaction by emergency services such as Fire, Police, Ambulance, Industrial Fire Brigades, etc., to an emergency.
environment	The physical, biological, cultural, economic and social characteristics of an area, region or site.
Environmental Assessment	The orderly and systematic evaluation of a proposal, including alternatives and objectives, and its effects on the environment, including the mitigation and management of these effects.
environmental management	That part of the overall management system which includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining environmental policy. (Refer to related term Environmental Management System).
Environmental Management Plan	The control, training and monitoring measures to be implemented during the design, construction and operation phases of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental (being socio-economic, cultural, physical, biological) assessments. Prepared within the framework of Defence policies, objectives, strategies and actions.
Environmental Management System	The concept and major components of an Environmental Management System (EMS) are set out in the Australian/New Zealand Standard (AS/NZS) ISO 1400l. An EMS has several key components as set out below: organisational commitment, corporate environmental policy, environmental aspects register, objectives and performance indicators, environmental management program documentation (often called an Environmental Management Plan or EMP), operational and emergency procedures, responsibility and reporting structure, training and awareness program, environmental impact, regulatory and legal compliance, and environmental performance review audits performance monitoring and measurement.
geotechnical	Relating to the form, arrangement and structure of the geology.
Greenhouse Gas	A gas which has an effect on the radioactive absorptivity of the earth's atmosphere and the atmosphere's temperature.
Greenhouse Effect	Predicted global climatic change (e.g. global warming) associated with build up of certain gases (such as water vapour, carbon dioxide, methane, chloroflurocarbons, ozone, nitrous oxide, etc.) within the atmospheric environment of the earth. These are known as Greenhouse Gases.
Greenhouse gas intensity	the amount of greenhouse gases per unit of energy produced from a power station (eg in units of kg CO_2-e/MWh)
groundwater	Subsurface water contained within the saturated zone.
Hydrocarbons	A class or compounds containing only carbon and hydrogen in various structures. Both naturally occurring and from anthropogenic sources.
Hydrology	Surface water and groundwater and their interaction with earth materials.
Hydrogeology	The study of subsurface water in its geological context.
L_{A1}	The noise level exceeded for 1% of the 15 minute interval.
L_{A10}	The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
L_{A90}	The LA90 level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the LA90 level for 10% of the time. This measure is commonly referred to as the background noise level.

Glossary

L_{Aeq}	The equivalent continuous sound level (LAeq) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
$L_{Aeq\ (1hr)}$	The LAeq noise level for a one hour period.
$L_{Aeq\ (15\ hr)}$	The LAeq noise level for the period 7am to 10pm.
$L_{Aeq\ (9\ hr)}$	The LAeq noise level for the period 10pm to 7am.
L_{eq}	The equivalent continuous sound level in dB(A); that is, the constant sound level which has the same acoustic energy as the original fluctuating noise for the same period of time.
Leachate	Water which has percolated through waste and reacted with the products of decomposition, chemicals and other materials in the waste.
Level of Service	A description of the operating performance of a road or intersection as defined in Austroads 'Guide to Traffic Engineering Practice, Pt 2 – Road Capacity.'
Lithologies	Rock types
Lower heating value	The heat content of fuel, measured in a bomb calorimeter when the products of combustion are cooled to the initial temperature and all of the water vapour formed during combustion is condensed to liquid. The lower heating value excludes the heat of vaporisation of the water produced from combustion of hydrogen atoms in the fuel.
mean	The sum of n values divided by n.
median	The middle value of a set of values.
Megalitre	One million litres
monitoring	The checking of impacts of a proposal or an existing activity in order to improve or evaluate environmental management practices. To check the efficiency and effectiveness of the environmental impact assessment process. To determine if the requirements of environmental legislation and associated regulations are being met.
Municipal Solid Waste	Solid Waste arising from household kerbside waste collected by Council's, and waste collected by Council from municipal parks and gardens, street sweepings and public bins. Excludes hazardous, clinical and related wastes.
Operation Environmental Management Plan	An element of an Environmental Management Plan that addresses the control, training and monitoring measures to be implemented during the construction phase of a project in order to avoid, minimise or ameliorate potentially adverse impacts identified during environmental assessments.
Organic	Chemical substances of animal or vegetable origin, consisting of hydrocarbons and their derivatives.
Particulate	Small particles, usually in suspension.
Plume	Area of impact extending from a source.
Putrescible waste	Waste that usually breaks down in a landfill to create landfill gases and leachate. Usually applies to food and animal products, however paper, cardboard and green waste will also break down to create landfill and leachate.
risk	Likelihood of a specific undesirable event occurring within a specified period or in specified circumstances. Listed as a frequency or probability.

Glossary

risk assessment	A process used to determine whether people and the environment are at risk (e.g. health and safety) from exposure to hazardous substances used or produced (mainly in an industrial or work place) so that appropriate control measures or management practices can be introduced to prevent or minimise the risk.
sediment/detention pond	Artificial earthen depression to retain water runoff for a period of time so as to control high intensity runoff.
sustainable use	Use of organism, ecosystem or their renewable resource at a rate within its capacity for renewal.
TAPM	The Air Pollution Model is an air quality dispersion model developed by the Commonwealth Scientific Investigation & Research Organisation.
total suspended solids (TSS)	Total load of particulates in water, measured in mg/L.
Socio economic	Pertaining to the social and economic characteristics of a community, or the study / assessment of social and economic issues and aspects of a development.
wind climate	A description of the meteorological conditions created by the wind involving measurements of wind speed, direction and frequency of gusts for average, seasonal and annual conditions.

Executive Summary

Introduction

Veolia Environmental Services (Australia) Pty Limited (Veolia) own and operate the Woodlawn Bioreactor and Crisps Creek Intermodal Facility (IMF). The Bioreactor is a major putrescible landfill that services the Sydney region and is located within the void of the former Woodlawn Mine. The Crisps Creek IMF services the Bioreactor by transferring containers from rail to road and is located 8km from the Bioreactor. Both facilities were approved by the Minister of Planning on 30 November 2000 and commenced operations in September 2004.

The Woodlawn Bioreactor is an integral part of the larger Woodlawn Eco-Precinct, which consists of two properties, 'Woodlawn' and 'Pylara' and covers an area of approximately 6,000 hectares. The first stage of the Eco-Precinct developed by Veolia was the Woodlawn Bioreactor. The other approved uses within the Woodlawn Eco-Precinct include an Alternative Waste Technology facility and a wind farm.

Veolia seeks approval to increase the maximum input rate of the Bioreactor from 500,000 tonnes per annum (tpa) to 1.13 million tpa. Simultaneously, Veolia seeks an increase in the maximum throughput rate at the Crisps Creek IMF to 1.18 million tpa.

In addition, Veolia is also seeking approval for the installation of additional lighting at the Bioreactor site, an increase in the Bioreactor and IMF hours of operation, an increase in the number of truck movements to transport waste from the IMF and regional centres, and to replace the original consent (DA-31-02-99) through the provision of a consolidated project approval.

The Minister for Planning is the consent authority for the Project, as determined by the relevant legislation. This Environmental Assessment has been prepared in accordance with the requirements of Part 3A of the *Environmental Planning and Assessment Act 1979* (*EP&A Act*) to provide the Minister for Planning with the required information to determine the environmental impacts and benefits of the Project. This Executive Summary provides a brief description of the key outcomes of the environmental assessment as detailed in each of the chapters.

Project Need and Justification

Since commencing operations in 2004, the Woodlawn Bioreactor has received approximately 400,000 tonnes of putrescible waste from the Sydney region by rail each year, as capped by the original conditions of consent. The Bioreactor has considerable capacity to receive putrescible waste generated from both Sydney and surrounding areas of regional NSW.

It is within this context and in response to arbitrary annual waste input limits and a substantial shortfall in annual available disposal capacity, as well as to underpin its further development of the overall Veolia Eco-Precinct, that Veolia seeks to expand operations at the Woodlawn Bioreactor.

The justification for the Woodlawn Expansion Project draws on the Wright Review 2009, an independent strategic review of landfill demand and capacity within the Sydney region and estimated take up of Alternative Waste Technology (AWT) as well as analysis of the regional disposal capacity and demand. This justification demonstrates that:

- the Project responds to an urgent need to expand aggregate annual waste input rates to address the chronic shortfall in available annual disposal capacity and meet the continuing need for putrescible waste landfill capacity in the Sydney region. The Project would address approximately 40% of the long term annual shortfall forecast in the Wright Review 2009;

Executive Summary

- the Project would satisfy regional demand for reliable, flexible and cost-effective waste management solutions enabling Councils to focus on further resource recovery initiatives and rehabilitation of existing landfills;
- the Project is consistent with the strategic direction for waste management in NSW and supports the progressive introduction, diversification and expansion of AWT needed to increase resource recovery and divert valuable materials from landfill;
- with the current challenge of climate change, the Woodlawn Bioreactor provides an environmentally responsible and sustainable solution that is consistent with existing greenhouse gas strategies;
- the Project utilises existing land and infrastructure, furthermore the project will be undertaken in an area in which Veolia have a comprehensive understanding (gained through continuous monitoring, testing and evaluation) of existing conditions, providing additional certainty with respect to predicted environmental outcomes; and
- the Project is located within the Woodlawn Eco-Precinct, which is consistent with the NSW WARR strategy through environmentally responsible disposal, development of alternative waste technologies and facilitation of regional waste programs such as green waste separation.

Accordingly, there is a clear, demonstrable need for the Project as confirmed through recent independent analysis for the NSW Government.

Alternatives to the Proposal

At this time, there are no viable new landfill sites for putrescible waste within the Sydney region. Accordingly, given the proven capacity at Woodlawn coupled with the restrictive policy context relating to the development of new landfill sites, other locations were not considered as a realistic alternative to this proposal.

Furthermore, alternative technologies were examined as part of the Environmental Assessment. While AWTs play an important role in the sustainable management of the waste stream in NSW, their performance in diverting waste from landfills has been below industry expectations. Given the substantial lead times related to developing AWT facilities, it is not viable to depend on accelerated AWT take up to deal with increasing putrescible waste streams.

Analysis shows that despite AWT introduction, the amount of putrescible waste continues to increase. Even with successful implementation of AWT, there would still remain a significant component of residual waste to be managed via disposal at putrescible landfills. Consequently, the need for putrescible landfill capacity remains. Increasing landfill input rate at Woodlawn would enable the uptake of AWT facilities to continue at a suitable rate, consistent with their role in a long-term waste and resource recovery strategy.

The Woodlawn Bioreactor has proven environmental benefits on a par with AWT facilities in terms of minimisation of environmental impacts and conversion of organics into a renewable power source. The accelerated timetable for landfilling would advance the timetable for rehabilitation of land degraded by mining at the site.

Executive Summary

The Woodlawn Bioreactor has achieved gas capture more effectively than original expectations and industry standards. Combined with the production of renewable electricity, this development delivers significant beneficial climate change outcomes.

Statutory Planning

The Project is subject to the development and assessment processes and requirements of Part 3A of the EP&A Act. A Project Application was accepted by the Department of Planning in January 2010, including a supporting Preliminary Environmental Assessment. The Director-General of the Department of Planning declared the project to be a Major Project and issued Director-General's Requirements on 1 March 2010.

The Project is subject to a range of environmental planning instruments, including State Environmental Planning Policies (SEPPs), and Local Environmental Plans (LEPs). The site is zoned Heavy Industrial IN3 under the provisions of Goulburn Mulwaree LEP 2009. The project is permissible in the zone with development consent.

The planning assessment indicates that the Project is in compliance with all relevant planning legislation and environmental planning instruments.

Stakeholder and Community Engagement

Throughout the development of the Woodlawn Eco Precinct, Veolia has been committed to meaningful community and stakeholder engagement. Veolia has worked in collaboration with relevant government agencies, and the local Tarago community, since the commencement of the Bioreactor to resolve issues that impact local environmental amenity.

Veolia has formed a Community Liaison Committee (CLC) in accordance with the requirements of the Ministerial Approval granted in 2000. The purpose of the CLC is to act as an interface between the residents of Tarago and Veolia management to proactively resolve issues that impact on local amenity which may have been caused by operations at the Bioreactor.

In accordance with the Environmental Assessment Requirements, consultation has been undertaken with a number of government agencies and stakeholders including:

- Department of Environment, Climate Change and Water;
- Goulburn Mulwaree Council;
- Palerang Council; and
- Local community representatives through the Community Liaison Committee.

Veolia is committed to maintaining regular contact with the regulatory authorities, neighbouring land owners, the Tarago community and other interested parties during the assessment of the proposed expansion of the Woodlawn Bioreactor. Issues that have been raised by stakeholders have been taken into account in the preparation of this Environmental Assessment.

Environmental Management

The Environmental Assessment includes a thorough review of current environmental management at the Bioreactor and the Crisps Creek IMF. Both sites are operated strictly in accordance with existing

approvals issued by the Department of Planning, as well as Environment Protection Licences (EPLs) issued by DECCW (and its predecessor).

The Woodlawn Bioreactor operations are underpinned by the objective of best practice environmental performance. This objective has been largely met through the implementation of a number of environmental management practices including:

- continuous leachate and gas recirculation and monitoring to optimise biological degradation rates and maximise methane production;
- up to 92% methane capture rates from open waste with horizontal gas collection systems to maximise landfill gas collection, and minimise fugitive emissions. In addition to the renewable energy benefit, capture and utilisation of this gas prevents harmful greenhouse gases from being released into the atmosphere;
- renewable energy production under the Green Power scheme, with renewable energy credits generated for all power;
- hydrogen sulphide control using in-situ addition of metal oxide (haematite and magnetite) to the waste as placed; and
- leachate management and disposal using biological treatment and evaporative control.

The Woodlawn Environmental Management Plan (EMP) provides an environmental management tool for the operation of the site and a means of identifying and concentrating on the key environmental, operational and rehabilitation issues for the facility. The suite of management and operational plans will remain in place as the principal means by which environmental management will continue, and all relevant documents will be updated accordingly to reflect the increase in waste being deposited at the Bioreactor.

Soils, Geology and Water Management

The assessment of the groundwater system surrounding the Bioreactor indicated that potential impacts from increasing the maximum input rate at the Bioreactor to 1.13 million tpa are negligible. The soils and geology of the site are not expected to be affected given that there are no significant excavations or construction activities generated by the Project with the exception of the installation of new lighting towers at the Bioreactor to facilitate night time operations. Additionally, the existing erosion and sedimentation control measures will continue to be maintained.

The movement and management of leachate has been assessed. Potential impacts from leachate production at the site are considered negligible for the following reasons:

- the change in the maximum input rate will not result in a change in the configuration of the final leachate profile post-closure;
- the potential for seepage of leachate is very low;
- modelling results indicate that impacts on the Crisps Creek catchment would be negligible; and

- modelling results indicate conclusively that contaminants would not migrate from the Bioreactor to the regional groundwater system at Crisps Creek over the 50 year time frame required for leachate to establish a benign state.

As no significant construction is being undertaken for this project, the impacts on surface water are also considered to be negligible. Surface water management practices already in place are considered suitable controls for any of the aforementioned potential contamination issues. These techniques prevent turbid or contaminated runoff from leaving the sites and entering natural watercourses.

Air Quality and Odour

A comprehensive air quality and odour impact assessment for the Project was carried out by Heggies Pty Ltd in accordance with relevant DECCW guidelines. This assessment provides details of existing levels of dust, suspended particulate matter and odour, and determines the assessment criteria, and predicts impacts as a result of the Project.

Air and odour modelling concluded that the Project is not predicted to have any adverse impacts in terms of odour or particulate matter at any of the modelled receptor locations. Based on the results of the modelling assessment, it is considered that the Project will not have a detrimental impact upon surrounding residents in terms of odour and air quality.

Greenhouse Gas Assessment

A greenhouse gas assessment was carried out by Heggies Pty Ltd which quantitatively estimated the greenhouse gas emissions impact directly associated with the Project, as well as other indirect, wider greenhouse gas impacts in accordance with DECCW guidelines.

The total greenhouse gas emissions for the Project is estimated to be 244 ktCO2-e, which represents 98% of the total estimated emission of 249 ktCO2-e. The fugitive emission of methane from the waste represents approximately 92% of the total estimated emission, while indirect emissions only represent approximately 0.7% of total estimated emissions from the Project. The carbon intensity of the Woodlawn Expansion Project is estimated to be 0.22 ktCO2-e/kt MSW (based upon 249 ktCO2-e/1130 kt MSW).

Despite the emissions associated with the Project, the total greenhouse gas impacts are to a large extent offset by the electricity generated on site at the Bioreactor. It is estimated that the Project would generate an additional 210,240 MWh of renewable electricity. This renewable electricity represents a GHG offset of approximately 166,347 t CO2-e by replacing electricity generated from fossil fuels.

From July 2009 to June 2010 the site generated 14,331 MWh of renewable energy, which is enough electricity to power approximately 1,800 homes for a year. At full capacity the Woodlawn Eco-Precinct, including the Bioreactor and the wind farm, is expected to generate almost 300,000 MWh per year, and provide power for the equivalent of approximately 37,500 homes a year.

Executive Summary

Noise Assessment

A comprehensive noise impact assessment for the Project was undertaken by Heggies Pty Ltd. The assessment provides details of existing noise levels within the Project area and surrounds, determines noise impact criteria based on existing noise levels and the relevant DECCW guidelines, and predicts noise levels that are expected to result from the Project. The assessment identifies that operational noise levels generated at both the Bioreactor and the Crisps Creek IMF are predicted to meet relevant noise criteria at the nearest receivers.

Traffic and Transport

A transport impact assessment was undertaken as part of this Environmental Assessment. Based on existing Annual Average Daily Traffic volumes and estimates for existing local traffic volumes, the additional traffic volumes resulting from the proposal are not expected to alter the Level of Service from the existing acceptable Level of Service along the transportation route between the Crisps Creek IMF and the Bioreactor, and along local roads that will be used to transport regional waste.

The existing access arrangements for the Woodlawn Bioreactor and Crisps Creek Intermodal Facility are adequate to support the proposal. Existing parking provisions at both sites have sufficient capacity to accommodate additional staff vehicles.

The use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit, as rail transport would result in three times less emissions than road transport. Avoiding long-haul road freight has generated amenity benefits for the local community reducing traffic, noise and air quality impacts.

Socio Economic Assessment

A socio-economic impact assessment was undertaken and indicated that the net impact of the Project would be negligible as it is likely to bring forward impacts and benefits that would have otherwise occurred, in effect condensing them into a shorter timeframe.

Identified impacts and benefits would be reduced in duration as a result of the increased input rates. Based on continued implementation of environmental management at the site, the community is likely to benefit overall in the long term. Veolia's contributions towards community facilities, through such groups as the Veolia Mulwaree Trust and through section 94 development contributions will continue.

The mitigation measures for social impact broadly relate to the mitigation measures relating to the control of noise levels, air and water quality, traffic and transportation, visual amenity and other environmental matters. These mitigation measures would be implemented to ensure that the proposed Project is managed in an effective and efficient manner in order to minimise impact on existing or possible future surrounding land uses.

Preliminary Hazard Analysis

A Preliminary Hazard Analysis (PHA) was undertaken by Planager Pty Ltd which assessed the potential for on and off site risks, including fire risk and management, risks associated with gases produced at the facility and risks relating to the storage of hazardous material. The PHA carried out for the Project was undertaken in accordance with the Department of Planning's Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 (*Guidelines for Hazard Analysis*). The main hazards associated with the proposed project are associated with fire and explosion (predominantly due to the potential ignition of methane gas) and general safety hazards.

Executive Summary

The risk screening carried out for the Project showed that the site is not considered to be *potentially hazardous*. With the low levels of risk associated with the Bioreactor, the PHA was a qualitative assessment and no quantification of any risks was conducted.

Further, the assessment found that the expansion Project is not likely to increase the severity of the hazards associated with the operation of the landfill site. The increase in the intensity of the production on-site is however likely to lead to a proportional increase in the likelihood of an incident, particularly from a biological or safety hazard to on-site population. It is not expected that the risk to off-site populations from an incident on-site would increase due to the waste expansion project. The risk to the off-site population is expected to remain negligible with the maintenance of a large buffer between on-site operations and the site boundaries.

The Project does not introduce any new hazards and is not likely to increase the severity of the hazards associated with the operation of the landfill site. The hazards associated with the Bioreactor are well known and understood. Furthermore, the hazards have been managed by Veolia through a number of management and operational plan that are rigorously maintained and monitored in accordance with Veolia company policy and legislative and licence obligations.

Landform and Site Rehabilitation

Final landform and site rehabilitation will not be impacted by the Project. Veolia has in place a detailed Post Closure Landfill Rehabilitation Management Plan that outlines a number of options to address final landform and rehabilitation issues, irrespective if the mine void is filled or not. The Project will not alter the existing strategies and options for final landform and rehabilitation. Rather, the increased input rate will shorten the operational life of the Bioreactor, bringing forward the final site rehabilitation.

Draft Statement of Commitments

As a requirement under section 75F (6) of the *EP&A Act,* the proposed expansion project requires the Environmental Assessment to include a Draft Statement of Commitments.

An overview of the existing environmental management provisions that are in place for both the Bioreactor and the Crisps Creek IMF, a summary of the relevant approvals and licences for both sites, as well describing the monitoring and auditing regime in place is provided in this Environmental Assessment.

The existing mitigation measures in operation have been assessed, and the potential environmental impact of the proposed expansion has been considered in relation to these. Additional measures have been identified and are included in each of the environmental chapters of the Environmental Assessment

A summary of these additional measures has been provided in the Draft Statement of Commitments for the Project.

Executive Summary

Conclusion

This Environmental Assessment has considered the potential impacts of the Woodlawn Expansion Project. It has been prepared in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* and the requirements of the Director-General of the NSW Department of Planning.

The Environmental Assessment has documented the potential environmental impacts associated with the Project, considering both potential positive and negative aspects and recommending management and mitigation measures to protect the environment where required beyond the existing environmental management on site.

Environmental investigations were undertaken to assess the potential environmental impacts of the Project. This included specialist assessment and investigations of issues relating to air quality and odour management, traffic and transport impacts, noise, greenhouse gas emissions, surface water management, hazards, and socio economic impacts.

The findings of these specialist investigations indicate that there are no significant adverse environmental impacts associated with the Project assuming the inclusion of appropriate environmental management measures into the Project which would minimise adverse impacts on the environment. The proposed adoption of the relevant measures identified in the Draft Statement of Commitments into the suite of Veolia's existing environmental management plans would be an important component of the proposal and reiterates the commitment of Veolia and its contractors to mitigation of environmental impacts identified in this assessment.

The Project would provide a number of important benefits, including:

- providing a response to the urgent need to expand aggregate annual waste input rates to address the chronic shortfall in available annual waste disposal capacity and meet the continuing need for putrescible waste landfill capacity in the Sydney region;
- the generation of additional renewable electricity at the Bioreactor, and;
- provision of continued and increased employment opportunities for local residents in the region.

In summary, there is a clear and demonstrable need for the Project. The proposal complies will all relevant legislation, environmental planning instruments and government policy, and provides crucial additional landfill capacity to sustainably manage putrescible waste from the Sydney Metropolitan area and for regional NSW.

1.1 Background

Veolia Environmental Services (Australia) Pty Limited (Veolia) own and operate the Woodlawn Bioreactor and Crisps Creek Intermodal Facility (IMF). The Woodlawn Bioreactor is an integral part of the Woodlawn Eco-Precinct, which is located in the Southern Highlands of NSW on approximately 6,000 hectares of land (**Figure 1-1**).

The Eco-Precinct (**Figure 1-2**) consists of two properties, namely Woodlawn and Pylara and includes the area of the Mining Lease Special (Crown and Private Lands) Lease 20 (known as SML 20), encompassing Woodlawn Mine, a former lead, copper and zinc mine which ceased mining operations in 1998. The first stage of the Eco-Precinct developed by Veolia was the Woodlawn Bioreactor, a major putrescible landfill that services the Sydney region. The Bioreactor is located within the void of the former Woodlawn Mine and commenced operations in September 2004. The Crisps Creek IMF is located 8km from the Bioreactor and transfers containers from rail to road.

Veolia seeks approval to increase the maximum input rate of the Bioreactor from 500,000 tonnes per annum (tpa) to 1.13 million tpa. Simultaneously, Veolia seeks an increase in the maximum throughput rate at the Crisps Creek IMF to 1.18 million tpa.

In addition, Veolia is also seeking approval for installation of additional lighting at the Bioreactor site, an increase in the Bioreactor and IMF hours of operation, an increase in the number of truck movements to transport waste from the IMF and regional centres, and to replace the original consent (DA-31-02-99) through the provision of a consolidated project approval.

The Woodlawn Expansion Project is considered to be a Major Project pursuant to clause 27 of Schedule 1 of the Major Development SEPP, entitled *Resource Recovery (Group 9 – Resource and Waste Related Industries)* and as such, requires a project approval from the Minister for Planning under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act).

URS Australia Pty Ltd (URS) has been commissioned by Veolia to manage and prepare this Environmental Assessment (EA) which accompanies the proponent's application for project approval.

1.2 The Proponent

Veolia Environmental Services (Veolia) is a global leader in waste management and resource recovery services, with major facilities across Australia and internationally. Veolia has been developing the Eco-Precinct and operating the Woodlawn Bioreactor for over five years. Throughout the course of the development, a strong community involvement and consultation program has been maintained. The Eco-Precinct is being developed by Veolia as an integrated site that aims to deliver environmental and social benefits in several areas, including:

- best practice management of putrescible waste materials, including resource recovery;
- production of renewable energy;
- reclamation and rehabilitation of a former mine site; and
- local employment and community development opportunities.

Chapter 1 Introduction

1.3 Project Components and Definition

Table 1-1 provides a summary of the proposal and the terms used throughout this EA along with a description of the areas to which they refer. Each of the areas referred to in **Table 1-1** is shown on **Figure 1-1** and/or **Figure 1-2.**

Table 1-1 Summary of Project, Key Areas and Terminology

Terminology Used in this EA	Refers to
Proposed Project	
Woodlawn Expansion Project	The proposal to which this EA relates, comprising: • bioreactor annual receiving capacity increase from its maximum assessed input rate of 500,000 tpa to 1.13 million tpa and Crisps Creek IMF annual receiving capacity increase from 780,000 tpa (500,000 tpa from the Bioreactor consent and 280,000 tpa from AWT consent) to 1.18 million tpa; • installation of additional lighting at the Bioreactor site, an increase in the Bioreactor and IMF hours of operation, and an increase in the number of truck movements to transport waste from the IMF and regional areas; and • replacement of DA-31-02-99 through the provision of a consolidated project approval. Also referred to as 'the Project' or the 'proposed Project'.
Key Areas and Facilities	
Woodlawn Eco-Precinct	An area of just over 6,000 hectares comprising two properties "Woodlawn" & "Pylara". The Eco-Precinct includes: • Special Mining Lease - SML 20; • the Woodlawn Bioreactor; • the Alternative Waste Technology Facility (AWT) (approved, not yet built) comprising Woodlawn Alternative Sorting and Processing (WASP) facility and Composted Organics and Green waste (WOCOG) facility; and • the Woodlawn Wind Farm (approved, not yet built).
Woodlawn Bioreactor	The Bioreactor site receives containerised waste by road from the Crisps Creek Intermodal Facility. The total area of the Lot and DP numbers that comprise the site is 395 hectares. The operating area of this site is 70 hectares and consists of the following key components: • mine void; • evaporation dam 3; • access road, administration offices, workshop and power generating infrastructure; and • leachate pipes, leachate dams and associated infrastructure.
Crisps Creek Intermodal Facility (IMF)	Dedicated facility which accepts containerised waste, via rail, from the Sydney region which is then transported by road to the bioreactor facility.
Alternative Waste Technology (AWT) Facility	Alternative waste technology facility designed to receive up to 280,000 tonnes of waste per annum, of which 240,000 tonnes per annum will be sent to the WASP facility and 40,000 tonnes per annum to the WOCOG facility. Approved, not yet built.
Woodlawn Alternative Sorting and Processing (WASP) facility	Sorting and processing facility designed to receive 240,000 tonnes of waste per annum.
Woodlawn Composted Organics and Green waste (WOCOG) facility	Organics and green waste facility designed to receive 40,000 tonnes of waste per annum.

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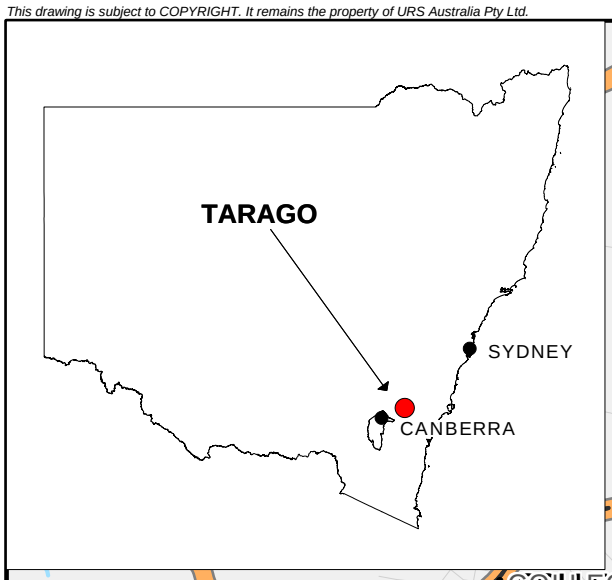

HUME HWY
GUNDARY
WOLLOGORANG
THE RANGE
TIRRANNAVILLE
GLEN CAIRN
COLLECTOR
QUIALIGO
Woodlawn
Bioreactor
Crisps Creek
Intermodal
Facility
CURRAWANG
Covan Creek
FEDERAL HWY
LAKE BATHURST
Lake
Bathurst
ROAD
TARAGO
Woodlawn
Eco-Precinct
Lake George
Taylors Creek
LAKE GEORGE
BYWONG
ROAD
TARAGO RD
MOUNT FAIRY
LOWER BORO
BORO
MAYFIELD
Goulburn Bombala Rly
WAMBOIN
BUNGENDORE
MANAR
KINGS HWY
MULLOON
WARRI
BUTMAROO

0 4 8
kilometres
N

LEGEND
Local Government Boundary
Woodlawn Eco-Precinct

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Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT	Title: **WOODLAWN ECO-PRECINCT LOCATION**
URS	Drawn: SB / Approved: LO / Date: 06/08/2010 Job No: **43177703** / File No: 43177703.018.wor	Figure: **1.1**

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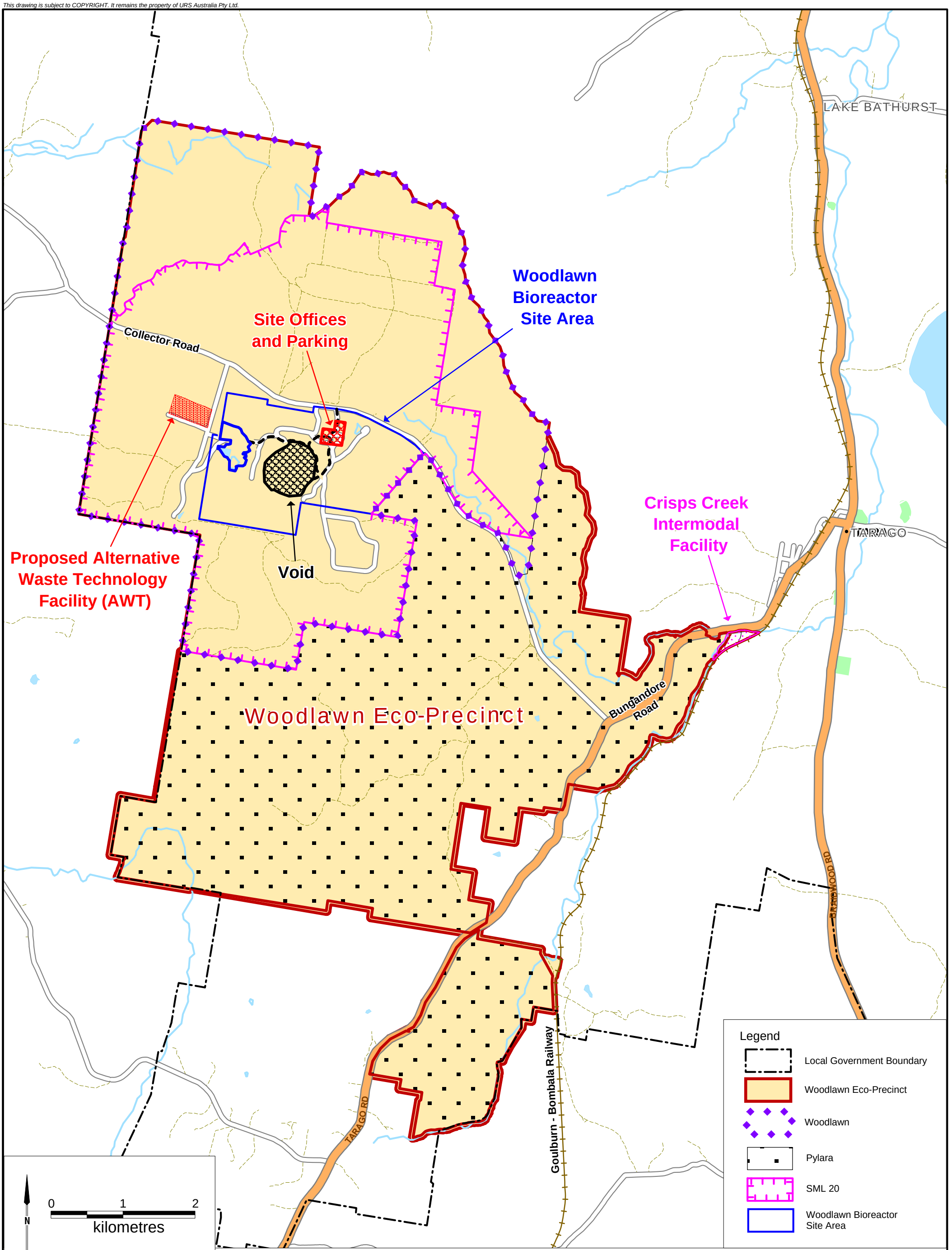

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Client	Project	Title
VEOLIA ENVIRONMENTAL SERVICES PTY LTD	WOODLAWN EXPANSION PROJECT	**WOODLAWN ECO-PRECINCT**
URS	Drawn: SB · Approved: LO · Date: 06/08/2010	Figure: **1.2**
	Job No: **43177703** · File No: 43177703.020.wor	

1.4 Project Objectives

The objectives of the Woodlawn Expansion Project are:

- to provide the Sydney Metropolitan Area and regional areas with much needed and justifiable additional waste management capacity in line with current community waste generation trends;
- to enable further development of the whole Veolia Eco-Precinct, including its resource recovery capabilities; and
- to ensure that any additional capacity is managed according to high environmental standards and in compliance with all relevant NSW government legislation and policies, and that stakeholders and the community are fully engaged.

1.5 Approved Activities & Relationship with Woodlawn Expansion Project

Current approvals which exist within the Eco-Precinct area comprise:

- November 2000 (DA-31-02-99): Woodlawn Waste Management Facility incorporating the Woodlawn Bioreactor and the Crisps Creek Intermodal Facility. The bioreactor was originally assessed to receive up to 500,000 tpa of putrescible waste by rail from Sydney. This approval now includes up to 50,000 tpa of regional waste by road.
- October 2005 (DA-250-10-2004-I): Woodlawn Wind Farm comprising 20 turbines located on a ridgeline which crosses the Woodlawn & Pylara properties. The rights to this windfarm are now owned by Infigen. Not yet constructed.
- November 2007 (DA 06_0239): Woodlawn Alternative Waste Transfer Facility: designed to receive up to 280,000 tonnes of waste per annum of which 240,000 tpa will be sent to the Woodlawn Alternative Sorting and Processing (WASP) facility and 40,000 tpa to the Woodlawn Composted Organics and Green waste (WOCOG) facility. Residual waste from the AWT facility would be delivered to the Woodlawn Bioreactor.

Whilst the AWT facility has not yet been constructed and regional waste is not yet being received at the Bioreactor, for the purpose of this Environmental Assessment (EA) report, the assessment studies: i) take into consideration and assess the additional volume of waste through Crisps Creek to the proposed WASP/WOCOG facility associated with the AWT approval; and ii) take into consideration and assess the additional volume of waste received by road from surrounding regional areas.

This EA takes into account the impacts of the entire operations (i.e. approved and proposed) of both the Bioreactor and the Crisps Creek IMF. While the assessment has an emphasis on the impacts associated with the increased input and throughput rates, cumulative impacts resulting from the increase have been assessed throughout all aspects of this EA.

Table 1-2 provides a summary of the existing and proposed consents within the Eco-Precinct.

Chapter 1 Introduction

Table 1-2 Existing and Proposed Consents

Facility	Existing Consents	Proposed Consents
Woodlawn Bioreactor	DA-31-12-99	New Part 3A consent
Crisps Creek IMF	DA-31-12-99 (for operating conditions & up to 500,000 tpa) DA 06_0239 (for additional 280,000 tpa only)	New Part 3A consent
AWT	DA 06_0239	DA 06_0239 (no change)
Windfarm	DA-250-10-2004-I	DA-250-10-2004-I (no change)

1.6 Environmental Assessment

In NSW, the *Environmental Planning and Assessment Act 1979 (*EP&A Act) and supporting legislation, the *Environmental Planning and Assessment Regulation 2000 (*EP&A Regulation), provide the framework for development and environmental assessment in NSW. Part 3A of the EP&A Act relates to a category of development known as Major Developments. State Environmental Planning Policy (SEPP) 2005 (Major Development) identifies categories of development which are considered to be Major Projects to which Part 3A of the EP&A Act applies.

1.6.1 Major Projects

The Woodlawn Expansion Project is considered to be a Major Project pursuant to clause 27 of Schedule 1 of the Major Development SEPP, entitled *Resource Recovery (Group 9 – Resource and Waste Related Industries)* resulting in the Woodlawn Expansion Project being subject to the provisions and assessment processes of Part 3A of the EP&A Act.

An application was originally submitted to the Department of Planning (DoP) in November 2007, including a supporting Preliminary Environmental Assessment (PEA), requesting that the Woodlawn Expansion Project be assessed under the provisions of Part 3A of the EP&A Act.

The DoP issued Director General's Requirements (DGRs) in March 2010 pursuant to section 75F(2) of the EP&A Act. Refer to **Table 1-3** and **Appendix A** for the DGRs.

1.6.2 Pre Lodgement Consultation

Veolia has been liaising with the DoP for over two years in relation to the proposed expansion project. A PEA was originally submitted to the DoP in November 2007 that sought approval for an increase in both local waste and waste from Sydney and other regional areas. On the advice of the DoP, Veolia submitted a separate application to modify the existing development consent under Section 75W (Part 3A) of the *Environment Planning and Assessment Act 1979* to permit Woodlawn to receive up to 50,000 tpa of putrescible waste by road from surrounding local Councils. The Regional Waste Modification only assessed the impacts of receiving waste from surrounding regional council areas (namely Palerang ,Goulburn Mulwaree, Queanbeyan and Bega Valley).

Veolia has met with representatives of the DoP and held discussions with the local community through Community Liaison Committee meetings throughout this process. These meetings provided a forum for discussion and consideration of issues to be addressed by Veolia in the Project Application for this Part 3A application. The issues raised at these meetings are summarised in **Chapter 5 Community and Stakeholder Engagement**.

1.6.3 Decisions & Assessments

Subsequent to the Environmental Assessment, copies of all submissions or a report of all issues raised will be provided to Veolia and relevant Government authorities. Veolia will review all submissions and consider and respond to issues raised.

The Director General will prepare an assessment report on the Project which will take into account comments from relevant Government authorities as well as other stakeholders and the community. The assessment report will be provided to the Minister for Planning who will determine whether to grant Project Approval and, if so, the conditions under which the Project would operate.

1.6.4 Key Assessment Requirements

The DGR's identified specific issues to be addressed in the Environmental Assessment. These comprised review and assessment of:

- Groundwater impacts;
- Traffic related impacts;
- Noise impacts;
- Air quality impacts;
- Odour related impacts;
- Greenhouse gases;
- Hazard; and
- Socio economic impacts.

These key issues are addressed with specific investigations completed by specialists and for which separate reports have been developed. These investigations were used as source materials for this Environmental Assessment and are submitted as components of this Project Application. Where these investigations are very detailed they are presented in **Volume 2 (Appendices)** and summaries provided in the relevant sections of this main report. In other instances, the whole assessment forms the relevant section of this main report.

Chapter 1 Introduction

Table 1-3 Evaluation of Environmental Assessment Requirements

Requirement	Description	Chapter / Section of Environmental Assessment
General Requirements		
Executive Summary	The Environmental Assessment must be prepared to a high technical standard and must include an executive summary.	Executive Summary
General Requirements	A detailed description of the following: – Historical operations on the site; – Existing and approved operations and facilities, including any statutory approvals that apply to those operations and facilities; – An assessment of the compliance of the existing operations against these statutory approvals; and – The existing environmental management and monitoring regime on site	Chapter 1 Chapter 2 Chapter 6
	A detailed description of the Project, including: – The alternatives considered, including justification for the preferred alternative (ie, the Project); and – Plans of any proposed building or upgrade works	Chapter 2 Chapter 3
	A risk assessment of the potential environmental impacts of the Project, including the key issues for further assessment.	Chapter 7
	A detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above) which includes: – A description of the existing environment, using sufficient baseline data: – An assessment of the potential impacts of all stages of the project, including any cumulative impacts, taking into consideration any relevant laws, guidelines and plans; and – A description of the measures that would be implemented to avoid, minimise and, if necessary, offset the potential impacts of the project including detailed contingency plans for managing any significant risks to the environment.	Chapters 6 – 15
	A summary of the management plans and monitoring programs at the facility, and a description of the proposed changes and programs to accommodate the proposal.	Chapter 6

Requirement	Description	Chapter / Section of Environmental Assessment
	A statement of commitments, outlining the proposed environmental management and mitigating measures.	Chapter 16
	A conclusion justifying the project, taking into consideration the suitability of the site, the economic, social and environmental impacts of the project as a whole, and whether it is consistent with the objects of the *Environmental Planning and Assessment Act 1979.*	Chapter 17
	A signed statement from the author of the environmental assessment certifying that the information contained in the report is neither false nor misleading.	First page of this EA document.
Key Assessment Requirements		
Waste	The Environmental Assessment (EA) must include: – An analysis of whether there is justifiable demand for the Project in accordance with the Infrastructure SEPP; – The measures that would be implemented to ensure that the Project is consistent with the aims, objectives, and guidance in the NSW Waste Avoidance and Resource Recovery Strategy 2007. – Accurate estimates of quantities, and details of input rates, and nature of waste to be transported and landfilled for both the Woodlawn Bioreactor and the Crisps Creek IMF, and details on landfill cell design and integrity.	 Chapter 3 Chapter 3 Chapter 3
Air	The EA must include: – A quantitative assessment of the potential air quality impacts of the Project.	Chapter 9
Odour	The EA must include: – A quantitative assessment of the potential odour impacts of the Project.	Chapter 9
Greenhouse Gas	The EA must include: – A quantitative assessment of scope 1, 2 and 3 greenhouse gas emissions of the project, and a qualitative assessment of the potential impacts of these emissions on the environment; and – An assessment of all reasonable and feasible measures that could be implemented to minimise the generation of greenhouse gas emissions associated with the Project.	Chapter 10

Chapter 1 Introduction

Requirement	Description	Chapter / Section of Environmental Assessment
Traffic and Transport	The EA must include: – Accurate predictions of the traffic volumes likely to be generated during construction and operation; – A detailed assessment of the potential impacts of this traffic on the capacity, efficiency and safety of the surrounding road network; – A detailed assessment of the potential impacts, capacity, and efficiency of the rail network and intermodal facility; – Details of any proposed road upgrade works; and; – Details of the proposed access and parking arrangements on site.	Chapter 12
Soil and Water	The EA must include: – Details of the proposed erosion and sediment control plans (during construction), the stormwater and leachate management system (during operations), flooding, potential offsite drainage impacts, and water supply and efficiency measures; – Detailed modelling of the potential surface water and groundwater impacts of the project; and – A site water balance for the Project, including a description of the measures that would be implemented to minimise water use on site and any water licensing requirements for the Project.	Chapter 8
Hazards	The EA must include: – A Preliminary Hazard Analysis (PHA) of the Project, including a detailed assessment of the potential on site and off site risks, such as: – Fire risk and management; – From gases produced by the land filling; – From the storage of any hazardous materials; and – Details of procedures for the assessment, handling, storage , transport and disposal of all hazardous and dangerous material at the site.	Chapters 7 and 14
Rehabilitation and Final Landform	The EA must include: – A detailed description (including plans and RLs) of how the site would be rehabilitated and integrated into the landscape.	Chapter 15

Requirement	Description	Chapter / Section of Environmental Assessment
Noise	The EA must include: – A quantitative assessment of the potential construction, operational and traffic noise impacts of the project.	Chapter 11
Social and Economic	The EA must include: – An assessment of the costs and benefits of the Project as a whole and whether it would result in a net benefit to the NSW community.	Chapter 13
References		
	The EA must take into account relevant State government technical and policy guidelines.	The EA has referred to a number of specific technical and policy guidelines throughout the EA and specifically within Chapter 18.
Consultation		
	During the preparation of the EA, the proponent should consult with the relevant local, State and Commonwealth government authorities, service providers, community groups and affected landowners. In particular, you must consult with: – Department of Environment, Climate Change and Water; – Roads and Traffic Authority; – Goulburn Mulwaree Council; and – Palerang Council.	Chapter 5

2.1 Introduction

This Chapter describes the site and surrounding land uses, identifies surrounding receptors, provides a description of the existing Veolia operations and provides a description of the activities associated with the proposed Woodlawn Expansion Project.

2.2 Property Description

The Woodlawn Expansion Project relates to two sites: the Woodlawn Bioreactor and the Crisps Creek Intermodal Facility (IMF) (**Figure 2-1**).

The Woodlawn Bioreactor is located within the Woodlawn Eco-Precinct, approximately 10km south west of the village of Tarago and approximately 40km south of Goulburn in south western NSW. The Bioreactor is located approximately 500m south of Collector Road on top of a ridgeline that forms part of the Great Dividing Range, with an elevation of approximately 800m AHD.

The Woodlawn site (**Figure 2-1**) has a total area of approximately 3,000ha, of which the Woodlawn Bioreactor key operations occupy approximately 70ha as shown in **Figure 2-3.** The Bioreactor is located on land that was formerly used as an open cut mine.

The Crisps Creek IMF is located approximately 8km to the east of the Bioreactor, and approximately 2km south of Tarago, and has a site area of approximately 10ha. It is bound by the Mulwaree River to the north and west, while the Sydney to Canberra railway forms the boundary to the east and south.

The Woodlawn Expansion Project includes the land titles listed in **Table 2-1.**

Table 2-1 Titles for Development Area

Lot Identifier	Owner	Description	Proposed Use
Lot 19, DP 827588, and Lots 25, 30, 88 and 91, DP 754919	Veolia Environmental Services	Relevant parts of Woodlawn mine site, consented as a waste facility (including associated infrastructure) in 2000.	Ongoing use as a waste management facility (including associated infrastructure) with an increased maximum input rate of 1.13 million tonnes per year.
Lot 1, DP 1045652	Veolia Environmental Services	Dedicated facility which accepts containerised waste, via rail, from the Sydney region which is then transported by road to the bioreactor.	Ongoing use as an Intermodal Facility with an increased maximum throughput rate of 1.18 million tpa.

2.3 Surrounding Environment

The Bioreactor site is located within the Woodlawn Eco-Precinct and is bound by Collector Road to the north, and neighbouring land to the east, south and west all of which is owned by Veolia. The Crisps Creek IMF is bound by the Mulwaree River to the north and west, while the Sydney to Canberra railway forms the boundary to the east and south.

Land surrounding the Bioreactor, the Crisps Creek IMF and the Eco-Precinct is predominantly used for rural purposes on large land holdings. The region is characterised by agricultural activities, including the cultivation of crops and the grazing of livestock. This is reflected in the land use zoning of surrounding properties.

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LAKE BATHURST

Collector Road

Woodlawn
Bioreactor

Crisps Creek
Intermodal
Facility

TARAGO

Woodlawn Eco-Precinct

Bungendore
Road

BRAIDWOOD RD

TARAGO RD

Goulburn - Bombala Railway

N

0 1 2
kilometres

Legend

- Local Government Boundary
- Woodlawn Eco-Precinct
- Woodlawn
- Pylara
- SML 20

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Client	Project	Title
VEOLIA ENVIRONMENTAL SERVICES PTY LTD	WOODLAWN EXPANSION PROJECT	**WOODLAWN ECO-PRECINCT**

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Drawn: SB	Approved: LO	Date: 06/08/2010
Job No: **43177703**	File No: 43177703.009.wor	

Figure: **2.1**

As the Woodlawn Eco-Precinct lies within two local government areas (Goulburn Mulwaree and Palerang), a number of Local Environmental Plans (LEPs) apply to surrounding land. Land to the north and east of the Eco-Precinct is within Goulburn Mulwaree Council, falls under the Goulburn Mulwaree LEP 2009, and is mainly zoned Rural Landscape. Land to the south and west of the Eco-Precinct is within Palerang Council, falls under the Yarrowlumla LEP 2002 and is predominantly zoned General Rural, while land to the east is also within Palerang Council but falls under the Tallaganda LEP 1991, and is largely zoned Rural.

2.4 Surrounding Receptors

The nearest settlement to the Bioreactor and Crisps Creek IMF is the village of Tarago, which is approximately 10km to the east and 2km to north east of each facility respectively. Other notable settlements include Bungendore, located approximately 30km to the south and Goulburn, located approximately 40km to the north.

The closest sensitive receptors are shown in **Table 2-2** and on **Figure 2-2**.

Properties owned by Veolia comprise Cowley Hills, Woodlawn and Pylara. All sensitive receptors are located at a considerable distance from the Bioreactor operations; two receptors are located within 1km of the Crisps Creek IMF. Based on the noise assessment undertaken for the Project, Chinnery is the closest affected residence to the IMF. A residence on Lime Street is closer but due to topographic shielding is less affected than Chinnery (**Appendix G Noise Impact Assessment**).

Table 2-2 Nearest Sensitive Receptors

Property Name	Approximate Distance from Woodlawn Site (m)	Ownership
Cowley Hills	2,000	Veolia
Woodlawn Farm	1,600	Veolia
Pylara	4,000	Veolia
Torokina	3,700	Privately owned
Willeroo	5,900	Privately owned
Bernallah	4,500	Privately owned
Widgemoor	5,350	Privately owned
Chinnery	680 (from the Crisps Creek IMF)	Privately owned
Lime Street	660 (from the Crisps Creek IMF)	Privately owned

Note: Chinnery is the closest affected residence to the IMF. A residence on Lime Street is closer but due to topographic shielding is less affected than Chinnery. Refer Appendix G Noise Impact Assessment.

2.5 Existing Operations – Waste Activities

2.5.1 Existing Operational Phases

There are currently five distinct operation phases related to the Bioreactor project. Each phase is described below.

Chapter 2 Project Description

Phase 1 – Sydney Based Operations

General solid putrescible waste is collected by Veolia and its contractors around the Sydney metropolitan area, where it is then transported to the Clyde Transfer Terminal (CTT), which is located in western Sydney. The CTT incorporates dust suppression systems, three-tier odour management safeguards and noise barriers which make it the most advanced facility of its kind in Australia. Once the waste reaches the CTT, it is compacted into sealed containers and transported via rail to the Crisps Creek IMF at Tarago. The CTT is subject to separate consent and licensing requirements.

Receptor 9
Willeroo

Collector Road

Receptor 1
Woodlawn Farm

Receptor 2
Cowley Hills

Receptor 8
Bernallah

Receptor 7
Widgemoor

Receptor 4
Torokina

Receptor 3
Pylara

Receptor 5
Chinnery

Receptor 6
Lime Street

Crisps Creek
IMF

Bungandore
Road

Braidwood Road

Goulburn - Bombala Railway

0 2.000
kilometers

Legend

- Receptors

Woodlawn Bioreactor Infrastructure

- Access Road
- Void
- Evaporation Dam 3
- Site Offices, Parking, Workshop, Power Generating

N

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Roads & Railway from Mapinfo Streetpro 2010
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Client

VEOLIA ENVIRONMENTAL SERVICES PTY LTD

Project

WOODLAWN EXPANSION PROJECT

Title

RECEPTOR LOCATION PLAN

Figure: **2.2** | Rev: A | **A3**

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Chapter 2 Project Description

Phase 2 – Rail Transport from CTT to Crisps Creek

This phase involves one train set carrying up to 56 containers, being dispatched from the CTT to the Crisps Creek IMF on a daily basis. Rail operational movements are undertaken in the following manner:

- locomotives arrive to prepare a train at around 9.30pm at Clyde Transfer Terminal;
- the train set departs Clyde at approximately 1.30am the next morning, arriving at the Crisps Creek IMF at approximately 6.30am; and
- unloading of containers begins at approximately 7am. At the IMF, all the waste containers are then removed from the wagons by container handlers and then placed onto trucks for transportation to the Bioreactor.

Phase 3 – Transport of Waste from Crisps Creek IMF to the Bioreactor

All the incoming trucks from the Crisps Creek IMF are weighed at the weighbridge building located on the site access road and each individual container identification number is recorded before trucks proceed to the active tipping face of the Bioreactor. The containers are then unloaded onto the active tipping face within the void by way of the container tipper.

Current operations generate a total of 128 truck movements per day, which equates to approximately 16 movements per hour. These figures take into account return movements from the Bioreactor back to the Crisps Creek IMF.

Phase 4 – Deposition of Waste into the Bioreactor

Once the waste has been deposited at the active tipping face, compactors are used to spread and compact the waste. The waste is initially placed carefully to protect gas and leachate infrastructure. The compaction process breaks up the material and assists with the biodegradation rate, minimising the void space within the waste as well as helping to reduce the potential for fire hazards by reducing potential oxygenation of the fill. Additionally, compaction also helps to reduces odours, litter, and pest and vermin presence.

Phase 5 – Rail Operations back to Sydney

Containers, once emptied, are returned to the Crisps Creek IMF using the same trucks that transported them to the Bioreactor. The containers are then reloaded onto the waiting train set using the same heavy duty forklifts that were used to unload the containers earlier in the morning. The train then departs late in the afternoon to return to the Clyde Transfer Terminal back in Sydney.

2.5.2 Woodlawn Bioreactor

2.5.2.1 Overview

The Woodlawn Bioreactor (**Figure 2-3**) comprises a number of elements including:

- access road;
- bioreactor mine void;
- evaporation dam 3;
- facility administration office, workshop, power station and associated infrastructure; and
- leachate pipes, leachate dams and associated infrastructure.

The mine void is approximately 39ha in area, has a depth of approximately 200m and an air space capacity of approximately 25 million cubic metres.

The Bioreactor is licensed to accept General Solid Waste (putrescible) which is classified under Schedule 1 Part 3 of the Protection of the Environment (Operations) Act 1997 as waste other than special waste, hazardous waste, restricted solid waste or liquid waste and anything that is classified as general solid waste (putrescible) by the DECCW. The Woodlawn Bioreactor and the Crisps Creek IMF have been issued with Environment Protection Licenses (EPLs) by DECCW (Woodlawn Bioreactor EPL No 11436 and IMF EPL No 11455).

The approved hours of operation for the Woodlawn site are between 6:00am and 7:00pm and for the IMF they are between 6am to 6pm Mondays to Saturdays for rail movements and 7am to 6pm Mondays to Saturdays for operations at the site. The Environment Protection Licence (EPL) for the Bioreactor and IMF allows Veolia to vary these operational hours, subject to approval by the Department of Environment, Climate Change and Water (DECCW).

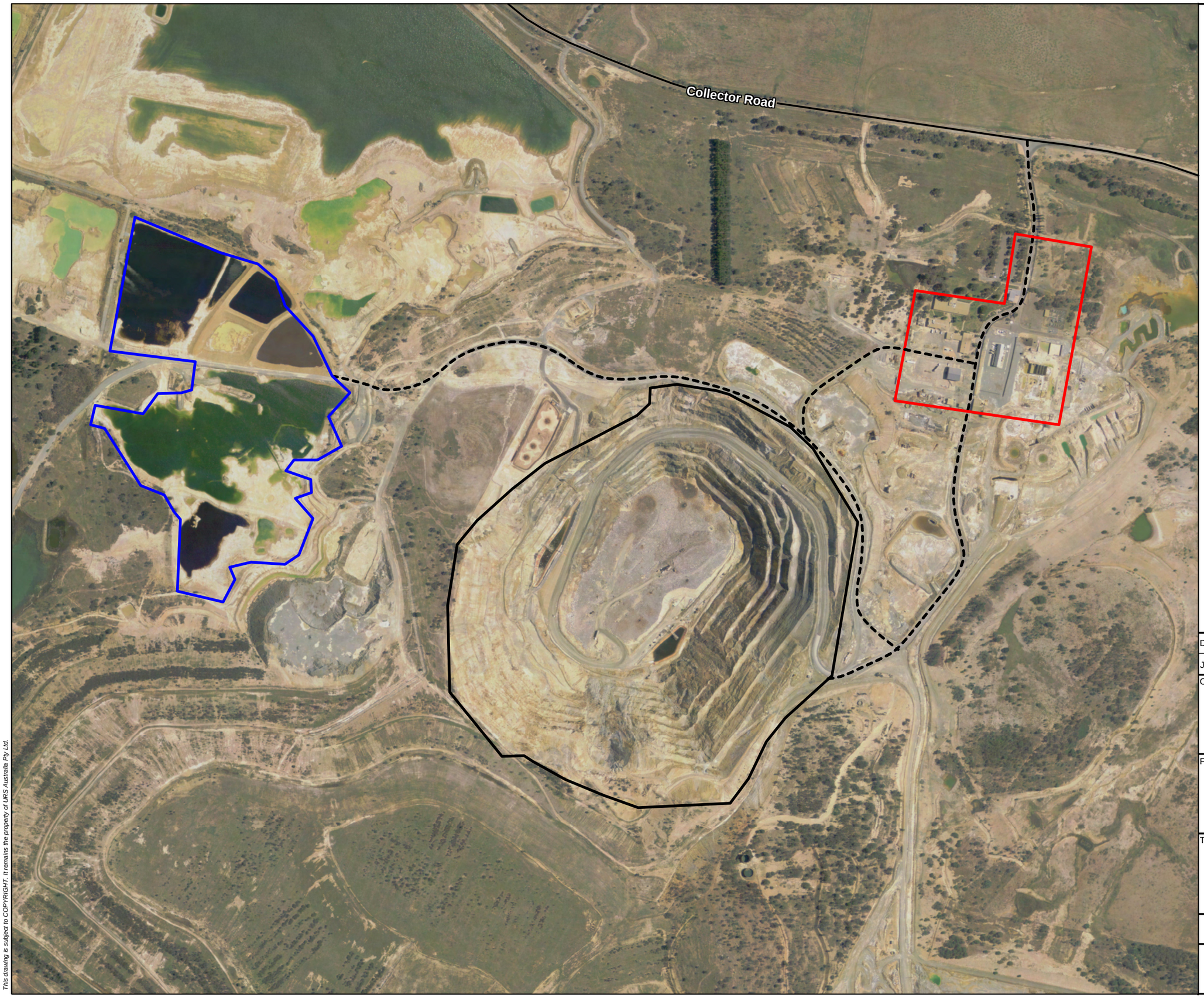
A series of photographs illustrating the Bioreactor site are provided in **Figure 2-4**.

2.5.2.2 Waste Input Rates

Condition 4 of the original development consent (DA No. 31-02-99) for the Bioreactor and the Crisps Creek IMF provided a sliding scale for input rates, whereby input would be capped at 400,000 tonnes per annum (tpa), reducing by 10% every five years until a level of 290,000 tpa is reached.

Condition 5 of the original development consent for the Bioreactor limits the waste input rate to no more than 500,000 tonnes per annum (tpa) in any one year, subject to the findings of an independent assessment of landfill capacity and demand in the Sydney Region.

Given the overwhelming demand (and need) for putrescibles landfill, Veolia requested the Department of Planning remove the reducing tonnage restriction within the consent and enable regional waste to be received at the facility by road. The facility currently has approval to receive up to 500,000 tonnes per annum of waste, including 450,000 tpa by rail from Sydney and 50,000 tpa by road from regional areas.



Legend

- Access Road
- Mine Void
- Site Offices, Parking, Workshop, Power-Generating Infrastructure
- Evaporation Dam 3

N

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Client

VEOLIA ENVIRONMENTAL SERVICES PTY LTD

Project

WOODLAWN EXPANSION PROJECT

Title

WOODLAWN BIOREACTOR KEY COMPONENTS

Figure: **2.3** | Rev: A | **A3**

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WOODLAWN EXPANSION PROJECT

Title
BIOREACTOR PHOTOGRAPHS

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Job No: **43177703**	File No: 43177703.017.wor	

Figure: **2.4**

Rev: A

A3

2.5.2.3 Capacity and Projected Life

The Bioreactor has a total capacity of 25,000,000 cubic metres.

Based on the proposed increased maximum throughput rate at Crisps Creek IMF and increased maximum input rate at the Bioreactor as described in this EA, the Bioreactor has a projected remaining project life in the order of 25 years, assuming a gradual ramp up of tonnes from current levels to the maximum proposed rates over a period of approximately 10 years (refer **Section 2.8**).

2.5.2.4 Power Infrastructure

Power infrastructure at the Bioreactor comprises:

- 66/11kV zone substation;
- two 11kV switching stations;
- one 750KVa pad mount distributing substation;
- 11kV circuit breakers;
- transformers;
- high and low voltage power lines and poles; and
- standby generator.

Power transfer is provided via two high voltage networks to load centres across the site: one provides power to the void, the other provides power to the Woodlawn mine (i.e. activities associated with mine, tailings pumps waste rock areas etc.). Load centres distribute power to infrastructure requirements such as pumps and power outlets. All operation and maintenance on high voltage infrastructure is performed by Country Energy

High voltage is converted at the pad mount substation to low voltage power for site facilities, flare operation, auxiliary equipment at power station. A standby generator is available to provide backup low voltage power when required.

Exported power from the generators is distributed via a high voltage cable to the Country Energy 66/11kV Substation. Electricity is converted from the landfill gas generators through a series of transformers within the power station and finally converted to 66kV within the Country Energy substation, where the power is exported into the electrical grid. Refer **Section 2.5.2.8** for further details of the Woodlawn Bioenergy project.

2.5.2.5 Bioreactor Landfill Technology

Bioreactor landfill technology involves the controlled addition of moisture and the recirculation of leachate to result in a greatly accelerated rate of waste decomposition and an increased rate of landfill gas (or biogas) generation and waste stabilisation. Landfill gas is collected using horizontal and vertical gas extraction networks to optimise the production of methane and, subsequently, the generation of green electricity to feed into the power grid.

A bioreactor is “a landfill that uses enhanced microbiological processes to transform and stabilise the readily decomposable organic waste constituents within 5-10 years of the bioreactor process being implemented” (Pacey et al. 1996).

Bioreactor landfills are designed, constructed and operated to optimise moisture content and increase the rate of anaerobic degradation. Normal operation includes recovery of leachate and its redistribution through the waste mass. The goal is to substantially increase the rate of biodegradation to achieve maximum gas generation rates and optimise recovery for energy production.

Bioreactor technologies can be described as representing ‘advances in municipal solid waste technology that have emerged out of continuous and ongoing research into optimising waste degradation in landfills (WMAA Technical Paper 2009).

The benefits of a bioreactor over other landfill technologies include:

- a reduced period of stabilisation of the waste and thus a reduced but intensified landfill gas generation;
- an increased rate of landfill gas generation allowing greater opportunity for beneficial utilisation of the landfill gas;
- reduced greenhouse gas emissions through enhanced landfill gas capture rates;
- an increased rate of settlement of the waste resulting in enhanced void space utilisation;
- reduced leachate treatment costs due to recirculation within the waste mass;
- reduced post closure management period due to quicker stabilisation of waste; and
- earlier use of the rehabilitated site for other beneficial uses.

2.5.2.6 Landfill Design

Detailed consideration of the design, staging and performance of landfill cells and the management and extraction of landfill gas was undertaken as part of the original EIS to establish operations at the Woodlawn Bioreactor. Supplementary work was carried out in support of the EIS that was subsequently presented as part of the evidence put forward to the Commission of Inquiry (COI) in 2000.

Design of the Bioreactor allows for the gradual staging of landfill cells and lifts in response to monitoring and current best practice. The initial site preparation works to establish the land fill cells involved the installation of a waste liner and placement of drainage material to construct a basal leachate collection system to intercept the downward migration of leachate, and to assist with leachate collection and recycling.

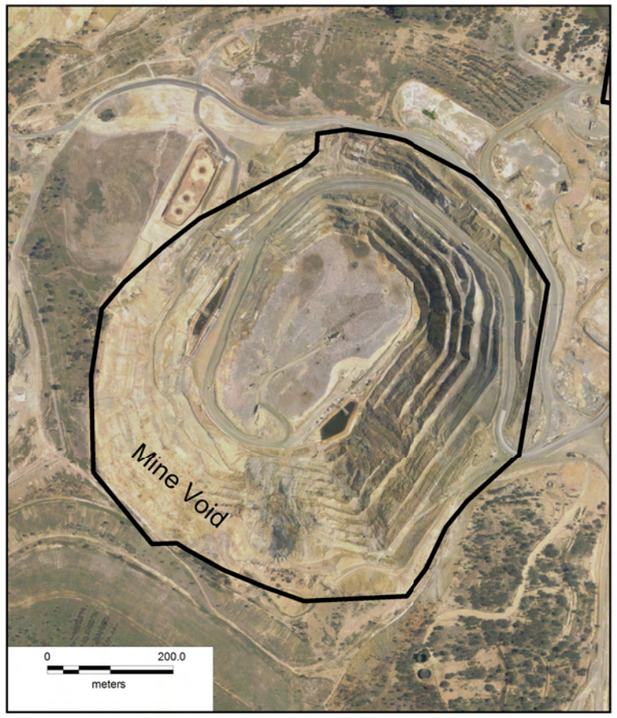
Future cells and lifts are designed to continually improve leachate and gas management systems.

As the waste enters the bioreactor the waste surface increases in height and area. Tipping occurs in lifts with the waste being placed from one side of the bioreactor to the other prior to starting the next lift. The conical shape of the void in which the bioreactor is located ensures the surface area of the waste increases with each lift. As the surface area increases more gas extraction systems are installed. The increase in surface area also increases the time surface infrastructure can remain in

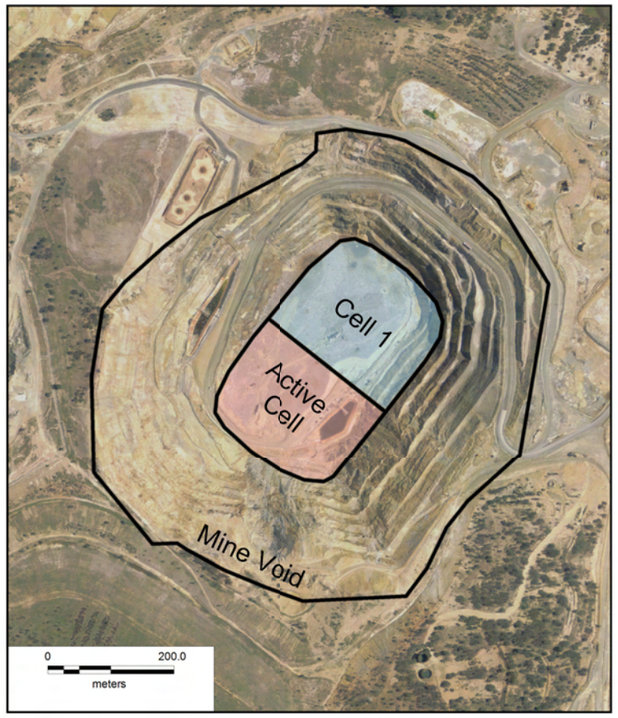
place before it needs to be decommissioned as the tipping passes through that area. Once tipping is completed in an area, the gas infrastructure can be recommissioned. With each new lift more gas and leachate infrastructure is placed within the waste mass for future gas and leachate management.

The Woodlawn Bioreactor facility was designed using best practice principles of bioreactor technology, as described in the section above.

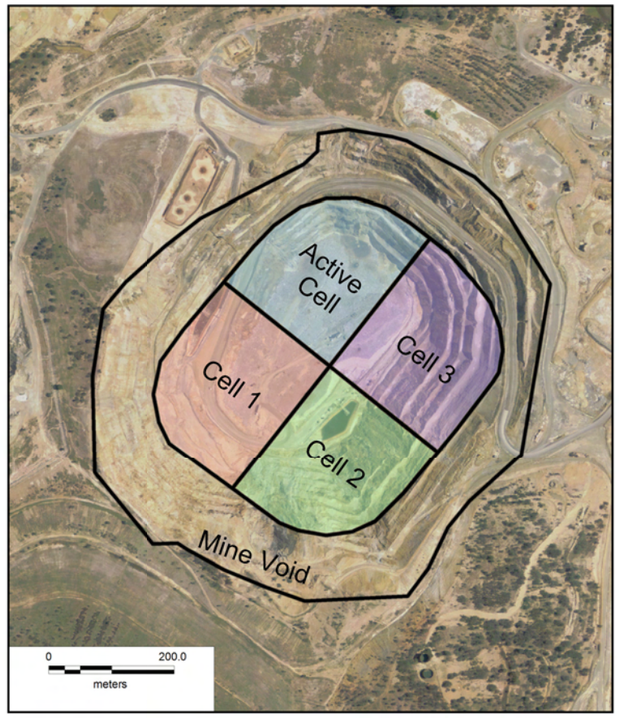
Figure 2-5 provides the conceptual filling plan for the Bioreactor.



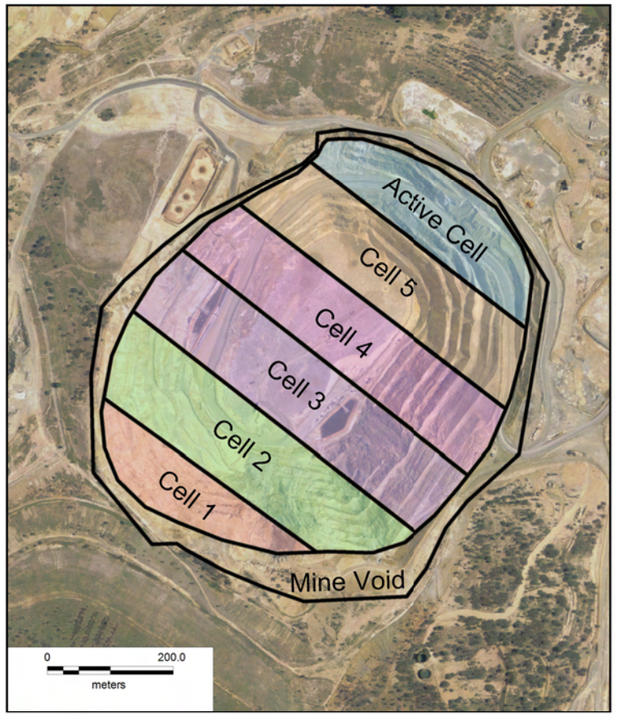
WASTE ROCK BASE AND LEACHATE COLLECTION SYSTEM INSTALLED, TIME = 0 YEARS



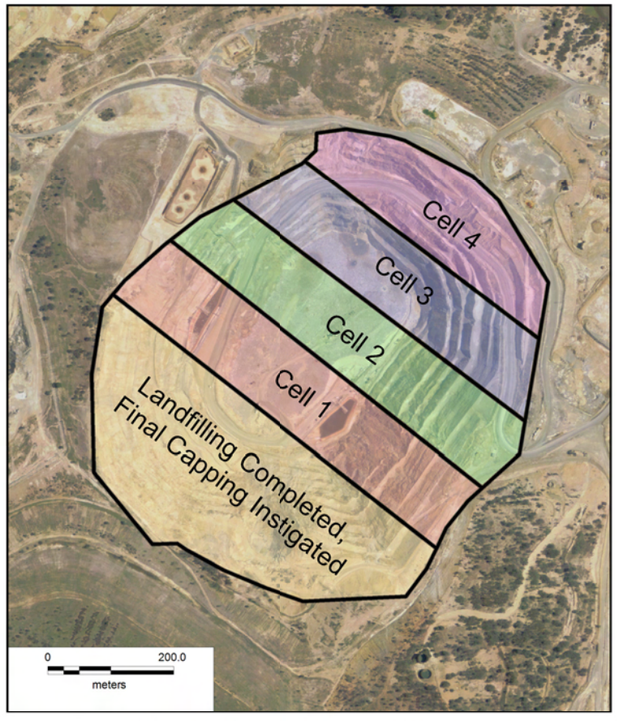
WASTE DEPTH 50m, TOTAL CUMULATIVE 2.1Mm³, TIME = 6 YEARS



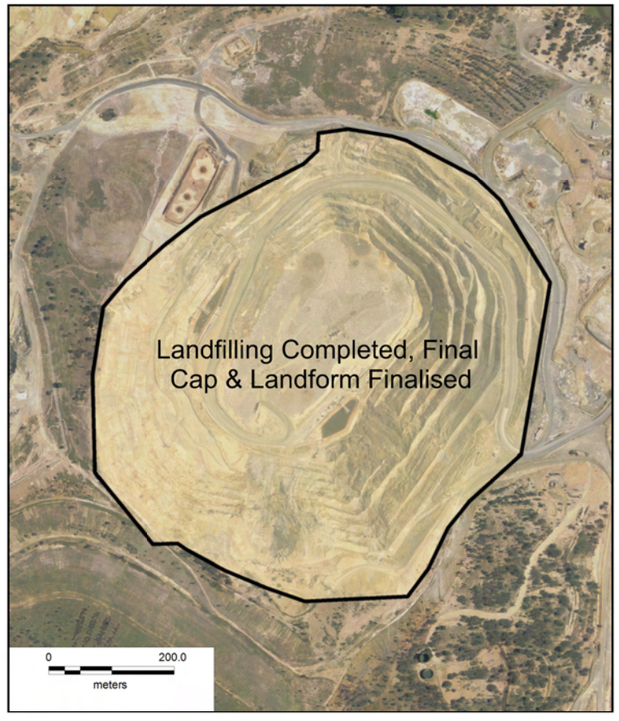
WASTE DEPTH 100m, TOTAL CUMULATIVE 8.5Mm³, TIME = 22 YEARS



WASTE DEPTH 150m, TOTAL CUMULATIVE 18.8Mm³, TIME = 43 YEARS



WASTE DEPTH 200m, TOTAL CUMULATIVE 25.0Mm³, TIME = 50 YEARS



WASTE ROCK BASE AND LEACHATE COLLECTION SYSTEM INSTALLED, TIME = 0 YEARS

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Client

VEOLIA ENVIRONMENTAL SERVICES PTY LTD

Project

WOODLAWN EXPANSION PROJECT

Title

CONCEPTUAL FILLING PLAN (INDICATIVE) FOR WOODLAWN BIOREACTOR

Figure: **2.5**

Rev: A

A3

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2.5.2.7 Landfill Gas Management

The landfill gas (LFG) extraction system, although dynamic is used to maximise the capture of methane with the principle aim of generating electricity. The active gas extraction system uses suction to actively remove landfill gas (LFG) from the waste mass under a vacuum. The LFG extraction and collection system consists of a network of extraction wells and collection pipes within the waste mass to transport the LFG to the purpose built power station.

Since the project began in September 2004, there have been around 65 leachate and gas extraction wells installed in the waste. A plan showing the current network of extraction infrastructure and a further description of the system is provided in **Appendix F Greenhouse Gas Assessment**. These wells have been installed to optimise the capture of LFG. As the surface area of the waste mass increases, the ability to increase the number of wells is possible. With the principle aim of accelerating the decomposition of the waste, leachate recirculation is achieved by the removal of microbial rich liquid from the wells and subsequently recirculating on the fresh waste during daily land filling.

Horizontal gas extraction systems are also installed during the active landfilling phase. These systems are specifically design to capture LFG as the natural degradation process takes place. These systems are constructed of HDPE perforated pipe, with a drainage medium covered to increase the zone of influence. Similar to the wells, these systems allow for leachate recirculation and LFG gas flow.

The LFG collection system is dynamic, and as a result its operation is closely monitored and adjusted to evaluate the conditions within the bioreactor to effectively maintain a continuous supply of gas to the landfill gas generators.

2.5.2.8 Energy Generation

The Woodlawn Bioenergy project was officially opened by Veolia on the 14th of April 2008, however the first landfill generator was commissioned in February 2008. Up until that point, all LFG captured from the bioreactor was destroyed by a flare, this was and still is an Environment Protection Licence requirement when the LFG is not used for power generation. The second generator was commissioned in November 2008 with the third in March 2010.

The Woodlawn Bioenergy project comprises the existing three GE Jenbacher gas engines, gas conditioning equipment, High Voltage / Low Voltage systems, HAASE low emission flare-stack and a gas extraction booster system, which applies suction to the waste mass. The current power station is designed to house six engines and it is anticipated that a total of four buildings will be completed over the coming years to accommodate 24 engines as the gas yield increases.

Figure 2-6 and **Figure 2-7** illustrate key components of the Bioenergy project.

With the anticipated increase in annual waste tonnages to the Woodlawn Bioreactor, the installation of gas extraction systems will still be a primary objective of the project. The bioreactor processes can still be maintained, with leachate recirculation practices still a core component of the accelerating the waste decomposition process. With the increase in waste volumes, this gives scope to access larger volumes of LFG capture over a shorter period of time.

Since commencement of the Woodlawn Bioreactor until the end of 2009, the site has abated 119,490 tonnes of CO_2e through flaring and electricity production. The site has also generated 19,726 Renewable Electricity Certificates (REC's) and 74,167 New South Wales Greenhouse Abatement Certificates (NGAC's). Preliminary independent on site testing indicates that the level of methane capture at the Woodlawn Bioreactor is up to 92%, which results in significant environmental benefits, when compared to traditional processes (GHD 2007).

From July 2009 to June 2010 the site generated 14,331 MWh of renewable energy, which is enough electricity to power 1,791 homes for a year.

Figure 2-6 Woodlawn Generator

Figure 2-7 Woodlawn HUB

2.5.3 Crisps Creek IMF

2.5.3.1 Overview

The Crisps Creek IMF has a total site area of approximately 10ha, of which 1.75ha is currently occupied by the IMF. **Figure 2-8** provides an overview of the IMF layout and facilities. Principal elements of the Crisps Creek IMF comprise:

- access road;
- hard stand areas for container storage;
- two rail sidings to enable train sets to be split for unloading; and
- facility administration and site office.

Figure 2-9 provides recent photos taken of the site which illustrate the key site components and activities.

The approved hours of operation for the Crisps Creek IMF are between 7:00am to 6:00pm on Mondays to Saturdays. Train operations may be conducted from 6:00am to 6:00pm. The Environment Protection Licence (EPL) for the IMF allows Veolia to vary these operational hours, subject to approval by the Department of Environment, Climate Change and Water (DECCW).

Legend

- Access Road
- Rail Sidings
- Site Office, Equipment Storage
- Hardstand Area, Container Storage

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Drawn: SB	Approved: DRAFT	Date: 02/08/2010
Job No: **43177703**	File: 43177703-012.wor	

Client

VEOLIA ENVIRONMENTAL SERVICES PTY LTD

Project

WOODLAWN EXPANSION PROJECT

Title

CRISPS CREEK IMF KEY COMPONENTS

Figure: **2.8**	Rev: A
	A3

URS

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Figure 2-9 Crisps Creek IMF

2.5.3.2 Rail Transport

The Woodlawn Bioreactor utilises existing rail infrastructure to deliver the long-haul component of waste transportation by rail. The use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit, as rail transport would result in three times less emissions than road transport.

The rail operations currently involve one train with 56 containers being transported from Clyde to Crisps Creek up to 6 days per week. The train currently arrives at Crisps Creek IMF at approximately 6.30am and departs at approximately 4.30pm. This scheduling is based on restrictions within the existing network, including freight operating curfews and train crossing loops.

Further details regarding the rail operations are provided in **Appendix H – Transport Impact Assessment**.

2.6 Other Existing Operations – Woodlawn Eco-Precinct

2.6.1 Mine Site Rehabilitation

The Woodlawn Bioreactor is located on a disused mine site that operated as an open cut and underground base metals mine throughout the 1980s and 1990s. Following the closure of the mine, Veolia took over the mine rehabilitation obligations, as well as the ongoing monitoring for potential environmental impacts.

The Woodlawn Mining Operations Plan (MOP) outlines the process and timing for whole of mine rehabilitation for the parts of Woodlawn which fall outside the Bioreactor consented areas. A summary of the rehabilitation activities undertaken since Veolia became responsible is provided below.

The rehabilitation strategies for the mine void and evaporation dam 3 (ED3), which are part of the Bioreactor consented area, form part of the Post-Closure Landfill Rehabilitation Management Plan (PCLRMP) and outlined in **Chapter 15 Landform and Site Rehabilitation**.

The original development consent required the rehabilitation of the western ridge of the void to divert water away from the void. This rehabilitation work has also included the application of composted green waste and initial plantings to stabilise the area.

The former mineral ore processing area is a high priority for rehabilitation. Following a 3 phase Environmental Site Assessment of this area, Veolia has commenced the first stage of rehabilitation through the demolition of the concentrate silos and removal of the higher contaminated material to the tailings dams.

Ongoing research is also being undertaken to investigate the suitable rehabilitation methods for the tailing dams. These investigations have been focused on finding synergies with the waste industry through the use of waste materials rather than natural resources. To this end, a trial was undertaken to investigate the feasibility of using municipal solid waste compost as a rehabilitation material. These trials are continuing and are being led by Tri Origin Minerals.

2.6.2 Farm Operations

The original Woodlawn mine site included an operating farm on the property which acted as a buffer zone during the mine operations. When Veolia was granted development consent for the Woodlawn Bioreactor, the conditions of development consent required Veolia to acquire the neighbouring farm, Pylara, to create a larger buffer zone around the Bioreactor operations. These two properties now form the 6,000 hectare land owned by Veolia and known as the Woodlawn Eco-Precinct.

Since purchasing Pylara, Veolia has integrated the farming operations on the Woodlawn and Pylara properties and implemented sound management practices to achieve higher productivity from the farm. This has included a new sheep breeding program focused on careful genetic selection, nutrition and grazing rotation, which has resulted in improved meat and wool productivity while reducing impacts on the soils.

Chapter 2 Project Description

2.6.3 Aquaculture Trial

In keeping with the objective of utilising as many resources as possible within the Woodlawn Eco-Precinct, Veolia has been looking for ways to utilise the waste heat created through the production of renewable energy from the landfill gas. As part of this program, Veolia is currently trialling a silver perch aquaculture project.

The aim of this project is to trial the feasibility of establishing a self filtering aquaculture operation on site which utilises the waste heat during energy generation. This trial also incorporates hydroponics in the filtration system to remove excess nutrients. If current trials are successful, the opportunity may also exist for carbon dioxide produced as a result of the methane reduction during energy generation to be fed into the hydroponics system to increase the rate of plant growth.

2.7 Environmental Management

Veolia operates in accordance with its conditions of consent and Environment Protection Licences. ***Chapter 6 Environmental Management*** provides a comprehensive overview of the environmental performance of the Bioreactor and Crisps Creek IMF.

The Bioreactor has generated significant greenhouse gas savings when compared to other landfill sites. As the majority of waste that is input into the Bioreactor is delivered via rail, Veolia has ensured that a significant number of trucks have been removed from the road, resulting in reduced transport congestion along with greenhouse gas emission savings.

Since commencement, the Bioreactor has abated 119,490 tonnes of CO_2 equivalent tonnes through flaring and electricity production. The site has also generated 19,726 Renewable Electricity Certificates and 74,167 New South Wales Greenhouse Abatement Certificates. Preliminary independent on site testing indicates that the level of methane capture at the Woodlawn Bioreactor is greater than 92% which results in significant environmental benefits, when compared to traditional landfill processes (GHD 2009).

2.8 Woodlawn Expansion Project

There are two components to this Major Project Application.

The first is to obtain approval to increase the input rate at the Bioreactor to a maximum of 1.13 million tpa, and to simultaneously increase the throughput capacity of waste being transported and unloaded at the Crisps Creek IMF to a maximum of 1.18 million tpa. To facilitate the increased input and throughput rates, approval is sought for installation of additional lighting at the Bioreactor site, an increase in the Bioreactor and IMF hours of operation, and an increase in the number of truck movements to transport waste from the IMF and regional centres to the Bioreactor.

As detailed in ***Chapter 1 Introduction***, whilst the AWT facility has not yet been constructed, and regional waste is not yet being received at the Bioreactor, for the purpose of this Environmental Assessment (EA) report, the assessment studies: i) take into consideration and assess the additional volume of waste through Crisps Creek to the proposed WASP/WOCOG facility associated with the AWT approval; and ii) take into consideration and assess the additional volume of waste received by road from surrounding regional areas.

The second component is for this Major Project Application to replace the existing consent that permits the ongoing operations for both the Bioreactor and the Crisps Creek IMF under DA 31-02-99, which was approved in November 2000. Veolia proposes that all of the relevant operational conditions applying to both the Bioreactor and the Crisps Creek IMF under DA 31-02-99 continue to apply, except where those conditions are modified or made redundant by this Major Project Application.

The remainder of this Chapter provides a description of the existing and proposed annual waste volumes and the associated activities (i.e. the additional lighting, increased hours of operation and increased truck movements) for which approval is sought.

2.9 Annual Waste Volumes

2.9.1 Bioreactor Facility

Veolia propose to increase the annual waste received at the Woodlawn Bioreactor to a maximum of 1.13 million tpa. A breakdown of the proposed input rate is provided in **Table 2-3**.

Table 2-3 Existing and Proposed Waste Input - Woodlawn Bioreactor

Waste	Waste Input (tonnes per annum)
Previously assessed Bioreactor maximum input rate	500,000
Approved Alternative Waste Technology (AWT) Facility - Residual (1) (2006)	100,000
Regional waste inputs (2)	130,000
Proposed additional waste by rail	400,000
Total	**1,130,000**

(1) the processing of waste at the approved AWT Facility (DA 06-0239) is expected to result in approximately 40% residual material. This volume currently forms part of the total approved 500,000 tonnes per annum into the Bioreactor.

(2) local waste tonnes includes 50,000 tonnes approved under the existing Woodlawn Consent (DA 31-02-99).

The Bioreactor was previously assessed to accept up to 500,000 tpa from Sydney by rail. The existing Woodlawn Consent (DA 31-12-99) has subsequently been modified to enable up to 50,000 tpa of waste to be accepted from regional areas by road. The Woodlawn AWT is approved to process up to 280,000 tpa of waste. 100,000 tpa of residual waste from the AWT is approved to be deposited into the Bioreactor.

Regional waste inputs into the Bioreactor comprise an additional proposed 80,000 tpa of waste from regional sources, as well as 50,000 tpa of waste approved under the existing consent.

2.9.2 Crisps Creek IMF

The Crisps Creek IMF is currently approved to handle up to 780,000 tpa of waste. Of this total, 500,000 tpa was previously assessed under the original DA 31-12-99, while 280,000 tpa was assessed under the AWT DA in 2007.

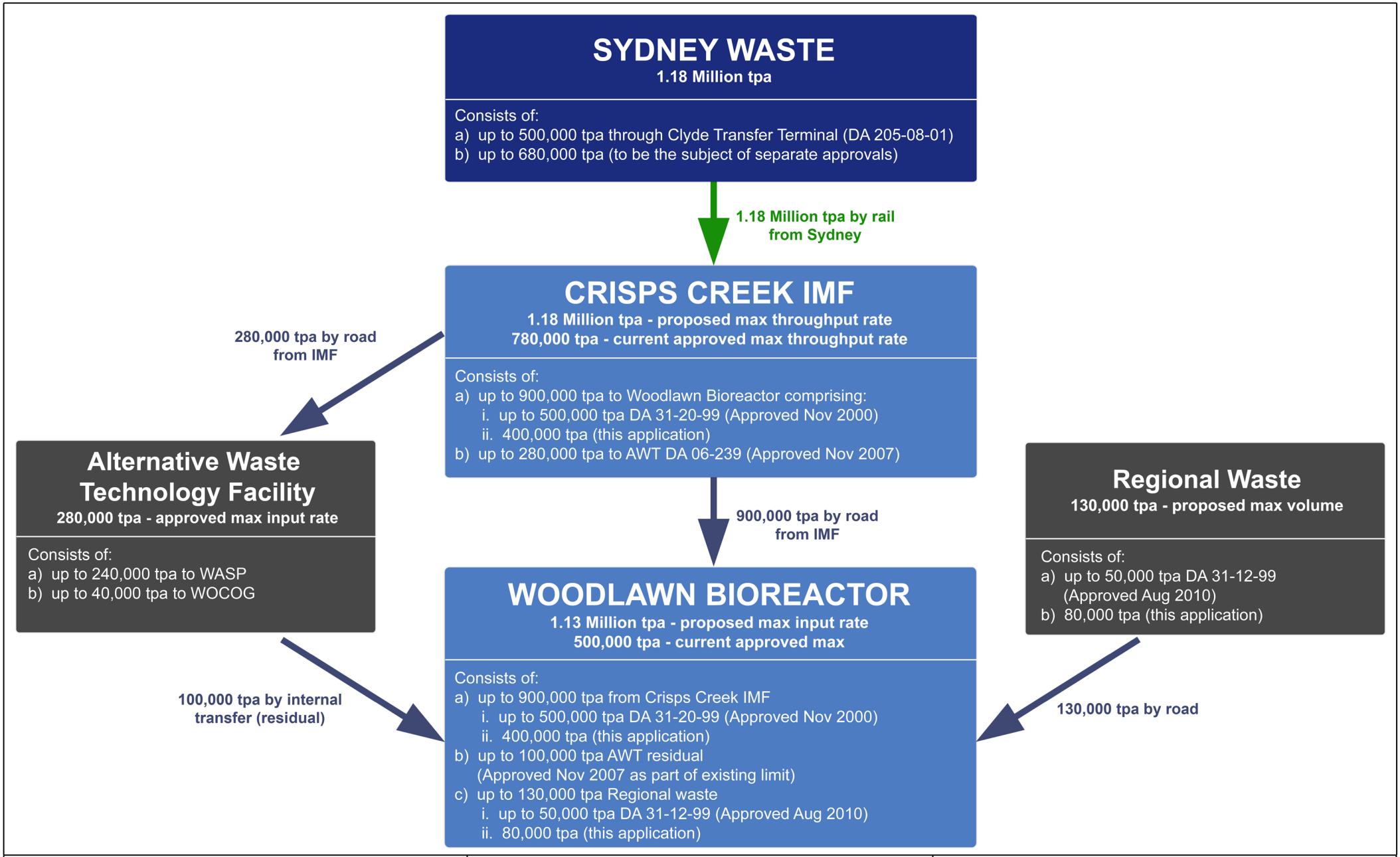
Chapter 2 Project Description

As part of the Woodlawn Expansion Project, approval is sought for an increase in the tonnage of waste that can be transported through the Crisps Creek IMF to 1.18 million tpa, a total increase of 400,000 tpa (**Table 2-4**).

Table 2-4 Existing and Proposed Waste Throughput - Crisps Creek IMF

Waste	Waste Throughput (tonnes per annum)
Previously assessed maximum throughput rate	500,000 tonnes per annum
Approved additional waste direct to AWT	280,000 tonnes per annum
Proposed additional waste direct to Bioreactor	400,000 tonnes per annum
TOTAL	**1,180,000 tonnes per annum**

Figure 2-10 provides a schematic which illustrates existing and proposed waste quantities, sources and destinations.



Client VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project WOODLAWN EXPANSION PROJECT	Title WASTE QUANTITIES SCHEMATIC
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Chapter 2 Project Description

2.10 Associated Activities

In order to facilitate the proposed increase in the throughput rate at Crisps Creek IMF and input rate at the Woodlawn Bioreactor, approval is sought for installation of additional lighting at the Bioreactor, an increase in the Bioreactor and IMF hours of operation and an increase in the number of truck movements to transport waste from the IMF and regional areas to the Bioreactor. This Section provides an overview of each of these activities.

2.10.1 Woodlawn Bioreactor and IMF Lighting

The only construction activities associated with the Project comprise the installation of additional lighting towers at the Bioreactor site. Lighting is required along the access road and in working areas of the void. Approximately twenty 400 Watt lights will be installed and will be connected to existing mains power. Additional lighting within the void (active tipping area) will be required during the evening period using four portable diesel powered light towers to provide adequate lighting to the tipping operations.

2.10.2 Hours of Operation

Approval is sought for an extension to the existing hours of operation at the Bioreactor and at the IMF as detailed in **Table 2-5**.

Table 2-5 Existing and Proposed Hours of Operation

Site	Existing Hours of Operation *		Proposed Hours of Operation *	
	Monday to Saturday	*Sundays & Public Holidays*	*Monday to Saturday*	*Sundays & Public Holidays*
Woodlawn Bioreactor	6am to 7pm	No work permitted on Sunday, Good Friday or Christmas Day	6am to 10pm	No work permitted on Sundays, Good Friday or Christmas Day
Crisps Creek Intermodal Facility	6am to 6pm (train movements only), operations are permitted between 7am and 6pm.	No work permitted on Sundays, Good Friday or Christmas Day	6am to 10pm (allowing for both operations and train movements).	No work permitted on Sundays, Good Friday or Christmas Day

* Hours of operation may be varied with the written consent of DECCW.

2.10.3 Road Transport

The increased input rate will result in additional vehicular movements as additional trucks will be required to deliver waste from regional sources as well as from the movements of additional trucks between the Crisps Creek IMF and the Bioreactor. **Chapter 12 (Traffic and Transport**) and **Appendix H** provide a detailed assessment of the transport and traffic related impacts associated with the Project.

With regard to rail transport, in June 2010, Veolia requested Pacific National, the rail operator responsible for the transportation of waste from Sydney to the Crisps Creek IMF, to undertake an assessment of existing rail capacity. The purpose of the assessment was to determine whether the proposed growth in delivery of additional waste from Sydney to the Crisps Creek IMF could be accommodated. The rail assessment demonstrated that a maximum of 1.18 million tpa rail capacity would be achievable. The details of the rail assessment are included in **Appendix H** of this Environmental Assessment, and are also presented in **Chapter 12 – Traffic and Transport**.

2.11 Summary

Table 2-6 provides a summary of the changes being sought by Veolia as part of the Woodlawn Expansion Project.

Table 2-6 Summary of Proposal

Site	Existing Approved Operations		Proposed Operations	
Woodlawn Bioreactor	**Maximum Assessed Input Rate and Waste Profile**		**Maximum Assessed Input Rate and Waste Profile**	
	500,000 tpa of General Solid Waste (Putrescible) .		1,130,000 tpa of General Solid Waste (Putrescible)	
	Hours Of Operation *		**Hours of Operation ***	
	Monday to Saturday	Sundays & Public Holidays	Monday to Saturday	Sundays & Public Holidays
	6am to 7pm	No work Permitted on Sunday, Good Friday or Christmas Day	6am to 10pm	No work permitted on Sunday, Good Friday or Christmas Day
	Site Area		**Site Area**	
	Existing Woodlawn Bioreactor consented area, part of Lot 19, DP 827588, and Lots 25, 30, 88 and 91, DP 754919		No change	
	Physical Works		**Physical Works**	
	As per existing consent		No change	
	Site Management Processes		**Site Management Processes**	
	As per existing consent and EPL		Pending approval	
	Total Staff Numbers		**Proposed Total Staff Numbers**	
	20 staff (including Crisps Creek staff)		31 staff (including Crisps Creek staff)	
	Truck Movements		**Truck Movements**	
	10 per hour from Crisps Creek IMF 10 per day from regional areas		15 per hour from Crisps Creek IMF 25 per day from regional areas	
	Equipment		**Equipment**	
	As per existing consent		1 extra forklift, compactor, bulldozer and tipper, and mobile lighting towers for Bioreactor site	

Chapter 2 Project Description

Site	Existing Approved Operations		Proposed Operations	
Crisps Creek IMF	**Maximum Assessed Throughput Rate**		**Maximum Assessed Throughput Rate**	
	780,000 tpa		1.18 million tpa	
	Hours of Operation *		**Hours of Operation ***	
	Monday to Saturday	Sundays & Public Holidays	Monday to Saturday	Sundays & Public Holidays
	6am to 6pm (train movements only), operations are permitted between 7am and 6pm.	No work Permitted on Sunday, Good Friday or Christmas Day	6am to 10pm (allowing for both operations and train movements).	No work Permitted on Sunday, Good Friday or Christmas Day
	Development Area		**Development Area**	
	Existing consented area, Lot 1, DP 1045652		No change	

* Hours of operation may be varied with the written consent of DECCW.

Project Need, Justification and Alternatives Chapter 3

3.1 Project Need

Since commencing operations in 2004, the Woodlawn Bioreactor has received approximately 400,000 tonnes of putrescible waste from the Sydney region by rail each year, as capped by the original conditions of consent approved by the Minister for Planning in 2000. The Bioreactor has considerable capacity to receive putrescible waste generated from both Sydney and surrounding areas of regional NSW.

It is within this context, and in response to arbitrary annual waste input limits and substantial shortfall in annual available disposal capacity, as well as to underpin its further development of the overall Veolia Eco-Precinct, that Veolia seeks to expand operations at the Woodlawn Bioreactor.

The proposed Woodlawn Expansion Project ('Project') is supported in part, by clear conclusions drawn from the 2009 *Wright Corporate Strategies' Public Review – Landfill Capacity and Demand* (the Wright Review 2009) commissioned by the Minister for Planning, the Review made determinations on a number of critical issues including:

- A continuing need for putrescible waste landfill capacity persists.
- That current input rate caps are considerably lower than the volumes of waste required to be sent to landfill – the gap will increase in future as a result of scheduled cap reductions.
- That aggregate waste input caps of around 2 million tonnes per year would be necessary to meet immediate demand.
- The removal of the annual input caps as a regulatory measure would have no adverse impact on resource recovery initiatives and would not increase the volumes of putrescible waste sent to landfill.

Should the Woodlawn Expansion Project not proceed, the industry could be forced into a position in which annual waste input limits are breached to meet the demand for safe putrescible waste disposal. The alternative is a new and lengthy landfill establishment process. This situation could result in several unfavourable flow on consequences.

Operators' confidence in making future resource recovery infrastructure investment decisions would also be affected. In addition, the regional benefits of introducing improved waste management and resource recovery options would not be realised.

Accordingly, there is a clear and demonstrable need for additional landfill capacity, which is outlined in this chapter.

3.2 Project Justification

The justification for the Woodlawn Expansion Project draws on the Wright Review 2009, an independent strategic review of landfill demand and capacity within the Sydney region and estimated take up of Alternative Waste Technology (AWT) as well as analysis of the regional disposal capacity and demand.

Chapter 3 Project Need, Justification and Alternatives

This justification demonstrates –

- The Project responds to an urgent need to expand aggregate annual waste input rates to address the chronic shortfall in available annual disposal capacity and meet the continuing need for putrescible waste landfill capacity in the Sydney region [1] – the Project would address approximately 40% of the long term annual shortfall forecast in the Wright Review 2009.
- The Project would satisfy regional demand for reliable, flexible and cost-effective waste management solutions enabling Councils to focus on further resource recovery initiatives and rehabilitation of existing landfills.
- The Project is consistent with the strategic direction for waste management in NSW and supports the progressive introduction, diversification and expansion of AWT needed to increase resource recovery and divert valuable materials from landfill.
- With the current challenge of climate change, the Woodlawn Bioreactor provides an environmentally responsible and sustainable solution that is consistent with existing greenhouse gas strategies.
- The Project utilises existing land and infrastructure, furthermore the project will be undertaken in an area in which Veolia have a comprehensive understanding (gained through continuous monitoring, testing and evaluation) of existing conditions, providing additional certainty with respect to predicted environmental outcomes.
- The Project is located within the Woodlawn Eco-Precinct, which is consistent with the NSW WARR strategy through environmentally responsible disposal, development of alternative waste technologies and facilitation of regional waste programs such as green waste separation.

3.3 New South Wales Policy Context

The NSW policies and strategies relevant to the proposal include:

- *Waste Avoidance and Resource Recovery (WARR) Act 2001*
- Waste Avoidance and Resource Recovery Strategy 2007
- Greenhouse Plan 2005
- Action for Transport 2010

Each of the documents referred to above are discussed below. Further details regarding the consideration of relevant environmental planning instruments and their relevance to the proposal are presented in **Chapter 4 Statutory Planning**.

[1] Wright Corporate Strategy, *Public Review Landfill Capacity and Demand* (March, 2009), p.11

3.3.1 Waste Avoidance and Resource Recovery (WARR) Act 2001

The *Waste Avoidance and Resource Recovery (WARR) Act* was the result of a major overhaul of waste policy objectives and forms the basis of a framework for waste management in NSW. The Act establishes a hierarchy to minimise the consumption of natural resources and final disposal of waste by encouraging waste avoidance, reuse and recycling.

The *WARR Act* promotes integrated waste and resource management planning, programs and service delivery on a state-wide basis to ensure that waste is managed to reduce environmental harm in accordance with the principles of ecologically sustainable development and the objectives of the *Protection of Environment Operations Act 1997*.

As a regional putrescible waste landfill servicing Sydney and surrounding regions, the Woodlawn Expansion Project would continue to deliver disposal capacity and the superior environmental outcomes of a bioreactor compared with conventional landfilling, whilst addressing capacity constraints outlined in the 2009 Review.

3.3.2 Waste Avoidance and Resource Recovery Strategy 2007

Waste Avoidance and Resource Recovery Strategy (WARR) Strategy 2007 provides a practical framework to achieve the policy objectives of increased diversion of waste to recycling, increased processing of residual waste and safe disposal of waste to minimise environmental harm.

The WARR Strategy focuses on solid wastes that, unless recovered and diverted to beneficial uses, would be disposed to putrescible and inert waste landfills throughout NSW. It contains broad targets for waste reduction, resource recovery and diversion of waste from landfill that supports the priorities of the State Plan and Sydney Metropolitan Strategy. Greenhouse gas abatement is also a key environmental driver of the WARR Strategy.

The Strategy identified a goal of not generating any more waste in NSW in 2008 than in 2003 as well as reducing the amount of waste sent to landfill. It also sets the following targets for increasing collection and recycling of materials by 2014 –

- Increase recovery and use of materials from the municipal waste stream from 26% (2000) to 66%.
- Increase recovery and use of materials from the commercial and industrial waste stream from 28% (2000) to 63%.
- Increase recovery and use of materials from the construction and demolition sector from 65% (2000) to 76%.

The Strategy recognises that waste avoidance and resource recovery practices, including progressive development of AWT systems, must be supported by safe, secure disposal options that minimise environmental harm.

As a long-haul facility for safe, secure management and final disposal of putrescible solid waste, the Woodlawn Bioreactor provides an essential service for the Sydney region. The Woodlawn Expansion Project will deliver increased flexibility, efficiency and integration of putrescible waste management for the Sydney and southern and south western regions of NSW. This facility is recognised as having optimised the logistics of waste management (logistics constitute around 60% of total waste management value chain) and has demonstrated comprehensive environmental risk management and effective recovery of landfill gases.

In addition, the Project will provide regional areas with long term security, many of whom are facing capacity constraints. Subsequently, regional areas can increase focus on development and implementation of waste avoidance and resource recovery programs that further the achievement of the Strategy's outcomes for waste generation, resource recovery and environmental management.

3.3.3 NSW Greenhouse Plan 2005

The NSW Greenhouse Plan (NSW Greenhouse Office, 2005) provides a strategic approach to combat climate change in NSW. The Plan sets emission reduction targets for NSW, including a 60% reduction in greenhouse gas emissions by 2050 and a return to year 2000 levels by 2025.

At a state level, NSW was estimated to emit 162.7 million tonnes CO_2-e (27% of national emissions). In terms of total emissions, the Project only represents 0.0004% of Australia's greenhouse gas emissions, and 0.0015% of all greenhouse gas emissions for NSW.

The Greenhouse Plan supports continued implementation of the Waste Strategy as the main instrument to avoid waste going to landfill and ensure effective capture of landfill gases. Public concern relating to emissions of greenhouse gas from waste disposal sites has driven implementation of gas measurement, capture and/or oxidation at existing and new landfills consistent with the Waste Strategy. In addition, innovation and capacity building in greenhouse emissions abatement have been encouraged via financial incentive under the NSW Greenhouse Gas Abatement Scheme and Climate Action Grants.

During the period since commencement of the Woodlawn Bioreactor until the end of 2009, the site has abated 119,490 tonnes of CO_2e through flaring and electricity production. The site has also generated 19,726 Renewable Electricity Certificates (REC's) and 74,167 New South Wales Greenhouse Abatement Certificates (NGAC's). Preliminary independent on site testing indicates that the level of methane capture at the Woodlawn Bioreactor is up to 92%, which results in significant environmental benefits, when compared to traditional processes (GHD, 2007). From July 2009 to June 2010 the site generated 14,331 MWh of renewable energy, which is enough electricity to power 1,791 homes for the year. A full capacity the Woodlawn Eco-Precinct, including the Bioreactor and the Windfarm, is expected to generate almost 300,000 MWh per year, and power approximately 37,500 homes a year.

These policies have effectively increased resource and energy recovery to create value from the residual waste stream and are reflected in the operation of the Woodlawn Bioreactor, which is optimised for commercial recovery of landfill gas. Results of the closed flux chamber testing (GHD, 2007) concluded that methane emissions from the surface of the Bioreactor were low i.e. < 0.3 g CH4/m2/hr, which is less than 8.3% of the methane extracted from the site (EReport, Veolia 2008). Such low emissions can be attributed to the active extraction of landfill gas during the landfill process.

3.3.4 Action for Transport 2010

The NSW Government's Transport Strategy includes plans to encourage increases in the volume of freight moved by rail as well as upgrade the metropolitan rail network.

The Woodlawn Bioreactor development utilises existing rail infrastructure to deliver the long-haul component of waste transportation by rail, consistent with relevant strategies for enhancing the safety and efficiency of the State's transport network.

Avoiding long-haul road freight generates amenity benefits across the region by reducing traffic congestion, noise and air quality impacts.

Energetics Pty Ltd prepared a report entitled *Management of Greenhouse Emissions from the Proposed Woodlawn Bioreactor* in 1999. It compared the greenhouse gas emissions as the mode of waste transport involving rail to Tarago and then road to Woodlawn, against the emissions for road transport between Sydney and Woodlawn (Energetics Pty Ltd, 1999). The study concluded that emissions due to rail transport (3,551 tonnes CO_2 per year) are three time less than emissions due to road transport (11,530 tonnes CO_2 per year). From this study, it is evident that the use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit.

3.4 Woodlawn Eco-Precinct Strategy

Veolia has demonstrated commitment to increasing pre-treatment of waste and resource recovery though its Bioreactor facility, encouraging high levels of gas capture and conversion of organics to energy (the core of the Bioreactor technology). However at current NSW diversion rates, landfill capacity shortfall will soon be critical.

The Woodlawn Eco-Precinct is owned by Veolia and incorporates a number of sustainable initiatives, including the Woodlawn Bioreactor and the approved WASP. By developing these facilities, the Woodlawn Eco-Precinct supports the NSW Government WARR Strategy in the following ways:

- Maximised energy generation from waste by enable additional tonnes of residual waste to be disposed of in a sustainable manner at the Woodlawn Bioreactor
- Development of new AWT facilities through WASP & WOCOG
- Facilitation of further regional waste management strategies by offering dedicated green waste processing solutions

Assuming a gradual ramp up in the increased tonnes being received at Woodlawn, the revised expected life of the Woodlawn Bioreactor would be in the order of 25 years. This would still enable diversification of sustainable disposal solutions for the Sydney market as well as further waste reduction and resource recovery initiatives.

The Woodlawn Eco-Precinct provides an ideal location for the development of future resource recovery opportunities as new technologies emerge while still providing long term residual waste disposal capacity at the Woodlawn Bioreactor.

3.4.1 Alternative Waste Management Measures

Veolia has further demonstrated a clear commitment to alternative waste management measures through its decision to gain Major Project Approval for its proposed AWT facility. The AWT facility will process up to 240,000 tonnes per year of putrescible waste and up to 40,000 tpa of green waste, and will play a significant role in the ongoing management and processing of waste. The majority of the waste going to the AWT facility will produce compost for mine site rehabilitation at the Woodlawn site, with residual waste that cannot be used for mine rehabilitation being diverted into the Bioreactor.

Chapter 3 Project Need, Justification and Alternatives

Once the approved AWT facility at Woodlawn has been constructed, unsorted municipal solid waste directed to this facility will be recycled to produce a compost product. The residual material will be then sent to the Bioreactor for conversion of residual organics to methane and energy.

3.4.2 Other Resource Recovery Measures

The Woodlawn Bioreactor facility receives waste from a variety of sources including mixed waste collections after kerbside recycling has taken place. That is, the residual material that arises after recyclables have been removed, and from other commercial sources. The bioreactor facility specifically maximises the recovery of energy from any organics that have not been removed during kerbside recycling.

The Woodlawn Bioreactor was the first facility of its kind in Australia and is licensed by DECCW with specific requirements to maximise the recovery of energy from the waste. To assist in meeting this requirement, the site incorporates over 30km of infrastructure designed to optimise leachate recirculation and gas recovery.

The Bioreactor facility is operated in order to reduce the long term aftercare of the waste and to reduce its potential to pollute the environment. This is a fundamental difference between the conventional landfill and the Bioreactor and has the following key benefits:

- Reduced greenhouse gas emissions: the net fugitive emissions of landfill gas over the site life can be reduced substantially due to the opportunity for early gas harvesting. At Woodlawn, gas extraction was in place 6 months from opening of the facility. This compares with many years at a conventional landfill; and
- Waste stabilisation within active management phase: in the case of a Bioreactor the bulk emissions are likely to occur while the landfill is being actively managed. This has strong environmental and intergenerational equity benefits reducing emissions such as odours over the long term.

The Woodlawn Bioreactor is designed to convert all available organic material to biogas by means of anaerobic digestion, and for this gas to be removed from the landfill for energy production[2]. The total weight of materials recycled can be readily correlated with energy production, with the mass removed (or recycled) from the waste being converted to biogas and used to generate electricity.

3.5 Sydney Justification

Justifiable demand for receiving additional waste from Sydney to the Woodlawn Bioreactor draws on the detailed analysis of current and future landfill capacity and demand presented in the Wright Review 2009. The Wright Review 2009 was commissioned by the Minister for Planning to provide advice on future waste infrastructure needs and to update the Independent Public Assessment first undertaken in 2000.

[2] *Recycling Organics For Energy At Woodlawn Bioreactor* (Report No 97623008_004, Golder and Associates 2009)

The justification also references the reasoning, methodology and assumptions taken into account in the Commission of Inquiry into Eastern Creek extension (Cleland, 2005), the previous Independent Public Assessment of landfill capacity and demand (Wright, 2000a) and multiple analyses of medium and long-term landfill requirements presented in Assessment Reports by NSW Department of Planning. It also considers the analysis of regional waste disposal needs presented in the findings of the Commission of Inquiry held into the environmental aspects of the Woodlawn Waste Management Facility (Cleland, 2000), which was the basis of the Conditions of Development Consent for Woodlawn Bioreactor.

Three main aspects are considered in providing justification for the Project, including:

- predictions of the waste generation rate and disposal rates;
- approved capacity and acceptance rates for existing putrescible landfills; and
- uptake of AWT for the treatment of putrescible waste.

While AWT facilities are part of the long-term solution to managing Sydney's waste streams, so far they have not performed at the level required to achieve the expected levels of diversion. The Woodlawn Expansion Project will not inhibit the uptake of AWT facilities at a realistic rate, consistent with their role in a long term waste and resource recovery strategy. In contrast, it will provide long term certainty for the disposal of residual waste from AWT facilities.

By providing policy and operational clarity, the Project will enable industry operators, as well as local government, to better plan their resource recovery infrastructure investments and strategies.

3.5.1 Putrescible Waste Generation and Disposal Rates

The generation of putrescible waste continues to increase as a result of population and economic growth in NSW and the Sydney region (NSW DECCW, 2009).

An analysis of the current putrescible waste generation and disposal rates in Sydney was undertaken as part of the Wright Review 2009, and the following data was taken from this Review.

An estimate of total municipal and commercial and industrial waste generated in Sydney is illustrated in **Figure 3-1**. It shows that the growth rate for municipal sector waste generation over the last seven years was moderate with 1.2% average annual growth[3]. However, commercial and industrial sector waste generation has grown at an annual rate of 4.2% and exhibited much more variability than the municipal sector[4].

[3] Ibid., p.18.
[4] Ibid., p.18.

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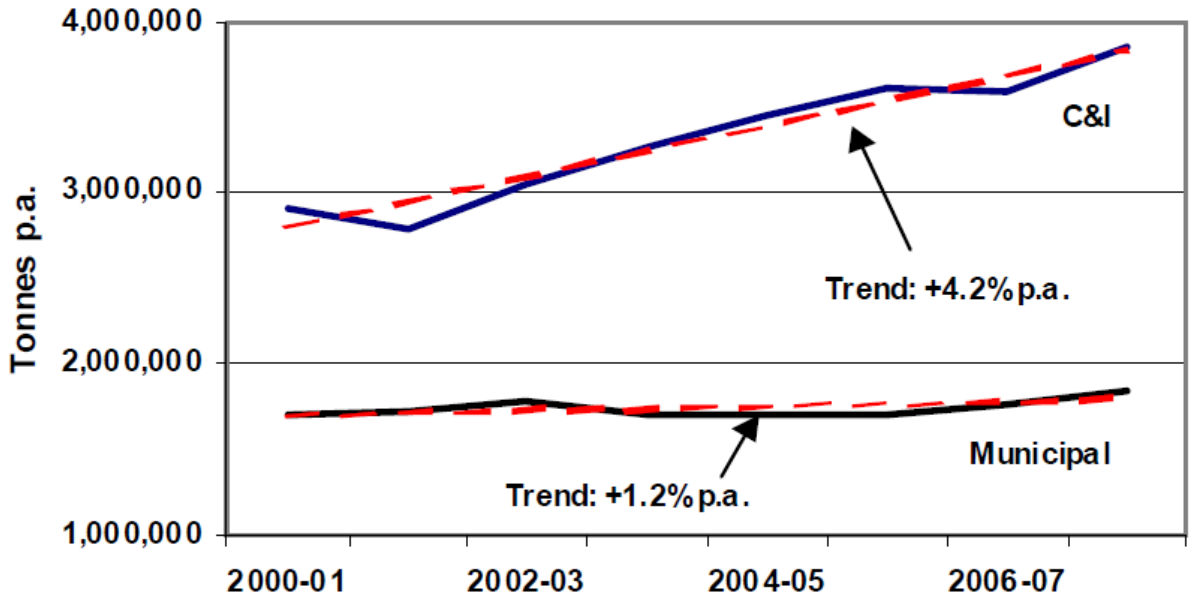
Recovery and recycling currently stands at a record level of around 42% of waste generated in both municipal and commercial and industrial sectors[5]. Since 2000/2001, municipal kerbside recycling has increased by around 90,000 tonnes per annum. Garden waste recovery has increased from 125,000 tonnes in 2000/01 to 212,000 tonnes in 2007/08. Recycling of commercial and industrial waste between 2000/01 and 2007/08 has doubled to around 1.6 million tonnes – however, the growth in commercial and industrial resource recovery was exclusively confined to dry waste such as timber, paper/cardboard, plastics and metals[6].

Improved source separation and resource recovery in both sectors has meant that the total amount of waste disposed to putrescible waste landfill has remained relatively constant at around 1,750,000 tonnes per year, other than for significant spikes in 2001/02 and 2007/08. In 2007/08, waste disposal jumped by 100,000 tonnes to more than 1,850,000 tonnes[7].

Almost all mixed residual putrescible waste generated in the municipal sector was delivered to putrescible waste landfills in Sydney or Woodlawn for disposal. In addition, nearly 40% of waste generated in the commercial and industrial sector was delivered to putrescible waste landfill for disposal. A small proportion of waste from both sectors was diverted to established AWT facilities in the Sydney region – Earthpower for commercial and industrial waste and, UR-3R and Ecolibrium (Macarthur) for municipal waste[8].

Figure 3-1 Total waste generation by sector (Wright, 2009)



[5] Ibid., p.26
[6] Ibid., p.26
[7] Ibid., p. 4.
[8] Ibid., p. 4

3.5.2 Sydney Landfill Demand

Demand for landfill capacity for waste disposal is a function of:

- Waste generation – that is, the amount of unwanted materials created and discarded, and
- Waste reduction – that is, the amount of discarded materials diverted to recycling and reuse.

3.5.2.1 Putrescible Waste Generation

The assessment of future landfill capacity requirements commenced with consideration of future waste generation from which estimates of future resource recovery and recycling can be deducted to arrive at landfill demand.

It is clear that while municipal solid waste recycling rates increased, the volume of waste produced has also continued to increase and has generated a continued strong demand for putrescible landfill capacity.

The Independent Public Assessment – Landfill Capacity and Demand (Wright, 2000) adopted a maximum 1.2% annual increase in municipal waste generation and 2.0% annual increase in commercial and industrial waste generation[9]. These forecast growth rates were offset further by anticipated waste avoidance resulting in annual waste generation forecasts of 0.7% (municipal) and 1.0% (commercial and industrial) – underestimating average annual growth in waste generation[10]. In the Commission of Inquiry into the extension of Eastern Creek Waste Management Centre in 2005 an annual increase in putrescible waste disposal demand of 1.4% was assumed (Cleland, 2005).

The progressive increase in waste generated over many years is generally regarded as a function of both population increase and economic conditions. According to NSW Department of Planning data, Sydney's annual population growth rate is expected to average 1.15% between 2009 and 2024 also, the average annual growth rate for NSW economic performance over recent years has been between 2.23% and 3.7%[11].

On this basis, the Wright Review 2009 adopted conservative annual growth rates for future waste generation of 1.0% for municipal waste generation from 2008/09 and 3.0% for commercial and industrial waste generation from 2009/10 (no growth in 2008/09)[12].

3.5.2.2 Alternative Waste Management Facilities

The NSW Waste Avoidance and Resource Recovery Strategy (NSW DECCW, 2007) recognise the importance of securing further improvements in putrescible waste resource recovery through alternative waste management options. It sets out a comprehensive program of initiatives based on working with business waste generators and the waste contracting industry – including partnerships to improve source separation and resource recovery systems. To a large extent, progress in reducing the amount of waste sent to putrescible landfills relies on the effective development of AWT facilities[13].

[9] Ibid., p. 18
[10] Ibid., p. 18
[11] Ibid., p. 38
[12] Ibid., p. 38
[13] Ibid., p. 7.

Current installed AWT operating capacity is nominally 275,000 tonnes per year. It should be noted that both the existing AWT facilities have experienced on-going operating issues and one is not yet operating at full capacity[14]. To date, only a small proportion of waste from both sectors was diverted to the two established AWT facilities.

A number of AWT facilities are scheduled for implementation in the Sydney region over the next few years – these are outlined in **Table 3-1**. Once all of these facilities reach full capacity, these projects could add a further 440,000 tonnes of gross putrescible waste processing capacity[15]. However, actual performance of these facilities and residual waste streams would also need to be accounted for.

The Wright Review 2009 considered alternative scenarios for AWT investment and take-up to supplement continuing development of traditional resource recovery initiatives to examine the extent to which landfill capacity is likely to be drawn down in coming years and the implications for future waste input caps[16].

Table 3-1 Alternative Waste Technology facilities in Sydney region (Wright, 2009)

Alternative Waste Technology	Start-up Year	Nominal Capacity, tonnes per annum
UR-3R (Eastern Creek) – operational	2005	(MSW) 175,000 tonnes
Earthpower (Camellia) – operational	2004	(C&I) 100,000 tonnes
Macarthur Resource Recovery Park (Jacks Gully) – operational	2008	(MSW) 90,000 tonnes (garden) 30,000 tonnes
SITA Advanced Waste Treatment (Kemps Creek) – operational	2009	(MSW) 80,000 tonnes (food/garden) 40,000 tonnes
Woodlawn Alternative Sorting and Processing (WASP) (Woodlawn) – approved	2013 (proposed)	(MSW) 240,000 tonnes (food/garden) 40,000 tonnes
WSN ArrowBio (Lucas Heights) – Planning assessment stage	2012 (proposed)	100,000 tonnes
WSN ArrowBio (Chullora) – application preparation stage	2013 (proposed)	100,000 tonnes

This needs analysis has assumed that all AWT facilities in the Sydney region are operated at full capacity and that all the proposed AWT facilities are approved, constructed and operated at full capacity, according to the planned development schedule. Subsequently, this analysis has responded to the predicted shortfall in landfill capacity remaining. The justification will continue to be valid and necessary to accommodate disposal of remaining putrescible waste and residual waste as additional AWT facilities are developed over time[17].

3.5.2.3 Sydney Landfill Capacity

Since 2000, capacity at landfills in the region have exhausted or been restricted to meet local demand. The following data presented in this section is based on Section 3 of the *Wright Review 2009.*

[14] Ibid., p.7 and p.39
[15] Ibid., p.8
[16] Ibid., p. 43-44.
[17] Ibid., p. 7 and p. 48-52.

The existing approved landfills in the Sydney region currently accepting putrescible waste are Lucas Heights, Eastern Creek, Woodlawn and Belrose. Jack's Gully Landfill was closed to general putrescible waste from July 2008 to reserve capacity for AWT residual materials from the AWT commissioning on site[18]. Belrose landfill is also nearing completion. The Wright Review 2009 noted that both Eastern Creek and Lucas Heights Landfills have only four to six years of active life remaining for acceptance of general putrescible waste[19].

With more than 40 million tonnes available landfill capacity (Wright, 2009), Sydney waste can be accommodated for more than 20 years at the current input rate (less than 2 million tonnes per annum)[20]. However, contractual and technical constraints limit the flexibility in using this capacity, as discussed below.

Lucas Heights Landfill

Although Lucas Heights Landfill has significant capacity remaining (5.5 million tonnes at January 2008), WSN and Sutherland Shire Council negotiated a waste transport limit of 575,000 tonnes per annum to Lucas Heights[21].

Eastern Creek Landfill

Eastern Creek Stage 2 Development was the subject of a Commission of Inquiry (Cleland, 2005) in late 2004, which recommended approval of a maximum waste capacity increase of 2.9 million tonnes, with a maximum annual input rate of 500,000 tonnes, reducing to 350,000 tonnes after 2011 and putrescible waste disposal to cease by June 2014[22]. The Commission of Inquiry (Cleland, 2005) proposed that the landfill should be permitted to receive residues from AWT processing until mid 2022 when it is due to close. The Minister for Planning subsequently approved an increase in capacity of the Eastern Creek facility for exceptional, short-term emergency circumstances.

Woodlawn Bioreactor

The 2000 Review (Wright, 2000b) recommended that the Government take action to secure a suitable long-haul landfill site as a strategic addition to the portfolio of waste management technologies. The development of the Woodlawn Bioreactor addressed this strategic gap in the waste management portfolio for the Sydney region.

Commissioning of the Woodlawn facility in 2004/05 increased the putrescible waste landfill capacity in the region by more than 30 million tonnes. Consent conditions limit the waste input rate to a maximum of 400,000 tonnes per annum, reducing by 10% every five years, subject to periodic review (Consent Condition No. 4).[23]

[18] Ibid., p. 19
[19] Ibid., p. 21
[20] Ibid., p. 21
[21] Ibid., p. 19 and 22
[22] Ibid., p. 20.
[23] Ibid., p. 19 and 20

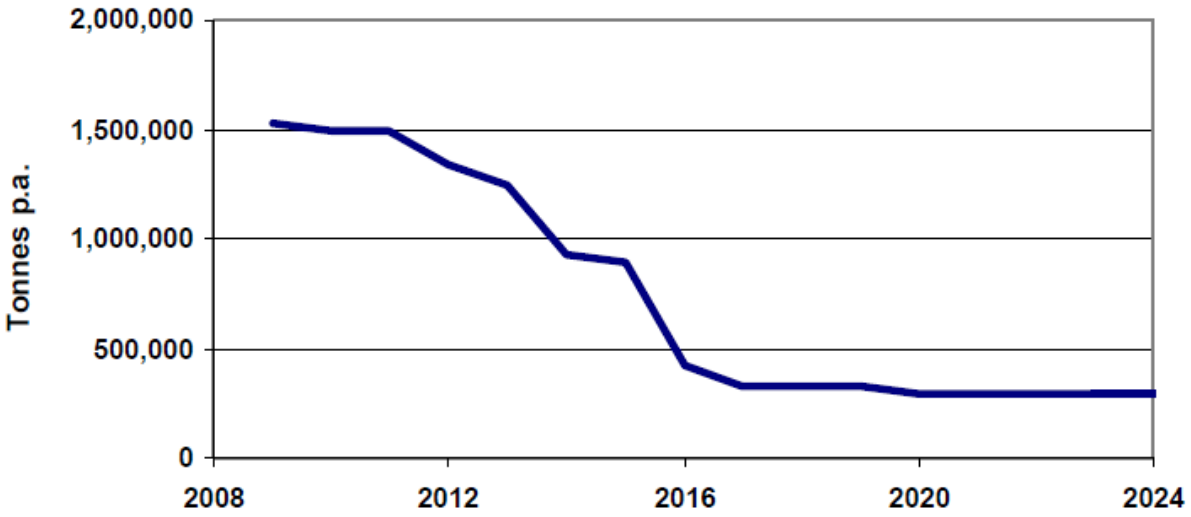
3.5.2.4 Allowable Annual Disposal Rates

The following data presented in this section is based on Sections 4 and 5 of the *Wright Review 2009.*

The annual waste input caps and annual delivery limit applied to the three main landfills limit waste placement in these facilities to 1,475,000 tonnes per year. In aggregate (with the reduced annual waste input at Belrose Landfill of 60,000 tonnes), the total constrained waste input from 2008/09 is effectively 1,535,000 tonnes per annum. Before the effective closure of Jack's Gully and input reduction at Belrose, the effective annual limit was around 2,000,000 tonnes per year. In contrast, putrescible waste disposal demand has reached 1,850,000 tonnes per year[24].

The gap between the constrained nominal aggregate allowable waste input and the current demand for waste disposal will increase in the near future as a result of schedule waste input cap reduction and progressive landfill depletion, as shown in **Figure 3-2**[25].

Figure 3-2 Allowable rate of waste input (Wright, 2009)



3.5.3 AWT Uptake and Disposal Demand

The Wright Review 2009 outlines three plausible scenarios as a basis for modelling the implications of possible sets of resource recovery initiatives. These waste flow and resource recovery scenarios are based on realistic forecasts of waste generation and resource recovery uptake rates – primarily, continuing take-up of AWT facilities to process municipal waste and various investment rates for AWT facilities to process commercial and industrial putrescible waste.

[24] Ibid., p. 54.
[25] Ibid., p. 3

The most likely scenario for resource recovery investment was based on the development of a number of additional AWT projects beyond those currently at planning stage, as well as improved participation in municipal recycling[26]. It assumes waste diversion is increased from the current level to 66% for municipal waste and from the current 3% to 20% (maximum) for putrescible C&I waste by 2023/24[27].

The Review draws the following clear conclusions from the analysis of landfill capacity and demand, despite the deployment of substantial AWT capacity for municipal waste and modest capacity for C&I waste processing.

- Annual demand to dispose of waste to putrescible landfills progressively declines from 1,800,000 tonnes for 2008/09 to 1,400,000 tonnes at 2023/24. However, continuing need for putrescible waste landfill capacity persists, despite attainment of the waste diversion targets[28].
- The aggregate annual waste input cap (plus allowance for disposal at Belrose, until completed) is continuously breached – by up to 1,100,000 tonnes per year. The specific waste input caps for Woodlawn and Eastern Creek would necessarily be breached each year. Aggregate input cap of around 2 million tonnes per year would be the necessary level[29].
- By end of 2023/24, landfill capacity is drawn down to approximately 23,000,000 tonnes, confined only to Woodlawn – that is, putrescible waste landfill capacity remains available at Woodlawn for future waste. Based on presently approved capacity, Eastern Creek landfill would be completed in 2013 and Lucas Heights by 2016[30].
- Target of 66% municipal waste recovery and use of secondary materials is attained by 2016/17. Processing of commercial and industrial putrescible waste makes a significant contribution to the overall 63% commercial and industrial waste recycling target with a 20% level of recovery and reuse[31].

All AWT uptake scenarios modelled resulted in modest decreases in disposal demand but failed to eliminate the annual waste input cap breach. Also, the forecast year of closure for Eastern Creek and Lucas Heights was unchanged[32].

The Wright Review 2009 showed that the time scales for approval and commissioning of new AWT facilities meant that no significant impact in reducing disposal demand was seen prior to the closure of the two main landfills.

In addition, model runs made with annual waste input caps removed from the relevant landfills did not make a significant difference to the outcomes recorded or the forecast timing for the closure of the two main Sydney putrescible landfills.

[26] Ibid., p. 40
[27] Ibid., p. 46
[28] Ibid., p. 51
[29] Ibid., p. 54
[30] Ibid., p. 49
[31] Ibid., p. 49
[32] Ibid., p. 10

A number of common strategic assumptions were made to assist in this analysis[33], including –

- 1,850,860 tonnes of municipal solid waste generated in 2007/08 with annual growth rate of 1% per annum from 2008/09.
- 3,834,236 tonnes of commercial and industrial waste generated in 2007/08 with annual growth rate of 3% per annum from 2009/10, assuming zero growth in 2008/09.
- Proportion of waste presenting to putrescible waste landfills is 90% of municipal solid waste and 39% of commercial and industrial waste.
- Waste levy increasing from current level of $46.70 per tonne at the rate of $10 per year plus CPI to 2015/16.

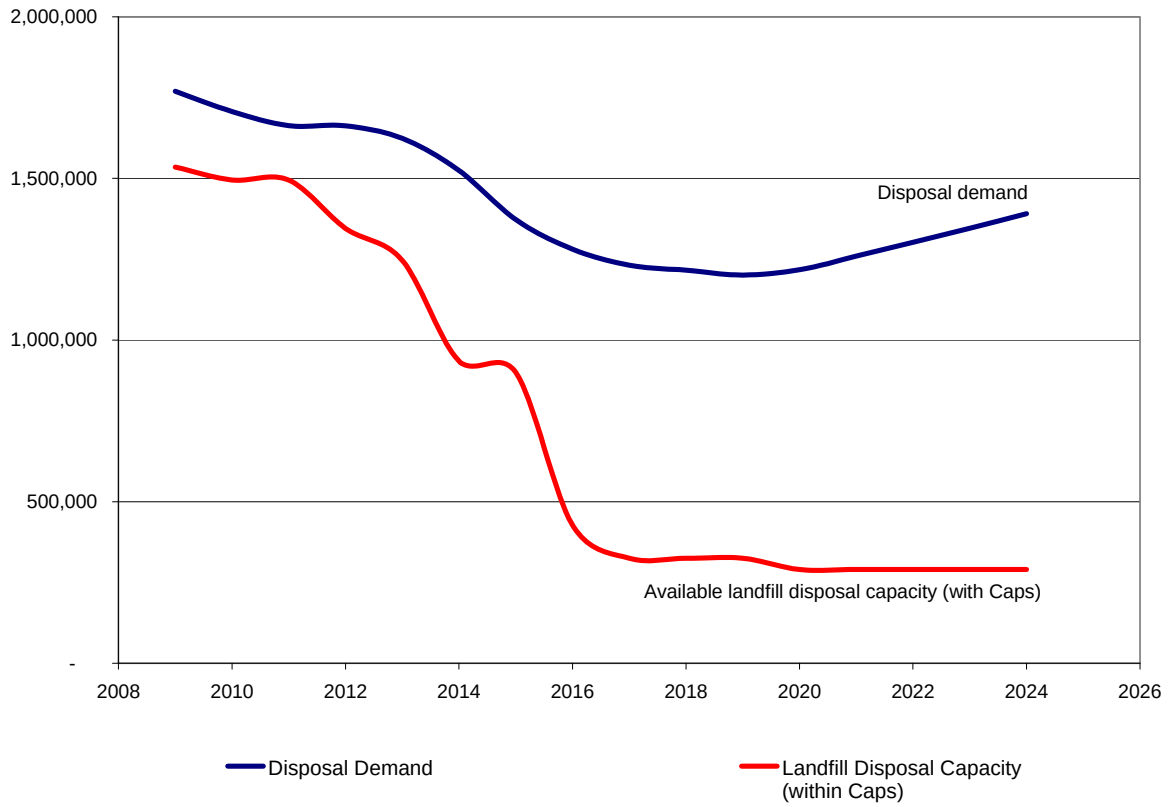
3.5.4 Landfill Capacity Shortfall

A landfill capacity shortfall evaluation was also undertaken as part of the Wright Review 2009, and found that despite finding that putrescible waste disposal capacity in Sydney is secure for more than 20 years, concluded that there is "***a serious and probably chronic shortfall between the amount of putrescible waste presenting for disposal and the notional aggregate waste input cap"*** (Wright, 2009).

The Wright Review 2009 clearly illustrates the lack of available landfill capacity within the Sydney metropolitan area up to 2024. By 2016, all putrescibles landfill sites in the Sydney metropolitan area (including Jacks Gully, Belrose, Lucas Heights and Eastern Creek) will have ceased operations, leaving Woodlawn as the only major site for putrescibles waste disposal[34]. **Figure 3-3** graphically illustrates the gap between landfill disposal demand and available landfill disposal capacity if waste input caps are maintained.

[33] Ibid., p. 45
[34] Ibid., p. 11

Figure 3-3 Shortfall Between Landfill Disposal Demand and Landfill Capacity



With Jack's Gully closed in 2008 and Belrose winding down, effective annual input limit has decreased by around 400,000 tonnes, clearly imposing additional reductions on the notional available annual waste disposal limit applying before 2008/09[35].

As demonstrated in Section 3.4.2, the total constrained waste input rate from 2008/09 is effectively limited to 1,535,000 tonnes per annum at the operating landfills. In contrast, putrescible waste disposal demand has reached 1,850,000 tonnes per year. In these circumstances, Veolia and WSN facilities subject to the input constraints are now confronted with having to accept waste and breach their caps; there is no other landfill available and insufficient AWT capacity to absorb the surplus demand[36].

The gap between the constrained nominal aggregate allowable waste input and the current demand for waste disposal will continue to increase in the near future as a result of schedule waste input cap reduction and progressive landfill depletion. The Wright Review 2009 suggests that an aggregate input cap of around 2 million tonnes per year would be necessary to meet immediate demand[37].

[35] Ibid., p. 11.
[36] Ibid., p. 45 and 54.
[37] Ibid., p. 60.

3.5.5 Summary

The Wright Review 2009 has indicated a strong increasing trend in disposal demand to 2024 resulting in a corresponding increasing shortfall in putrescible landfill capacity. Beyond 2024, this trend is likely to continue. Based on the total volume of waste to be received at Woodlawn and the proposed input rates, the Woodlawn Bioreactor would have capacity beyond the period assessed by the Wright Review 2009 – in the order of 25 years. This capacity would be able to support and promote development of future AWT facilities and minimisation measures going forward, ensuring that Woodlawn only caters to the predicted shortfall in residual waste disposal in Sydney and regional areas.

The Review of Sydney waste recommends that the waste input caps be discarded as a regulatory measure to enable the market to operate free of arbitrary commercial regulation that may have unintended consequences. The Review also recommends an immediate increase in waste input caps be lifted to 2 million tonnes per year based on the long term gap between landfill demand and supply being expected to be approximately 1 million tonnes per annum.

Given that the proposed increase to waste being received at the Bioreactor from Sydney is only 400,000 tonnes per annum, this application would be able to address approximately 40% of the expected long term shortfall for the Sydney metropolitan area.

3.6 Regional Justification

While the overwhelming majority of additional waste to be accepted at the Woodlawn Bioreactor will be sourced principally from the Sydney Metropolitan area, 130,000 tpa could be sourced from regional areas in southern and south western NSW. This section provides an overview of regional waste volumes, and the need for additional landfill capacity to be supplied in the face of growing demand from regional areas within proximity to the Bioreactor.

3.6.1 Regional Needs Analysis

Since the Bioreactor opened in 2004, Veolia has been in contact with several regional areas that may choose to send waste to Woodlawn in the future.

Following preliminary discussions with the aforementioned regions, an assessment into waste disposed at landfill facilities within the vicinity of the Woodlawn Bioreactor was undertaken to ascertain waste volumes generated by regional areas. **Table 3-2** provides a breakdown of waste sent to landfills for disposal by a select number of regional areas that may take advantage of Woodlawn's capacity.

Table 3-2 Regional Waste to Landfill

Regional Area	Municipal	Private	Commercial & Industrial	Construction & Demolition	Other	Total
ACT (1)	57,277	20,521	85,156	20,792	6,306	190,052
Eurobodalla (2)						20,943
Upper Lachlan (2)	2,345		26.73	164.18		2,536
Yass Valley (2)						2,500
Shoalhaven (3)	32,000		20,000	4,000	3,000	59,000
Wollongong (4)	37,802					99,345
Wollondilly (5)						20,000
Wingecarribee (6)						6,123

Source: 1. Figures taken from the ACT State of the Environment Report 2007
2. Adapted from the Regional State of the Environment Reports 2004-2009
3. Figures adapted from the Shoalhaven State of the Environment Report 2008/09 period
4. Figures adapted from the Wollongong State of the Environment Report 2008/09 period
5. Estimate of total waste generated from personal conversation with Wollondilly Council staff
6. Figures adapted from the Wingecarribee State of the Environment Report 2008/09 period

The ACT Government and each regional Council have differing waste management requirements, based on access to existing landfill supply capacity as well as the standards of landfill management at each of these facilities. A summary of the disposal situation for each of the entities listed in **Table 3-2** is provided below.

Australian Capital Territory[38]

In 1996, the ACT Government developed a 'No Waste by 2010' Waste Management Strategy for Canberra. One of the aims of this strategy was to minimise waste and divert waste from landfill within the ACT. This strategy has now been in place for 10 years and the current volume of waste being landfilled in the ACT is just less than 200,000 tonnes each year.

The only operating landfill within the ACT is located at Mugga Lane. This follows the closure of other landfill facilities in recent times, resulting in limited disposal capacity within the ACT. While this limited capacity was one of the key drivers for the no waste strategy, it has also resulted in multiple small extensions of Mugga Lane.

The 2008/2009 data shows that the ACT waste sent to landfill consisted of approximately 46% commercial and industrial waste, 31% domestic waste, 13% construction and demolition waste, and 10% from private deliveries. The "ACT No Waste Strategy and Targets: Review & Assessment of Options" report has identified a further extension to the Mugga Lane landfill on adjacent land as the most cost effective solution to manage the current domestic waste volumes generated within the ACT.

Canberra is located 50 kilometres from Woodlawn, so it may be feasible for some waste from the ACT to be delivered the Woodlawn Bioreactor, thereby extending the life of disposal capacity within the ACT, and enabling them to focus on further waste reduction programs as part of the no waste strategy. Given the ACT Government's current strategy to seek a further extension to the Mugga Lane landfill, it is most likely that any waste that would be considered for receipt at Woodlawn would come from the commercial and industrial and private sectors rather than the domestic or council sector.

[38] ACT State of the Environment Report (Office of the Commissioner for Sustainability and the Environment, 2007 to 2008).

Current waste data suggests that there is approximately 85,000 tonnes per annum of Commercial and Industrial (C&I) waste and 20,500 tonnes per annum of Private waste generated within the ACT that is currently landfilled at Mugga Lane. The ACT No Waste - Strategy and Targets' report identifies this waste stream as having potential for further waste reduction or recycling initiatives, which may reduce this volume further, however it is expected that there would still be a residual volume of C&I waste which would require disposal.

Eurobodalla[39]

The Regional State of the Environment Report for the ACT and select regional Councils for 2004 - 2009 stated that waste going to landfill in the Eurobodalla Shire Council area was 20,953 tonnes for the year 2008-2009. This figure represented a 21% reduction from 2004-2005 data.

Eurobodalla Shire Council currently operates two landfills, one at Surf Beach in the northern part of the Shire, and the other at Brou Lake in the south. A waste transfer station is also located in Moruya. The two landfills occupy a combined area of 20 hectares. Of the 20 hectares, four hectares are used for current landfill operations, another four hectares are available for future use and the remaining area is a buffer zone. At current disposal rates Council expects that remaining life of the landfills is 9 years for Surf Beach and 9 years for at Brou Lake (Regional State of the Environment Report 2009).

Council adopted a revised Waste Minimisation Strategy in February 2009 that reflects the goals of NSW Waste Avoidance and Recovery Strategy 2007. In this Policy, Council has aggressive waste to landfill reduction targets, including:

- Municipal waste – from a baseline 26% to 66%
- Commercial and industrial (C&I) waste – from a baseline 28% to 63%
- Construction and demolition (C&D) waste – from a baseline 65% to 76%.

Upper Lachlan[40]

The Regional State of the Environment Report for the ACT and select regional Councils for 2004 - 2009 stated that waste going to landfill in the Upper Lachlan Shire Council area was 2,536 tonnes for the year 2007-2008. This figure represented a 25% reduction from 2004-2005 data. However, despite this reduction in overall waste going to landfill, the proportion of waste going to landfill has remained constant at around 84%.

Five sites in the Shire are used for land filling, and include Crookwell; Bigga; Tuena; Gunning; and Collector. The total area dedicated to landfilling is approximately 20 hectares, and there is a waste transfer station at Taralga. Preliminary discussions with Upper Lachlan Shire have indicated that they are interested in using the Bioreactor to assist with their waste management obligations.

[39] *Regional State of the Environment Report – Eurobodalla* (Office of the Commissioner for Sustainability and the Environment, 2008 to 2009).

[40] *Regional State of the* Environment Report - Upper Lachlan (Office of the Commissioner for Sustainability and the Environment, 2008 to 2009).

Yass Valley[41]

Yass Valley Council provides a weekly kerbside garbage collection and a fortnightly recycling kerbside collection for urban residents. Five transfer stations are located with the Council area at Yass, Murrumbateman, Bookham, Bowning and Binalong, in addition to two landfill sites at Wee Jasper and Gundaroo.

The only licensed landfill operated by Yass Council is located at Murrumbateman, which is utilised for the disposal of all domestic waste. The landfill has been in operation since 1986 and has an anticipated life of five to six years at the current rate of usage. Approximately 2,500 tonnes of waste are taken to the Murrumbateman Landfill each year.

The South West Region Waste Management Group, comprising the Councils of Harden, Boorowa, Cootamundra, Yass, Gundagai, Tumut, Young and Tumbarumba, has commenced operations at the regional landfill at the Bald Hill Quarry site near Jugiong. Council now disposes of approximately 50 tonnes per week to this facility, including all wastes collected at the kerbside and which is disposed of at the Yass, Binalong, Bowning and Bookham Transfer stations (Regional State of the Environment Report 2009).

Other Regional Councils

Waste data from other regional Councils including Wollongong, Shoalhaven, Wingecarribee and Wollondilly have been provided in **Table 3-2**. While these Councils do not neighbour the Woodlawn Bioreactor and have some existing disposal capacity available, they have been included to provide a general overview of the potential waste disposal requirements of regional NSW and represent some areas that could potentially access the Woodlawn Bioreactor in the future.

3.6.2 Summary

This information shows there is a significant volume of waste generated by the ACT and regional Councils in NSW that could benefit from being disposed at the Woodlawn Bioreactor rather than in local landfills. Analysis of historical information also shows that whilst the rate of recycling does appear to be increasing within the region, there has also been an overall increase in waste generation such that, as a whole, the total amount of waste being disposed of throughout these areas has not changed significantly over the past few years.

The acceptance of regional waste at the Woodlawn Bioreactor provides for a more sustainable environmental outcome for regional waste disposal without requiring the development of new infrastructure.

[41] *Regional State of the Environment Report – Yass Valley* (Office of the Commissioner for Sustainability and the Environment, 2008 to 2009).

Chapter 3 Project Need, Justification and Alternatives

3.7 Assessment of Project Alternatives

The Woodlawn Expansion Project utilises existing infrastructure, is consistent with current land use of the site and allows for operations to be undertaken within an area where monitoring and knowledge of existing conditions provides additional certainty with respect to predicted environmental outcomes.

To confirm the appropriateness of the proposal, it was weighted against other waste management and waste disposal alternatives. However, each of these alternatives presents real uncertainties that would affect their ability to effectively and reliably address the capacity issue.

3.7.1 Further Alternative Waste Technology Developments

While AWTs are part of the long-term solution to managing Sydney's waste streams, so far they have not been able to achieve the expected levels of landfill diversion – only 50,000 tonnes was diverted to AWTs in 2007/08. Given substantial lead times and inherent commercial and technological risks, and resistance among some stakeholders to the current additional costs of some forms of AWT, it is not viable to depend on accelerated AWT take up in the shorter term.

Based on the Government's existing policy settings and tools, it is likely that progress towards the widespread adoption of AWTs in the Sydney region will continue in the medium to longer terms. AWTs must process an increasing proportion of Sydney's putrescible waste to reduce the reliance of putrescible waste management on landfill disposal. While a number of strategies to reduce landfill demand can be theoretically identified, it is not possible to accurately predict the rate of introduction of improved technology and resource recovery practices and the long term effect on landfill capacity requirements.

Analysis shows that despite AWT introduction the amount of putrescible waste continues to increase. Even with successful implementation of AWTs, there would still remain a significant component of residual waste to be managed via disposal at putrescible waste landfill. Consequently, the need for putrescible landfill capacity will remain. Increasing landfill input rate at the Woodlawn Bioreactor would enable the uptake of AWT facilities to continue at a suitable rate, consistent with their role in a long-term waste and resource recovery strategy.

3.7.2 Alternative Landfill Sites

Approved Sites

Approved putrescible waste landfills in the Sydney region are operating to maximum approved input rates with limited landfill capacity remaining. Presently, WSN facilities at Eastern Creek and Lucas Heights are the only other sites capable of accepting significant volumes of putrescible waste into the future. However, forecasts indicate that Eastern Creek and Lucas Heights would reach capacity in 2012 and 2019, respectively. Negligible landfill capacity remains at alternative locations such as Belrose, Windsor or Jacks Gully.

Once Eastern Creek is exhausted, only Lucas Heights Waste Management Centre – Stage 2 has sufficient capacity to accept waste from the Sydney region. The consent for Lucas Heights limits waste disposal at the site to 575,000 tonnes per annum (the transport limit was negotiated between WSN and Sutherland Shire Council), to supply putrescible waste disposal certainty for that local community in the short to medium term. Also, Lucas Heights was subject to significant local community

opposition, which was one of the drivers for the current limit on annual tonnages of waste received at the facility. Any increase in the annual input rate at Lucas Heights would undermine this agreement and result in landfill capacity in the Sydney region being exhausted even earlier than would already be the case. It is unlikely that residents of the Sutherland Shire and Sutherland Shire Council would support any increase in disposal rates at Lucas Heights.

New Landfill Sites

At this time, there are no viable new landfill sites for putrescible waste within the Sydney region. It is currently the position of NSW Government that approvals for new landfills for disposal of putrescible solid waste will be severely restricted to promote waste avoidance and resource recovery. Accordingly, given the proven capacity at Woodlawn, coupled with the restrictive policy context relating to the development of new landfill sites, other locations were not considered as a realistic alternative to this proposal.

3.8 Project Benefits

The Woodlawn Expansion Project utilises existing land and infrastructure, whereby Veolia has a comprehensive understanding (gained through continuous monitoring, testing and evaluation) of existing conditions, providing additional certainty with respect to predicted environmental outcomes.

The Woodlawn Bioreactor has proven environmental benefits on par with AWT facilities in terms of minimisation of environmental impacts and conversion of organics into a renewable power source. The accelerated timetable for landfilling would advance the timetable for rehabilitation of land degraded by mining at the site.

The Woodlawn Bioreactor has achieved gas capture more effective than original expectations, and industry standards. Combined with the production of renewable electricity, this development delivers significant beneficial climate change outcomes.

Since operations commenced, the Woodlawn Bioreactor has generated over 25,000MWh of renewable energy, and in the 2009/2010 financial year produced enough electricity to power approximately 1,800 homes for the year. At full capacity the Woodlawn Eco-Precinct, including the Bioreactor and the Windfarm, is expected to generate almost 300,000 MWh per year, and power approximately 37,500 homes a year.

The use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit. Avoiding long-haul road freight has generated amenity benefits for the local community reducing traffic, noise and air quality impacts.

The use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit, as rail transport would result in three times less emissions than road transport.

Furthermore, the Woodlawn Bioreactor facility has good support in the local community and some interest from the region as a practical solution to waste management and resource recovery. The success of this long-haul facility presents a responsible waste management outcome when viewed in terms of economic, social and environmental benefits.

Chapter 3 Project Need, Justification and Alternatives

It is estimated that the proposed Eco-Precinct developments (the approved AWT and Woodlawn Expansion Project) would result in the creation of up to 29 more full-time positions, which could be filled by people from the local area.

The Woodlawn Expansion Project responds to the resource recovery policies outlined in the Infrastructure SEPP, while at the same time assisting in addressing the chronic shortfall in available annual putrescible waste disposal capacity. The analysis in this chapter clearly demonstrates the need for the project that is consistent with the relevant legislative and policy framework. The Woodlawn Expansion Project offers an efficient, reliable and long-term solution for integrated waste management services across the region.

4.1 Introduction

The Woodlawn Expansion Project must be assessed in accordance with the relevant provisions of Commonwealth and State environmental and planning legislation. Additionally, there are a number of statutory planning controls and policies that need to be considered as part of the Environmental Assessment for the Project.

This chapter outlines the relevant legislation, environmental planning instruments, and policy documents applicable to Project, and demonstrates how the Project is consistent with applicable environment and planning provisions.

4.2 Commonwealth Legislation

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Commonwealth Minister for the Environment must approve any actions that may have a significant impact on matters of "national environmental significance" (NES). In such a case, the action would be a 'controlled action' under the EPBC Act.

The EPBC Act lists eight matters of NES that must be addressed when assessing the impact of a project. These include:

- Nationally threatened species and ecological communities;
- World heritage sites;
- National heritage places;
- Wetlands of international importance (RAMSAR wetlands);
- Listed migratory species;
- Nuclear actions;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park.

A search of the EBPC database has revealed that the subject site is not a World Heritage property, does not contain and is not close to any wetlands of international significance, and is not located in a marine environment. Similarly, the proposal does not involve any nuclear activities, nor does the Project impact Commonwealth land. The project will not affect any nationally threatened species or ecological communities or any listed migratory species.

The increase in waste input rates at the Bioreactor to a maximum of 1.13 million tpa and the throughput rate at the Crisps Creek IMF to a maximum of 1.18 million tpa would not have a significant impact upon matters of NES meaning that the Project does not constitute a controlled action. As such, a referral to the Commonwealth Minister for the Environment, Water, Heritage and the Arts is not considered necessary.

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4.3 NSW Legislation

4.3.1 Environmental Planning and Assessment Act 1979

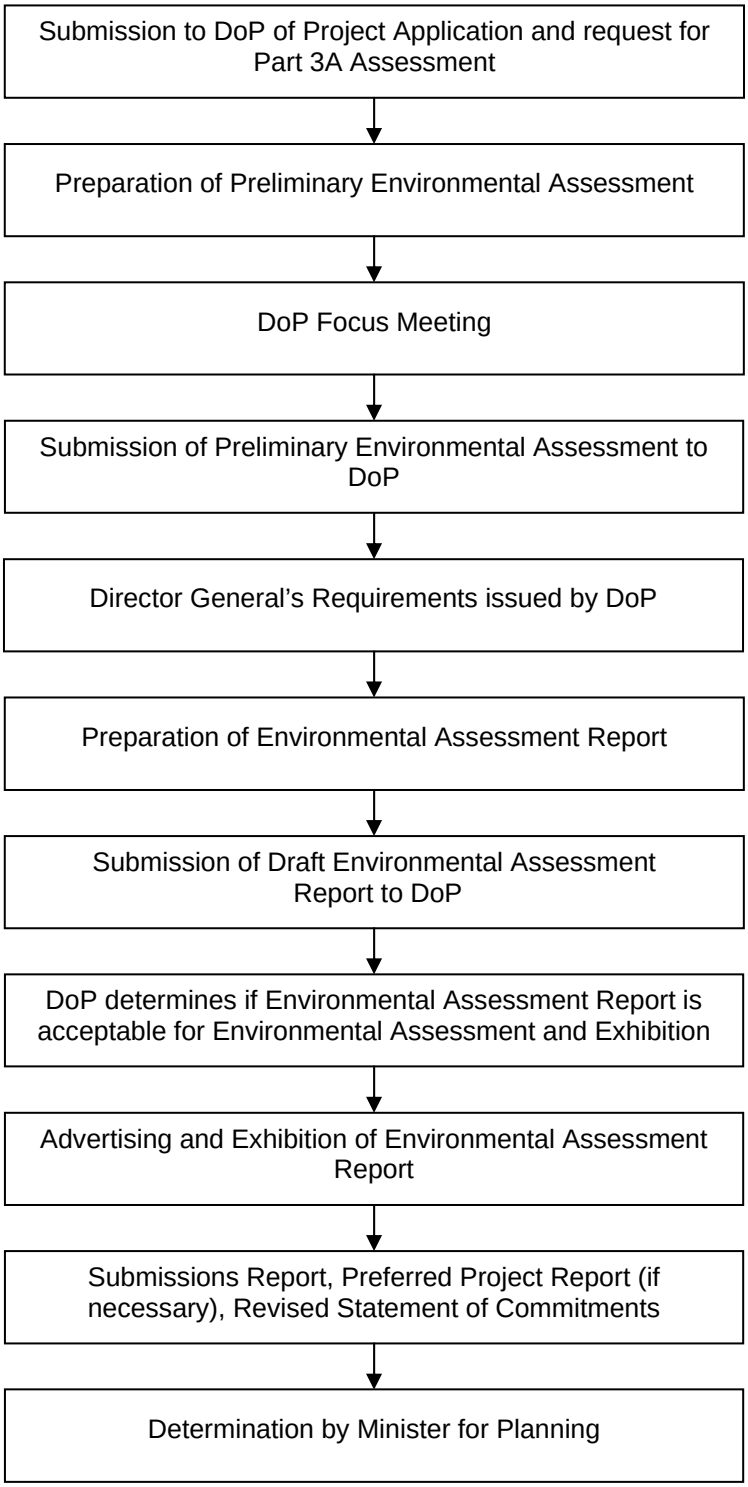
The *Environmental Planning and Assessment 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), provide the framework for development and environmental assessment in NSW. Part 3A of the EP&A Act provides for a category of development known as Major Projects. *State Environmental Planning Policy (Major Development)* 2005 (SEPP Major Development) identifies categories of development which are considered to be Major Projects to which Part 3A of the EP&A Act applies.

On 1 March 2010, the Director General declared that the Project was a Major Project and was to be assessed under the provisions of Part 3A, and the Director Generals Requirements (DGRs) pursuant to section 75F(2) of the EP&A Act (refer to **Appendix A** for the Director General's declaration). Compliance with the SEPP Major Development is outlined in **Section 4.4.1**.

The DGRs specify that an Environmental Assessment must be prepared to address all appropriate environmental considerations. **Figure 4-1** illustrates the development and approvals process under Part 3A for the Woodlawn Expansion Project.

Veolia has attended several meetings in 2010 with representatives of the Department of Planning which included a site visit at the Woodlawn Bioreactor in February 2010. The meetings provided a forum for discussion and consideration of a number of key issues to be addressed by Veolia when considering planning approvals for the Woodlawn Expansion Project.

Figure 4-1 Approvals Process for Woodlawn Waste Facility Expansion Project



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4.3.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) relates to the management of pollution and waste disposal in NSW and is administered by the NSW Department of Environment, Climate Change and Water (DECCW). Under section 48 of the POEO Act, premise based scheduled activities (as defined in Schedule 1 of the POEO) require an Environment Protection Licence (EPL).

Schedule 1 of the POEO Act identifies types of development that require an EPL. Both the Woodlawn Bioreactor and the Crisps Creek IMF have EPLs issued by the DECCW.

Under Schedule 1, both sites are licensed as waste facilities that undertake premises based scheduled activities. The Woodlawn Bioreactor falls under "waste disposal (application to land)", and Crisps Creek falls under "waste storage". It is anticipated that these licences will be varied following approval of this proposal (to reflect the increased tonnage) and Veolia will continue its regular liaison with DECCW throughout the EA process.

4.3.3 Waste Avoidance and Resource Recovery Act 2001

As discussed in Section 3.3.1 of Chapter 3, the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) was the result of a major overhaul of waste policy objectives and forms the basis of a framework for waste management in NSW. The WARR Act establishes a hierarchy to minimise the consumption of natural resources and final disposal of waste by encouraging waste avoidance, reuse and recycling.

The WARR Act promotes integrated waste and resource management planning, programs and service delivery on a state-wide basis to ensure that waste is managed to reduce environmental harm in accordance with the principles of ecologically sustainable development and the objectives of the POEO Act.

As a regional putrescible waste landfill servicing Sydney and surrounding regions, the Woodlawn Expansion Project would continue to deliver disposal capacity and the superior environmental outcomes of a bioreactor compared with conventional landfilling, whilst addressing capacity constraints outlined in the 2009 Wright Review.

4.4 Environmental Planning Instruments

4.4.1 State Environmental Planning Policy (Major Development) 2005

According to *State Environmental Planning Policy 2005 (Major Development)*, development categorised as a 'major project' requires assessment and approval of the Minister for Planning in accordance with Part 3A of the EP&A Act. The Major Development SEPP defines certain types of development as comprising 'major projects'.

Part 3A of the EP&A Act outlines the process to be followed for major developments within NSW. In accordance with Schedule 1 of the Major Development SEPP, Group 9(27) "Resource recovery or waste facilities" the Project complies with the following criteria:

(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.

In accordance with Clause 27(1) of Schedule 1 of the SEPP, the Project is a major development and subject to the provisions of Part 3A of the EP&A Act.

4.4.2 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy 2007 (Infrastructure) came into force on 1 January 2008. It simplifies the process for providing infrastructure in areas such as education, hospitals, roads, railways, emergency services, water supply and electricity delivery. The Infrastructure SEPP consolidates and updates 20 previous State planning instruments which included infrastructure provisions. It also includes specific planning provisions and development controls for 25 types of infrastructure works or facilities.

Under Division 23 of the Infrastructure SEPP, development for the purpose of waste or resource management facilities is permitted with consent in a prescribed zone. "Development" is taken to include the expansion of an existing facility. The current zoning of the subject site is IN3 Heavy Industrial, which is one of the prescribed zones listed under Division 23. Accordingly, consent for the proposed expansion must be sought from the Minister for Planning.

Additionally, clause 123 of Division 23 of the Infrastructure SEPP states that in determining the Project, the consent authority (in this case, the Department of Planning) must take certain matters into consideration. The Project complies with the criteria specified in the Infrastructure SEPP, as noted in **Table 4-1**.

Table 4-1 Infrastructure SEPP - Clause 123 Compliance

Requirement	Description	Chapter / Section
Whether there is a suitable level of recovery of waste, such as by using alternative waste treatment or the composting of food and garden waste, so that the amount of that waste is minimised before it is placed in the landfill.	The Woodlawn Bioreactor is designed to encourage high levels of gas capture and conversion of organics to energy (the core of the Bioreactor technology). Further to the resource recovery benefits of the Bioreactor, the AWT facility at Woodlawn will produce a compost product for mine site rehabilitation. The residual material will be then sent to the Bioreactor for conversion of residual organics to methane and energy.	Chapter 3, Section 3.4 – Woodlawn Eco-Precinct Strategy
Whether the development adopts best practice landfill design and operation.	Design of the Woodlawn Bioreactor allows for the gradual staging and landfill cells and lifts in response to monitoring and current best practices.	Chapter 2, Section 2.5.2.6 – Landfill Design
Whether the development reduces the long term impacts of the disposal of waste, such as greenhouse gas emissions or the offsite impact of odours, by maximising landfill gas capture and energy recovery.	Preliminary independent on site testing indicates that the level of methane capture at the Woodlawn Bioreactor is up to 92%, which results in significant environmental benefits, when compared to traditional processes. From July 2009 to June 2010 the Woodlawn Bioreactor generated 14,331 MWh of renewable energy, which is enough electricity to power 1,791 homes for the year.	Chapter 3, Section 3.3.3 – NSW Greenhouse Plan 2005

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Requirement	Description	Chapter / Section
Whether the landfill on which the development is located is degraded land such as a disused mine site.	The Woodlawn Bioreactor is located on a disused mine site that operated as an open cut and underground base metals mine throughout the 1980s and 1990s.	Chapter 2, Section 2.6.1 – Mine Site Rehabilitation
Whether the development is located so as to avoid land use conflicts, including whether it is consistent with ant regional planning strategies or locational principles including the publication EIS Guideline: Landfilling (Department of Planning, 1996), as in force from time to time.	The Woodlawn Bioreactor is not in conflict with the surrounding land uses and is consistent with the relevant regional planning strategies.	Chapter 4, Section 4.6 – Relevant Planning Strategies
Whether transport links to the landfill are optimised to reduce the environmental and social impacts associated with transporting waste to the landfill.	The use of long-haul rail transport as an alternative to road freight offers a significantly more fuel-efficient alternative contributing a major greenhouse benefit, as rail transport would result in three times less emissions than road transport.	Chapter 3, Section 3.3.4 – Action for Transport 2010

Clause 123 of Division 23 of the Infrastructure SEPP was changed between the Director-General Requirements being issued and the final submission of this Environmental Assessment. Therefore this EA includes consideration of both the old and new requirements under the clause (refer **Chapter 3 Project Need, Justification and Alternatives**).

4.4.3 State Environmental Planning Policy (Rural Lands) 2008

The State Environmental Planning Policy (Rural Lands) 2008 (Rural Lands SEPP) is applicable to the Project as the site is located within local government areas to which the SEPP applies. The aims of the Rural Lands SEPP include the protection of state and regionally significant rural lands from inappropriate land use changes, and the orderly and economic use and management of rural lands.

Additionally, the SEPP also contains a number or rural planning principles that underpin land use and planning assessments in rural areas. The relevant principles include:

(a) the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas,

(b) recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State,

(d) in planning for rural lands, to balance the social, economic and environmental interests of the community,

(h) ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.

As outlined earlier in this EA, the Project is not changing the use of the land. The site has been used for mining and other non rural land uses for some time, and is currently zoned for industrial purposes. Furthermore, the Project will not in any way reduce the viability or productivity of adjacent rural land holdings. It is also important to note that the Project will continue to support local economic development, which is consistent with the provisions of both the Goulburn Mulwaree Strategy and the Sydney to Canberra Corridor Strategy (see further below).

4.4.4 Drinking Water Catchments Regional Environmental Plan No. 1

As part of improvements to simplify the State's planning system, as of 1 July 2009, regional environmental plans (REPs) are no longer part of the hierarchy of environmental planning instruments in NSW. All existing REPs are now deemed State Environmental Planning Policies (SEPPs).

Consequently, the Drinking Water Catchments Regional Environmental Plan No. 1 (Drinking Water REP) applies to the Project as the site is partially located within the Sydney drinking water catchment area.

The aims of the Drinking Water REP are, inter alia:

> *(a) to create healthy water catchments that will deliver high quality water while sustaining diverse and prosperous communities, and*
>
> *(b) to provide the statutory components in Sustaining the Catchments that, together with the non-statutory components in Sustaining the Catchments, will achieve the aim set out in paragraph (a), and*
>
> *(c) to achieve the water quality management goals of:*
>
> > *(i) improving water quality in degraded areas and critical locations where water quality is not suitable for the relevant environmental values, and*
> >
> > *(ii) maintaining or improving water quality where it is currently suitable for the relevant environmental values.*

Clause 25 of the Drinking Water REP requires that the recommended practices and performance standards of the Sydney Catchment Authority are incorporated into any developments within the catchment area.

The current recommended practice for landfills is the "Environmental Guidelines for Solid Waste Landfills", published by the Environment Protection Authority in 1996. These guidelines also form the basis for the facility's Environment Protection Licence (EPL11436) administered by the DECCW. Accordingly, the existing operations are consistent with the Sydney Catchment Authority's current recommended practices and performance standards for landfills, and these practices will not be affected by the proposed modification.

Clause 26 of the Drinking Water REP also requires proposed developments to demonstrate they would have a neutral or beneficial effect on water quality. This assessment was undertaken as part of the original development consent for the Woodlawn Bioreactor 1999. Furthermore, the additional studies into groundwater impacts undertaken for this Environmental Assessment (attached as **Appendix C**, and as outlined in **Chapter 8**) provide further evidence that the Project will not impact the water quality of the catchment.

Chapter 4 Statutory Planning

4.4.5 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33) applies to development for the purpose of potentially hazardous and/or offensive industries. The Woodlawn Bioreactor constitutes a potentially hazardous and offensive industry as defined under clauses 3 and 4 of SEPP 33. Given that SEPP 33 applies to this proposal, the proponent is required to prepare a Preliminary Hazard Analysis in accordance with the current circulars or guidelines published by the Department of Planning and submit the analysis with the development application. This is discussed in more detail in **Chapter 14** and the full Preliminary Hazard Analysis is available in **Appendix J**.

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

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) promotes the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

Clause 7 of SEPP 55 states, inter alia, that:

(1) 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 reference to 'land' in clause 7 (1)(a) specifically refers to land on which development for a purpose referred to in Table 1 of the Contaminated Land Planning Guidelines is being, or is known to have been, carried out. In Table 1 of the document "*Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land*", waste storage and treatment is listed as an activity that may cause contamination.

Under s.145A of the EP&A Act, contaminated land is defined as areas that include "*land in, on, or under which any substance is present at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.*".

Accordingly, the Bioreactor site would be considered to be a contaminated site, meaning that the provisions of SEPP 55 apply. However, the proponent is not proposing to change the use of the site beyond increasing the volume of the current land filling activities. Hence, it is considered that the land is suitable in its contaminated state for the purpose for which the development is proposed to be carried out.

Additionally, the contamination at the site will be managed through the previously approved Landfill Closure plan, which was submitted with the original EIS (Woodward-Clyde, 1999). The Woodlawn site has been used as a mine and consists of evaporation ponds and disused infrastructure associated with the operations of the Woodlawn Mine. A waste rock dump and a number of tailing dams are also located to the south and south east of the bioreactor landfill site. In accordance with conditions 20 and 21 “Site Rehabilitation” and conditions 22 to 24 “Rehabilitation Management Plan” Veolia has committed to rehabilitate and revegetate designated areas within the Woodlawn Eco-Precinct area.

The Project would not change the existing operations and or existing conditions of consent relating to site rehabilitation.

Consequently, the Project satisfies the provisions of SEPP 55.

4.5 Local Planning Controls

In deciding whether to approve a Part 3A project, the Minister is not bound by the provisions of any local environmental plans (LEPs). However, the Planning Minister can choose to take them into account in deciding whether to approve a project, and the Director-General must identify them in the Director-General's report to the Minister. The relevant local planning controls that apply to the Project are listed below.

4.5.1 Goulburn Mulwaree Local Environmental Plan 2009

The Goulburn Mulwaree Local Environmental Plan 2009 (Goulburn Mulwaree LEP) covers the land that is the subject of this assessment. This land is zoned IN3 Heavy Industrial. The objectives of this zone are:

- *To provide suitable areas for those industries that needs to be separated from other land uses.*
- *To encourage employment opportunities.*
- *To minimise any adverse effect of heavy industry on other land uses.*
- *To recognise and provide for the diverse demands and implications of industry, warehousing, transport and servicing activities and ancillary land uses.*

The facility operates under an existing development consent which is consistent with these objectives. The expanded operations at the Woodlawn Waste Facility would continue to be consistent with the provisions of the Goulburn Mulwaree LEP. In particular, the proposed expansion would increase employment opportunities for the local workforce, as well as ensuring that a heavy industrial land use continues on land that is suitably zoned for this purpose.

4.5.2 Goulburn Mulwaree Development Control Plan 2009

The *Goulburn Mulwaree Development Control Plan 2009* (Goulburn Mulwaree DCP) was created to support the Goulburn Mulwaree LEP and provide guidance for developments within the Goulburn Mulwaree Local Government Area. It also provides guidelines for managing Aboriginal and European heritage, landscaping, vegetation protection, dryland salinity, waterbody protection, groundwater, biodiversity, heavy vehicle generating developments, etc.

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The Goulburn Mulwaree DCP expressly acknowledges the existence of the Woodlawn Waste Facility, located near the township of Tarago. The DCP seeks to "*reinforce Tarago's character as a rural town servicing surrounding rural areas and villages. This plan also seeks to enable a variety of land uses including commercial, employment, recreational and mixed uses. This plan aims to augment the transition of existing industrial uses in Tarago to large lot residential uses.*" Tarago is a suitable alternative location for residential development with strong employment links to Canberra and is experiencing some growth pressure as an alternative to Bungendore and. to a lesser extent. Queanbeyan.

The Project is consistent with these objectives as there is sufficient buffering around the site so that residential properties are not compromised. The development also promotes employment opportunities, which would have positive impacts on a growing community.

Section 3.17 of the DCP: Heavy Vehicle Generating Developments – Haulage Routes, has some relevance for this project. According to the DCP:

"*A principal haulage route needs to be nominated when submitting a development application for a project such as a quarry, transport terminal, distribution centre or the like, which involves significant heavy vehicle movements. The applicant needs to justify selection of the haulage route based upon traffic engineering grounds, amenity considerations and availability of alternative options (i.e. rail). If the existing road network is unsatisfactory then upgrades will be required.*"

There would be an increase in heavy vehicle movements as a result of the expansion of the Woodlawn Waste Facility; however, the nominated haulage route, which has been utilised for this purpose for six years, is well able to cope with the increase in traffic, as outlined in **Chapter 12**.

4.6 Relevant Planning Strategies

A number of planning strategies are also relevant when taking into consideration the development of the Woodlawn Waste Expansion Project. These are listed below.

4.6.1 Sydney to Canberra Corridor Regional Strategy

The *Sydney–Canberra Corridor Regional Strategy* applies to the local government areas of Wingecarribee, Goulburn Mulwaree, Upper Lachlan, Yass Valley, Palerang and Queanbeyan. The primary purpose of the Regional Strategy is to accommodate and manage growth while ensuring that the rural landscapes and environmental settings of the Region are not compromised. It seeks to ensure that land is available and appropriately located to sustainably accommodate the projected population growth and associated housing, employment and environmental needs over the period until 2031.

The Proposal is considered to be in accordance with the strategy as it will facilitate the continued operation of a significant industrial site in the Region that is an important local employment generator for the local population based in Tarago. Additionally, the Project, through the mitigation measures documented throughout various sections of this Environmental Assessment, will not adversely impact the environment of the Region.

4.6.2 Goulburn Mulwaree Strategy 2009

The Goulburn Mulwaree Strategy was prepared by Goulburn Mulwaree Council in conjunction with the Department of Planning. The Strategy process was initiated following the amalgamation of Goulburn Council and Mulwaree Council in 2004, and provided a foundation that assisted the Council with the preparation of a new comprehensive LEP.

The Goulburn Mulwaree Strategy establishes a framework for the future growth and development of the various settlements within the Council area up to 2020. A number of key principles underpin the Strategy, including the managed and sustainable growth of Tarago so that it retains its distinct rural, village like atmosphere.

The Project is broadly consistent with the Strategy in that is provides for local economic development for the local population of Tarago, while not compromising the village- like qualities unique to Tarago.

Stakeholder and Community Engagement | Chapter 5

5.1 Introduction

Throughout the development of the Woodlawn Eco Precinct, Veolia has been committed to meaningful community and stakeholder engagement.

Since the commencement of the Woodlawn Bioreactor, Veolia has sought to work in collaboration with relevant government agencies, the local Tarago community, and other stakeholders to identify and resolve issues that may impact on local environmental and social amenity. Similarly, Veolia has also sought to work with stakeholders for subsequent developments within the Eco Precinct.

In 2004, Veolia established the Woodlawn Bioreactor Community Liaison Committee (CLC). The purpose of the CLC is to provide a forum for open discussion between Veolia, the local community, Goulburn Mulwaree Council (GMC) and other stakeholders on issues relating to the Eco-Precinct's and the Bioreactor's operations and performance.

The CLC has met on a quarterly basis in an open and transparent forum. The CLC's meeting schedule has recently been changed to monthly meetings. Its minutes are available to members of the public.

For example, the CLC has worked to continuously improve odour management, particularly as the Bioreactor commenced operation, and has worked through a number of issues in relation to the consent of the proposed Alternative Waste Technology (AWT) facility at the Eco-Precinct.

In addition to the CLC, Veolia:

- provides sponsorship to the Tarago Times community newspaper;
- supplies a regular column in the Tarago Times to keep residents informed of local activities within the Eco-Precinct;
- has a local resident on the Woodlawn Mining Rehabilitation and Environmental Management Process Committee, and;
- maintains feedback telephone lines for the Woodlawn Bioreactor, which are continually promoted through the Tarago Times.

Furthermore, Veolia with the local community's cooperation moved to establish the Veolia Mulwaree Trust in 2003. The objective of the Veolia Mulwaree Trust – which includes one Veolia company representative together with 3 independent members with strong standing in the local community - is to provide funding to any charitable purpose and to projects for the benefit of the community of the former Mulwaree Shire Council area, or a community within a Council area immediately surrounding or adjoining the former Mulwaree Shire area.

The Veolia Mulwaree Trust has supported numerous organisations through its grants and donations since 2005, including distribution of some $3.2million. A web site (http://mulwareetrust.org.au/) has also been established to provide information about the Veolia Mulwaree Trust's Community Grants Program.

Chapter 5 Stakeholder and Community Engagement

5.1.1 Stakeholder Identification

In accordance with the Director General's Requirements (Refer to **Appendix A**), consultation for the project has included the following groups:

- Department of Environment, Climate Change and Water;
- Goulburn Mulwaree Council;
- Palerang Council; and
- Local community representatives through the CLC.

5.1.2 Purpose of Consultation

In order to undertake a comprehensive Environmental Assessment of the Project, appropriate emphasis needs to be placed on issues of greatest significance to the local environment, neighbouring landowners and the wider community. To ensure this has occurred, a program of community and Government consultation, review of previous technical reports and new preliminary environmental studies was undertaken to identify relevant environment issues and potential impacts.

5.2 Consultation Activities Prior to Submitting Environmental Assessment

Preliminary consultation for the Project in the local district has been led by Veolia and has consisted of:

- direct contact with local authorities;
- presentation by Veolia staff to the CLC;
- distribution of a Project Fact Sheet "Woodlawn Consent Modification" within the Tarago district that explained the planning process and encouraged community comments; and
- presentation of feedback during a CLC meeting whereby interested parties could submit to Veolia any concerns they had in relation to the Project.

In addition to local consultation, Veolia has also been liaising for over three years with the Department of Planning (DoP) and the DECCW in relation to the proposed expansion of the Woodlawn Bioreactor. A Preliminary Environmental Assessment (PEA) was originally submitted to the DoP in November 2007 that sought approval for an increase in both local waste and waste from Sydney and other regional areas.

In 2009, the DoP recommended that Veolia submit a separate application to modify the existing development consent under Section 75W (Part 3A) of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act), to permit Woodlawn to receive up to 50,000 tonnes per annum of putrescible waste by road from surrounding local Councils. The regional waste modification assessed the impacts of receiving waste from surrounding local council areas.

Veolia has attended several meetings in 2010 with representatives of DoP. These meetings provided a forum for discussion and consideration of issues to be addressed by Veolia in the Project Application.

Table 5-1 provides a summary of the consultation activity undertaken during the development of the Environmental Assessment, key issues raised and where they are addressed in the Environmental Assessment.

Table 5-1 Consultation undertaken during the preparation of Environmental Assessmen

Stakeholder	Form of Consultation	Date	Key issues raised	Where issues are addressed in the EA
State Government				
Department of Planning (DoP)	Planning Coordination Meetings.	Various	Reflected in the Director General's Requirements (DGR's) issued by the DoP.	Throughout the EA (see section 1 of the EA).
Department of Environment, Climate Change and Water (DECCW).	Veolia has an ongoing relationship with DECCW through licensing and environmental monitoring requirements. Additional communication with regards to greenhouse gases was received on 19 March 2010	Various	Reflected in DGR's and existing licenses.	Throughout EA.
Local Government				
Goulburn Mulwaree Council (GMC)	There is a GMC representative on the CLC, and discussions have taken place about accepting waste from GMC at Woodlawn in 2007 and 2009.	Various	No specific issues raised at this point of time	N/A
Palerang Council (PC)	Preliminary contact with PC to discuss the possibility of accepting waste from the Council.	Various	No specific issues raised at this point of time	N/A
Local Community				
Woodlawn Community Liaison Committee (CLC)	VES and a representative from URS briefed the CLC about the Woodlawn Project, providing details in relation to the scale and impacts of the proposal.	25 February 2010. 25 March 2010. 22 April 2010. 27 May 2010. 24 June 2010.	Tarago representatives were primarily concerned with traffic and associated amenity impacts associated with additional truck movements through the Tarago village due to the Bioreactor potentially accepting local and regional waste. Other issues also related to odour and noise. Concerns in relation to the impacts of another train service were also raised.	Chapter 12 – Traffic and Transport, Chapter 11 – Noise, Chapter 9 – Air Quality and Odour, Chapter 3 – Project Need, Justification and Alternatives.

5.3 Commitment to Ongoing Consultation

Veolia is committed to maintaining regular contact with the local and State Government authorities, neighbouring land owners, the Tarago community and other interested parties during the assessment of the proposed expansion of the Woodlawn Bioreactor.

In accordance with the provisions of the EP&A Act, the Environmental Assessment will be on exhibition for a period of at least 30 days. This period enables stakeholders to comment on the proposal through the exhibition phase of the Project. Any submissions received during that period will be considered as part of the assessment process.

Chapter 5 Stakeholder and Community Engagement

Veolia will foster full community engagement in the exhibition process – including the opportunity the community has to make submissions – by organising additional consultative means, such as:

- a public briefing session;
- additional briefings of the CLC on request;
- briefings of local authorities on request;
- briefings of the Veolia Mulwaree Trust on request;
- site visits for stakeholders on request; and
- correspondence / literature distribution to the local district.

Following exhibition of the Environmental Assessment, copies of all submissions, or a report of all issues raised will be provided to Veolia and relevant Government authorities. Veolia will review the submissions and respond to issues raised.

The Director General of the DoP will prepare an assessment report on the Project, which will take into account the comments from relevant Government authorities as well as other interested stakeholders. The assessment report will be provided to the Minister for Planning who will determine whether to grant approval for the Project and any conditions under which the facility will operate in accordance with the EP&A Act.

Veolia would ensure that ongoing dialogue with affected stakeholders continues to effectively monitor the social and environmental impacts of the development over time. This would include initiatives such as:

- notifying adjoining landowners and the Tarago community of when operational changes are likely to be initiated;
- reporting progress via Veolia's column in the Tarago Times; and
- maintaining project information on the Veolia's website and continuously updating the Tarago community through the CLC.

6.1 Introduction

Veolia operates the Bioreactor and the Crisps Creek IMF strictly in accordance with existing approvals issued by the Department of Planning, as well as EPLs issued by DECCW (and its predecessor). Veolia has a rigorous regime of environmental management in place for both facilities as required under the DECCW EPLs.

This chapter provides an overview of the environmental performance of the operations, existing environmental management provisions that are in place, a summary of relevant approvals and licences for the sites, as well as describing the monitoring and auditing regime in place.

6.2 Environmental Performance

The Woodlawn Bioreactor operations are underpinned by the objective of best practice environmental performance. This objective is supported by the conditions of development consent, which include a Bioreactor Performance Management Program. The program is maintained to manage implementation of the ongoing monitoring of environmental performance.

This objective has been largely met through the following best practice standards in environmental management:

- continuous leachate and gas recirculation and monitoring to optimise biological degradation rates and maximise methane production;
- up to 92% methane capture rates from open waste with horizontal gas collection systems to maximise landfill gas collection, and minimise fugitive emissions. In addition to the renewable energy benefit, capture and utilisation of this gas prevents harmful greenhouse gases from being released into the atmosphere (GHD, 2007).
- renewable energy production under the Green Power scheme, with renewable energy credits generated for all power;
- hydrogen sulphide control using in-situ addition of metal oxide (haematite and magnetite) to the waste as placed; and
- leachate management and disposal using biological treatment and evaporative control incorporating natural evaporation and mechanical evaporator blower systems in open lagoons following treatment.

These standards have resulted in the Woodlawn Bioreactor receiving a number of awards in waste management, engineering, transport and logistics, since commencing operations in 2004. These awards include:

- Engineers Australia – Awards for Excellence, Environment and Department of Public Works Sustainability Award in 2005;
- Chartered Institute of Logistics and Transport – ACT and Southern New South Wales, and National Achievement of the Year Award in 2006;
- Waste Management Association of Australia – National Landfill Excellence Award in 2007;

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- Society of Chemical Industry – Plant of the Year Award in 2009;
- United Nations Association of Australia - World Environment Day Awards, Best Specific Environmental Initiative Finalist in 2010.

The focus on renewable energy as a core objective of the Bioreactor operation has created the potential for the Woodlawn Eco-Precinct to be one of the largest green energy sites in NSW through the generation of electricity from both the Bioreactor and the Windfarm.

Regular independent environmental audits undertaken at both the Woodlawn Bioreactor and Crisps Creek IMF sites on the whole support the good environmental performance of these operations. These audits show that the majority of development consent conditions are being fully complied with, and in an area where an issue has been identified, Veolia has worked with the relevant government agencies as well as the local community towards improving the environmental performance of the operations.

Independent Environmental Audits are undertaken every three years, and they are supported by internal environment audits which are undertaken annually. The most recent Independent Environmental Audit was undertaken in 2008 by a certified Lead Environmental Auditor from Golder Associates and included two site visits and a desktop review to assess the level of compliance of the operations against the conditions of consent. The report concluded that Veolia is generally in compliance with the consent conditions and also highlighted some potential areas for improvement mostly associated with odour management. Further details regarding measures that have been taken to address odour management are provided in **Chapter 9 Air Quality and Odour**.

6.3 Woodlawn Bioreactor Environmental Management Plan

The Environmental Management Plan (EMP) has been prepared in accordance with the requirements of the EPA Environmental Guidelines: Solid Waste Landfills (1996), the Conditions of Consent and the site's Environmental Protection Licence (EPL 11436 and EPL 11455).

The purpose of the EMP is to provide an environmental management tool for the operation of the site and a means of identifying and concentrating on the key environmental, operational and rehabilitation issues associated with the facilities. The EMP is a working document. The management strategies contained are intended for review on an annual basis. Where necessary, the EMP is changed as new strategies and technologies become available. The upgrading and reissuing of the EMP and associated management plans is undertaken by Veolia as an internal process.

The EMP includes a number of plans, schedules and procedures in line with the requirements of the EPLs and the consent conditions. Key supporting documents include:

6.3.1 Barrier System and Quality Assurance Plan

The Barrier System and Quality Assurance Plan provides a methodology for identifying and treating any surfaces within the void that require a barrier system. The barrier system refers to any clay or synthetic liners that are installed within the void ensure required permeability levels are maintained on all surfaces.

6.3.2 Geotechnical Stability Monitoring Plan

This plan describes the actions that are implemented for monitoring and assessing the geotechnical stability of the mine void. The geotechnical stability of the mine void is primarily a safety issue, however, instability has the potential to disrupt bioreactor operations. Review of procedures for waste placement and pit wall stability occur on an annual basis.

6.3.3 Bioreactor Performance Monitoring Program

A Bioreactor Performance Monitoring Program (BPMP) has been developed to monitor the bioreactor treatment system so that the efficiency and performance of the system can be optimised. The BPMP provides a routine set of monitoring parameters that are used to assess the efficiency of bioreactor operations and environmental performance.

6.3.4 Filling Schedule

This Filling Schedule has been prepared in accordance with Consent Condition 35, and is consistent with the concept detailed in the *Woodlawn Waste Management Facility – Environmental Impact Statement, 1999*.

6.3.5 Surface Water Management Schedule

The Surface Water Management Schedule (SWMS) has been developed to ensure that surface water is successfully controlled and managed during the operation of the Bioreactor and Intermodal facility. Part of the SWMS involves a water balance to be undertaken over the life of the bioreactor, identifying the volume of inputs and outputs into the void and identifies storage requirements and additional water requirements needed over the life of the bioreactor. The SWMS is provided within **Appendix C** and is discussed further within ***Chapter 8 Soils, Geology and Water Management***.

6.3.6 Evaporation Dam 3 Management Plan

In accordance with consent condition 70 the Evaporation Dam 3 (ED3) Management Plan outlines the existing management of ED3 and the surface water contributions to ED3. Based on the outcome of water balance calculations, the management of ED3 during operation of the bioreactor has been outlined. Management of ED3 also involves developing an emergency management plan to prevent environmental damage in the event of flow spilling from ED3.

6.3.7 Post Closure Landfill Rehabilitation Management Plan

The Post Closure Landfill Rehabilitation Management Plan addresses the rehabilitation and long-term management issues associated with stormwater, leachate, biogas, management of ED3 and revegetation for the site. The staging of the rehabilitation works is dependent on the proposed filling plan.

6.3.8 Gas Management Plan

This Gas Management Plan has been developed for the Woodlawn Bioreactor to assist in the monitoring of biogas generation and control, which is critical to the performance of the bioreactor. Gas management involves implementing a landfill gas system, which monitors and controls generated gas for the period of landfill gas production. One of the requirements of the EPL is to monitor the effectiveness of the gas control measures, by the routine monitoring of subsurface and surface gas emissions. The frequency and type of monitoring is outlined in **Section 6.6**.

6.3.9 Leachate Management Plan

The Leachate Management Plan summarises the design of the water infiltration and leachate management system for the bioreactor. The plan includes management of groundwater seepage that may enter the mine void during operation of the bioreactor. This plan also incorporates the Leachate Contingency Management Plan. This plan has been produced in conjunction with a Surface Water Management Scheme which includes provisions for the collection of the majority of surface water from the sides of the pit so that it does not enter the waste, as required in the Conditions of Consent.

6.3.10 Groundwater Monitoring Program

The Groundwater Management Program describes the actions that will be implemented for monitoring and assessment of groundwater level, flow and quality at the bioreactor site and at ED3. The objectives of this Plan are to monitor groundwater flow and direction in and around the mine void and to detect the movement of any groundwater pollution from the void, attendant infrastructure and wheel wash facility and ED3.

6.3.11 Ambient Air Quality Monitoring Plan

The Ambient Air Quality Monitoring Plan incorporates the Odour Monitoring Plan and the Dust Management Plan for the Woodlawn Bioreactor and the Crisps Creek Intermodal Facility. This plan forms part of the Woodlawn Bioreactor Environmental Management Plan. This plan provides a framework for information both in the near-field and far-field to support ongoing management of the operational phase of the project and assist with compliance at nominated sensitive receptor locations.

6.3.12 Noise Management Protocol

This plan outlines the management techniques and mitigation measures employed to comply with the Consent Conditions for both the Intermodal facility and Woodlawn Bioreactor in relation to operational and road traffic noise.

6.3.13 Emergency Management Plan

The plan describes the general policy and approach to be followed when dealing with an emergency or incident and is aimed at addressing various types of emergencies, including fire, explosion, rock falls, traffic accidents and wind and structural damage. The Woodlawn Bioreactor Emergency Management Plan has been prepared in accordance with the relevant consent conditions.

6.4 Existing Licences and Approvals

Table 6-1 provides a list of the licences and approvals currently in place at the two facilities.

Table 6-1 Existing Licences and Approvals

Name of Licence	Regulatory Body	Main elements / purpose of Licence
Woodlawn Environment Protection Licence (EPL) 11436	Department of Environment, Climate Change and Water (DECCW)	Site is licensed to operate the bioreactor in accordance with a set of conditions.
Crisps Creek IMF (EPL) 11455	DECCW	Site is licensed to operate the IMF in accordance with a set of conditions.
Development Consent DA 31 – 02 – 99	Department of Planning (DoP)	Enables sites to be constructed and operated as a IMF and Bioreactor and stipulates requirements in relation to such elements as infrastructure and operation.
Licence to Operate and Onsite Sewage Management Facility - Woodlawn and Crisps Creek IMF	Goulburn Mulwaree Shire Council (GMC)	Permits operation of onsite septic system.
Mines Lease	Department of Primary Industries (DPI)	Permits mining activities at Woodlawn

6.5 Performance Reporting

Performance reporting is undertaken to provide information on the environmental monitoring and operational activities of the Bioreactor and Intermodal facility. Each of the performance reports are described below.

6.5.1 Conditions Compliance Reports

In accordance with Consent Condition 18, a Conditions Compliance Report is to be prepared every two years following the date of commencement of construction activities, which was in September 2002. A copy of this report is submitted to the DoP, the DECCW, and Goulburn Mulwaree Council (GMC).

6.5.2 Independent Environmental Audits

In accordance with Consent Condition 19, an independent audit of the environmental performance of the development is to be undertaken every three years, following the commencement of operations at the facility. The audit report is submitted to the DoP, the DECCW, GMC and the Community Liaison Committee.

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6.5.3 Annual Environmental Management Report

The preparation of the Annual Environmental Management Report (AEMR) is a condition of Woodlawn's Mining Lease under the Mining Rehabilitation and Environmental Management Process (MREMP). The AEMR contains detail of the mine's environmental management and rehabilitation activities and is undertaken on an annual basis. A copy of the report is submitted to the relevant government agencies including DPI (Mineral Resources), DECCW, GMC, Sydney Catchment Authority, Sydney Water, Dams Safety Committee.

6.5.4 Annual Return

In accordance with Consent Condition 138, Veolia must provide an annual return to the DECCW as required by the site licence under the Protection of Environment Operations (POEO) Act. Veolia must provide the results of the annual monitoring undertaken at the site, any complaints received, a report on compliance with licence conditions and the licence fee.

6.5.5 Monthly Report

Each month, Veolia provides the DECCW with a report on the total tonnage of waste received at the facility.

6.5.6 Incident Reporting

The DECCW will be notified of any incident that represents a threat to the environment and that may lead to a breach of licence conditions. Initial contact is made via the DECCW's Pollution Line and a written notice would follow. Such incidents include, but may not be limited to:

- identification of non-conforming waste;
- fires at the bioreactor, either surface or subsurface;
- identification of any failure of an environmental protection system;
- detection of subsurface gas migration in a perimeter gas well at greater than 1.25% methane (v/v); and
- any other incident or observation that could potentially pose an immediate environmental hazard.

6.5.7 Volumetric surveys

In accordance with the Protection of the Environment Operations (Waste) Regulation 2005, a volumetric survey is undertaken every six months. This survey is used to determine the volume filled over that period and the compaction rate achieved.

6.5.8 Summary of Reporting Requirements

Table 6-2 summarises the reporting parameters, frequency of reporting, and items to be included in the reports.

Table 6-2 Woodlawn Reporting Requirements

Name of Report	Frequency	Information included in the report
Conditions Compliance Report	Every two years	Assessment of compliance with conditions with consent.
Independent Environmental Audit	Every three years	Assessment of environmental performance of the facility.
Annual Environmental Management Report	Yearly	Detail of the mine's environmental management and rehabilitation activities in accord with the Mining Rehabilitation and Environmental Management Process (MREMP).
Monthly report	Monthly (25th of the month)	Tonnage of waste received.
Annual return	Yearly (due on or before 5 November)	Annual return form including details of monitoring results and complaints received during the reporting period.
Incident reporting	Notify as soon as practicable following incident, followed by written report	Details of incident.
Volumetric survey	Six monthly	Volume of waste filled and compaction rate achieved.

6.6 Existing Environmental Monitoring Regime

The environmental monitoring regime including sampling locations, parameters and sample frequency are identified in **Table 6-3**.

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Table 6-3 Environmental Monitoring Regime

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Meteorology	Meteorological Station	Wind speed @ 10m Wind direction @ 10m Sigma theta @ 10m Temperature @ 10m Temperature @ 2m Solar radiation Rainfall	Continuous	EPL conditions and Conditions of Consent (CoC) EPL – Point 9	Logged at 15 minutes intervals to provide 1 hour average values, must be able to provide instantaneous wind speed and direction to assist in investigation of complaints.
Leachate Quality Management	Leachate Pond Leachate Management System	Alkalinity as HCO3 - & CO32- Ammonia as N Calcium Chloride Conductivity Magnesium Potassium Sodium Sulphate TDS TOC pH TSS Phosphorus (Total) Aluminium Barium	Annually	EPL points 23 and 24	

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
		Chromium (Hexavalent) Chromium (Total) Arsenic Fluoride Mercury Copper Lead Manganese Bicarbonate PHA Zinc Cobalt Cadmium Carbonate Nitrate Nitrite Organochlorine Pesticides Organophosphate Pesticides Total Phenolics BTEX TPH			

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Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Water Quality					
Surface Water	Monitoring Sites: 115 Spring 2 105 WM201 WM202 (ED3 S) WM203 (ED3 N) WM200 (Raw Water Dam) Pond 2 Pond 3	Ammonia as N BOD Conductivity Potassium TDS TOC pH DO Redox Potential	Quarterly After rainfall events greater than 25mm If quarterly monitoring not possible due to lack of flow, monitoring based on rainfall events and creek flow assessment Special frequency 1 (EPL)	EPL EPL – Points 13 to 22	
Mine Site Surface Water	Farm Road Culvert Site 100 Site 109	pH Conductivity	Quarterly	Mine	Metal Analysis on an annual basis. Zinc, Copper, Iron, Lead, Sulphate
	ED1 ED2 Waste Rock Dam South Tailings Dam Nth tailings Dam Plant Collection Dam ED2 SCT STD Return Water	pH Conductivity	Quarterly	Mine	Metal Analysis on an annual basis. Zinc, Copper, Iron, Lead, Sulphate

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Intermodal Facility	110 (IMF) 150 (IMF) 130 (IMF) Outlet from IMF Stormwater Pond	Ammonia as N BOD Conductivity Potassium TDS TOC pH DO	Quarterly	EPL EPL – POINTS 1 TO 3 130 added by Veolia for extra upstream data	In the case of no flow at these points sampling may need to be based on rainfall events
Water Levels in Dams	ED3 North ED3 South Waste Rock Dam ED2 ED1 Nth Tailings Dam South Tailings Dam Raw Water Dam	Level	Monthly – in accordance with CoC 132	ED3 in EPL, others for Mine Site. EPL Point 54	To be recorded on key indicators list.
Pump Readings	PP06 (in pit) PP07 (in pit) PP08 (in pit) Bore Field Booster 1 – Flow meter Woodlawn Dam (Raw Water Dam) Pump & flow meter Plant Collection Dam South Tailings Return Water	Pump hours / reading	Monthly	EPL and Mine Site	To be recorded on key indicators check list

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Groundwater					
Groundwater Wells	MB1 – 17 ED3B WM1 WM3 WM4 WM5 WM6 WM7 MW8S MW8D MW9S MW10S	Quarterly Alkalinity as HCO3 & CO32- Ammonia as N Standing Water Level Calcium Chloride Conductivity Magnesium Potassium Sodium Sulphate TDS pH <u>Annually</u> Standing Water Level Chromium Arsenic Copper Fluoride Lead Manganese Bicarbonate Cadmium	Annually and Quarterly	EPL EPL – Points 25 to 53, and 55 to 58	

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
		Carbonate Nitrate Nitrite Organochlorine Pesticides Organophosphate Pesticides Total Phenolics TOC Zinc Aluminium Phosphate Barium Chromium (Hexavalent) Chromium (Total) Mercury Cobalt BTEX TPH PHA			
Piezometers	P38 P44 P45 P58 P59 P100	Standing Water level (m, AHD)	Quarterly	EPL, EPL Point 48 to 53	

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Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Other Groundwater Modelling	MB 1 – 20	pH Standing Water Level (m, AHD) Conductivity	Quarterly	Mine	Some overlap with EPA requirements – MB 1, 4, 6 already complete, 1 – 17 level required. Note, MB 18 is now filled in and MB 9 not monitored. Metals analysis on an annual basis. Zinc, copper, iron, lead, sulphate.
	NTP1 NTP2 SP2C SP3C ETP8 SP11B E3 F1 F7 X1 X2 Y1 Z1	pH Standing Water Level (m, AHD) Conductivity	Six monthly	Mine	Metals analysis on an annual basis. Zinc, Copper, Iron, Lead and Sulphate.

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Landfill Gas					
Subsurface Gas	GMBH1 GMBH2 GMBH4	CH4 - % By Volume	Quarterly	EPL & the Bioreactor Performance Monitoring Program (BPMP) EPL – Points 1, 2 & 4	Special method 1 – ELP Licence only requires quarterly methane, at locations in and near the mine void as shown in Landfill Environmental Management Plan (LEMP).
	Internal to the Bioreactor: at gas manifolds and	CH4 CO2 O2 H2S CO N balance Flow Relative pressure	Operational requirement for performance of Power Station	BPMP	Additional monitoring as part of BPMP
	At flare	CH4 CO2 O2 H2S	Weekly	BPMP	Additional monitoring as part of BPMP
Surface Gas	Locations on the surface of the landfilled waste (grid 30m x 30m)	CH4 - % By Volume	Quarterly	EPL & BPMP EPL – Point 6	Special method 2 – EPL only requires quarterly methane, Additional monitoring as part of BPMP. Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
Landfill Gas Extraction Booster	Power Station – Flare Compound	CO2 Dry Gas Density Moisture Content Molecular Weight of Stack Gases O2 Temperature VOC Volumetric Flow Rate	Annually	EPL EPL – Point 5	Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills
Landfill Gas Flare	Power Station - Flare Compound	Temperature Residence Time	Annual	EPL EPL – Point 7	
Landfill Gas Fired Power Station	Air Discharge	CO2 Dry Gas Density Moisture Content NO2 O2 H2S Sulphuric Acid mist and/or sulphur trioxide Temperature VOC Velocity Volumetric flow rate CO Molecular Weight of Stack Gases	Annually	EPL EPL – Point 8	Sampling procedure as per NSW EPA Environmental Guidelines: Solid Waste Landfills

Program	Sampling Locations	Parameters	Frequency of Sampling	Requirement	Comments
		HS2			
Ambient Air Quality	DG 22 – West Void DG 24 – East Void DG 28 - Pylara	Particulates – Deposited Matter	Monthly	EPL EPL – Points 10-12	
Odour	Odour monitoring is performance based as required.				
Pest, Vermin and Weed Management	Bioreactor and Intermodal sites	Presence of vermin and / or noxious weeds	Monthly	CoC 152	Regular inspections of the sites by relevant staff members. Appropriate corrective actions as required. Inspection by registered pest controller. Appropriate corrective actions as required.
Geotechnical Stability	Mine Void	Visual inspection of pit crest, all berms and toe of slope, and photographic record.	Weekly	CoC 137	Refer to existing Geotechnical Management Plan and Barrier System and Quality Assurance Plan
		Slope monitoring survey	Monthly		
		Survey interpretation and geotechnical monitoring report	Quarterly		

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6.7 Record Keeping

The environmental licence stipulates that all relevant data and information pertaining to environmental monitoring must be recorded and maintained on site, including but not limited to:

- Sampling dates, times and name of sampler;
- Chain of Custody, analysis and results;
- Complaints received and corrective actions taken; and
- Copy of the EPL, development consent and other relevant approvals.

6.8 Auditing

Veolia has a comprehensive internal audit process which covers different levels of audits including:

- Systems Audits - an assessment of compliance to the documented system, known as National Integrated Management System (NIMS) audits are completed by Veolia's Compliance division as well as by the external Certification Provider.
- Legislative Audits – these audits involve an assessment of compliance to relevant legislation, regulations codes of practice and licences.
- External Audits - undertaken by the Certification Provider to ensure that the VES NIMS complies with the relevant standards, including ISO 9001, 14001, 4801. Other external audits include WorkCover and Australian Quarantine Inspection Services (AQIS) compliance audits.

7.1 Introduction

The likelihood of an environmental impact occurring can be described in terms of its probability. Overlaying this probability is the need to recognise that a degree of uncertainty may be associated with possible environmental impacts, particularly during the initial risk assessment process. Where there is scientific uncertainty, a cautious approach will identify a higher level of risk.

Each identifiable impact can be assigned an occurrence rating, between being 'rare' through to 'almost certain'. In simplifying the possible impacts for the purpose of an environmental risk assessment, an element of subjectivity must also be introduced.

A detailed risk environmental risk assessment of the Project was undertaken by Veolia for both the Bioreactor and the Crisps Creek IMF sites, and is attached as **Appendix B.**

This chapter outlines the key findings from this assessment as they relate to environmental risk, and details the wider methodology utilised to carry out the environmental risk assessment for the proposed expansion project as presented in this EA.

7.2 Methodology

A number of sources were used to ascertain the level of environmental risk associated with the Project, including the issues raised by stakeholders and local residents. Additionally, the assessment was based on existing hazard management plans and other operational documents that are used by Veolia in the day to day management of both the Bioreactor and the Crisps Creek IMF. A Preliminary Hazard Analysis (refer to **Chapter 14**) was also undertaken as part of the Environmental Assessment for the proposed expansion.

7.2.1 Veolia Workplace Risk Assessments

The current Workplace Risk Assessments prepared by Veolia for both the Bioreactor and the Crisps Creek IMF sites consider site operations in terms of the discrete tasks or process steps required. Hazards associated with each operational step have been determined and then assigned a risk level in the absence of controls. The risk level is based on the degree of severity or consequence of the identified hazard in terms of health and safety, environmental impact, reputation risk and financial cost. The determination of the 'Risk Score' assigned to each task considered in the existing environmental risk assessments is shown in **Table 7-1** below.

Table 7-1 Risk Score Calculation

Risk Score	Consequence/ Severity	
1	Insignificant	No injuries, no environmental harm, low financial cost
3	Minor	First aid injuries or illnesses only. Release to environment immediately contained. Medium financial loss, disclosable event (i.e. to management), minor loss of production and/or service capacity,
7	Moderate	Medical treatment required, lost time injury or illness or temporary reversible illness with limited period of disability. Release to environment contained with internal/external assistance, possibility of Appropriate Regulatory Authority action. Regulator intervention (no escalation but cost), high financial cost, minor publicity, internal and external cost, disclosable event (i.e. to VES Board), loss of production and/or service capacity, contract dispute.
15	Major	Extensive injuries – Permanent partial disability or severe lost time injuries or illnesses. Release to environment contained with internal/external assistance. Major financial loss, loss/suspension of licence, loss of major contract, reasonable intimation of court proceedings/ARA action, publicity, internal and external cost (both high), disclosable event (ie - in respect of VE stock exchange listing), substantial loss of production and/or service capacity, loss of production capability.
40	Catastrophic	Death, or irreversible severe disability or impairment. Pollution event with detrimental effect. Huge financial loss, significant publicity, corporate criminal penalties, substantial fine (>$.5 mill), loss of major contract before contract termination date.

The risk inherent in each specific task is then assessed based on the activities' risk score plus consideration of the frequency or likelihood of a particular incident or situation to occur. Veolia's Risk Assessment Matrix is presented in **Table 7-2**.

Table 7-2 Veolia's Risk Assessment Matrix

	Consequences					
Frequency	**Score**	**1**	**3**	**7**	**15**	**40**
	10	High-10	High-30	Extreme-70	Extreme-150	Extreme-400
	6	Moderate-6	High-18	High-42	Extreme-90	Extreme-240
	3	Low-3	Moderate-9	High-21	High-45	Extreme-120
	1	Low-1	Low-3	Moderate-7	High-15	High-40
	0.5	Low-0.5	Low-1.5	Low-3.5	Moderate-7.5	High-20

The Workplace Risk Assessment Worksheets prepared by Veolia for both the Bioreactor and the Crisps Creek IMF sites assigns a risk level to activities in the absence of mitigation controls, and with mitigation controls in place. The current risk assessment worksheets are attached as **Appendix B.**

7.2.2 Issues Raised by Stakeholders

Issues that were raised by key stakeholders were considered to be crucial in assisting in defining the level of environmental risk associated with the Project. The issues raised by key stakeholders are reflected in the Director General's Requirements following consultation with Veolia in relation to the Project. The issues include:

- Air quality (odour and dust) related issues;

- Greenhouse gas impacts;
- Traffic and transport related impacts;
- Surface and groundwater impacts;
- Noise related impacts;
- Socio economic impacts;
- Impacts associated with hazards arising from the operation and expansion of the facility, such as fire, hazardous materials, pests and health impacts; and
- Impacts on neighbouring agricultural land uses.

7.2.3 Issues Raised by Community

To augment the depth and coverage of the environmental risk assessment, it is also important to take into the consideration the views of local community stakeholders. The issues raised by the community focused on the localised amenity impacts that may be arise from the expansion the Bioreactor capacity. In particular, community representatives on the Community Liaison Committee were concerned with air, odour, noise and traffic related impacts associated with the Project. Their views are covered in more detail in **Chapter 5, Community and Stakeholder Consultation.**

7.3 Summary of Environmental Issues and Potential Risks

The identification and prioritisation of environmental issues associated with the Project has been based on the consideration of:

- The planning and legislative requirements affecting the site;
- The environmental context of the Project area and the region;
- The outcomes of the community and stakeholder consultation undertaken thus far;
- A review of previous investigations of the Project site;
- Existing operational and management plans used by Veolia; and
- The findings of the specialist environmental studies undertaken for the preparation of this EA.

Based on these considerations, a summary of the environmental risk analysis has been prepared and is presented in **Table 7-3** below.

Table 7-3 Environmental Risk Analysis

Issue	Environmental Risk	Likelihood of Occurrence	Addressed in Section
Pest, disease and agriculture related impacts	Introduction of pests and the spreading of disease as a result of the proposed expansion.	Possible without control measures, however unlikely due to existing approved, operational management measures.	Refer **Table 14-3** and **14-4** in **Chapter 14** and **Appendix J**
Surface Water	Contamination of surface water.	Possible without control measures, but unlikely due to existing approved Surface Water Management Scheme.	Refer **Chapter 8** and **Appendix C**
Groundwater	Contamination of ground water.	Possible without control measures, however unlikely due to the use of leachate barrier systems and existing Groundwater Management Scheme.	Refer **Chapter 8** and **Appendix C**
Noise	Increased noise impacts above the DECCW guidelines. Impacts on local residents.	Rare due to the large buffer distance between both the Bioreactor and the IMF and sensitive receivers.	Refer **Chapter 11** and **Appendix G**
Air quality and Odour	Emission of air pollutants and odour above the DECCW guidelines.	Low level of risk due to the large buffer distance between the Bioreactor, the IMF and sensitive receptors.	Refer **Chapter 9** and **Appendix D**
Greenhouse gas emissions and energy use	Excessive energy consumption and related GHG emissions compared to similar facilities.	Known consequences with significant offset through generation of electricity from methane produced at the site.	Refer **Chapter 10** and **Appendix F**
Traffic and transport	Significant impacts on local Tarago community, impacting levels of service and traffic flow.	Rare due to the relatively low level of truck movements.	Refer **Chapter 12 and Appendix H**
Socio economic	Negative impact on existing social conditions and on economic vitality of the Tarago district.	Rare as the Project will generate additional employment demand, while amenity impacts are low.	Refer **Chapter 13 and Appendix I**
Hazard and risk	Increased risk to human health and the environment from expansion, especially from dangerous materials and gases.	Rare as hazardous substances may not received at the Bioreactor.	**Chapter 7** and **Chapter 14 and Appendix J**
Cumulative impacts	Possible cumulative impacts include noise, air quality and odour, surface water, groundwater, and traffic.	Possible without adequate control measures and management techniques.	Each respective Environmental Assessment Chapter considers possible cumulative impacts; refer to **Chapters 8 -15**

7.4 Other Potential Issues

7.4.1 Flora, Fauna and Heritage

The footprint of the Bioreactor and the area of activity at the IMF will not change as a result of the Woodlawn Expansion Project. All operations associated with the proposal will take place in areas that have been surveyed and assessed. Recent discussions have been held with DECCW as part of this application, with regard to flora, fauna and heritage in light of previous biodiversity and heritage survey work undertaken at the site. It is considered that the Project will not generate any impacts on Aboriginal cultural heritage or on flora and fauna.

7.4.2 Lighting

Additional lighting is required along the Bioreactor access road and in working areas of the void. Approximately twenty 400 Watt lights will be installed and will be connected to existing mains power. Additional lighting within the void (active tipping area) will be required during the evening period using four portable diesel powered light towers to provide adequate lighting to the tipping operations. As the lighting is located along the access road and in the void, the impact on nearby receptors is considered to be negligible.

At the IMF, no additional lighting is required, however approval is sought for an extension to the existing hours of operation as detailed in **Chapter 2 Project Description**. As there is no line of sight from the IMF to nearby receptors it is considered that there will be no impact as a result of the extended use of the existing lighting.

7.5 Conclusion

This Chapter has outlined the most significant potential environmental risks associated with the proposed expansion. The potential risks were prioritised within this environmental assessment after careful analysis of existing risk assessments available for current operations, technical specialist investigations to determine project impact assessment, and stakeholder and community consultation.

The hazard and risk assessment carried out and summarised in **Chapter 14** of this EA found that the waste expansion project would not introduce any new risks or hazards to the Bioreactor and that the risks and hazards are all well known and understood by Veolia management and staff.

This Environmental Assessment has considered that the proposed expansion would allow for operations to be undertaken within an area where monitoring and knowledge of existing conditions provides additional certainty with respect to predicted environmental outcomes. **Chapter 2** and **Chapter 6** outline that throughout its operational life, the Woodlawn Bioreactor has proven to be a reliable, secure and environmentally-sound facility that brings flexibility to integrated waste management across the region.

The demonstrated operational and environmental performance of the Bioreactor indicates that the facility will satisfy the anticipated level of performance required to meet present and future community waste management needs plus environmental and health performance objectives. Past environmental performance endorses the suitability of the location and compatibility with nearby land uses. In place are proven risk management strategies with the ability to handle abnormal events such as fires, earthquakes, storm water intrusion, flooding or accidental discharge of chemicals.

8.1 Introduction

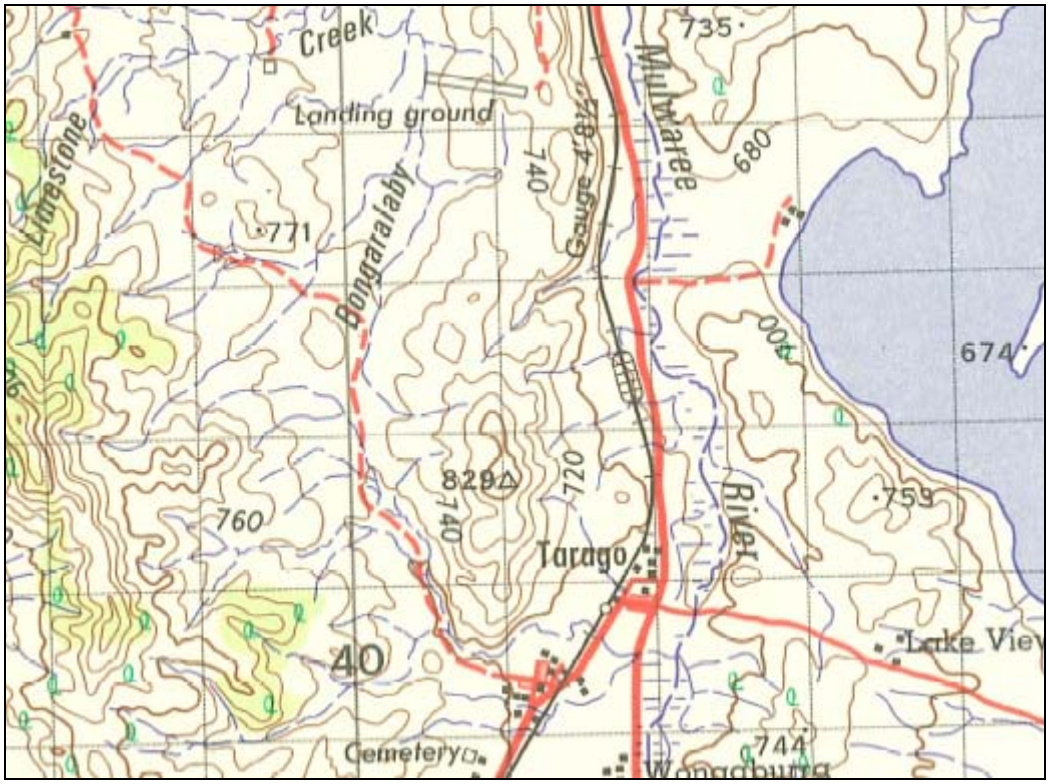
This Chapter presents an assessment of the soils, geology and water management impacts of the Project. As the Project does not involve any significant construction activities at either the Bioreactor or the Crisps Creek IMF (especially in terms of excavation), the focus of this chapter is on the impact of increasing the maximum input rate of the Bioreactor to 1.13 million tpa, and what implications this will have in terms of groundwater management at the Bioreactor.

8.2 Regional Geology and Setting

8.2.1 Topography

The natural ground surface surrounding the Bioreactor lies at an elevation of approximately 800 m AHD, with the base elevation of the mine void at approximately 630 m. The Bioreactor is situated on a ridge which forms part of the Great Dividing Range (Parisotto, 2007). **Figure 8-1** illustrates the topography of the site and surrounding area, including the area of the Crisps Creek IMF.

Figure 8-1 General area and site topography



For the majority of the site, crests are narrow with common rock outcrops and surface stone. East facing slopes tend to be longer and steeper as they fall away to the topographically lower terrain of the Braidwood physiographic region. In the eastern boundary of the site, there are occasional rock outcrops particularly on crests where ferrunginised rock such as ironstone is occasionally present. To the west of the site, hillslopes are the dominant landform element.

8.2.2 Regional Geology

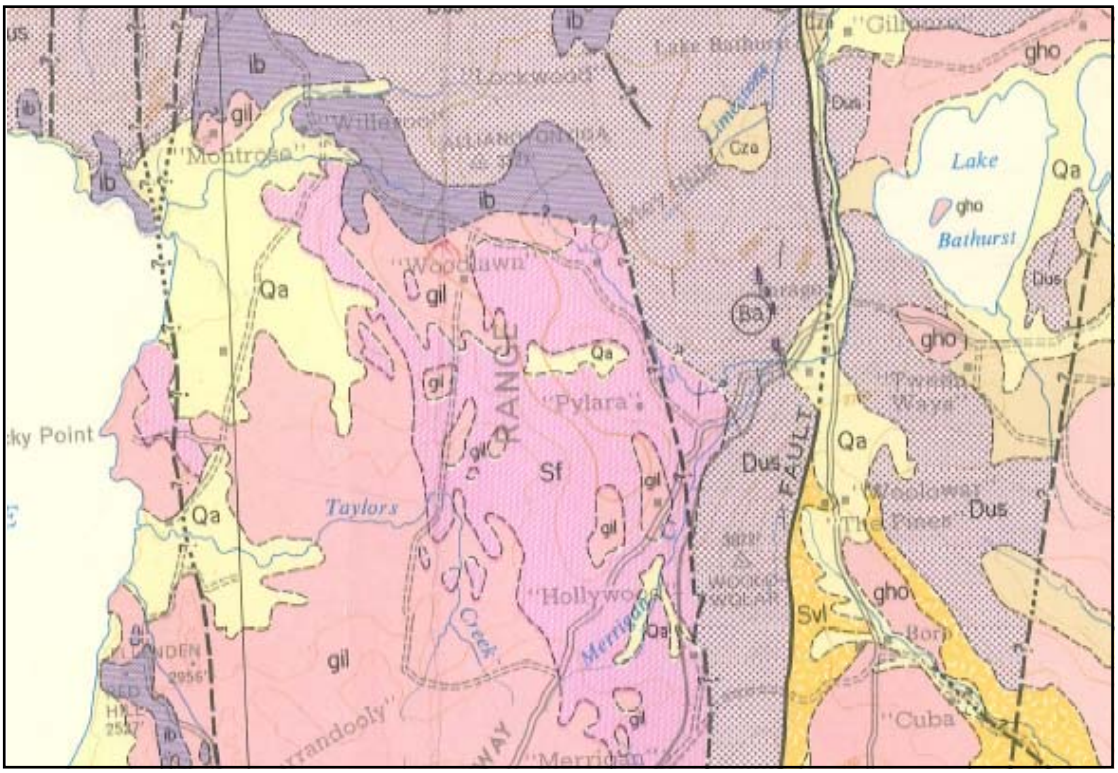
The site lies within the South Eastern Highlands Bioregion. The South Eastern Highlands Bioregion covers the dissected ranges and plateau of the Great Dividing Range that are topographically lower than the Australian Alps, which lie to the southwest. It extends to the Great Escarpment in the east and to the western slopes of the inland drainage basins. The Bioregion continues into Victoria. The substrate is formed of Palaeozoic granites, metamorphosed sedimentary rocks and Tertiary basalts. (DECC, 2008).

The highlands are part of the Lachlan fold belt that runs through the eastern states of Australia as a complex series of metamorphosed Ordovician to Devonian sandstones, shales and volcanic rocks intruded by numerous granite bodies and deformed by four episodes of folding, faulting and uplift. The general structural trend in this bioregion is north-south and the topography strongly reflects this (DECC, 2008).

The geology of the Tarago area is illustrated on the Canberra 1:2500 000 Geology Map. An extract from the map is illustrated in **Figure 8-2**.

As the site lies within the Lachlan Fold Belt, it is also underlain by a series of metamorphosed Ordovician Age sediments and Devonian sandstones. The Silurian to Devonian pink granite intrusions (gif) lie to the south east of the site, and form the western boundary of the site. The dominant rock unit in the area is the volcanic and sedimentary rocks of the Mount Fairy Group (sf). These include shale, phyllite, sandstone, limestone, tuff and minor intrusions.

Figure 8-2 Geology of the Site



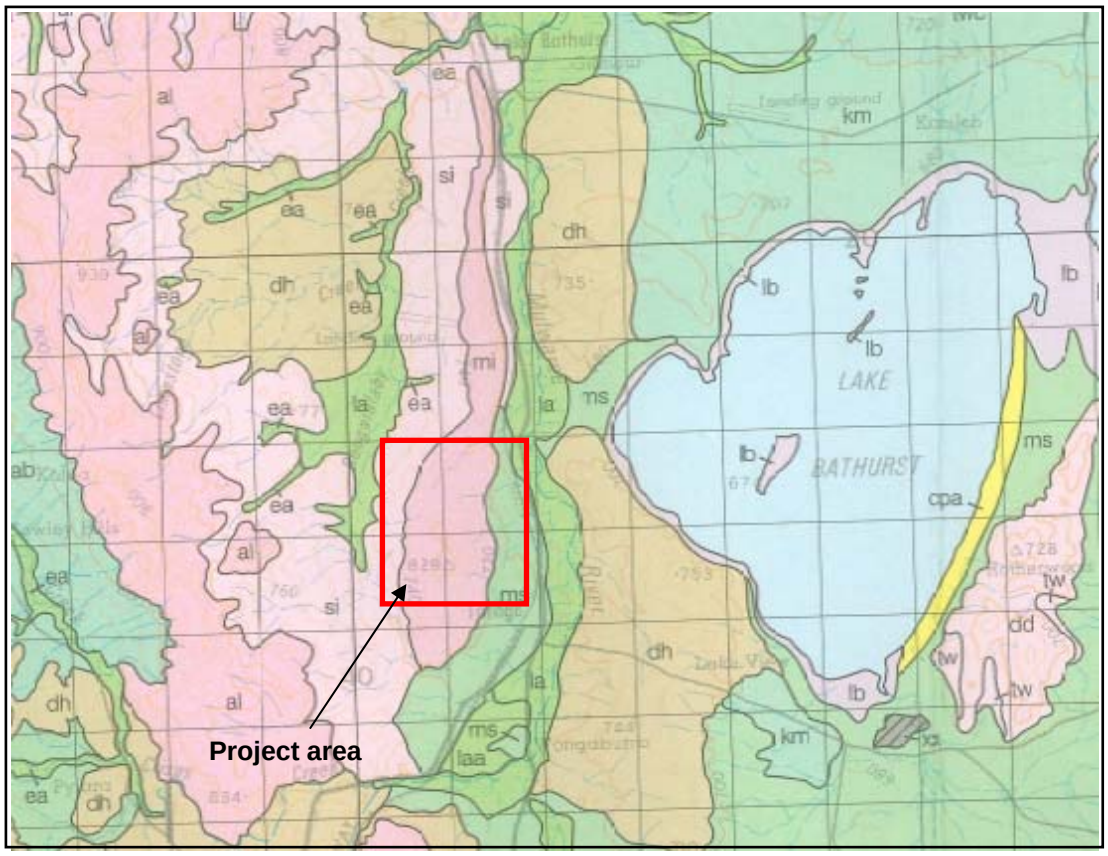
The western edge of the project area is dominated by the pink granite formations (gil), whilst intermediate and basic intrusions crop up in the northern boundary (ib). There are potentially some quartz sandstone, conglomerate, red shale, limestone and greywacke intrusions at the very northern edge of the site.

The entire area has been faulted and folded over geological time and has resulted in re-crystallisation of minerals within the bedrock. Minor faults passing through the mine void exhibit significant fracture patterns parallel to the fault planes, although such zones do not exhibit significant permeability because the feldspathic nature of the rocks has resulted in openings being choked by clay minerals and sericite deriving from the feldspars (Woodward Clyde Pty Ltd, 1999).

8.2.3 Soil

The Soil Conservation Service of New South Wales 1:100,000 Braidwood Soil Landscape Map indicates the two predominant soil landscapes in the project area are Morass and Misery Mountain. There is also potential that the site flanks the Sight Hill landscape to the west (**Figure 8-3**).

Figure 8-3 Soil landscapes of the Project area



In general, upper slopes are well drained but with shallow soils (>50 cm). Minor sheet erosion has been identified as a limitation in each of the soil landscapes, whilst the potential for acidity is greatest across the majority of the site, within the Misery Mountain landscape. An overview of soil landscapes is presented below in **Table 8-1**.

Table 8-1 Site soil landscapes

Soil Landscape	Soil	Soil Limitations	Landscape Limitations
Morass (ms)	Crest: shallow, well drained Lithosol Midslope: moderately deep, moderately well-drained Yellow Earths Lower slope: moderately deep, poorly drained Solodic Soils	Scald erosion Salinisation Minor sheet erosion on steeper slopes	Seasonal waterlogging Low fertility Low wet bearing strength Low permeability of subsoil High – severe foundation hazard
Misery Mountain (mi)	Crest: extremely shallow, well drained Lithosol Midslope: shallow, moderately well drained Yellow Podzolic soils Lower slope: moderately deep, poorly drained Yellow Podzolic.	Minor sheet erosion Infertile soils Acidic – high potential for aluminium toxicity Shallow soils	Steep slopes Moderate to high foundation hazard Localised run on Localised mass movement hazard
Sight Hill (si)	Crest: extremely shallow, well drained Lithosols Midslope: moderately well drained Shallow Earths Lower slopes: moderately deep and mod. well drained Red Podzolic soils and imperfectly drained Yellow Podzolic soils.	Shallow soils Minor sheet erosion Saline scalds Stoniness	Moderate to high foundation hazard Low wet bearing strength Localised steep slopes

The Sight Hill unit occurs on rolling to steep hills on volcanics and comprises interbedded volcanic and sedimentary rocks of the Mount Fairy Group. It is dominantly an acid to neutral brown gradational profile with Red and Yellow Podzolics on the lower slopes. Erosion hazard for this soil is moderate (topsoil) and high (subsoil).

The Misery Mountain landscape occurs on steep to rolling mountains and hills on volcanics. The soil is acidic with a high potential for aluminium toxicity. Yellow Podzolics dominate the mid-upper and lower slopes, whilst Lithosols are found on the upper and mid-lower slopes. Erosion hazard for this soil is low.

The Morass landscape is found on undulating rises on Tertiary sediments. Scald erosion and salinisation are common, particularly on lower slopes at the margins of other soil landscapes. The soil is a brown to black gradational profile with Solodic Soils on the lower slopes. Erosion hazard is high (topsoil) and moderate to high (subsoil).

8.2.4 Climate

Based on Köppen climate classification, the climate of the area is classified as oceanic or maritime (Cfb). It is characterised by moderately cool summers and comparatively warm winters. The range of seasonal temperatures in areas with oceanic climate is relatively narrow. Based on long-term (early 1970s to current) meteorological record for the Goulburn station (illustrated below), the long term average temperatures in summer vary from 9.3°C to 27.7°C and in winter from 1.4°C to 20.1°C. For Goulburn, the average annual rainfall is 640.3 mm, during 125 of rain days a year with 9 to 12 rainy days each month. Average monthly precipitation is relatively higher during summer months, and extreme rainfall events are also more characteristic for summer (148 mm high rain for January).

8.2.5 Hydrogeology

The aquifer systems in the area of the Bioreactor can be broadly divided into the fractured basement Ordovician and Silurian-Devonian aged volcanic, intrusive and sedimentary rocks and the overlying fluvial and hillwash sequences. The basement rocks exhibit low permeability which is due entirely to fractures.

Higher permeabilities in the fractured bedrock aquifer are associated with secondary (solution derived) porosity in limestone rocks which occur in outcrop to the north-east of the Bioreactor, however these rocks are not intersected in the former mine sequence and have no hydraulic influence on the void (Woodward-Clyde 1997).

Higher permeability sedimentary aquifers separated by low permeability clays and silts occur within overlying sediments where they exist at the bottom of the valleys and to a lesser extent on the slopes. The hydrological significance of these colluvial and alluvial permeable layers is that they are the ultimate conduit through which groundwater discharges and release to the downstream environment. Importantly, however this aquifer system is not intersected by the mine void. (Woodward-Clyde 1997).

Groundwater recharge occurs to the bedrock primarily through direct rainfall infiltration to open fractures and joints in areas where bedrock outcrops. Groundwater discharges from the bedrock aquifer only where open fracture conduits exist and where the permeability of these conduits is sufficient to produce a flow rate which is significant in terms of the local catchment hydrology (Woodward-Clyde, 1997).

Regional groundwater flow gradients are a subdued reflection of surface topography and gradients away from the Great Dividing Range can be expected to exist.

8.3 Groundwater and Leachate Management

8.3.1 Groundwater Characteristics

The project area lies within the Lachlan Fold Belt groundwater management unit which has an area of 210,585 km^2. The depth to the top of the aquifer is 40m, and has a sustainable yield of 1,057,599ML/year (Australian Water Resources, 2005).

Despite the fact that the mine void is over 200m deep and extends for at least 160m below the natural water table, the total groundwater inflow into the mine void is estimated to be approximately 1L/sec which indicates that the void is encapsulated within effective structural boundaries which isolate it from the external hydrological environment (Woodward Clyde Pty Ltd, 1999; Veolia, 2010). The Bioreactor has an engineered basal liner but did not require side liners because of the low intrinsic permeability of the rock mass (Woodward-Clyde 1997).

Groundwater quality in the alluvial and bedrock aquifers varied from potable (<1000 mg/L TDS) to suitable only for stock supplies (>5000 mg/L TDS). Groundwater quality in the area is highly variable reflecting the degree of hydraulic connection to sources of rainfall recharge (Woodward Clyde Pty Ltd, 1999).

8.3.2 Water Management History

The Bioreactor began receiving waste in September 2004 and the opening of the facility coincided with high rainfall events in the area. High rainfall events combined with groundwater inflows placed a surcharge of water inflows to the waste mass and subsequently permission was sought to store excess leachate at the adjacent evaporation pond, ED3. Control of leachate is required to encourage and facilitate methane generation (Refer Appendix C-1).

Monitoring of leachate and groundwater levels, and the volume of leachate being pumped has been carried out at the Bioreactor since filling began.

The quarry void, with a surface area of 39ha, has its own catchment and captures inflows of surface water from rainfall as well as ongoing inflows of groundwater.

Management of water at the Bioreactor has been important for Veolia to ensure that there are suitable moisture conditions within the waste to promote biodegradation and optimise generation of landfill gas. The water balance demonstrates the effectiveness of liquid management protocols.

Veolia has implemented a number of actions that have led to improvements in managing leachate levels within the waste, including:

- the removal and treatment of leachate;
- groundwater dewatering;
- the extraction and recirculation of leachate; and,
- the enhancement of evaporative disposal.

Leachate extraction is currently managed through evaporation over the surface of the waste mass.

8.3.3 Void Water Balance

URS was commissioned to develop a water balance model calibrated with more than 5 years of data obtained from Veolia's continual monitoring of the Bioreactor's performance. Based on anticipated waste loads, climatic conditions and management arrangements, this model was used to predict the future level of leachate saturation under the changing disposal rate within the void. Details of the water balance model are attached in Appendix C-1.

The water balance model was based on:

Liquid out = Liquid in +/- Liquid contributing to change in storage

Inflows

Total inflow to the pit calculated from September 2004 – January 2010 data was 665,561 m^3. The components of the inflow are summarised in **Table 8-2.**

Table 8-2 Components of Inflow

Inflows	% of Total Inflow
Groundwater Inflow	21
Rainfall (direct onto waste)	13
Indirect Rainfall (sides of the pit)	63
Added Water[1]	<1
Recirculated Leachate	2

Outflow

Total outflow from the pit calculated for the same period was 465,641 m^3, or 70% of inflow. The components of outflow are summarised in **Table 8-3**.

Table 8-3 Components of Outflow

Outflows	% of Total Outflow
Dewatering below liner	31
Intercepted stormwater	45
Leachate extracted	13
Loss to unsaturated storage	11

Change in Storage

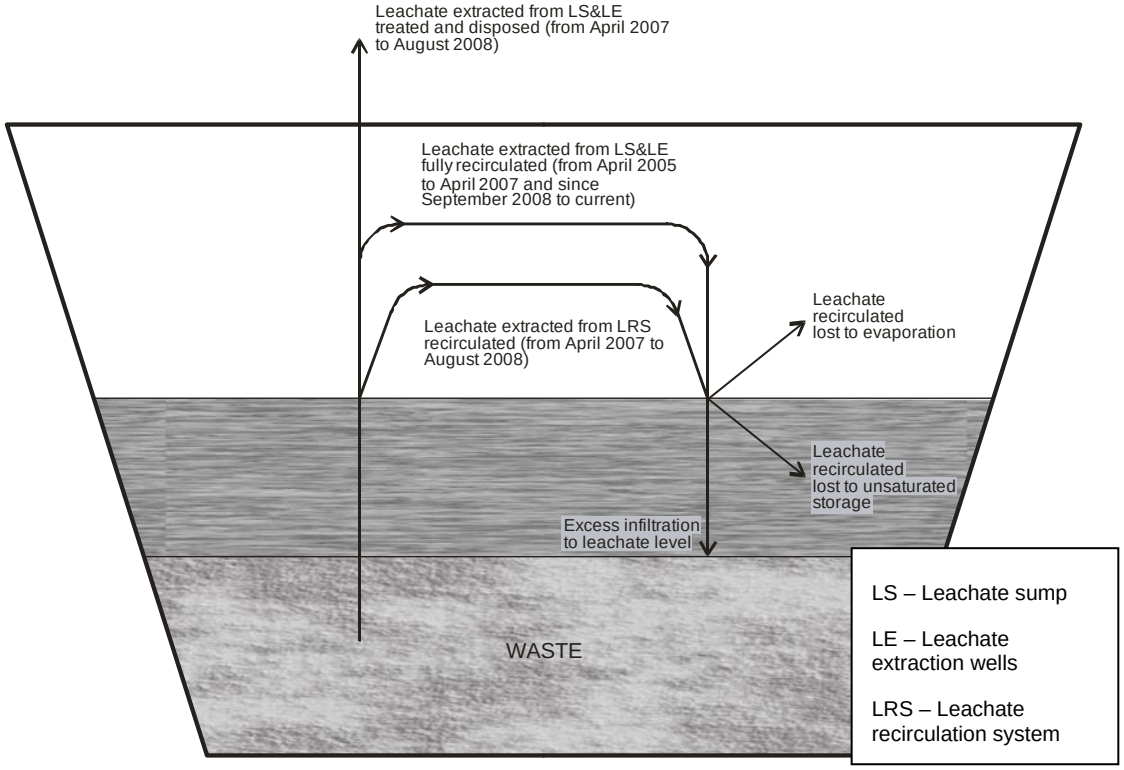
The change in storage (reflected by the rise in leachate level) was calculated to be 199,921 m^3, or 30% of the inflow. Since landfilling began, the leachate level has risen 36m in the waste mass while the waste mass itself has risen more than 50m.

Leachate recirculation

Liquid in storage is the leachate occupying void space in the waste and the change in storage leads to the change in leachate levels in the waste. Leachate recirculation acts as both a removal and addition to the saturated zone of the waste, as outlined in **Figure 8-4**.

[1] Refers to any water brought into the Bioreactor, including water used to extinguish any landfill fires

Figure 8-4 Leachate recirculation



The leachate extracted from the waste over the five year period was 58.7ML (13% of total liquids out). With the exception of the period between April 2007 and August 2008, all leachate extracted was recirculated.

8.3.4 Existing Leachate Management System

In the context of this report, leachate management refers to the infrastructure and processes undertaken to control moisture levels in and around the waste mass. While the intention of leachate management is to improve gas production, the methods adopted to achieve this can vary depending on the short and long term objectives of the project. Leachate management includes extraction of organically rich leachate from within the waste and recirculation of this leachate into areas of less degraded waste to facilitate the degradation process. Monitoring of leachate quantity and quality within the bioreactor is also an important part of leachate management and decision making at Woodlawn.

Operational leachate management measures, including the associated infrastructure, are utilised at Woodlawn to optimise control over moisture content within the waste and improve gas production. These measures are summarised below.

- Leachate extraction wells (LE) are an important part of the leachate management on site. The number of extraction wells available determines the ability to extract larger volumes of leachate over shorter periods of time and enables leachate levels within the waste to be reduced or maintained at the desirable level. The leachate is recirculated in areas of newer less degraded waste.

- Leachate surface recirculation facilitates the management of leachate volumes as well as the activation of degradation of new waste. The use of sprinklers to spread the leachate evenly over an area allows for the even distribution of leachate on the waste surface, a reduction in liquid volume through evaporation and absorption and the ability to manage large volumes within a relatively small area.
- Leachate extraction from horizontal gas blankets opens up gas flows through the system. All horizontal blankets are graded at low slopes (e.g. 1:20) and leachate and condensate from within the gas lines drain to a series of Knock Out Pots (KOP), equipped with a pneumatic pump inside which extracts leachate. The ability to remove leachate from these systems improves the overall management of leachate in the bioreactor.
- Waste Activation Sumps/Cells operate separately within the waste. The sumps are clay lined and filled with drainage material. Wells are constructed into the drainage material and are extended as the waste level rises throughout the void. This creates a leachate collection point with a fast recharge rate, and more powerful electric pumps are used. This enables extraction of large volumes of leachate in a short period of time allowing for improved de-saturation of the waste and gas collection. Gas production improves by managing leachate within smaller controlled areas within the greater waste mass.
- Absorption trenches are used to recirculate volumes of leachate into areas of fresh waste to assist in activating the area. They improve the movement of leachate and gas through the waste mass, drainage is installed as increasing the hydraulic conductivity improves the ability to remove leachate and gas from the waste. Leachate is injected directly into the trenches to saturate the fresh waste. These areas are targeted in future drilling programs to access the LFG and the excess leachate that has not been absorbed by the waste is extracted.
- Drainage trenches used initially to recirculate volumes of leachate and moisten new waste are being placed strategically in areas where future drilling will take place. This enables quick and effective de-saturation of the area, and the trench lines will be used to increase the catchment area for gas extraction.
- The Leachate Treatment Pond is located within the void and has capacity to store and treat up to 12 ML of leachate pumped directly from the void, if required, such as after extreme rainfall events.
- Treated Leachate Storage Pond has a potential to store up to 20ML of treated leachate if required. This storage capacity would only be used as a contingency plan in case of any highly unusual events.
- Sludge remaining upon the completion of treatment within the treatment pond is returned to the waste in the bioreactor. The sludge is high in organics and is worked into the fresh waste improving its degradation and gas productivity.

8.3.5 Protection of Environmental Integrity

The Woodlawn Bioreactor provides a number of levels of protection for adjacent groundwater, surface water and soil from leachate. Protection is afforded by the following attributes of the site and engineering controls:

- Groundwater flow is directed into the mine pit and this is anticipated to continue for many years after the bioreactor closes;
- Leachate levels are maintained within the waste mass at an elevation below the elevation of the natural groundwater levels;
- Accelerated biodegradation of the waste mass ensures that waste degradation will stabilise more quickly than conventional landfilling because the moisture content of the waste is maintained at optimum levels;
- The rock mass has a low intrinsic permeability that will not allow for migration of leachate away from the facility, even under conditions of positive leachate head;

Management measures are designed to provide additional protection to the adjacent environment. These measures include:

- Leachate recirculation facilitates rapid degradation of waste and minimises time required for stabilisation of waste mass;
- Leachate recirculation also promotes and enhances evaporative disposal and reduces the volume of leachate returned to the waste mass;
- Detailed monitoring of leachate levels, leachate quality and groundwater quality in adjacent bores enables identification of any breaches of environmental integrity should they occur and facilitates the early adoption of remedial measures; and
- Minimisation of stormwater inflows to reduce the volumes of leachate generated.

These measures ensure that the Woodlawn Bioreactor minimises its environmental footprint.

8.3.6 Leachate Characteristics

Leachate Quality

Leachate from the leachate dam at the Woodlawn Bioreactor is monitored on a regular basis for a variety of analytes. From mid-2007 to mid-2009, a leachate recirculation system was operating and leachate quality monitored (refer Appendix C-1 for the laboratory results for the leachate).

The TDS, Volatile Fatty Acids and Total Organic Carbon concentrations are elevated as a result of decomposition of the biomass and ammonia nitrogen concentrations have remained elevated. The results signify that the waste mass is still undergoing biological degradation. The changing pH conditions are a reflection of the leachate treatment process.

The observed increasing landfill gas flow rate also reflects the increasing methanogenic decomposition of the waste mass.

Leachate Volumes

The volumes of leachate extracted have been measured at the site since 2005 and the data are presented below.

Table 8-4 Leachate Volumes - Woodlawn Bioreactor

	Date	Reported total extracted leachate (m^3)
Record started	31/08/2004	
Year_1	31/08/2005	989
Year_2	31/08/2006	6,179
Year_3	31/08/2007	16,964
Year_4	31/08/2008	12,367
Year_5	31/08/2009	12,036
Last update of the water balance model	19/01/2010	10,202
Total volumes	19/01/2010	58,737

Leachate is recirculated across the landfill with no offsite discharge.

8.3.7 Prediction Scenarios

Prediction Scenario 1 – Increased Waste with Average Climate

The scenario predicted using the water balance model represents an increased waste input rate from current levels (licensed to accept 400, 000 t/year) to 1.13 Mt/ year over a 10 year period from 2010 – 2020. This scenario assumes that the rate of input would remain at 1.13 Mt/year after 2020.

The modelling predicted that the waste volume within the void would be 19.4 Mm^3 by the end of 2030, with an elevation of 802.5 mAHD. The leachate level was predicted at 702.5 mAHD (or 100m below the waste level) by the end of 2030.

Prediction Scenario 2 – Increased Waste with Two Successive Wet Years

This scenario is considered a worst case situation where there are two successive 90^{th} percentile (based on BoM Goulburn 1971-2009 statistics) wet years within the 10 year timeframe. The resulting plot shows that the leachate level is expected to rise by up to 20m over the two year timeframe if there is no additional leachate recycling.

If high rainfall years occur early in the filling cycle, the leachate level could be reduced by additional leachate recycling.

Conclusions

The predicted scenario showed that an increased maximum waste input rate of 1.13 million tpa over a 10 year period would result in a reduction in the rate of leachate rise because of a greater volume of unsaturated storage becoming available within the waste mass. The benefit of this would be that leachate could be contained within the waste rather than requiring off site disposal.

If two successive 90th percentile wet years were to occur during the filling stage, the leachate level would rise up to 20m. In this case the leachate level could be reduced by additional leachate recycling.

The impact of an increased waste disposal rate would be beneficial in reducing the rate of leachate rise within the waste, and the water balance modelling confirmed the effectiveness of existing water management measures in managing leachate levels within the waste.

The full details of leachate management are outlined in the URS report ***Leachate Management at Woodlawn Bioreactor***, which is attached as **Appendix C-1**.

8.3.8 Potential Groundwater Impacts

The assessment of the groundwater system surrounding the Bioreactor indicated that potential impacts from increasing the maximum input rate at the Bioreactor to 1.13 million tpa are negligible. The soils and geology of the site are not expected to be affected given that there are no significant excavations or construction activities generated by the Project (with the exception of the installation of new lighting towers to facilitate night time operations. Additionally, Veolia is proposing to maintain their existing erosion and sedimentation control measures.

The potential impacts of concern are likely to stem from leachate movement and management issues. Potential impacts for leachate production on site are considered negligible for the following reasons:

- The change in the maximum input rate will not result in a change in the configuration of the final leachate profile post-closure.
- The potential for seepage of leachate is very low.
- Modelling results indicate that impacts on the Crisps Creek catchment would be negligible.
- Modelling results indicate conclusively that contaminants would not migrate from the Bioreactor to the regional groundwater system at Crisps Creek over the 50 year time frame required for leachate to establish a benign state.

Other impacts of the proposed increased maximum input rate include:

- a reduction in time to fill to <25 years; and
- the rate of saturation would increase as a result of consolidation within the waste mass.
- unsaturated storage would increase as a result of the additional waste mass.

The change in the maximum input rate would not result in a change in the configuration of the final leachate profile post-closure, as this would be dependent on the characteristics of the capping profile and the climatic conditions of the site.

8.4 Surface Water Management

8.4.1 Site Characteristics

The Woodlawn Bioreactor is situated at the head of the Allianoyonyiga and Crisps Creeks catchments. The watershed of the Wollondilly River/Lake George catchment also traverses the site. Lake George is located approximately 7.5km to the west and Lake Bathurst approximately 8.5km to the northeast of the mine site. The site is classified as a 'no discharge site'. This means that all surface water generated from within the void and mine site is collected and stored in the evaporation dams to prevent water from leaving the site. Only clean surface water from undisturbed or rehabilitated areas is allowed to drain into Crisps Creek and Allianoyonyiga Creek.

The Intermodal Facility (IMF) is located in the Crisps Creek/ Mulwaree River catchment approximately 8 kilometres downstream of the mine and immediately upstream from the Crisps Creek/Mulwaree River confluence.

8.4.2 Woodlawn Bioreactor – Surface Water Management

Surface water management at Bioreactor and the Crisps Creek IMF is carried out in accordance with the existing Surface Water Management Scheme (SWMS) which forms part of the Woodlawn Bioreactor Landfill Environmental Management Plan.

The bioreactor facility comprises a single access road connecting the mine void and Collector Road. This is hard surfaced and constructed close to existing grade and may be realigned as required. Surface waters will be shed to disperse into natural hollows located on adjacent sections of the mine site located in the catchment of the plant collection dam. There is now a wheel wash facility constructed adjacent to the roadway which directs cleaning waters to the existing lined plant collection dam.

The bioreactor site uses the evaporation dam 3, namely ED3, as a store and disposal route for contaminated surface water. The measurement of the volume of this pond and the maintenance of an inventory of waters reporting to and from this pond are required under the existing Conditions of Consent. The surface water management scheme outside the void is shown in **Figure 8-5**.

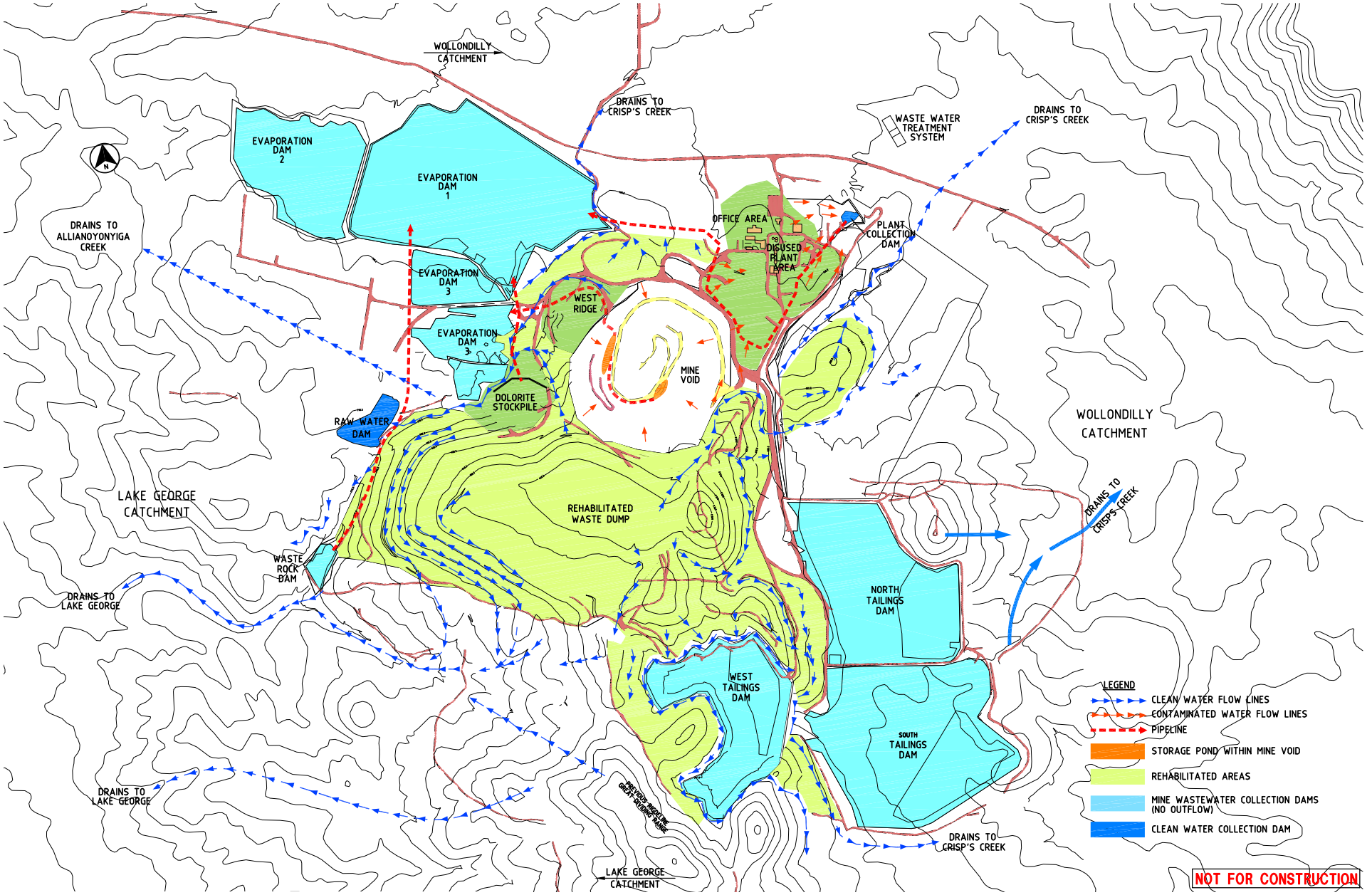
The surface water management scheme inside the void involves intercepting, diverting and pumping surface water at various points from within the void into ED3. The main objective of surface water management within the void is to segregate as much contaminated surface water generated within the void from the leachate generated within the bioreactor cells.

Surface water generated from the mine pit walls, access road and filled areas is considered contaminated surface water due to the physical and chemical characteristics of the rock and fill material. The result is the generation of acidic runoff from all exposed areas within the void. Given the poor quality of the stormwater, there is limited scope to reuse this water back through the bioreactor.

Within the void, the majority of surface water is collected. Any surface water entering the active filling area is classified as leachate. Collection and management of leachate is discussed in **Section 8.3.4** and **Appendix C-1.**

The majority of surface water generated within the void will be collected and stored for pumping to ED3. Surface water is managed within the 4 sub-catchments, as shown in **Figure 8-6**.

Two main ponds, Pond 2 and Pond 3, serve as the primary stormwater interception, storage and transfer ponds. The location of the storage ponds is shown in **Figure 8-7**.



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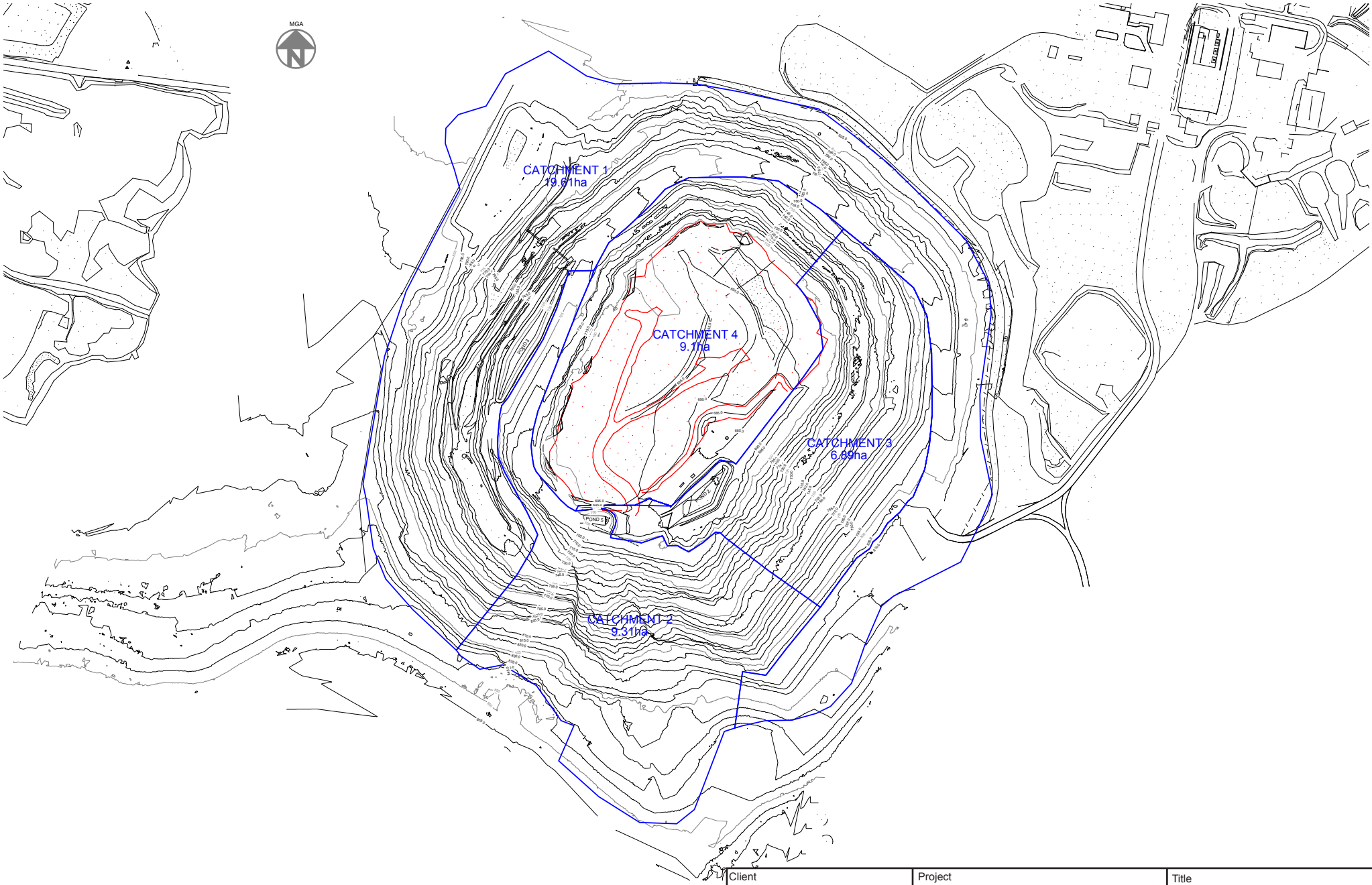
150m 0 150 300 450 600 750m

SCALE 1:15000 AT A3

Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: SURFACE WATER MANAGEMENT AT WOODLAWN BIOREACTOR
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-5



VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR

A1 SHEET

0 50 100 150 200 250 METRES

SCALE: 1:2500

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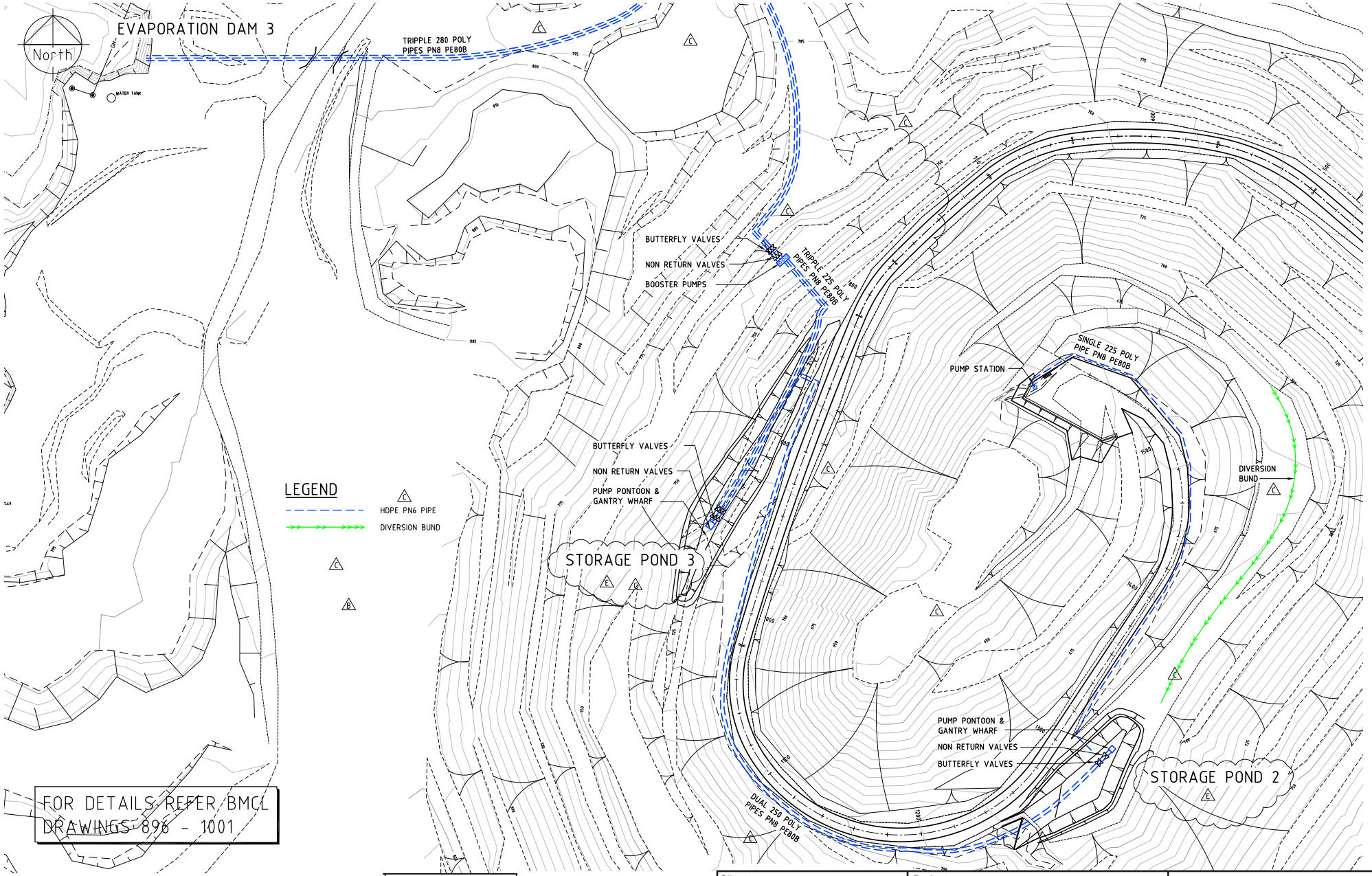
Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: LOCATION OF STORMWATER CATCHMENTS - WOODLAWN BIOREACTOR
URS	Drawn:	Approved:	Date:
	Job No:	File No:	Figure: 8-6



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Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: LOCATION OF STORMWATER PONDS 2 & 3
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-7

8.4.3 Crisps Creek IMF - Surface Water Management

Surface water control measures for the IMF include the following:

Paved and Sealed Areas

Collection of the all the stormwater from the sealed surfaces is achieved via an open channel system that runs around the perimeter of the hardstand area. Stormwater runoff generated within this area is diverted underneath the access road and rail sidings through culverts, and to the stormwater treatment system located at the north-eastern end of the Intermodal facility (**Figure 8-8** to **Figure 8-10**).

The stormwater system captures the first flush water through a pipe with a flap valve to ensure no back flows. The first 15mm of runoff for each square metre of the hardstand area is contained on site, in accordance with the EPL requirements. This volume is referred to as the first flush and is considered by the DECCW as the volume required to be collected to isolate the most contaminated runoff generated during a storm event.

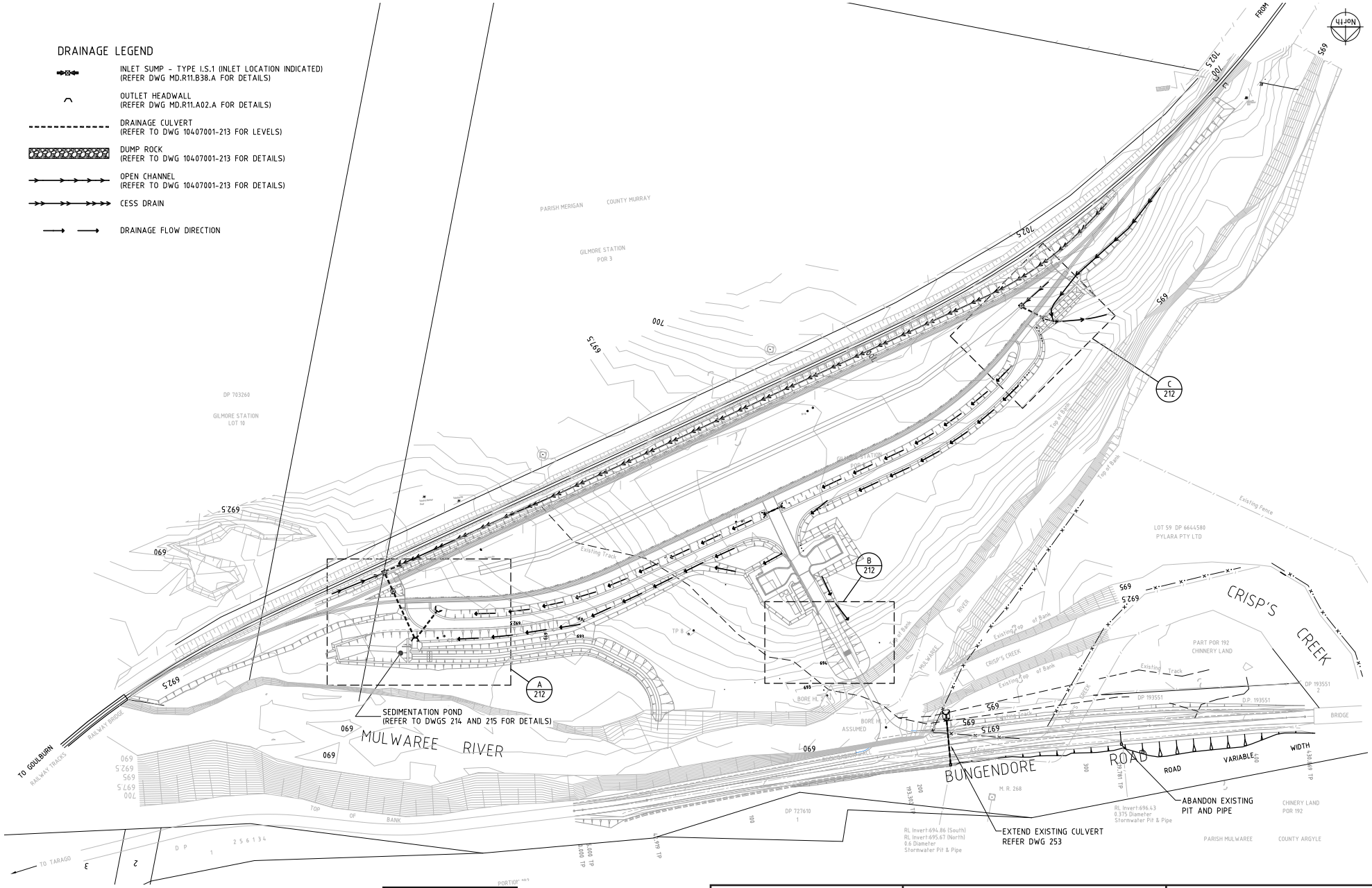
Once the first flush volume has been isolated, any excess stormwater is diverted over a weir into a sedimentation pond. This stormwater passes through gross pollutant trap prior to discharge along a grass lined channel into Mulwaree River. The grass lined channel is approximately 150 metres long, and attempts to emulate a nature drainage path that may flow into the river.

Regular inspection of the stormwater system is undertaken to determine the need to clean out any sediment built-up.

8.4.4 Surface Water Monitoring

The surface water monitoring program for the Bioreactor and IMF sites is contained within the SWMS. The program outlines the actions that will be implemented for monitoring surface water during the operation and rehabilitation phases.

The existing surface water monitoring program at Woodlawn utilises six fixed monitoring points on creeks and additional points on evaporation ponds, tailings and other dams, as shown in Figures 8-11 and 8-12. These monitoring points are located in the Wollondilly and Lake George catchments and include monitoring points located on Crisps Creek and Allianoyonyiga Creek. Monitoring of these locations for surface water quality has been conducted over a number of years and an extensive database of water quality data is available.



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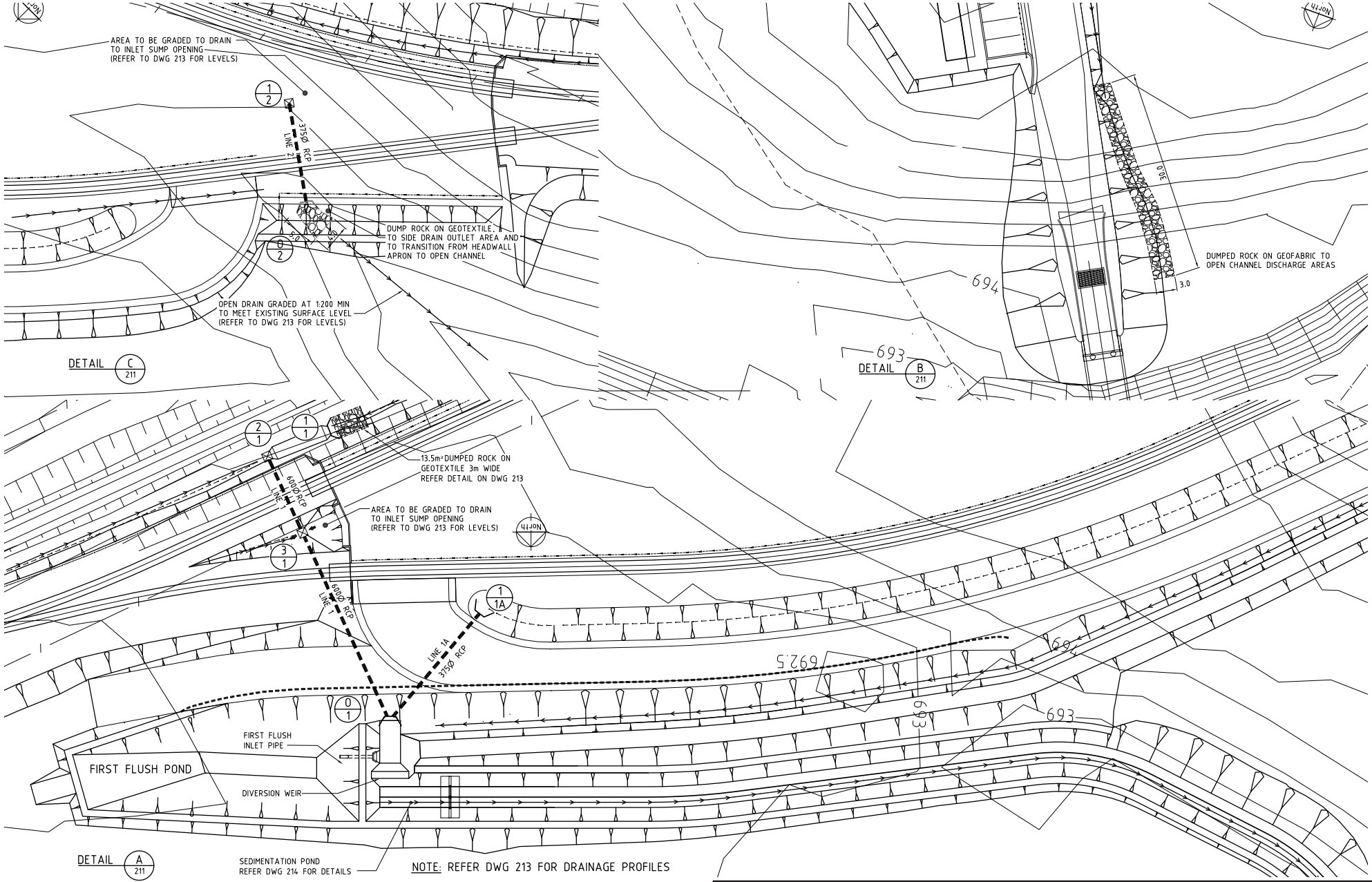
Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: SURFACE WATER MANAGEMENT CRISPS CREEK IMF
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-8



SCALES

2.5 0 5 10m

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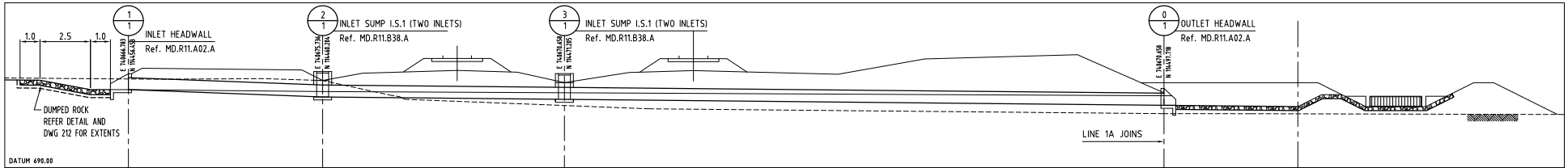
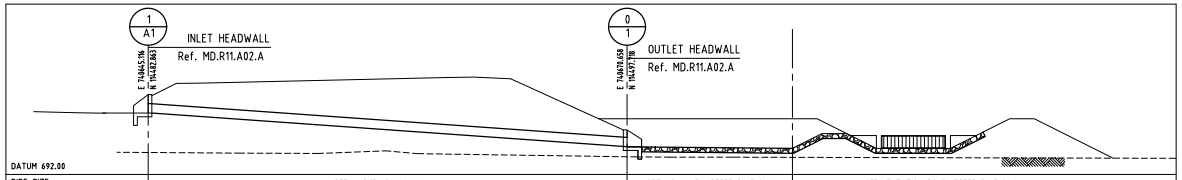
Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: SURFACE WATER MANAGEMENT AT CRISPS CREEK IMF - DRAINAGE DETAILS
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-9



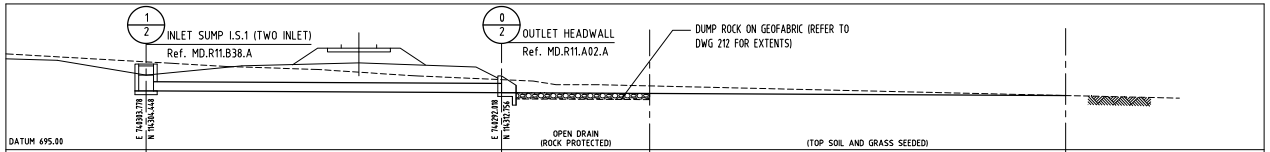
DATUM 690.00					
PIPE SIZE	600mm RCP (CLASS 3)	600mm RCP (CLASS 3)	600mm RCP (CLASS 3)	OPEN CHANNEL (REFER DWG 214)	SEDIMENTATION POND (REFER DWG 214)
PIPE GRADE	1:26.630 / 3.755%	1:100 / 1.0%	1:100 / 1.0%	1:95.714 / 1.045%	
DEPTH TO INVERT	0.535	0.825	-0.317	-0.419	-0.360
INVERT LEVEL	693.905	693.540 (PIPE) - 694.365 (SUMP INLET)	693.420 (PIPE) - 694.260 (SUMP INLET)	693.125	693.055
FINISHED SURFACE LEVEL	-	694.815 (TOP OF COVER)	695.385 (TOP OF COVER)	-	-
CHAINAGE	0.000 9.720m	9.720 12.100m	22.020 29.800m	51.820 6.7m	

STORMWATER LINE 1



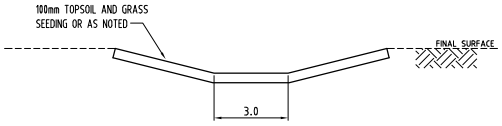
DATUM 692.00				
PIPE SIZE	375mm RCP (CLASS 4)	OPEN CHANNEL (REFER DWG 214)	SEDIMENTATION POND (REFER DWG 214)	
PIPE GRADE	1:14.212 / 7.036%	1:95.714 / 1.045%		
DEPTH TO INVERT	-1.60	-0.419		
INVERT LEVEL	694.490	693.125		
FINISHED SURFACE LEVEL	-	-		
CHAINAGE	0.000 19.40m	19.400 6.7m		

STORMWATER LINE 1A

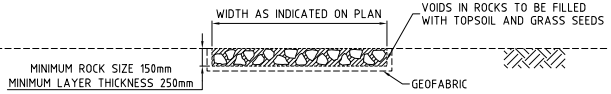


DATUM 695.00				
		OPEN DRAIN (ROCK PROTECTED)	(TOP SOIL AND GRASS SEEDED)	
PIPE SIZE	375mm RCP (CLASS 3)		OPEN DRAIN	
PIPE GRADE	1:200 / 0.5%		1:200 / 0.5%	
DEPTH TO INVERT	1.179	0.529		
INVERT LEVEL	697.380 (PIPE) - 698.020 (SUMP INLET)	697.310		
FINISHED SURFACE LEVEL	698.470 (TOP OF COVER)	-		
CHAINAGE	0.000 14.400m	14.400		

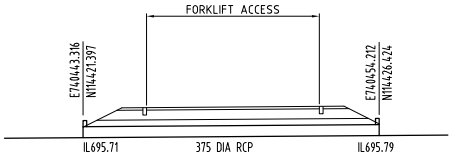
STORMWATER LINE 2



OPEN CHANNEL DETAIL
N.T.S



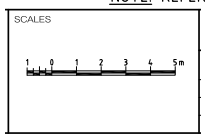
DUMP ROCK DETAIL
N.T.S



CULVERT (C1)

NOTES:
1. FOR PIPE BEDDING DETAILS (REFER RTA DWG MD.R11.A01.A)
2. ALL PIPES RRJ UNLESS NOTED OTHERWISE.

NOTE: REFER DRG 212 FOR DRAINAGE LAYOUTS



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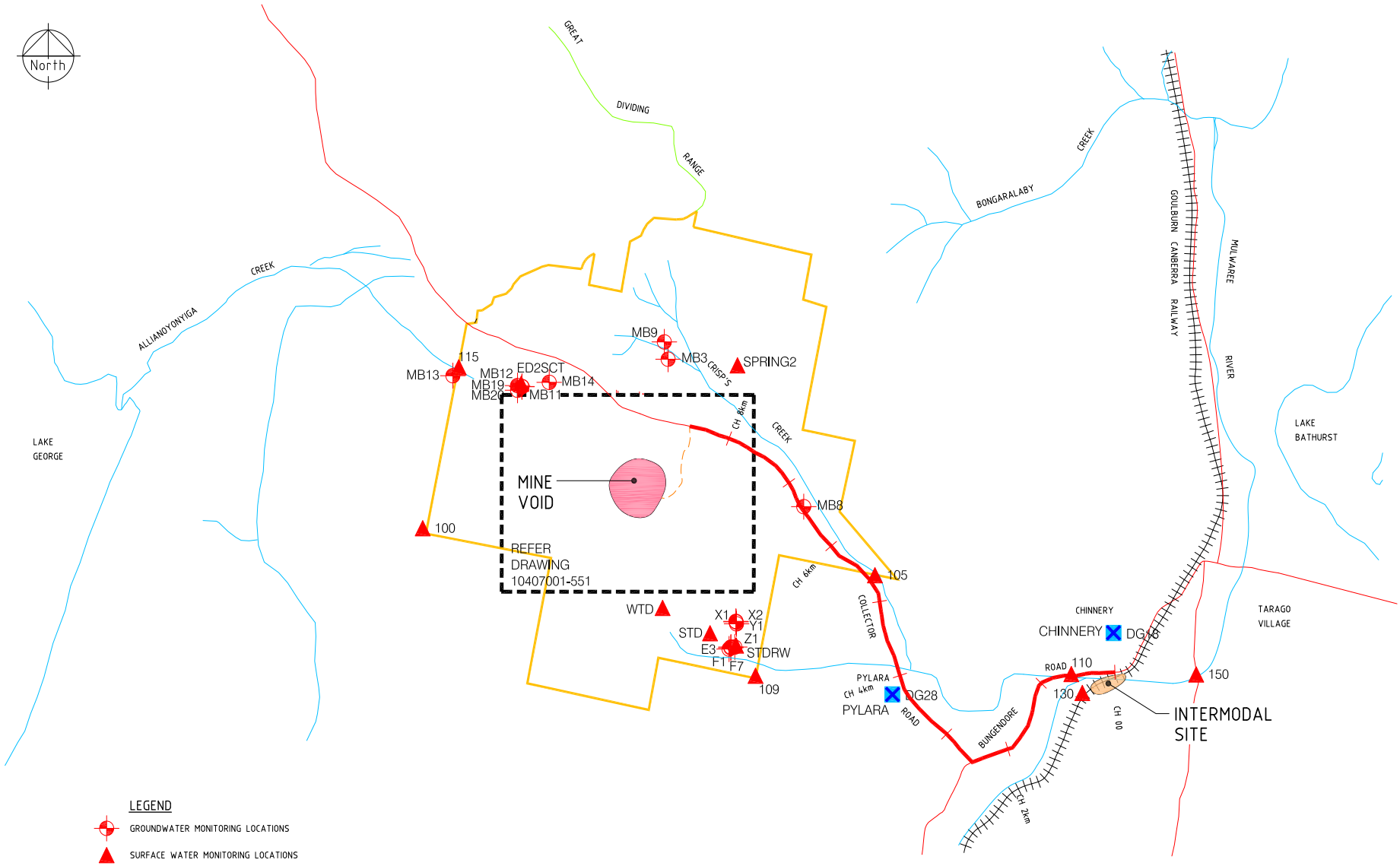
Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: DRAINAGE SECTIONS CRISPS CREEK IMF
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-10



LEGEND

- GROUNDWATER MONITORING LOCATIONS
- SURFACE WATER MONITORING LOCATIONS
- AMBIENT AIR SAMPLING LOCATION
- NOISE MONITORING LOCATION
- PROPOSED GAS MONITORING BOREHOLES

SCALES

250 0 500m 1km

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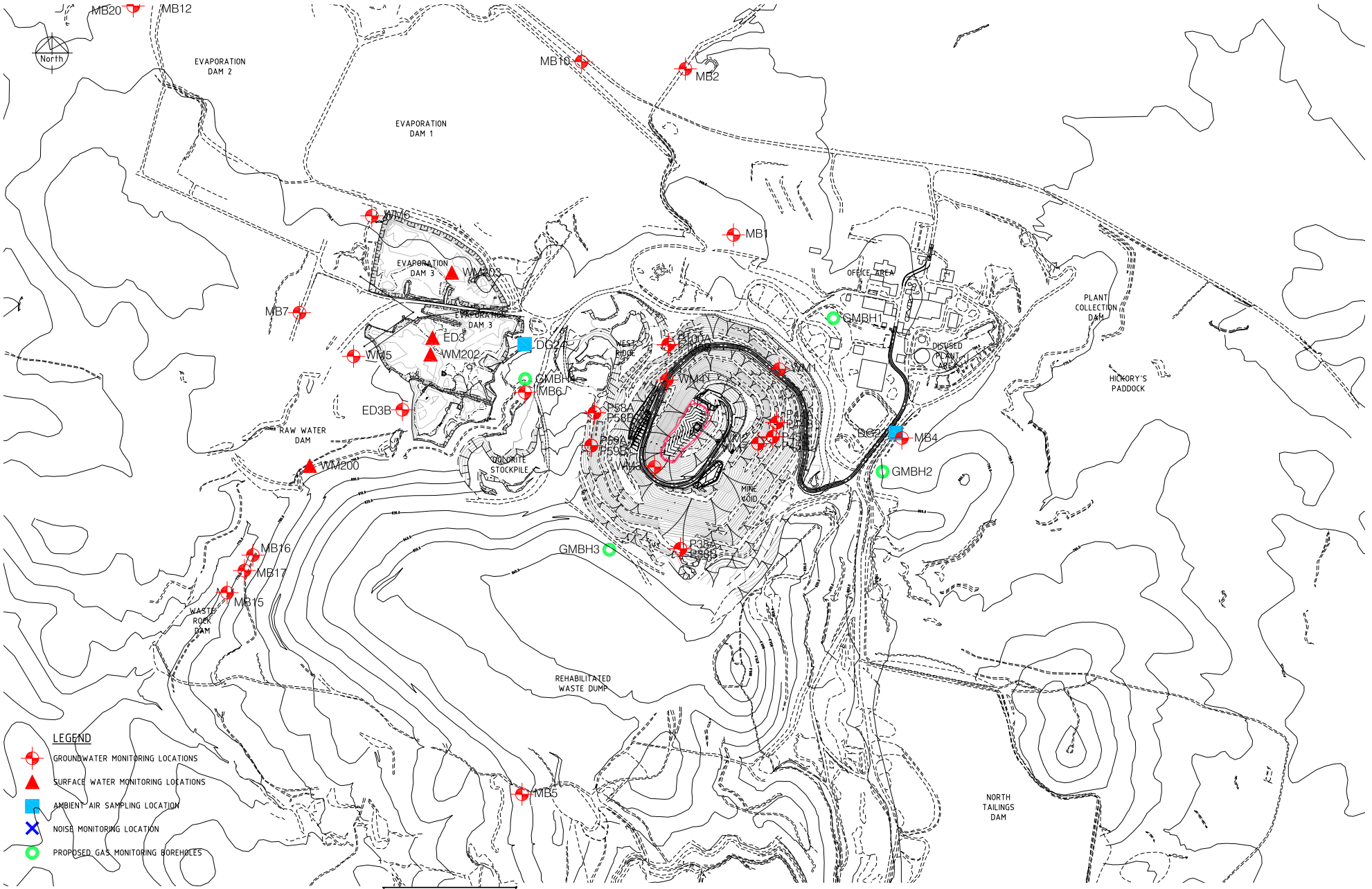
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-11



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Client: VEOLIA ENVIRONMENTAL SERVICES PTY LTD	Project: WOODLAWN EXPANSION PROJECT		Title: EPA MONITORING LOCATIONS WOODLAWN BIOREACTOR
URS	Drawn: AO	Approved: WB	Date: 05/08/2010
	Job No: 43177703	File No: 43177703.001	Figure: 8-12

A list of monitoring locations and sampling parameters is presented ***Chapter 6 Environmental Management***. The results of the surface water monitoring presented in Annual Returns and Compliance reports as outlined in ***Chapter 6*** are summarised in **Appendix C-2**.

Surface Water Monitoring Locations - Woodlawn Bioreactor

Surface water monitoring is conducted on a regular basis to ascertain that the site activities do not impact on surface water quality, and is fundamental to assess compliance with the Environmental Protection Licence (EPL). The background water quality (both surface and groundwaters) in the area is likely to reflect the presence of the large sulphide ore body, where acidic waters and elevated concentrations of heavy metals would occur naturally.

Nine surface water monitoring points are registered on the Woodlawn Bioreactor EPL, the locations are as follows:

- Site 105 (Crisps Creek), located at the Crisps Creek/Pylara Boundary, downstream of the void and tailings impoundments.
- Site 115 (Allianoyonyiga Creek), located at the Woodlawn/Willeroo boundary to the north, downstream of ED2 and part of ED1 and ED3N water storage systems.
- WM202, located within ED3 South.
- WM203, located within ED3 North.
- WM200 (Raw Water Dam), located down-gradient of ED3 South and dolerite stockpile, and west of the rehabilitated waste rock dump.
- WM201 (existing mine building, intermittent flow), located at the (disused) Plant Area (the demolished remains of the former mine processing equipment and associated infrastructure), which reflect modified drainage systems.
- Spring 2 (Crisps Creek) feeds into Crisps Creek. This spring flows during wet weather.
- Ponds 2 and 3 (lined sediment ponds capturing runoff entering the void).

Surface Water Monitoring Locations - IMF

In the vicinity of the Intermodal Facility (IMF), surface water monitoring is conducted at three locations at various monitoring frequency, the locations are as follows:

- Site 110, situated on Crisps Creek, approximately 8 kilometres downstream of the mine and immediately upstream from the Crisps Creek/Mulwaree River confluence and IMF, at the bridge crossing on Bungendore Road; .
- Site 130, identified as upstream monitoring point for IMF, in the Mulwaree River, before the confluence at Crisps Creek; and
- Site 150, situated on the Mulwaree River, approximately 2.5 km down-gradient of the IMF.

The surface water monitoring results are tabulated and presented graphically in **Appendix C-2**.

Woodlawn Bioreactor Surface Water Quality

The surface water chemistry is highly variable across the monitoring locations, reflecting variable chemistry of surrounding rocks.

- Waters in Ponds 2 and 3 (Tables 1 and 2, Charts 1 and 2) are brackish (9.2 – 10.9 mS/cm, respectively) and acidic pH (4.14 – 4.16 respectively) and characterised by magnesium-sulphate water type. Water quality shows variable but generally stable trends for ammonia, pH, iron, zinc and sulphate levels over time. The variations may reflect runoff from waste/weathered rock (containing pyrite) is entering the void and holding ponds.
- At Site 115 (Table 3, Chart 3), surface water at downstream area is fresh (1.2 mS/cm), pH neutral 7.15 and is characterised by sodium-chloride water type. The results show a fluctuating trend for EC, zinc, sulphate, iron and ammonia, thought to reflect variable flow conditions due to climate.
- Water from Spring 2 (Chart 4) is fresh (1.3 mS/cm) and slightly acidic (pH 5.99), and shows calcium-sulphate water type. All parameters exhibit an overall declining trend (pH, EC, ammonia, sulphate, zinc, iron, TOC). The water has become slightly acidic over time. It is likely to represent background quality reflecting recent drought conditions.
- At Site 105 (Chart 5), water is brackish (1.7 mS/cm) and pH near-neutral (7.20), characterised by sodium/magnesium-chloride water type. The key parameters have been fluctuating (but generally stable), reflecting the contribution of runoff, evaporation processes and groundwater baseflow.
- Water from WM200 (Chart 6) is brackish (2.8 mS/cm) and pH-neutral (6.74), characterised by sodium/magnesium – chloride/sulphate water type. The time-series indicates rising sulphate and zinc trends from 2004 to mid-late 2007, however since 2007, concentrations have stabilised and/or decreased.
- Water from WM201 (Table 4, Chart 7) is fresh (0.6 mS/cm) and pH-neutral (6.77), characterised by sodium-sulphate/chloride water type.
- Water from WM202 (ED3S) (Table 5, Chart 8) is brackish (9.5 mS/cm), acidic at pH 3.88 and is characterised by magnesium-sulphate water type.
- Water from WM203 (Table 6, Chart 9) is brackish (13.9 mS/cm), acidic at pH 3.95, and is characterised by magnesium-sulphate water type.

IMF Surface Water Quality

The water chemistry reported for the surface water locations at IMF is similarly fresh (EC 0.5 to 1.2 mS/cm), pH-neutral (7.12 to 7.4) and is characterised by sodium-chloride water type.

- Water sampled at Site 150 (Table 7, Chart 10) is characterised by fluctuating EC, sulphate, iron, ammonia, zinc and TOC. The highest ammonia concentration (0.84 mg/L) was recorded in January 2007.
- Water sampled at Site 110 (Table 8, Chart 11) is exhibits variable concentrations of key parameters and the highest ammonia concentration (0.82 mg/L) was recorded in January 2007.

- Water sampled at Site 130 (Table 9, Chart 12) exhibited slightly overall decreasing yet variable trends for zinc, ammonia, iron and TOC.

8.4.5 Potential Surface Water Impacts

Stormwater runoff has the potential to become contaminated from:

- exposed surfaces of soil and fill stockpiles;
- oil and grease leaking from machinery and trucks;
- spillage of waste due to container door failure;
- contaminated water from the container wash facility;
- dust from the access roads within the mine void; and
- dust from the active landfill areas.

However, as no significant construction is being undertaken for this project, the impacts on surface water are assumed to be negligible. Surface water management techniques already in place are considered suitable controls for any of the aforementioned potential contamination issues. These techniques prevent turbid or contaminated runoff from leaving the sites and entering natural watercourses.

The techniques include the following:

- Surface water that comes into contact with disturbed areas is captured and contained onsite. This water is either retained in the tailings dams or directed to the evaporation dam system.
- Rainfall runoff from undisturbed or rehabilitated areas is diverted offsite via a system of diversion bunds and contour drains.
- Rainfall runoff within the Bioreactor area (including the mine void) and other disturbed areas is diverted to storage ponds and ED3.

Woodlawn is a “zero discharge site”, and as such any water in contact with disturbed areas is captured and contained on site.

8.5 Flooding

The Bioreactor is located on a topographic high which is not subject to flooding. No flood study data or flood inundation maps are currently available for either the bioreactor or the IMF. However, it should be noted that the intermodal facility site is at a higher elevation than the Tarago railway sidings and several residences located within Tarago. Anecdotal evidence from residents of Tarago indicate that the railway siding has never been flooded (Woodward Clyde,1999).

Based on the elevation of the ground surface around the perimeter of the mine void, and the relatively small size of the catchment upslope of the landfill site, the implications of flood events or drainage flows on the mine void are expected to be insignificant. Increasing the filling rate of the void will have no impacts on the flooding potential of the site.

Chapter 8 Soils, Geology and Water Management

8.6 Mitigation and Maintenance Measures

As the Project does not involve significant construction activities, the mitigation measures that are recommended reflect the existing management plans for both groundwater and surface water management that are implemented by Veolia. As such, the following section details current management and maintenance measures in place, as well as some standard erosion and sedimentation control measures.

Erosion and Sediment Control

- All surface water will continue to be managed in accordance with the existing Surface Water Management Scheme.
- Restrict traffic to defined site access roads where possible.
- Use of the existing wheel wash facility to remove soil adhering to the wheels and undercarriage of trucks prior to departure from the bioreactor site.
- An extensive network of diversion drains and erosion and sediment control structures are installed around the site to ensure clean water is directed away from contaminated areas.

Groundwater, Leachate and Surface Water

The mitigation measures currently in place at the Bioreactor are sufficient to manage leachate within the waste without the need for diversion of any leachate out of the pit. These include:

- diversion of rainfall runoff from the sides of the pit before it comes in contact with the waste – estimated to be 68% of the indirect runoff in the pit;
- extraction of leachate and recirculation on top of the waste, ensuring maximum evaporative discharge capacity; and
- extraction of groundwater from the base of the pit adjacent to the waste and discharge outside of the pit to Evaporation Dam 3.

Stormwater management measures (runoff interception) will continue to reduce the amount of stormwater runoff entering the waste.

Table 8-5 summarises the mitigation measures proposed for the proposed Project.

Table 8-5 Mitigation Measures

Mitigation Measure	Implementation - Operation
Erosion	
Restrict traffic to defined site access roads where possible.	✓
Use a wheel wash to remove soil adhering to the wheels and undercarriage of trucks prior to departure from the landfill site.	✓
Install diversion drains and erosion and sediment control structures around the site to divert clean water from contaminated areas.	✓
Groundwater and Surface Water	
Divert rainfall runoff from the sides of the pit before it comes in contact with the waste.	✓
Management of leachate in accordance with the Leachate Management Plan.	✓
Recirculate leachate on top of the waste, ensuring maximum evaporative discharge capacity.	✓
Dewatering of groundwater from the base of the pit in accordance with the Leachate Management Plan.	✓
Maintenance	
Routinely assess rainfall, evaporation, groundwater levels, piezometer levels, pond levels, pump hours, flow meters, surface water chemistry, groundwater chemistry.	✓
Clean any drains that have become blocked through sediment pollution.	✓
Check that drains are operating as intended.	✓
Check that rehabilitated lands have established sufficient groundcover to reduce the erosion hazard effectively and initiate repair as appropriate.	✓
Control emissions of dust from unsealed roads and other exposed surfaces by use of surface sealants and/or water spray carts or other appropriate equipment. Keep surfaces moist rather than wet.	✓
Keep all sediment detention systems in good, working condition.	✓
Dispose of any pollutants removed from sediment basins in areas where further pollution to downslope lands and waterways should not occur.	✓
Construct additional erosion and/or sediment control works as might become necessary to ensure the desired protection is given to downslope lands and waterways.	✓

9.1 Introduction

Heggies Pty Ltd was commissioned by Veolia to assess the likely impact of the Woodlawn Expansion Project on air quality and odour emissions. The scope of the assessment included modelling to determine the potential impacts on air quality and odour that would arise from increasing the maximum input rate at the Woodlawn Bioreactor to 1.13 million tpa and the maximum throughput rate at the Crisps Creek IMF to 1.18 million tpa. The full Technical Assessment is provided as **Appendix D** of this EA and a summary of the key findings are presented within this chapter.

The modelling was undertaken using CALPUFF and Ausplume. The results from these models were then compared to current known air quality and odour levels, which have been obtained from site data collected since August 2004.

9.2 Assessment Methodology

To quantify any increase in generated odour, a 'base case' has been modelled, against which the increased waste input scenario can be assessed. In the case of dust, a cumulative assessment of proposed operations and background concentrations of particulates were modelled representing the operations of the Bioreactor.

It was assumed that processing of larger quantities of waste will result in increased odour being generated, mainly from the fresh tip face, rather than from leachate storage. The modelling assumed that all liquid storage areas are at capacity and the fresh tip face is currently 80m by 80m (projected to increase to approximately 140m by 140m (2ha) under the increased waste processing scenario). These assumptions represent a worst case scenario as leachate storage areas are not likely to be at capacity, nor are tip faces as large as those modelled within this report considered likely.

Additionally, potential emissions from the approved AWT were quantitatively assessed to allow the determination of the potential cumulative odour and dust impact from all approved and proposed odour and dust sources from waste activities within the Woodlawn Eco-Precinct.

In order to quantify potential odorous emissions from the Project, a combination of site specific odour emission rate data and data derived from similar facilities (for the AWT) were used to conduct a Level 3 odour impact assessment in accordance with the NSW Department of Environment, Climate Change and Water (DECCW) 2006 document, *Technical Framework: Assessment and Management of Odour from Stationary Sources in New South Wales* (DECCW, 2006a).

The assessment involved the modelling of local meteorology and the dispersion of odorous emissions to predict the level of impact that may be experienced in the surrounding environment. To quantify emissions of dust and particulates from the Project, emission factors as defined in Commonwealth Department of Environment and Heritage *Emission Estimation Technique Manual for Mining version 2.3* (DEH, 2001) and relevant United States Environmental Protection Agency (USEPA) AP-42 emission factors, were used.

9.3 Air Quality & Odour Criteria

Project specific air quality and odour criteria data have been developed for the site and are provided in **Table 9-1**.

Chapter 9 Air Quality and Odour

Table 9-1 Air Quality and Odour Criteria

Parameter	Criteria
Odour	6 OU/m^3
TSP	90 µg/m^3
Dust Deposition - maximum total	4 g/m^2/month
PM_{10}	50 µg/m^3

Odour

Impacts from odorous air contaminants are often nuisance-related rather than health related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve "no odour".

The detectability of an odour is a sensory property that refers to a theoretical minimum concentration that produces an olfactory response or sensation. This point is called the odour threshold and defines one odour unit per cubic metre (OU/m^3). An odour goal of less than 1 OU/m^3 would theoretically result in no odour impact being experienced. Based on available literature, the level at which an odour can be perceived as a nuisance ranges from 2 – 10 OU/m^3 depending on factors like the odour characteristic; the sensitivity of the receiving population; the ambient odour level; public expectations; characteristics of the odour source; and whether the particular odour is likely to be associated with any adverse health effects. The odour criteria of 6 OU for this proposal is based on the approved method of determination as set out by the NSW DECCW.

Particulate Generation (including dust, TSP and PM_{10})

The term 'dust' and 'particulate matter' (PM) is used to describe the range of particles that exists in the air we breathe. PM exists naturally in the atmosphere, eg sea-salt spray and pollens. PM can be increased due to human activities such as vehicle exhaust, industrial processes, power stations, mining, farming and wood heaters, or smoke from bushfires.

Exposure to PM can be associated with health and amenity impacts and is considered as an important pollutant due to its ability to penetrate into the respiratory system. The likely risk of impact depends on a range of factors including the size, structure and composition of the PM and the general health of the person. Both the PM_{10} and Dust Deposition criteria used in this current assessment have been derived from DECCW approved methods.

Total Suspended Particulates (TSP) refers to the total of all particles suspended in the air. The air quality goal for TSP used in the current assessment is the recommended criteria according to the National Health and Medical Research Council (NHMRC) at their 92nd session in October 1981.

9.4 Existing Environment

9.4.1 Climate and Meteorology

Using on-site weather data from 2005 – 2008, wind conditions at the Woodlawn site have been assessed. Data was obtained from a Veolia operated weather station at 10m and at two Wind Power prospecting weather stations, namely Woodlawn13 and Collex Mast, during 2005. This data set has been summarised in **Table 9-2**.

Table 9-2 Annual Wind Behaviour at Woodlawn

	Woodlawn Bioreactor	Woodlawn13 Mast		Collex Mast	
Observation Height	10m	30m	45m	40m	65m
Frequency of Calms (%)	3.1	0.4	0.3	0.1	0.1
Average Wind Speed (m/s)	3.2	7.6	7.9	9.0	8.7
Dominant Wind Direction	WNW and W	WNW	WNW	WNW	WNW

The above data is a typical velocity profile, with wind speed increasing with height. The anomaly in the Collex Mast, with the lower wind speed (8.7m/s) at 65 m height, may be attributed to the influence of the adjacent complex terrain.

9.4.2 Air Quality Parameters

Odour

The Woodlawn Bioreactor is the only source of similar odorous emissions in the local region. Accordingly, the *Air Quality and Odour Assessment* does not consider that cumulative impacts between emissions from the Woodlawn Bioreactor and any other site in the surrounding region would occur.

Dust Deposition

Background dust deposition monitoring has been conducted at the Woodlawn site at a number of locations since 2002 (i.e prior to operations commencing on site in 2004). To determine the likely background dust levels under current operations at the Woodlawn Facility, dust deposition monitoring data from between January 2007 to January 2010 was analysed.

From January 2007 to January 2010, average insoluble matter (g/m^2/month) was 3.5 in the “east void” of the Bioreactor, 3.1 in the “west void” of the Bioreactor, and 2.6 in Pylara, a neighbouring property. These three locations were considered representative for the determination of ambient conditions across the site.

Particulate Matter

Particulate matter refers to airborne particles typically less than 50 microns (µm) in diameter and ranging down to 0.1µm in size. Particles less than 10 µm and 2.5 µm in diameter and referred to as PM_{10} and $PM_{2.5}$ particles respectively.

Background monitoring of PM_{10} has been conducted on a regular basis at the Pylara site since August 2004. The average concentration at Pylara between August 2004 and November 2007 was $9\mu g/m^3$.

9.4.3 Sensitive Receptors

The nearest potentially affected residences are summarised in **Table 9-3**.

Table 9-3 Potentially Affected Residences

Property Reference	Property Name	Distance to Woodlawn Bioreactor (m)	Elevation (m AHD)
REC 1	Woodlawn Farm	1,600	796
REC 2	Cowley Hills	2,000	794
REC 3	Pylara	4,000	742
REC 4	Torokina	3,700	720

The properties of "Woodlawn", "Cowley Hills" and "Pylara" are all Veolia-owned residences and as such, could be considered to be 'Project-related' residences. However, in the interests of minimising odour and dust impacts on the surrounding area, the odour and dust impact from both current and proposed project operations have been assessed at all surrounding residences, including 'Project-related' residences.

The residences to the east of the facility ("Woodlawn Farm" and "Cowley Hills") are on a similar level to the proposed facility with no significant topographical features in-between. To the northwest and west of the proposed facility the land falls away to a height of 700 m AHD.

Local atmospheric dispersion could be influenced by night-time katabatic drainage flows from elevated terrain or channelling effects in valleys or gullies around the site.

9.5 Air Quality Impact Assessment

The impact of odour predicted to be generated by the proposed Project was calculated in accordance with the equation used by the NSW DECCW, as specified in the Approved Methods. Air pollutant concentrations were simulated using CALPUFF.

A review was also carried out of the potential for particulate generation (including dust, TSP and PM_{10}) during the operation of the proposed expanded landfill (including the AWT facility and the movement of waste on-site). The migration of particulate matter was modelled using Ausplume.

Odour

The odour base and expansion estimates were predicted using CALPUFF. The results are given in **Table 9-4** and **Figure 9-1**.

Table 9-4 Predicted 99th Percentile 1 Second Average Odour Concentration

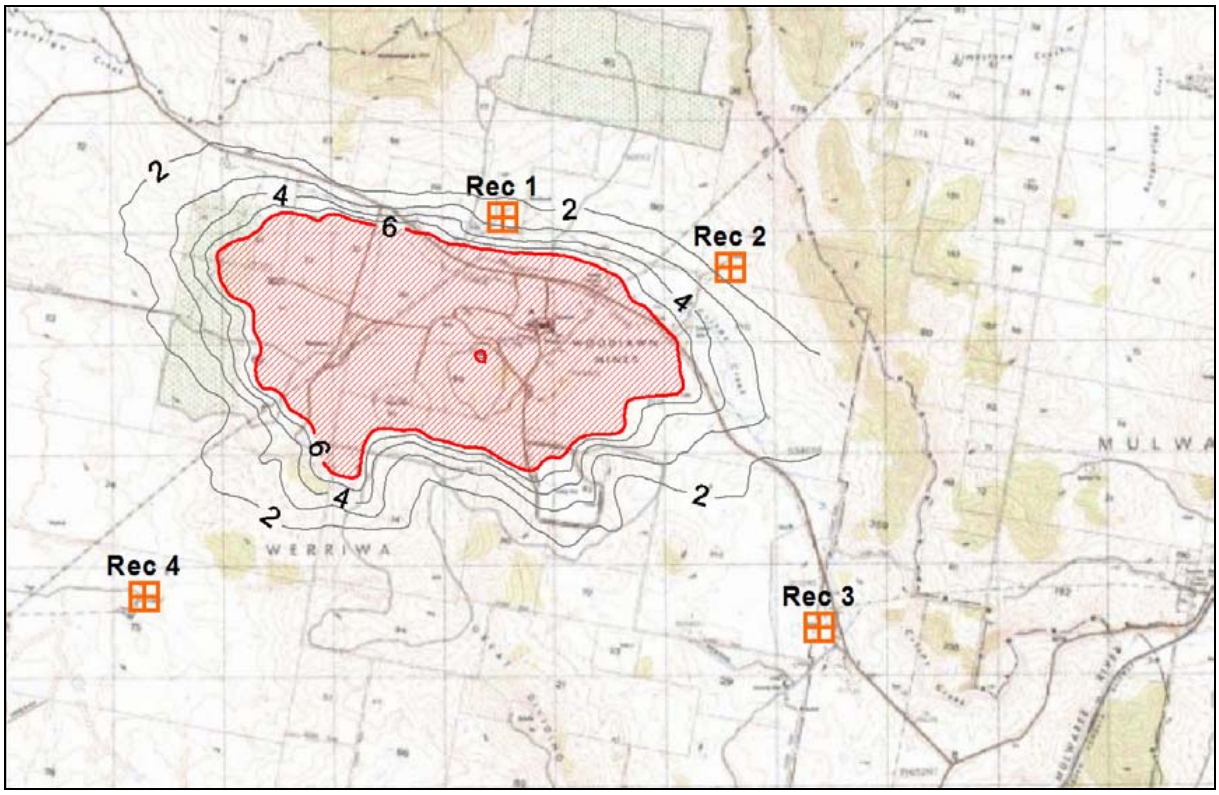
Receptor ID	Predicted odour concentration (OU/m^3) – Base Case	Predicted Odour Concentration (OU/m^3) – Woodlawn Expansion Project
Receptor 1: Woodlawn Farm	2.6	4.1
Receptor 2: Cowley Hills	1.4	2.0
Receptor 3: Pylara	0.6	1.2
Receptor 4: Torokina	0.7	1.3

Concentrations are predicted to range between 0.6 OU and 2.6 OU at all receptors for the base case (current) scenario, increasing to between 1.2 OU and 4.1 OU for the Expansion Project scenario.

Figure 9-1 shows the ambient odour concentrations for the site and surrounding area as predicted by CALPUFF.

Figure 9-1 The 99th Percentile 1 Second Average Odour Concentration

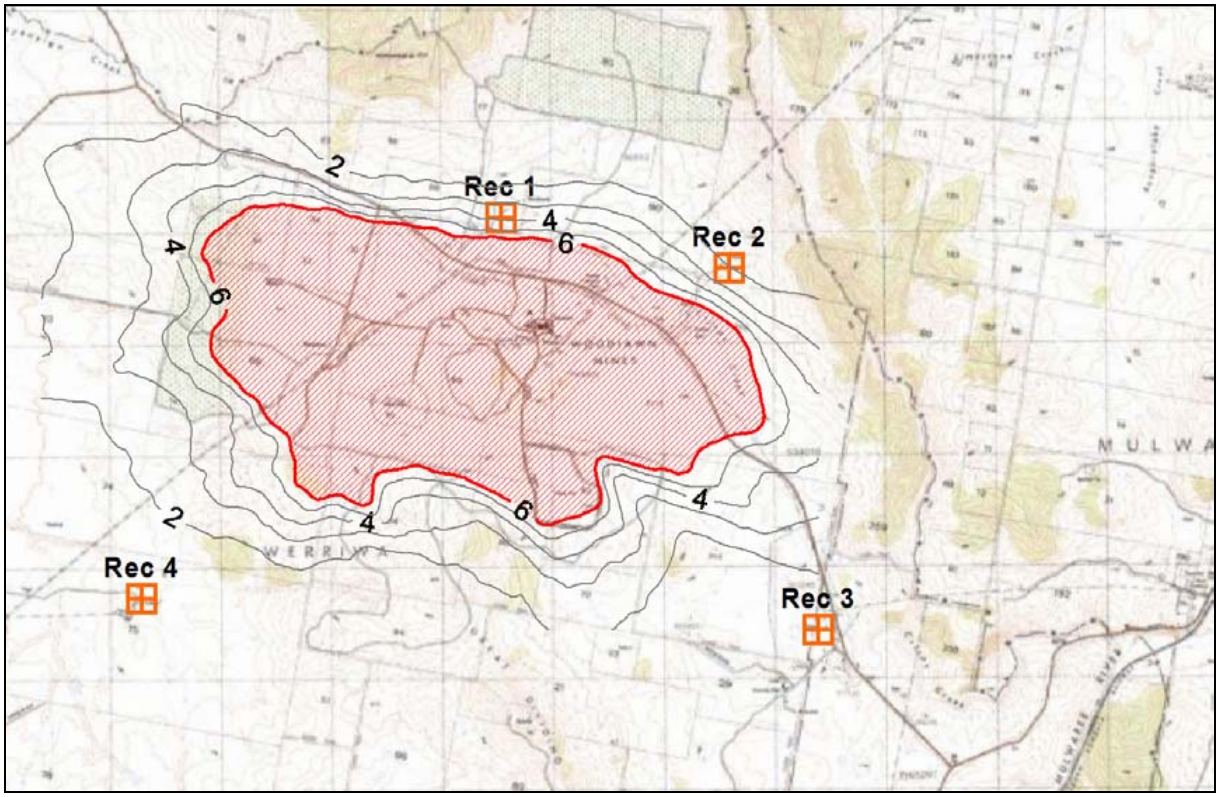
Base scenario



Source: Heggies Pty Ltd, 2010:33

Figure 9-2 shows the predicted odour concentration impact as predicted by CALPUFF for the proposed expansion.

Figure 9-2 The 99th Percentile 1 Second Average Odour Concentration Impact of the Woodlawn Expansion Project



Source: Heggies Pty Ltd, 2010:33

It is predicted that under the worst case operating conditions, odour concentrations will satisfy the project odour criterion of 6OU at all surrounding residences in both scenarios modelled. Onsite management practices such as waste covering will act to minimise any impacts on all modelled receptors.

Dust Deposition

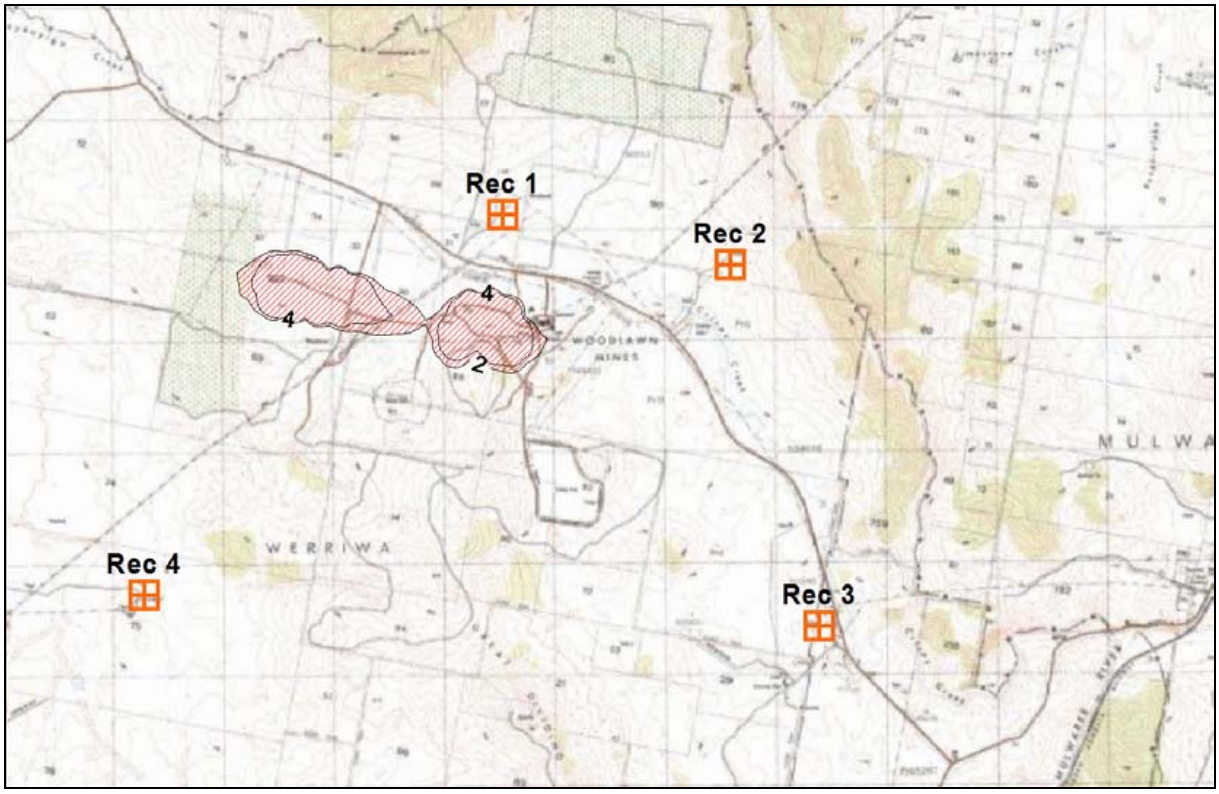
Dust deposition rates were obtained from Ausplume predictions (**Table 9-5**). Although background deposition rates are lower than 3.5 g/m^2/month, this value has been used as a consistent conservative background rate.

Table 9-5 Background and Predicted Incremental Dust Deposition

Annual Average Dust Deposition (g/m^2/month)				
Residence	**Background**	**Increment**	**Background + Increment**	**Project Goal**
1. Woodlawn Farm	3.5	0.05	3.55	4.0
2. Cowley Hills	3.5	0.07	3.57	4.0
3. Pylara	3.5	0.04	3.54	4.0
4. Torokina	3.5	0.02	3.52	4.0

The above results show that increases in the annual average monthly dust deposition associated with the project will not exceed the project goal of 4.0 g/m^2/month. **Figure 9-3** shows the Predicted Annual Average Incremental Dust Deposition resulting from the proposed expansion.

Figure 9-3 Predicted Annual Average Dust Deposition



Source: Heggies Pty Ltd, 2010:35

Total Suspended Particulates

The average predicted concentrations at the nearest receptor locations over a one year time frame are presented in **Table 9-6**. Background levels of TSP are assumed to be 18 µg/m^3.

Table 9-6 Background and Predicted Incremental Total Suspended Particulate

Annual Average TSP (µg/m^3)				
Residence	**Background**	**Increment**	**Background + Increment**	**Project Goal**
1. Woodlawn Farm	18	0.2	18.2	90
2. Cowley Hills	18	0.3	18.3	90
3. Pylara	18	0.1	18.1	90
4. Torokina	18	0.1	18.1	90

Increases in the annual average TSP concentration associated with the Waste Expansion Project are predicted to be insignificant in comparison with the current background levels, and are predicted to comply with the project goal of 90 µg/m^3.

PM_{10}

Table 9-7 shows the results of the CALPUFF predictions for the 24-hour average PM_{10} concentrations. The results show the maximum 24-hour average PM_{10} concentrations predicted at the nearest receptor locations surrounding the Woodlawn site over a one year time frame.

Table 9-7 Background and Predicted 24-Hour Average PM_{10} Concentrations

Maximum 24-Hour PM_{10} Concentrations ($\mu g/m^3$)				
Residence	**Background**	**Increment**	**Background + Increment**	**Project Goal**
1. Woodlawn Farm	36.6	10.5	47.1	50
2. Cowley Hills	36.6	12.5	49.1	50
3. Pylara	36.6	5.6	42.2	50
4. Torokina	36.6	3.3	39.9	50

The results presented in **Table 9-7** show that at all receptor locations, the maximum 24-hour average concentration of PM_{10} (background plus increment) associated with the proposed Project is predicted to be below the project goal of 50 $\mu g/m^3$ (24-hour average).

The contribution of the Project to total 24 hour PM_{10} concentrations is predicted to be low, with a maximum incremental 24-hour PM_{10} concentration of 12.5 $\mu g/m^3$ predicted to be at 'Cowley Hills'. Even assuming a high background PM_{10} concentration of 36.6 µg/m3 (the 99.9th percentile of three years of monitoring data), the total predicted PM_{10} concentration as a result of the Project is predicted to comply with the project goal.

Table 9-8 shows the results of the CALPUFF predictions for annual average PM_{10}. The results show the predicted annual average PM_{10} concentration at the nearest receptor locations surrounding the Woodlawn site over a one-year time frame.

Table 9-8 Background and Predicted Annual Average PM_{10} Concentrations

Maximum Annual Average PM_{10} Concentrations ($\mu g/m^3$)				
Residence	**Background**	**Increment**	**Background + Increment**	**Project Goal**
1. Woodlawn Farm	9	0.5	9.5	30
2. Cowley Hills	9	0.6	9.6	30
3. Pylara	9	0.3	9.3	30
4. Torokina	9	0.2	9.2	30

The results presented in **Table 9-8** indicate that at each receptor location, the maximum annual average concentration of PM_{10} (background plus increment) associated with the proposed project is predicted to be significantly below the project goal of 30 $\mu g/m^3$ for each modelling scenario. The contribution of the Project to the total annual average PM_{10} concentrations is predicted to be insignificant with a maximum incremental annual average PM_{10} concentration of 0.6 $\mu g/m^3$ predicted at "Cowley Hills".

9.5.1 Conclusions

Atmospheric dispersion modelling of odour has indicated that at all surrounding residences, odour is predicted to be at concentrations less than 4.1 OU as a 99th percentile, 1 second average. The Project specific odour performance goal was assumed to be 6 OU. Comparison with a 'base case' scenario designed to reflect current operating conditions at the site has shown no increase in odour impact at surrounding receptors resulting from the increase in surface area of waste.

A worst case scenario has been modelled, with all liquid storage areas modelled at capacity and with an active waste tipping area of 2 ha. In reality, leachate (treated and untreated) storage areas are unlikely to be at levels approaching capacity as leachate is used on the waste to encourage degradation of fresh waste. Excessive storage is unlikely and an active waste tipping face of the modelled size should not be required in reality.

Based upon the results of this modelling assessment, it is not considered that the proposed Woodlawn Expansion Project will lead to an exceedance of the odour performance goal.

Cumulative particulate matter emissions associated with the proposed Woodlawn Expansion and the approved AWT facility are not predicted to result in exceedances of the adopted criteria for the Project. Dust deposition levels are significantly below the adopted background level and are predicted to result in incremental increases of less than 0.07 g/m^2/month at all receptors. PM_{10} concentrations are predicted to be less than 13 µg/m^3 as a 24-hour maximum and 0.7 µg/m^3 as an annual average at all receptors. Total suspended particulate concentrations are predicted to be less than 0.3 µg/m^3 as an annual average at all modelled receptors.

9.6 Mitigation Measures

9.6.1 Odour

From the results of the assessment, no additional mitigation measures beyond those already established at the site would be required to manage odour impacts associated with the proposed expansion.

Odour control at the facility is carried out in line with an Ambient Air Quality Management Plan (AAQMP) and relies on appropriate management techniques to achieve the Project air quality goals.

9.6.2 Air Quality

From the results of the assessment, no additional mitigation measures beyond those already established at the site would be required to manage potential air quality impacts associated with the proposed expansion. In order to ensure project air quality goals are achieved, the following general environmental management controls will be maintained and implemented:

- traffic would be restricted to designated sealed access roads within and around the site;
- waste within the bioreactor would continue to be covered at days end; and
- water carts for dust suppression continue to be utilised as required.

Chapter 9 Air Quality and Odour

Air quality monitoring which is undertaken in accordance with the existing AAQMP would continue at the site. Regular air quality reports will be prepared, inclusive of the following:

- details identifying the principal sources of fugitive emissions;
- summary of any monitoring results exceeding the criteria levels and explanations for circumstances which lead to any exceedance; and
- details of corrective action, and confirmation of successful implementation.

Table 9-9 summarises the mitigation measures proposed for the proposed project.

Table 9-9 Mitigation Measures

Mitigation Measure	Implementation - Operation
Odour control and Air Quality Management at the facility is to be carried out in accordance with the existing Ambient Air Quality Management Plan (AAQMP).	✓
Veolia will maintain their established odour incident management system. Should any odour complaints be received, these would be recorded with the details of the location, time, odour character and duration. Details of subsequent corrective actions would be documented.	✓
Traffic is restricted to designated sealed access roads within and around the site.	✓
Waste within the bioreactor is covered at days end.	✓
Water carts for dust suppression continue to be utilised as required.	✓
Existing monitoring and reporting requirements of the AAQMP will continue to operate.	✓

10.1 Introduction

A greenhouse gas assessment for the Project was undertaken by Heggies, the results of which are provided as **Appendix F**. The greenhouse gas assessment quantitatively estimates the greenhouse gas impacts directly associated with the Project, as well as other indirect, wider greenhouse gas impacts. The results of the assessment are presented below.

10.2 Greenhouse Gas Assessment Methodology

The greenhouse gas inventory for the Project has been based on the accounting and reporting principles detailed within the Greenhouse Gas Protocol (the Protocol) (WBCSD/WRI, 2004). The greenhouse gas emission inventory for the Project is based on the methodology detailed in the Protocol, and the relevant emission factors in the *National Greenhouse Accounts (NGA) Factors* (the NGA factors) (DCC, 2009), and the relevant *Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance* (IPCC, 2000).

Quantification of potential emissions from the Woodlawn Expansion Project has been undertaken in relation to both carbon dioxide (CO_2) and other non-CO_2 greenhouse gas emissions including methane (CH_4) and nitrous oxide (N_2O). To report these emissions, they are converted to carbon dioxide equivalents (CO_2-e) as specified under the Kyoto Protocol. The Global Warming Potential (GMP) adopted for each greenhouse gas emitted are as follows: carbon dioxide GWP of 1, methane GWP of 21; and nitrous oxide GWP of 210, as detailed in the NGA Factors.

The Protocol further defines direct and indirect emissions through the concept of emission “scopes”.

Scope 1: Direct greenhouse gas emissions

Direct greenhouse gas emissions occur from sources that are owned or controlled by a company. For example:

- Emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc;
- Fugitive emissions of greenhouse gases; and
- Emissions from on-site power generators.

Scope 2: Electricity indirect greenhouse gas emissions

This accounts for greenhouse gas emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated but they are allocated to the organisation that owns or controls the facility or equipment where the electricity is consumed. Scope 2 emissions also capture the importing of energy (such as chilled water or steam) into a site.

Chapter 10 Greenhouse Gas Assessment

Scope 3: Other indirect greenhouse gas emissions

This is an optional reporting class that accounts for all other indirect greenhouse gas emissions resulting from a company's activities, but occurring from sources not owned or controlled by the company. Examples include extraction and production of purchased materials; extraction and distribution of purchased fuels; and use of sold products and services.

For the purpose of this Environmental Assessment, Heggies undertook quantitative assessments for Scope 1 and 2 activities, and semi quantitative assessment for Scope 3 activities.

10.3 Landfill Gas Extraction

The Woodlawn Bioenergy Project, the landfill gas extraction system and the associated infrastructure are described in **Chapter 2 Project Description** and **Appendix F Greenhouse Gas Assessment**. With the anticipated increase in annual waste tonnages to the Woodlawn Bioreactor, the installation of gas extraction systems during the active landfilling phase would continue. The Bioreactor processes would be maintained, with leachate recirculation practices still a core component of accelerating the waste decomposition process. With the increase in waste volumes, this gives scope to access larger volumes of landfill gas capture over a shorter period of time.

10.4 Emissions Sources

Emissions sources for Scope 1, 2 and 3 emissions are summarised **Table 10-1** below.

Table 10-1 Emission Sources

Project Component	Direct Component	Indirect Emissions	
	Scope 1	Scope 2	Scope 3
Fugitive emissions	Uncontrolled emissions of CH4, from methanogenesis of waste not collected and emitted through the surface of waste	N/A	N/A
Methane Combustion	Controlled emissions from the thermal oxidation of CH4 generated through the methanogenesis of waste and collected through the gas harvesting system.	N/A	N/A
Petrol and Diesel	Emissions from the combustion of petrol and diesel at the Project (plant and transport purposes)	N/A	Estimated emissions attributable to the extraction, production and transport of petrol and diesel consumed at the Project.
Electricity Consumption	N/A	Electricity consumption associated with all activities	N/A
Transport in 3rd Party Owned Vehicles	N/A	N/A	Estimated emissions attributable to the operation of non-Veolia owned vehicles (trucks and trains) that transport waste to site.

10.5 Results

The collated data relating to various emissions sources presented in **Table 10-1** was fed into a model to estimate the total greenhouse gas emissions that would be generated by increasing the waste input rate to 1.13 million tpa. The assumptions applied when assessing the estimated greenhouse gas impacts are provided in **Appendix F Greenhouse Gas Assessment.**

The results of the estimated Greenhouse Gas Emissions are presented in **Table 10-2.**

Table 10-2 Estimated Greenhouse Gas Emissions

Scope	Parameter	Assumed Value (1,130,000 tpa)	Greenhouse Gas Emissions (t CO2-e)
Scope 1	Diesel Consumption	1,566,906 litres	4,228
	Petrol consumption	37,397 litres	89
	Methane contribution (80%)	1,130 ktpa	11,525
	Uncontrolled methane emissions (20%)	1,130 ktpa	226,000
	Oxidation of 10% of uncontrolled methane emissions	1,130 ktpa	2,260
		Subtotal	*244,102*
Scope 2	Electricity Consumption	3,336,721 kWh	2,969
		Subtotal	*2,969*
Scope 3	Diesel consumption on site	1,566,906 litres	322
	Petrol consumption on site	37,397 litres	7
	Diesel consumption in trucks	177,828 litres	36
	Diesel consumption in trains	7,084,800 litres	1,456
		Subtotal	*1,822*
		Total	**248,893**

10.6 Conclusions

Based upon the assumptions used, the total CO2-e emission from Scope 1 emissions is estimated to be 244 ktCO2-e, which represents 98% of the total estimated emission of 249 ktCO2-e.

The uncontrolled (or “fugitive”) emission of methane from the waste represents approximately 92% of the total estimated emission. The impact of the combustion of approximately 80%(v/v) of the methane generated through the methanogenesis of the waste represents only 4.7% of the total estimated emission. Scope 3 emissions are shown to represent approximately 0.7% of the total estimated emission from the Project.

The carbon intensity of the Scope 1, Scope 2 and Scope 3 emissions from the Woodlawn Expansion Project is estimated to be 0.22 ktCO2-e/kt MSW (based upon 249 ktCO2-e/1130 kt MSW).

It should be noted that in addition to the GHG emissions figures provided above, approximately 210,240 MWh of electricity will be generated as a result of disposal of 1,130,000 tpa of waste in the year of maximum methane production at the Bioreactor.

Chapter 10 Greenhouse Gas Assessment

As described in **Appendix F**, a theoretical model has been used to estimate the potential gas generation capacity of the site. The year of modelled maximum gas generation (2036, 12,750 m^3/hr) is associated with a maximum electricity generation capacity of 24 MW per hour. This renewable electricity represents a GHG offset of approximately 166,347 t CO2-e by replacing electricity generated from fossil fuels.

11.1 Introduction

A noise assessment for the Woodlawn Expansion Project was undertaken by Heggies Pty Ltd. The noise impacts associated with the Project were independently assessed in accordance with the following policy guidelines:

- Australian Standard AS 1055:1997 Description and Measurement of Environmental Noise Parts 1, 2 and 3;
- Department of Environment, Climate Change and Water (DECCW) NSW Industrial Noise Policy (INP);
- NSW Environmental Noise Control Manual (ENCM); and
- Environmental Criteria for Road Traffic Noise (ECRTN) for traffic related noise impacts.

The full technical report is provided as **Appendix G** to this EA, and a summary of findings is presented within this chapter.

11.2 Methodology

11.2.1 Assessment Process

Responsibility for the control of noise emission in New South Wales is vested in Local Government and DECCW. The Industrial Noise Policy (INP) was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the DECCW to regulate premises that are scheduled under the POEO Act.

The INP provides two forms of noise criteria with the aim of achieving environmental noise objectives; to account for intrusive noise which involves setting a noise goal relative to the existing acoustic environment, and to protect the amenity of particular land uses. Assessments of sleep disturbance and road traffic noise are based on guidelines contained within the *NSW Environmental Noise Control Manual* (ENCM).

Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than five decibels above the measured background level (L_{A90}).

Assessing Amenity

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion.

Chapter 11 Noise

Assessing Sleep Disturbance

DECCW has acknowledged that the relationship between maximum noise levels and sleep disturbance is not currently well defined. Criteria for assessing sleep disturbance has not been identified under the INP and hence sleep arousal has been assessed using the guidelines set out in the ENCM Chapter 19-3.

To avoid the likelihood of sleep disturbance the ENCM recommends that the $L_{A1(1minute)}$ noise level of the source under consideration should not exceed the background noise level (L_{A90}) by more than 15 dBA when measured outside the bedroom window of the receiver during the night-time hours (10:00 pm to 7:00 am).

Road Traffic Noise

The Environment Protection Authority released the "*Environmental Criteria for Road Traffic Noise*" in May 1999. The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts.

11.2.2 Noise Modelling

A computer model was used to predict noise emissions from operation of the proposed expansion project. The operational noise modelling was undertaken using SoundPLAN v6.4 software. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Topographic contours and operational plans were supplied by Veolia for the purpose of modelling noise from the proposed development. Prediction of noise emission levels was carried out under calm and prevailing atmospheric conditions.

Sound power levels of relevant equipment have been obtained from measurements on the Woodlawn site or have been sourced from a Heggies database of similar equipment.

11.3 Existing Environment

11.3.1 Ambient Background Noise Monitoring

Ambient noise levels were measured during a previous assessment[*] (Heggies report 30-1392R1R3 *Woodlawn Alternative Waste Technology Facility Noise Impact Assessment*, January 2006).

[*] The background assessment conducted for the approved AWT was considered appropriate for use in this assessment as the background levels recorded were conservative (low). The background levels recorded for the AWT were predominantly below the minimum levels set in the INP and therefore further monitoring could only have resulted in higher ambient levels and hence higher project specific criteria.

A background monitoring survey was undertaken at the nearest residential locations as shown in **Table 11-1**. It should be noted that there is a residence on Lime Street that is closer to the IMF than Chinnery but this residence is afforded shielding by topographic features that reduce the predicted noise levels below those levels at Chinnery.

Table 11-1 Background Noise Monitoring Locations

Noise Monitoring Locations	
Location A	Cowley Hills (owned by Veolia)
Location B	Woodlawn Farm (owned by Veolia)
Location G	Chinnery

The background noise monitoring consisted of continuous, unattended noise logging and operator attended noise surveys. The operator attended noise surveys help to define noise sources and the character of noise in the area and are, therefore, used to qualify unattended noise logging results.

11.3.2 Unattended Continuous Noise Monitoring

A summary of the results of the unattended continuous noise monitoring are given in **Table 11-2**. The ambient noise levels from each monitoring location are presented in graphical format in **Appendix G**.

Table 11-2 Summary of Existing Ambient Background Noise Levels

Location	Description	Background Noise Level (L_{A90} dBA)	Existing industrial noise contribution L_{Aeq} (dBA)
		Rating Background Level	
Location A	Daytime	30 dBA	<44 dBA
Cowley Hills (owned by Veolia)	Evening	30 dBA	<39 dBA
Logger serial number 16-203-506	Night	30 dBA	<34 dBA
Location B	Daytime	31 dBA	<44 dBA
Woodlawn Farm (owned by Veolia)	Evening	30 dBA	<39 dBA
Logger serial number 16-203-509	Night	30 dBA	<34 dBA
Location G	Daytime	30 dBA	<34 dBA
Chinnery	Evening	30 dBA	<34 dBA
Logger serial number 16-203-506	Night	30 dBA	<34 dBA

Notes: Monday to Saturday, Daytime 7.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 7.00 am.
Sundays & Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
The LA90 represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
The LAeq descriptor corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Existing industrial noise contributions were determined from attended measurements at each of the monitoring locations. The existing industrial noise contribution was not discernable at the monitored locations.

11.3.3 Operator Attended Noise Measurements

The results of the operator attended noise measurements are shown in **Table 11-3**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and local activities.

Table 11-3 Operator Attended Noise Measurements

Location	Date/Start Time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission Typical Maximum Levels L_{Amax} (dBA)
		L_{Amax}	L_{A1}	L_{A10}	L_{A90}	L_{Aeq}	
Location A Cowley Hills (owned by Veolia)	4/5/05 10:15 Day W=1 m/s NW Temp=17°C	77	72	46	35	56	Truck passby 74, 75, 76 Birds Insects 34 -38 Wind in trees 35-36
Location B Woodlawn Farm (owned by Veolia)	4/5/05 11:15 Day W=1 m/s NW Temp=16°C	66	57	50	44	49	Birds Insects 45-46 Wind in trees 45-50
Location G Chinnery	13/5/05 14:50 Day W=0.5 m/s NW Temp=17°C	61	46	36	26	35	Truck on Highway 40 Car on Highway 35 Farm activity (farm car) 49 Birds 50

It should be noted that the typical maximum noise levels recorded during the operator attended surveys do not reflect the L_{Aeq} contribution of these sources.

11.4 Project Specific Noise Criteria

11.4.1 Operational Noise Design Criteria

The noise emission design criteria for the Woodlawn Bioreactor have been established with reference to the INP as outlined in **Section 11.2**.

The amenity criteria have been set from the criteria in the INP (as detailed in Tables 3 and 4 of **Appendix G**), with adjustments to account for existing industrial noise contributions as necessary.

The acoustical environment typifies that of a rural environment. The residences in the general area have been assessed under the relevant receiver type as shown in **Table 11-4**. The intrusive and amenity noise assessment criteria for the assessment localities, with reference to the INP, are also presented in **Table 11-4**.

Table 11-4 Operational Project Specific Noise Criteria

Location	Locality (Noise Amenity Area)	Period	Intrusiveness Criteria $L_{Aeq(15minute)}$ (dBA)	Amenity Criteria LAeq(Period) (dBA)
A	Cowley Hills (owned by Veolia) (Rural)	Day	35	50
		Evening	35	45
		Night	35	40
B	Woodlawn Farm (owned by Veolia) (Rural)	Day	36	50
		Evening	35	45
		Night	35	40
G	Chinnery (Rural)	Day	35	50
		Evening	35	45
		Night	35	40

For Monday to Saturday, Daytime 7.00 am - 6.00pm; Evening 6.00pm - 10.00pm; Night-time 10.00pm - 7.00am.
On Sundays and Public Holidays, Daytime 8.00am - 6.00pm; Evening 6.00pm - 10.0 pm; Night-time 10.00 pm - 8.00am.

The intrusive criteria is the limiting criteria at all areas during all periods.

The INP states that these criteria have been selected to protect at least 90% of the population, living in the vicinity of industrial noise sources, from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

11.4.2 Intermodal Facility

Currently, the Intermodal Facility does not operate during the evening period. It would be expected that a noise limit of 35 dBA $L_{Aeq(15minute)}$ would be applied to the evening period for normal operations and a noise limit of 45 dB(A) $L_{Aeq(15minute)}$ for freight trains entering and leaving the premises during the evening period.

11.4.3 Sleep Disturbance Noise Goals

The relevant sleep disturbance noise goals for each residential area are provided in **Table 11-5**.

Table 11-5 Sleep Disturbance Criteria

Location	Locality (Noise Amenity Area)	Period	Sleep Disturbance Criteria $L_{A1(1minute)}$ dBA
A	Cowley Hills (owned by Veolia) (Rural)	Night	45
B	Woodlawn Farm (owned by Veolia) (Rural)	Night	45
G	Chinnery (Rural)	Night	45

11.4.4 Road Traffic Noise Design Criteria

Road traffic noise criteria are set out in the ECRTN. The criteria recommended in the policy document are based on the functional categories of the subject roads, as applied by the RTA. Bungendore Road would be classified as a sub-arterial road and Collector Road would be classified as a collector road. The relevant road traffic noise criteria for the subject development are provided in **Table 11-6**.

Table 11-6 Road Traffic Noise Criteria

Type of Development	Criteria		Where Criteria are already exceeded
	Day 7am – 10pm	Night 10pm – 7am	
Land use developments with potential to create additional traffic on existing freeways/ arterials	60 dBA $L_{Aeq(15hour)}$	55 dBA $L_{Aeq(9hour)}$	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.
Land use developments with potential to create additional traffic on existing collector roads	60 dBA $L_{Aeq(1hour)}$	55 dBA $L_{Aeq(1hour)}$	

11.5 Assessment of Impacts

Operational modelling was conducted for the Crisps Creek IMF as well as for the Woodlawn Bioreactor. The modelling scenario accounted for all of the noise-generating plant and machinery anticipated to be at each site during different times of the day. The details of the scenario are provided in **Appendix G**.

11.5.1 Bioreactor Operational Noise Modelling Results

Noise emission levels were predicted for the Project for a typical operational scenario. Noise levels predicted at the nearest residential receiver locations are provided in **Table 11-7**.

Table 11-7 Predicted Woodlawn Bioreactor Noise Levels

Location	Assessment Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Project Specific Noise Criteria dBA $L_{Aeq(15minute)}$
		Calm Conditions	Adverse Conditions	
Location A Cowley Hills (owned by Veolia)	Morning Shoulder	<33	<37	35
	Day	<34	N/A	
	Evening	<34	N/A	
Location B Woodlawn Farm (owned by Veolia)	Morning Shoulder	<34	<37	35
	Day	35	N/A	36
	Evening	35	N/A	35
Location C Pylara (owned by Veolia)	Morning Shoulder	<30	<30	35
	Day	<30	N/A	
	Evening	<30	N/A	

Location	Assessment Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Project Specific Noise Criteria dBA $L_{Aeq(15minute)}$
		Calm Conditions	Adverse Conditions	
Location D Torkina	Morning Shoulder	<30	<30	35
	Day	<30	N/A	
	Evening	<30	N/A	
Location E Willeroo	Morning Shoulder	<30	<30	35
	Day	<30	N/A	
	Evening	<30	N/A	
Location F Bernallah	Morning Shoulder	<30	<30	35
	Day	<30	N/A	
	Evening	<30	N/A	

The noise impact of the proposed Project has minimal impact on noise generated by the current bioreactor operation. Operational noise levels of the bioreactor operation with the proposed Project are predicted to meet the project specific noise criteria at all residential locations under calm weather conditions. Operational noise levels of the bioreactor operation with the proposed Project are predicted to meet the project specific noise criteria at all but two (2) residential locations where exceedances of up to 2 dBA are predicted under prevailing weather conditions. These properties - Cowley Hills and Woodlawn Farm - are both owned by Veolia and as such are considered "project related" for the noise assessment.

11.5.2 Bioreactor and Intermodal Sleep Disturbance Analyses

The proposed expansion will not impact noise levels in the morning shoulder period between 6:00 am and 7:00 am (night) as no additional activities will occur during this period as a result of the proposal. Given the relative constant nature of existing approved noise sources that operate in the morning shoulder period it is not likely that sleep disturbance will occur as a result of the operation. L_{Amax} levels measured during a train arrival were used as input to the noise model in order to assess sleep disturbance. The maximum noise level is predicted to be below 40 dBA during a train arrival and will therefore meet the sleep disturbance criteria set for residential Location G (Chinnery).

11.5.3 Intermodal Facility Noise Modelling Results

Noise emission levels were predicted from the Intermodal Facility for a typical operational scenario. Noise levels predicted at Location G, which was deemed to be representative of the nearest residential receivers. It should be noted that there is a residence on Lime Street that is closer to the IMF but this residence is afforded shielding by topographic features that reduce the predicted noise levels below those provided for Location G. The predicted noise levels for location G are provided in **Table 11-8**.

Table 11-8 Predicted Intermodal Noise Levels - Chinnery

Location/Activity	Assessment Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		Project Specific Noise Criteria dBA $L_{Aeq(15minute)}$
		Calm Conditions	Adverse Conditions	
Location G Chinnery Train arrival	Morning Shoulder 6:00 am to 7:00 am	<30 dBA	<30 dBA	45 dBA
	Daytime 7.00 am to 6:00 pm	<30 dBA	N/A	50 dBA
	Evening 6:00 pm to 10:00 pm	<30 dBA	N/A	45 dBA
Location G Chinnery Loading/ unloading operations	Daytime 7.00 am to 6:00 pm	33 dBA	N/A	35 dBA
	Evening 6:00 pm to 10:00 pm	33 dBA	N/A	

Operational noise levels from the IMF are predicted to meet the project specific noise criteria at all residential locations during the morning shoulder, daytime and evening periods.

11.5.4 Cumulative Noise Assessment

The INP prescribes detailed calculation routines for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(Period)}$ amenity criteria at potentially affected receivers for a development (in isolation). Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view of maintaining acceptable noise *amenity* levels for residences.

The results contained in **Table 18, Appendix G** show that the cumulative impact of the Woodlawn Expansion Project and the approved developments (i.e. the Wind Farm and AWT) will comply with the relevant amenity criteria set in accordance with the INP at residential receivers surrounding the site.

11.5.5 Cumulative Intrusive Noise Assessment

Noise emissions from the Woodlawn Bioreactor and AWT have been assessed separately. It should be noted that the EPL for the Woodlawn Bioreactor does not contain noise limits for the approved AWT facility.

Although the Woodlawn Bioreactor and AWT facilities are two distinct operations with separate development consents, as part of this noise assessment DECCW wish to examine the cumulative noise impact against the intrusive criteria for the Bioreactor and the AWT operations. Notwithstanding this, the noise emission levels of the combined Bioreactor and AWT operations were modelled.

The INP does not establish a procedure to determine cumulative intrusive criteria. To take into account the project specific noise levels for the proposed Bioreactor and the existing consent of the approved AWT, a cumulative intrusive criteria was developed by logarithmically adding the two criteria. The predicted cumulative intrusive levels from the proposed Bioreactor and approved AWT against the relevant criteria are provided in **Table 20** of **Appendix G**.

The cumulative noise impact of the proposed Bioreactor operation and the approved AWT complies with the cumulative intrusive criteria for the developments at all residential locations except Location B Woodlawn farm. At this location, an exceedance of up to 3 dB during the morning shoulder period under prevailing weather conditions is predicted. The cumulative operational noise levels are at or below 35 dBA at all residential locations with the exception of Location A Cowley Hills and Location B Woodlawn Farm. These properties - Cowley Hills and Woodlawn Farm - are both owned by Veolia and as such are considered "project related" for the assessment.

11.5.6 Road Traffic Noise Modelling Results

Collector Road/Bungendore Road

Additional traffic along Collector Road and Bungendore Road has been considered during the daytime period as waste will arrive at the site between 7:00 am and 10:00 pm. Five (5) additional heavy vehicle movements per hour from Crisps Creek IMF will occur on Bungendore Road (North of Collector Road). Trucks travelling through Tarago and Bungendore are programmed to arrive at the Woodlawn Bioreactor site during daytime hours of 7:00 am to 6:00 pm, however, are expected not to arrive at the site until 9:00 am.

Road traffic noise contributions from the proposed Waste Expansion Project have been predicted (at 40m from the roadside for Collector Road and 530m for Bungendore Road) along both Bungendore Road and Collector Road and are presented in **Table 11-9.**

Table 11-9 Predicted Road Traffic Noise Levels - Collector Road

	Predicted Traffic Noise Level Criteria	
	Day 7 am - 10 pm	Day 7 am - 10 pm
Bungendore Road	36 dBA $L_{Aeq(15hour)}$	60 dBA $L_{Aeq(15hour)}$
Collector Road	55 dBA $L_{Aeq(1hour)}$	60 dBA $L_{Aeq(1hour)}$

The road traffic noise level contribution from the Woodlawn site is predicted to be below the relevant noise goal specified in the ECRTN for both Bungendore and Collector Roads.

Tarago and Bungendore Towns

An additional assessment of noise impacts associated with traffic movements for the transport through Tarago and Bungendore has been conducted using the following assumptions:

- Trucks are travelling at 50 km/hr (speed limit through Tarago and Bungendore);
- 42 truck movements during the day period through Bungendore;
- 8 truck movements during the day period through Tarago;
- The road is classified as Arterial or Sub-arterial;
- Sound pressure level from trucks of 75 dBA at 20m or 110 dBA SWL (flat terrain low speed environment); and

- The nearest residence is 8m from the travel path of the truck.

The traffic noise contribution from heavy vehicles has been predicted at 8 metres from the roadside for Tarago and Bungendore and is presented in **Table 11-10**.

Table 11-10 Predicted Road Traffic Noise Levels - Tarago and Bungendore

	Predicted Traffic Noise Level Day 7 am - 10 pm	Criteria Day 7 am - 10 pm
Tarago	46 dBA $L_{Aeq(15hour)}$	60 dBA $L_{Aeq(15hour)}$
Bungendore	53 dBA $L_{Aeq(15hour)}$	60 dBA $L_{Aeq(15hour)}$

The contribution to traffic noise from heavy vehicles associated with the Project, including the previously considered traffic generated by the regional waste modification, will comply with the daytime ECRTN criteria.

11.6 Mitigation and Conclusions

Operational noise emission levels from Woodlawn Bioreactor and the Crisps Creek IMF due to the proposed Project are predicted to meet the relevant project specific noise goals over the extended hours at all existing residential receivers surrounding the site with the exception of Location A Cowley Hills and Location B Woodlawn Farm for which various marginal exceedances are predicted. These properties - Cowley Hills and Woodlawn Farm - are both owned by Veolia and as such are considered “project related” for this assessment.

The cumulative impact of noise from the existing Woodlawn Bioreactor, approved Wind Farm, and approved AWT are predicted to comply with the relevant criteria set in accordance with the INP at residential receivers surrounding the site.

The contribution to traffic noise from heavy vehicles associated with the Woodlawn site, including the additional traffic generated from the Crisps Creek Intermodal and additional local waste transportation, is predicted to comply with the ECRTN criteria.

Accordingly, given that the noise impacts associated with the Project are expected to be within expected noise goals, there are no specific mitigation measures that need to be implemented for the Project. The existing Noise Management Plan for the IMF and Bioreactor operations would be updated to account for the proposed operational changes associated with the Woodlawn Expansion Project.and to adequately ameliorate any noise related impacts.

12.1 Introduction

This chapter addresses the traffic and transport related impacts associated with the operation of the proposed Project, and is based on a detailed Transport Impact Assessment, which is attached as **Appendix H** of this Environmental Assessment. Impacts on traffic volumes and road conditions were considered and assessed and mitigation measures are recommended. The key findings of this report form the basis of this chapter.

12.2 Methodology

The Transport Impact Assessment consisted of a site visit and a desktop analysis using traffic count data obtained from the NSW Roads and Traffic Authority (RTA) database. Traffic generation during the operational phase of the Project was estimated based on operational activities provided by Veolia. These traffic generation estimates were applied to existing traffic volumes to determine the proportional increase arising as a result of the proposed Project.

As outlined in **Chapter 2 Project Description**, the existing route from Crisps Creek Intermodal Facility and the existing access to the Bioreactor site would be utilised for the delivery of waste. For the regional waste component, a number of assumptions (refer **Section 12.10.4**) were made relating to possible haulage routes.

12.3 Level of Service

12.3.1 Rural Roads - Two-Lane, Two-Way

In accordance with the *Guide to Traffic Generating Developments*, version 2.2 (RTA, October 2002), the Levels of Service relevant to rural local roads are summarised in **Table 12-1**. The threshold volumes for the peak hour flow (vehicles/hour) on two-lane rural roads associated with each Level of Service are based on the combined counts for both directions. These traffic volumes account for total vehicle movements. For the purpose of this study, the proportion of heavy vehicles is assumed to be five percent.

Table 12-1 Levels of Service, Rural Two-Lane Two-Way Roads

Level of Service	Traffic Volume Threshold (vehicles/hour) (Level Terrain)	Traffic Volume Threshold (vehicles/hour) (Rolling Terrain)	Definition
A	N/A	N/A	Free-flow conditions with a high degree of freedom for motorists to select speed and manoeuvre within traffic flow
B	590	420	Stable flow conditions, reasonable freedom to select speed and manoeuvre within traffic flow
C	970	760	Stable flow conditions, restricted freedom to select speed and manoeuvre within traffic flow

Level of Service	Traffic Volume Threshold (vehicles/hour) (Level Terrain)	Traffic Volume Threshold (vehicles/hour) (Rolling Terrain)	Definition
D	1,550	1,140	Approaching unstable flow conditions, severely restricted to select speed and manoeuvre within traffic flow
E	2,500	2,000	Close to capacity, virtually no freedom to select speed and manoeuvre within traffic flow. Small increases in traffic volume would generally cause operational problems.

Source: RTA, October 2002.

Roads operating at a Level of Service of C or better are generally considered to have acceptable flow conditions.

12.4 Existing Environment

The existing road network is dominated by the Hume Highway, Braidwood Road, Bungendore Road (Tarago Road♦) and Collector Road. Between the Crisps Creek Intermodal Facility and the Woodlawn Bioreactor, the route consists of travelling along Bungendore Road and then Collector Road.

12.4.1 Braidwood Road (MR51)

Braidwood Road is a classified road comprising a two-lane, two-way configuration. There is a shoulder on both sides of the road generally with a width of approximately one metre. Braidwood Road has a posted speed limit of 100 kilometres per hour for the majority of its length with 50 or 60 kilometres per hour through towns.

The nearest RTA count station (94.142) is in Bungendore, east of Bungendore Road.

12.4.2 Bungendore Road (MR268)

Bungendore Road is a classified road and comprises a two-lane two-way configuration for the majority of its length, with a shoulder of approximately one metre on each side. The posted speed limit is 100 kilometres per hour with a 60-kilometre per hour speed limit through the town of Tarago. The existing pavement along Bungendore Road appears to be in good condition.

At the Crisps Creek Intermodal Facility, Bungendore Road has a right-turn bay for a length of approximately 100 metres to provide access to the facility for westbound vehicles. Additionally, there is an acceleration lane for vehicles turning left out of the facility, for a length of approximately 100 metres.

At the time of the site visit, roadworks were being conducted the intersection of Bungendore Road and Collector Road. Therefore, the existing intersection configuration is unclear.

♦ The section of Bungendore Road south of Mount Fairy becomes Tarago Road as it approaches the township of Bungendore.

The nearest RTA count station (94.143) is in Bungendore, north of Braidwood Road.

12.4.3 Collector Road

Collector Road comprises a two-lane two-way configuration for the majority of its length, with a shoulder of approximately one metre on each side. The posted speed limit is 100 kilometres per hour. The existing pavement along Collector Road appears to be in good condition for the length between Bungendore Road and the Bioreactor access.

Roadworks were being conducted at the time of the site visit for a length of approximately 500 metres, which resulted in a work zone speed limit of 40 kilometres per hour, temporary signalised control to manage one-way traffic through this section and the provision of a sidetrack at the intersection with Bungendore Road. It is assumed that two-lane two-way configuration and a posted speed limit of 100 kilometres per hour for the length of the roadworks would be maintained at the completion of the works.

12.4.4 Existing Traffic

Traffic count data for relevant locations along the classified roads was obtained from the RTA database. The Annual Average Daily Traffic (AADT) for these roads is presented in **Table 12-2**. The local road network and the traffic count stations are shown on **Figure 12-1**.

Table 12-2 Summary of Historical AADT for Surrounding Road Network

Station	Location	2000 AADT	2003 AADT	Average Annual Growth	2010 AADT Estimate[1]	Peak Hour Volume Estimate[2]
94.143	**MR268 Bungendore Road**, north of MR51 Braidwood Road, Bungendore	2,085	2,577	+8%	4,420	440
94.142	**MR79 Braidwood Road**, east of MR268 Bungendore Road, Bungendore	4,444	4,536	<+1%	4,540	450
94.470	**MR268 Bungendore Road,** at Yarralumla Shire Boundary	684	663	-1%	618	54
94.804	**MR79 Braidwood Road.** 1.5 km south of Currawong Road, Goulburn	1,309	1,458	+3%	1,794	311

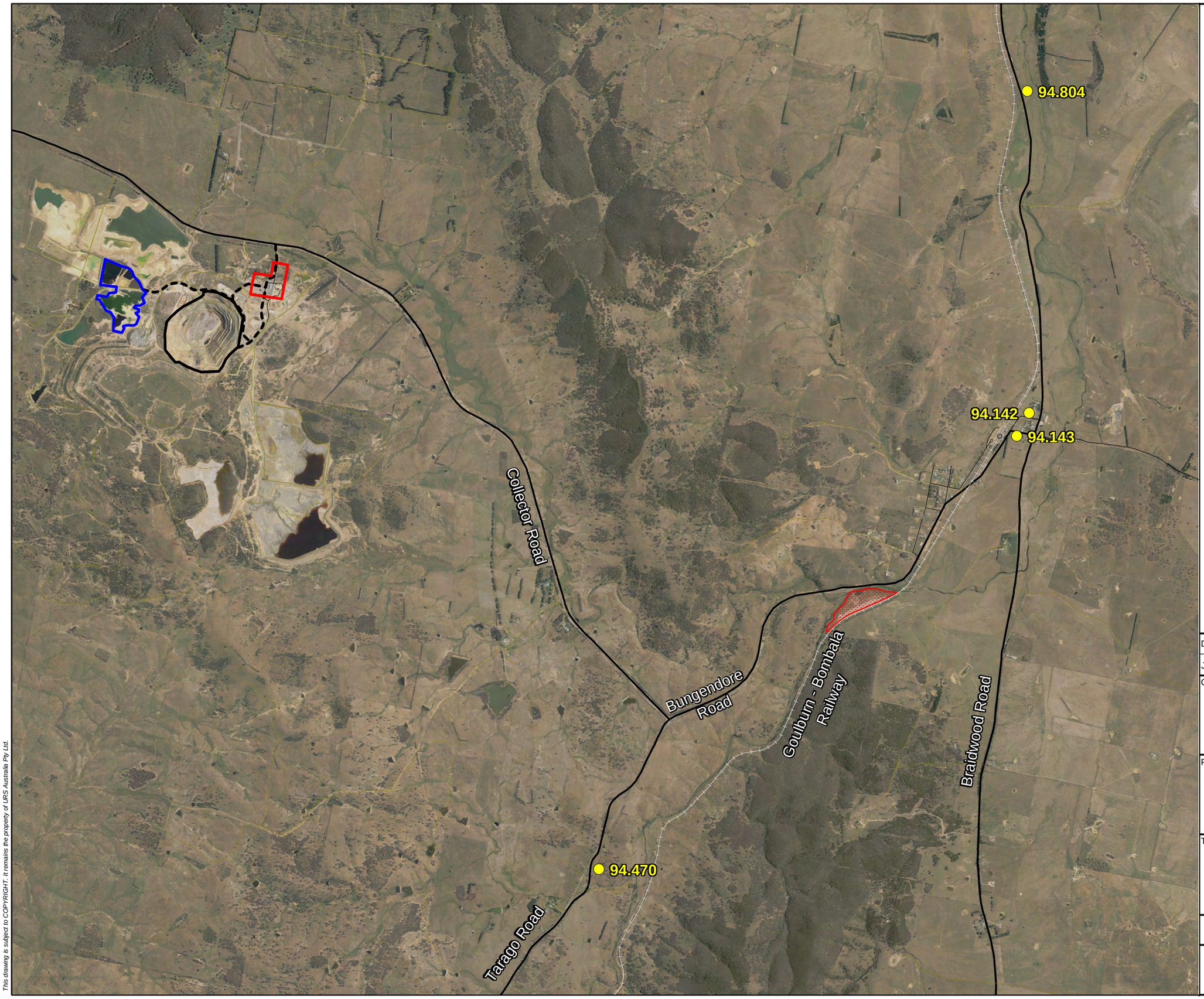
Source: RTA Traffic Volume Data Southern Region 2006.

Notes:

1. Based on linear average annual growth between 2000 and 2003 AADT data.
2. Based on the assumption that approximately ten percent of the AADT represents the peak traffic volume.

Comparing the AADT data in **Table 12-2** with the Levels of Service thresholds in **Table 12-1** indicate that Bungendore Road and Braidwood Road currently operate at Level of Service A.

Site observations on Collector Road suggest that the average daily traffic volume is less than 1,500 vehicles per day, which equates to up to 150 vehicles in the peak hour, assuming the peak hour volume represents ten percent of the average daily volume. Based on the Levels of Service specified in **Table 12-1**, Collector Road is currently operating at Level of Service A.



Legend

- RTA Traffic Count Station
- Crisps Creek Intermodal Facility

Woodlawn Bioreactor Site

- Access Road
- Void
- Site Offices, Parking, Workshop, Power Generati
- Evaporation Dam 3

N

*Map compiled using Mapinfo StreetPro 2010.
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RTA TRAFFIC COUNT STATION LOCATIONS

Figure: **12.1**	Rev: A
	A3

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12.4.5 Other State and Regional Roads

Part of this Project includes the receipt of up to 130,000 tonnes of waste per annum from regional Council areas. It is assumed that waste would be transported via three key highways that pass the Bioreactor locality before travelling along Braidwood Road, Bungendore Road and Collector Road to access the Bioreactor site. The three key highways (including a sample RTA AADT) are:

- Kings Highway, 3,705 (2006 AADT, approximately 30km east of Bungendore);
- Hume Highway (State Highway 2) – 21,071 (2003 AADT, Yarra, 1.5 km east of SH3); and
- Federal Highway (State Highway 3) – 2,619 (2006 AADT, 5km North of ACT Border).

12.5 Existing Operational Traffic

The return road haulage between the Crisps Creek IMF and the Woodlawn Bioreactor takes approximately seven hours. This time accounts for a 56-container train set to arrive and be unloaded, containerised waste to be transported to the Bioreactor and unloaded into the void, and to make the return trip to the Crisps Creek IMF. This equates to an average of 10 trips per hour or 20 vehicle movements (accounting for return trip). The original Bioreactor EIS considered traffic impacts for an average of 11 vehicles per hour, which equates to 22 movements per hour (accounting for a return trip).

12.5.1 Approved Operational Traffic

The Bioreactor facility is not the only development generating traffic within the Eco-Precinct. There are three approved facilities within the Eco-Precinct that will generate traffic concurrent with the proposed increases in vehicle activity at the Bioreactor site. The traffic generated by these facilities has been taken into account in this chapter to obtain an understanding of overall cumulative traffic impacts.

A summary of other approved, but not operational activities, in the Eco-Precinct include:

- The AWT facility – approved to accept up to 280,000 tpa of waste from the Crisps Creek IMF;
- The Woodlawn windfarm development – an approved wind energy facility on Collector Road (east of the Bioreactor site). Consent was given for approximately 200 vehicle trips generated per day during its construction phase only; and
- 50,000 tpa of regional waste to be received at the Bioreactor from the regional municipalities of Goulburn-Mulwaree, Queanbeyan, Bega Valley and Palerang Councils.

Chapter 12 Traffic and Transport

12.6 Access Arrangements

12.6.1 Crisps Creek IMF

The Crisps Creek IMF is located on Bungendore Road, approximately eight kilometres from the Woodlawn Bioreactor site. IMF access comprises a right-turn bay for eastbound movements on Bungendore Road (approximately 100 metres in length) and an acceleration lane for vehicles turning out of the facility travelling southwest towards the Bioreactor site. The sealed access road consists of a single lane of approximately seven metres width. The left and right turns into the Crisps Creek IMF access have large radii, which allow for heavy vehicle turning movements. The existing pavement adjacent to the access and along the access road is in good condition. The access location provides good sight distance in both directions.

12.6.2 Woodlawn Bioreactor

The Woodlawn Bioreactor access is on Collector Road and is a T-intersection incorporating a stop control. The access is approximately 30 metres wide with sufficient site distance to oncoming traffic in both directions. **Plates 12-1** and **12-2** illustrate the width and stop-control of the access to the Woodlawn Bioreactor. The access road is sealed with a width of approximately eight metres. The existing pavement on Collector Road adjacent to the access and the access road itself is in good condition. The left turn into the Bioreactor access has a large radius, which allows for heavy vehicle turning movements.

Plate 12-1 Woodlawn Bioreactor Access, Towards West

Plate 12-2 Woodlawn Bioreactor Access, Towards East

Source: URS, 4 February 2010.

12.7 Existing Rail Operations

Current operations involve one train set comprising of 56 containers, being transported from the Clyde Transfer Terminal to the Crisps Creek IMF on a daily basis.

The rail operations are summarised below:

- The train departs Clyde at approximately 1.30am with a laden set of containers;
- Arrive at Crisps Creek IMF at 6.30am;
- Unloading operations using a container handler commence at approximately 7 am;
- Containers are placed on prime movers to be transported to the Bioreactor;
- Prime movers return empty containers to the IMF and are reloaded onto the train; and
- Train departs the IMF at approximately 4.30pm.

12.8 Traffic Generation Estimates

12.8.1 Construction Traffic Generation

There is limited construction work associated with the Project as Veolia is not proposing to increase the footprint of either the Bioreactor of the IMF. Construction traffic would be limited to short-term deliveries to install the additional mobile and permanent lighting infrastructure at the Woodlawn Bioreactor to facilitate evening operations (**Chapter 2 Project Description**). Given the one off nature of these operations, any delivery and installation traffic is considered to have a negligible impact on the transportation network.

12.8.2 Operational Traffic Generation

The proposed increase in tonnage would require an increase to the hours of operation to unload and transport the additional containers received at Crisps Creek. **Table 12-3** summarises the average hourly vehicles required for the proposal in comparison to the original Bioreactor proposal.

Table 12-3 Average Hourly Heavy Vehicle Movements from Crisps Creek IMF, Waste Haulage

	Existing Operations	Proposed Operations	Change
Truck operation hours	0700 to 1800 (11 hours)	0600 to 2200 (16 hours)	+5 hours
Number of Vehicles to Bioreactor	10	15	+5 Vehicles
Number of Vehicles to AWT	0	6	+6 Vehicles
Total Number of Vehicles[1]	10	21	+11 Vehicles
Total Number of Vehicle Movements[2]	**20**	**42**	**+22 Vehicle Movements**

Source: Veolia, January 2010.

Notes:
1. Considers one-way vehicle movements (to/from Crisps Creek IMF)
2. Considers two-way vehicle movements (to/from Crisps Creek IMF)

Chapter 12 Traffic and Transport

The Major Project Application would require an increase in equipment and personnel at the Woodlawn Bioreactor and the Crisps Creek IMF. This includes an additional 11 employees, one forklift, one bulldozer, one landfill compactor and one container tipper. The delivery of the additional equipment is a one-off impact and is considered to have an insignificant impact on the surrounding transport network. For the purpose of this proposal it is assumed that the additional 11 employees would travel to the Bioreactor site in separate cars during the AM peak hour and leave the site in the PM peak hour.

The proposal also includes the receipt of up to 130,000 tpa of waste from regional areas, of which 50,000 tpa is already approved to be received from the regional municipalities of Goulburn-Mulwaree, Queanbeyan, Bega Valley and Palerang. Appendix H of the *Environmental Assessment – Modification to DA 31-02-99 to Receive Regional Council Waste at the Woodlawn Bioreactor* (AECOM/Veolia, February 2010) outlines the estimated traffic volumes and haulage routes between these regional areas and the Bioreactor site. These volumes are summarised in **Table 12-4**.

Although the exact sources and volumes of the additional 80,000 tpa of regional waste have not been confirmed, estimates of the traffic generated by the additional regional waste are also outlined in **Table 12-4**.

Table 12-4 Regional Vehicle Movement Impact Considerations

Council	Waste (tpa)	Annual Trucks	Daily Trucks One Way (Two-Way)
Approved Regional Waste (50,000 tpa) [1]			
Goulburn Mulwaree	20,000	1,053	4 (8)
Palerang	10,000	526	4 (8)
Queanbeyan	8,000	421	2 (4)
Bega Valley	12,000	632	2 (4)
Total	50,000	2,632	10 (20)
Additional 80,000 tpa proposed under this Environmental Assessment			
Upper Lachlan	3,000	158	1 (2)
Yass Valley	3,000	158	1 (2)
Eurobodalla	21,000	1,105	4 (8)
ACT[2]	53,000	2,789	9 (18)
Total	80,000	4,210	15 (30)

1. *Environmental Assessment – Modification to DA 31-02-99 to Receive Regional Council Waste at the Woodlawn Bioreactor (AECOM/Veolia, February 2010) – Appendix H*
2. *ACT figures based on 50% of total Commercial, Industrial and Private Waste Volumes, (ACT SoE Report, 2006/7)*

Based on a conservative approach, it is assumed that all the truck trips associated with the transportation of the 130,000 tpa of waste from regional areas would take the route via Bungendore Road and Collector Road only. A conservative truck capacity figure was used i.e. 19 tonnes. In addition, it was assumed that all daily truck movements outlined in **Table 12-4** (i.e. from surrounding areas) will occur during the peak periods. Although this may not actually occur during the operational phase, this will produce the conservative approach for the traffic impact analysis conducted in **Section 12.10** below.

Based on the figures contained in **Table 12-4**, a total of 130,000 tpa of regional waste will lead to a concomitant increase in regional traffic of approximately 6,842 vehicle trips to the Woodlawn Bioreactor per year (assuming each truck transports 19 tonnes of waste). Although waste can be transported six days per week for 52 weeks of the year, totalling 312 days per year, all waste transport has been assumed to occur during the modelled period and will represent the 'worst-case' scenario.

12.9 Other Developments in the Area

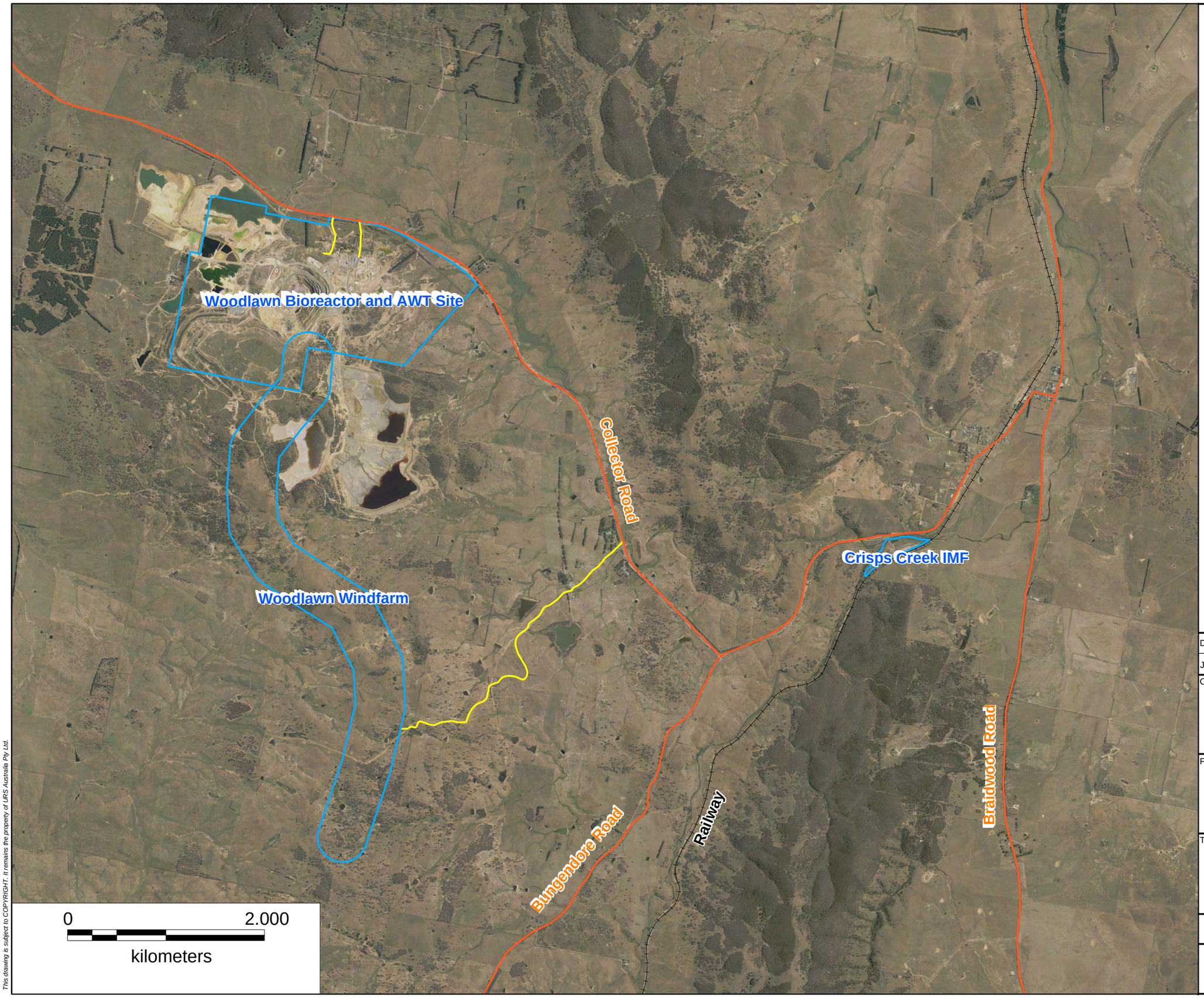
The Woodlawn Bioreactor is located on Collector Road which is subject to two additional developments that may be in their construction and/or operational phase at the same time as the increased traffic generation rates described above. The first of these developments is the Woodlawn Windfarm Project, a proposed wind energy facility incorporating twenty wind turbines. The site access to this windfarm for construction vehicles will be on Collector Road at the entrance to Pylara Farm, located east of the Bioreactor access road. Over-dimensional and construction vehicles accessing the windfarm site will be originating in Port Kembla and/or Goulburn and travel along Bungendore Road via Tarago.

The second development along Collector Road is the Woodlawn Alternate Waste Technology (AWT) Facility which is located west of the Bioreactor access road. Additional vehicles generated by this Project will be travelling between the AWT Facility and the Crisps Creek IMF.

Details of the vehicle generation assumed for each site is provided in **Table 12-5** and have been adopted in the traffic impact analysis in **Section 12.10** below.

The 130,000 tpa of waste received by the Bioreactor facility from regional LGAs (detailed in **Table 12-4** above) also needs to be taken into consideration when assessing the traffic impacts of the proposed increases in activities of the Bioreactor facility, of which 50,000 tpa is already approved.

Figure 12-2 illustrates the Bioreactor site with the nearby developments in the area.



Legend

- Site Boundaries
- Road
- Access to Sites
- Rail

N

*Map compiled using Mapinfo StreetPro 2010
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OTHER DEVELOPMENTS IN THE ECO-PRECINCT

Figure: **12.2**	Rev: A
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12.10 Impact of Traffic Generation

This section provides the degree of traffic impact created by the increase in the proposed vehicle movements and extended operational hours of the Bioreactor site. The AM Peak Hour is the chosen period to be assessed as this will produce the 'worst-case' scenario. The assumptions used in determining the traffic impact are outlined in **Section 12.10.4** below.

12.10.1 Impact on Midblocks

The impact on key roads surrounding the Crisps Creek Intermodal Facility and the Bioreactor Site with respect to increased traffic volumes is presented in **Table 12-5**.

Table 12-5 Impact Assessment of AM Peak Hour Vehicle Movements (two-way) for the Project

Activity	Collector Road	Bungendore Road	Braidwood Road
No Development			
Traffic Flow	150	440	450
Existing Operational Traffic, Woodlawn Bioreactor	10	10	0
Total Traffic Flow – Existing	160	450	450
Level of Service	A	A	A
With Proposal			
Proposed Operational Traffic (additional IMF deliveries)[1]	30	30	0
Proposed Operational Traffic, Regional waste deliveries)[2]	50	50	8
Estimated Operational Traffic, Woodlawn AWT[3]	12	12	0
Additional Staff Required at IMF and AWT facilities[4]	11	10	9
Estimated Construction Traffic, Woodlawn Windfarm[5]	70	65	58
Total Traffic Flow – with Proposal	333	617	525
Percentage Change (from No Development)	108%	37%	17%
Midblock Level of Service	A	B	A / B[7]

Source: URS, February 2010.

Notes:

1. Represents two-way movements between Bioreactor and IMF.
2. Refer **Table 12-4** for values – assumed all two-way movements occur during AM Peak Hour for 'worst-case scenario'.
3. Represents a total of twelve two-way truck movements between AWT site and IMF.
4. Represents one-way movements to site during AM Peak Hour. Assume employee distribution of 75% from Goulburn/Tarago, 15% from Bungendore and 10% from Collector.
5. Total construction volumes have been based on the *Woodlawn Wind Farm Modifications – Statement of Environmental Effects* (Aurecon, Jan 2010). Total of 50 one-way personnel movements and 20 return truck trips during AM Peak Hour. Assume employee distribution of 75% from Goulburn/Tarago, 15% from Bungendore and 10% from Collector for turning movement split for site access.
6. A level of service 'B' is still considered to have reasonable freedom of congestion and is not of any concern.
7. A level of service 'A' applies to Braidwood Road if the majority of its length is considered level terrain or is otherwise 'B' if considered rolling terrain. The site inspection indicated that the road typography is somewhere in between and therefore both levels of service have been provided. Nonetheless, a level of service 'B' is still considered to have reasonable freedom and is not of any concern.

Analysis of **Table 12-5** for the Major Project Application indicates the following key elements:

- AM Peak Hour traffic on Collector Road would be approximately 108 percent higher than the existing traffic volumes. Despite this significant increase in peak hour traffic volumes, the Level of Service for Collector Road remains unchanged at Level of Service A.
- AM Peak Hour traffic on Bungendore Road and Braidwood Road would increase by 37 and 17 percent respectively and would have negligible impact on the operation of the roads.

As outlined earlier, it is expected that up to 130,000 tpa of waste may be transported from regional areas to the Bioreactor site for disposal. An assessment of the proposed delivery of waste to the Bioreactor from these areas including sources, transportation arrangements, haulage routes and associated impacts, has been incorporated into **Table 12-5** and turning movements are outlined under the assumptions listed below. As addressed in **Section 12.10.4**, it is assumed that the route taken by road is likely to be via the state highway network then Bungendore Road and Collector Road to access the Bioreactor site. Based on the existing high traffic volumes on the state highway network and the likelihood that these vehicular movements would be spread over a wide transport network, it is anticipated that traffic generated by this proposal on other road midblocks would be negligible and would be dissipated within normal traffic growth.

The cumulative effect of nearby developments proposed to be developed or operating simultaneously has also been considered in **Table 12-5**.

12.10.2 Impact at Intersections

The SIDRA modelling package was used to analyse the performance of the existing road network to identify the current traffic characteristics (in 2010 estimates) at three key intersections between the Crisps Creek IMF and Woodlawn Bioreactor sites:

- Crisps Creek IMF site access / Bungendore Road intersection;
- Bungendore Road / Collector Road intersection; and
- Woodlawn Bioreactor site access / Collector Road intersection.

There are a number of other intersections in the surrounding area (such as in Goulburn, Collector and Bungendore), however the impact of operational vehicles at these intersections will be negligible i.e. the only vehicles during the operational phase of the development will be from regional areas and will amount to only a handful of vehicles per hour.

12.10.3 SIDRA Analysis

Table 12-6 provides the SIDRA analysis outputs for the three nominated intersections. The ‘degree of saturation’ and ‘95% queue length’ are used to compare the effect that operational vehicles will have on the operation of the intersections.

Table 12-6 SIDRA Analysis Results

Intersection		2010 Existing Conditions	2010 Estimated Values[1]	Critical Movement
Crisps Creek IMF site access / Bungendore Road intersection	Degree of Saturation	0.13	0.19	Eastbound Bungendore Road right turn into IMF site
	95% Queue Length	Less than one vehicle[2]	12m	
Bungendore Road / Collector Road intersection	Degree of Saturation	0.18	0.55	Eastbound Collector Road left and right turn movements into Bungendore Road
	95% Queue Length	7m	42m	
Woodlawn Bioreactor site access / Collector Road intersection	Degree of Saturation	0.05	0.23	Northbound Bioreactor site access right turn into Collector Road
	95% Queue Length	6m	15m	

Notes:

1. Includes impacts of proposed increase in Bioreactor volumes and cumulative effects of adjacent developments and regional LGA deliveries.
2. Queue Lengths of 'less than one vehicle' refer to a distance less than 6m.
3. The Degree of Saturation refers to the ratio of an intersection between the traffic demand at the intersection compared to its total capacity. An intersection with a Degree of Saturation approaching 0.90 to 0.95 is considered to be at capacity.
4. The 95% queue length value is used as an indication of the length whereby the probability of exceeding it is only 5% - often referred to as the design queue length.

The analysis summary provided in **Table 12-6** during the AM Peak Hour indicates that the additional truck movements associated with the proposed increase in activities at the Woodlawn Bioreactor site will cause no significant traffic impacts. The Degree of Saturation outputs for all three intersections are well below the 0.90-0.95 threshold and the longest queue length is expected to be 42m (i.e. approximately 7 cars). As such, there is no indication that intersection improvements will be required even after taking into account the additional cumulative impact of the adjacent developments on the existing traffic.

12.10.4 Assumptions

Turning movements and heavy vehicle volumes must be known or estimated in order for intersection performance to be analysed in SIDRA. The Midblock volumes, supplied by RTA counts, are the only known data and as such a number of assumptions have been made for the purposes of SIDRA modelling, including:

- Existing Traffic Conditions
  - Existing traffic directional split along Bungendore Road and Collector Road is assumed to be 50/50 (eg. 50% northbound, 50% southbound);
  - A conservative estimate of existing heavy vehicle proportion of 10% has been applied to all road sections;
  - The AM Peak Hour has been modelled and is estimated to represent 10% of total daily volumes; and

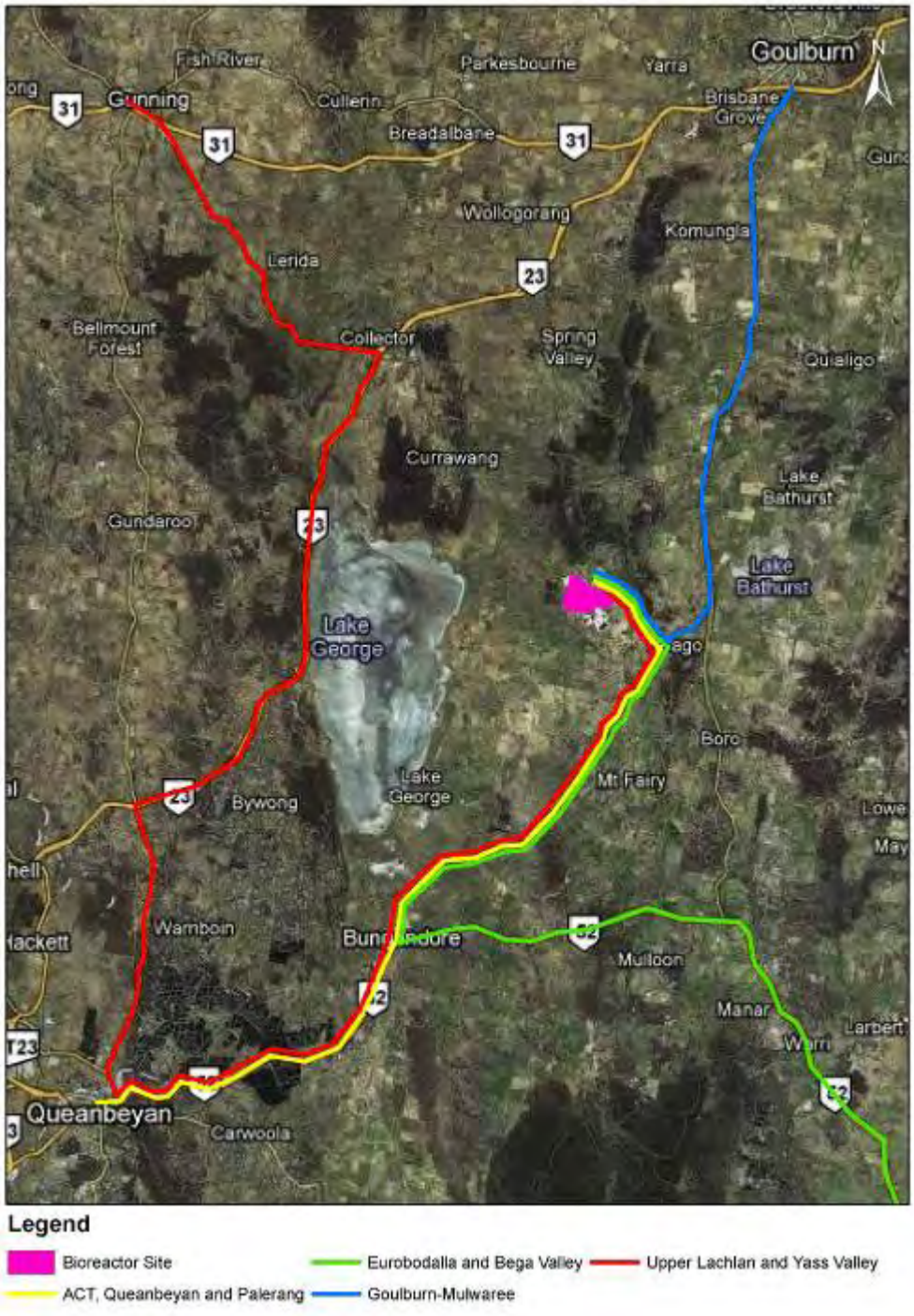
  - Collector Road attracts 10% of northbound traffic and 10% of southbound traffic on Bungendore Road.

- Additional Bioreactor Vehicles
  - The public road network is assumed to have 100km/h posted speed limits while the Bioreactor and IMF site accesses will apply a 50km/h speed limit;
  - All additional truck movements from regional areas (**Figure 12-3**) will occur in the AM Peak Hour;
  - All truck movements from regional areas will arrive at the site on Collector Road from the east with all deliveries following the route defined above;
  - All personnel vehicle movements will occur during the AM Peak Hour and will be inbound to the site; and
  - Daily truck vehicle volumes are assumed to occur evenly over the proposed 16-hour working day.

These assumptions may be conservative when being applied to the AM Peak Hour. However, these assumptions will provide a 'worst-case scenario' of the traffic impacts of the increased operations of the Woodlawn Bioreactor as well as taking into account the cumulative impacts of surrounding developments.

A diagram of the delivery routes, used for the various developments along Collector Road and predicted to contribute to the cumulative impact of the construction and/or operation of these sites, is provided in **Figure 12-4**.

Figure 12-3 Haulage Routes for Regional Areas



Woodlawn Bioreactor and AWT Site

Woodlawn Windfarm

Collector Road

Crisps Creek IMF

Bungendore Road

Railway

Braidwood Road

0 2.000

kilometers

N

Legend

- Site Boundaries
- Rail
- Road
- Woodlawn Windfarm Construction Traffic
- Woodlawn Bioreactor (IMF - Bioreactor)
- Woodlawn AWT (IMF - AWT)

*Map compiled using Mapinfo StreetPro 2010
URS Australia and Mapinfo Australia do not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that these two companies shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

Source: Aerial Imagery from ©Land & Property Management Authority (LPMA) [2009]
Datum: GDA94, Projection: UTM, Grid: MGA Zone 55

Drawn: SB	Approved: WB	Date: 11/08/2010
Job No: **43177703**	File: 43177703-023.wor	

Client

VEOLIA ENVIRONMENTAL SERVICES PTY LTD

Project

WOODLAWN EXPANSION PROJECT

Title

VEHICLE ROUTES OF DEVELOPMENTS IN ECO-PRECINCT

Figure: **12.4** Rev: A **A3**

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12.11 Vehicle Size

A conservative estimated capacity of waste transport vehicles between the Crisps Creek IMF and the Woodlawn Bioreactor site is a 19-tonne truck. This vehicle size and mass is below that of the B-Double which has a defined road network capable of accommodating these size limits. Map 30 of the RTA's *Travel Restrictions Vehicle Routes* indicates that Collector Road (between the Bioreactor site and Bungendore Road) and Bungendore Road (between Collector Road and Braidwood Road) are declared to be suitable for B-Double vehicle movements. These road sections incorporate the full route between the IMF and Bioreactor sites and as such there are no limitations in the existing infrastructure for vehicle sizes up to and including the B-Double (which includes 19-tonne trucks). Consequently, road and intersection upgrades (due to physical dimensions, weight and swept path of vehicles), associated with the proposed increased activity of the Bioreactor site, are not required; these upgrades have already been accommodated along the required lengths of Collector Road and Bungendore Road.

Section 7.2.2 of the *Goulburn Mulwaree Development Control Plan 2009* identifies a Haulage Route Standard. This standard outlines typical requirements expected by Council for road sections that are being upgraded due to utilisation as a haulage route for a particular development. However, no road or intersection upgrades along any haulage routes are required as Collector Road and Bungendore Road (between the IMF and Bioreactor facilities) have already been constructed to permit the use of vehicles up to a B-Double. As a result, the Haulage Route Standards do not apply to the proposed increase in vehicle movements outlined in this traffic assessment.

12.12 Access Arrangements

The existing accesses to the Crisps Creek Intermodal Facility and Bioreactor sites are adequate for the additional vehicles expected to be generated by the proposal, and allow for the heavy vehicle turning movements associated with the haulage of waste, including B-double access. The impact on the existing accesses is anticipated to be insignificant and the safety of the accesses would not be compromised with the additional traffic.

12.13 Parking Provision

There is currently parking provision for over 50 vehicles at the Bioreactor site with an observed utilisation of 10% during current operations. The additional employees generated by the proposed increase in activity at the site (total of 6) will be easily catered for by the current spare capacity of the parking area.

Existing truck parking areas within the Crisps Creek Intermodal Facility and the Bioreactor site are adequate for the additional vehicles required for the haulage of waste.

12.14 Rail Based Operational Impacts

In November 2009, Veolia requested Pacific National, the rail operator, to undertake an assessment of existing rail capacity to enable the proposed increase in tonnage to be transported from the Clyde marshalling yards to the Crisps Creek IMF. This assessment was updated in June 2010 by the rail operator and a copy contained in Appendix A.

The findings of this assessment concluded that 1.18 million tpa rail capacity at the Crisps Creek IMF would be achievable. This is based on the Crisps Creek IMF receiving two train sets per day, six days a week, with 60 containers on each train and a payload of 32 net tonnes per container.

It is important to note that under the existing EPL conditions, and under the conditions of the existing development consent for the operations of the Crisps Creek IMF, the facility is approved to receive and unload up to two trains per day 6 days a week.

12.14.1 Proposed Rail Scheduling

The transportation of 1.18 million tpa of containerised waste can be accommodated by the current rail system by running two train sets per day with 60 containers on each. Each train will be accommodated within the Crisps Creek IMF as shown in **Table 12-7** below**.**

Table 12-7 Crisps Creek IMF Siding Capacity

No. of Wagons	Total Length of Wagons (m)	Total length of train set incl. locomotive (m)	Length of Crisps Creek Siding 1 (m)	Length of Crisps Creek Siding 2 (m)	Total length of Crisps Creek Siding (m)	Variance (m)
60	876	940	557	580	1137	197

The proposed train would only be 29.2m longer than the one currently deployed by the rail operator and as such the proposed trains would still be within current rail specifications both in terms of infrastructure and operating / service conditions.

Train scheduling would be expected to work with the two trains arriving at two separate times during the day. Based on the current rail network constraints, the first train would be expected to remain on its current approved plan whereby it leaves Clyde at 01:42 and arrives at Crisps Creek at 06:30 and shunted into position. As is currently the case, the containers would be unloaded onto trucks and transported to Woodlawn. In order to accommodate a second train, the first train would leave Crisps Creek at approximately 13:15.arriving at Clyde by 19:30. Based on current operating conditions, the second train would be expected to leave Clyde at 09:30 after the morning commuter peak period, and arrive at Crisps Creek at 14:45. As with the first train it would then be unloaded and containers transported to Woodlawn on trucks. The second train would be scheduled to leave Crisps Creek at 20:00 and arrive at Clyde by 03:30. **Table 12-8** shows the expected operating plan to support the increased capacity based on existing freight operating curfews, crossings loops and rail network scheduling.

Table 12-8 Expected Future Rail Scheduling - Crisps Creek IMF

Future Operations Train Schedule				
	Train 1		Train 2	
	Clyde	Crisps Creek	Clyde	Crisps Creek
Depart	01:42		09:30	
Arrive		06:30		14:45
Depart		13:15		20:00
Arrive	19:30		03:30	

12.14.2 Crisps Creek Operations

The current infrastructure and equipment at both Crisps Creek and Woodlawn would enable the two trains to be safely and effectively unloaded at Crisps Creek, transported to Woodlawn, emptied and returned to Crisps Creek within the windows provided by Pacific National (**Table 12-8**). This is based on the current average turn around time for the road haulage of 40 minutes.

With a continuous flow of truck movements each train could be unloaded using a single container handler and a single container tipper within a 6 hour period. If a train is required to be unloaded and reloaded within a shorter period of time, a second container handler and container tipper could be utilised. This would effectively halve the period of time needed to unload and load a train. Two container handlers and container tippers are already a part of the current operation and are only used in the event of any unforseen issues arising due to maintenance, delays or emergency. This contingency measure would remain unchanged for the two train schedule.

12.14.3 Rail / Road Interactions

At present, the train is required to temporarily park across Bungendore Road level crossing after leaving the Crisps Creek Intermodal Facility. This is to enable the train driver to activate the manual switching device to allow for travel through to Goulburn. The obstruction of the level crossing has the potential to impact on motorist travelling on this part of Bungendore Road.

Veolia has received correspondence from Australian Rail Track Corporation (ARTC) advising that work has commenced to alter the method of train operation on the Canberra line to an electronic switching system known as 'Train Working Order'. Under this working, trains will no longer be required to stop at the Tarago platform and block the Bungendore Road level crossing. ARTC expects to finalise this work in 2011. A copy of this letter is included in **Appendix H – Transport Impact Assessment**.

12.14.4 Contingency Planning

Existing contingency plans for Crisps Creek for late trains or truck transport issues include the ability to unload trains quickly by using the second container handler and tipper. This effectively allows for the train to be unloaded twice as quickly as normally scheduled. Additional contingency measures include the ability to remove the last 6 to 8 containers from the train and place them on the IMF's hard stand, then replacing them with spare empty containers, thus allowing the train to leave earlier. The remaining containers can then be transported to Woodlawn for emptying without affecting the train schedule. These contingency measures would also apply in the case of two train sets.

12.15 Mitigation and Management Measures

Traffic generated by this proposal is not considered to have a significant impact on the existing transport network, with current operation anticipated to remain at an acceptable Level of Service for key roads.

The existing Traffic Management Plan for the IMF and Bioreactor operations would be updated to account for increased hours of operation and increased haulage of waste between Crisps Creek IMF and the Bioreactor site including the receipt of regional waste by road.

Chapter 12 Traffic and Transport

The pavement condition of the route between the Crisps Creek IMF and the Bioreactor site is to be monitored to assess damage caused by haulage vehicles. Financial contributions for repairs would be required under Council's Section 94 Contributions Plan.

Mitigation Measure	Implementation - Operation
Update the Traffic Management Plan for the existing operation activities to include the increased hours of operation and increased haulage activities	✓
Assess pavement condition and provide financial contributions to Council for repair of haulage routes	✓

13.1 Introduction

As part of this Environmental Assessment, a Socio-Economic Impact Assessment was undertaken to understand the broader social and economic impacts that would be generated by the Project. The Socio-Economic Assessment is provided as **Appendix I** to this EA and a summary of the findings are presented in this chapter.

13.2 Existing Regional Socio-economic Conditions

The existing local and regional socio-economic environment is outlined below. The Bioreactor facility falls within the local government area (LGA) of Goulburn Mulwaree Council and is on the boundary of Palerang Council. As any impact of the facility is largely localised, the area of analysis was restricted to those two LGAs.

An understanding of the current socio-economic conditions provides a comparative basis for impacts as it forms the basis for a 'without' proposed development scenario, which is supplemented by a 'with' development scenario addressed in later sections of this chapter.

13.2.1 Demographics

Population

As illustrated in **Table 13-1**, both the Goulburn Mulwaree and Palerang LGA population have experienced growth since 1996. This is consistent with (and, in the case of Palerang, significantly higher than) the rate of population growth for New South Wales as a whole during the period, which was 0.9 percent per year.

Tarago, the town nearest the Woodlawn site is not recognised as an urban locality, indicating that it most likely has a population of less than 200 people.

Table 13-1 Population change 1996 - 2006

LGA	Population (no. people)		Average annual growth rate
	1996	2006	
Goulburn Mulwaree	25,779	26,962	0.5%
Palerang	9450	12,386	3.1%

13.3 Labour force

In 2006, the labour force was 6,567 people in Palerang and 11,923 people in Goulburn-Mulwaree. **Table 13-2** outlines the difference in employment and unemployment rates between Palerang and Goulburn. As of 2006, Palerang has a higher proportion of the population employed than either Goulburn or NSW. The participation rate and unemployment rate in Goulburn-Mulwaree have shifted between 1996 and 2006 – it now sits below the state average participation rate, and above the average unemployment rate. Overall, unemployment rates have decreased in NSW, Goulburn and Palerang, with the greatest decrease evident in Palerang.

Table 13-2 Labour force participation and employment, 1996 - 2006

LGA/state	Participation rate[1]			Unemployment rate	
	1996	2006	2006	1996	2006
Palerang	71.1%	6,567	72.4%	6.2%	2.8%
Goulburn-Mulwaree	62.9%	11,923	57.9%	7.4%	6.2%
New South Wales	61.1%	3,092,600	63.2%	8.8%	5.9%

[1] Refers to the number/percentage of people of working age either working or looking for work

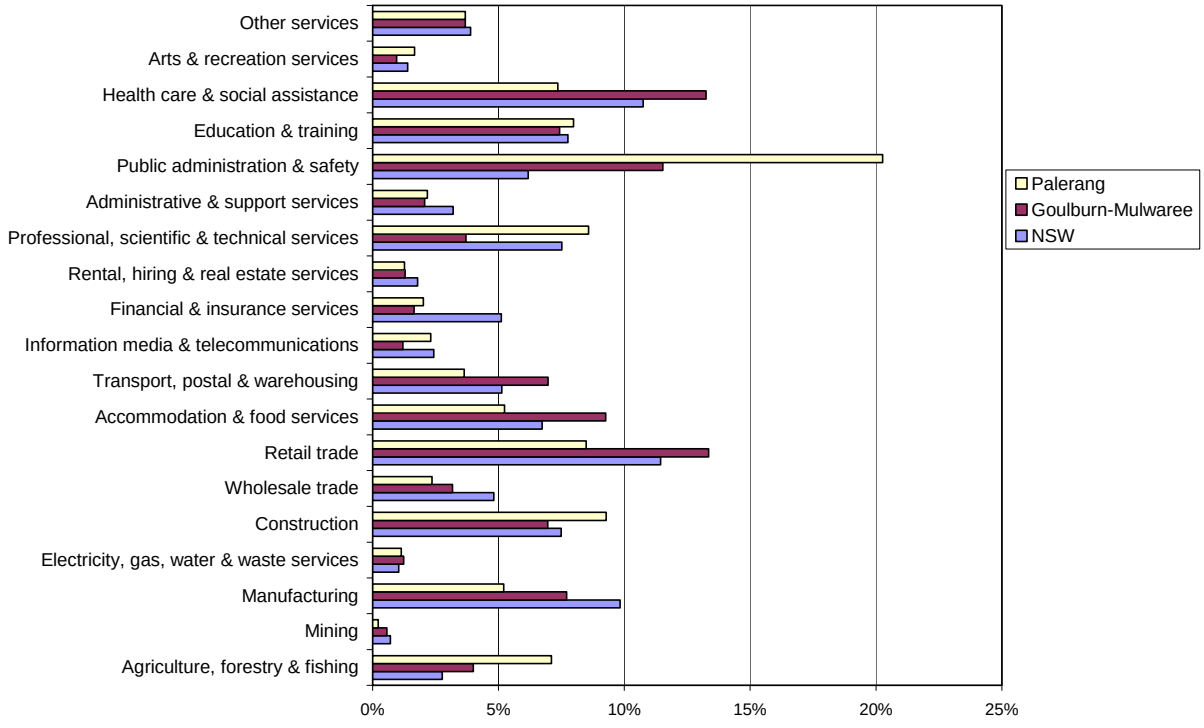
13.3.1 Industry Employment

In terms of the proportion of the working population, **Figure 13-1** outlines the major employment industries for Palerang, Goulburn and NSW.

The major industries in terms of the proportion of the working population employed in different industries are also shown in **Figure 13-1**. The three main industries in Palerang are public administration and safety (1,264 employees), construction (579 employees) and professional, scientific and technical services (535 employees). This is likely a function of the area's proximity to Canberra and Queanbeyan, with many of those employed commuting to these cities on a regular basis (Palerang Council, 2008).

In Goulburn, the three main industries are retail trade (1,476 employees), health care and social assistance (1,455 employees) and public administration and safety (1,267 employees).

Figure 13-1 Percentage employment by industry



Income

Household incomes across the project area vary substantially. The median weekly household income in Palerang in 2006 was reported as $1,285 – over $200 per week higher than the NSW average of $1,034. In Goulburn-Mulwaree, by contrast, the median weekly household income was $842 (ABS 2007).

13.4 Current Impacts

Localised impacts

The Bioreactor has been operational since September 2004. The site employs 26 staff (including 6 subcontractors), predominantly from Tarago and Goulburn, with major occupations being truck/forklift drivers and heavy machinery operators. In 2009, Veolia contributed approximately $3.8 million to the local community through purchases of goods and services. It is assumed that this would be ongoing for the life of the site (excluding site closure and remediation costs). This is in addition to the contributions made through the Veolia Mulwaree Trust.

Both during the initial community consultation program, and since operations began at the facility, Veolia have engaged directly with the community at a local level. Any issues raised by the community can be tabled at the Community Liaison Committee of which Veolia are a member, and which meets regularly to discuss the development. During commissioning of the Bioreactor facility a number of odour complaints were reported to Veolia by residents along Taylors Creek Road and Tarago Village. These complaints were identified in the most recent compliance report (Veolia 2009a), and, where attributable to Veolia, operations have been changed, improved or amended in order to reduce any offsite odour impacts. Veolia continues to monitor offsite impacts from the facility, as required by the Consent and Environment Protection Licence, and in accordance with the principles of continuous improvement required by Veolia's ISO 14001 accreditation. Veolia will continue to work with the local community as part of the Community Liaison Committee in all facets of the site operation.

Impacts associated with train movements through the level crossing in Tarago have also been raised through the community liaison committee. Issues raised include noise arising as a result of trains starting and stopping as well as the delays in road traffic while the train is occupying the level crossing. As these impacts relate to rail activities on the main rail corridor, Veolia have raised these issues with the rail operator, Pacific National, and the track owner, Australian Rail Track Corporation (ARTC) (Veolia 2009b). Correspondence in relation to these rail operations is included in the Transport Impact Assessment, which is provided as **Appendix H** to this Environmental Assessment.

Broader impacts

The site currently receives 400,000 tonnes of putrescible waste per year from the greater Sydney region. It provides a valuable alternative to assist in managing a current capacity shortage for putrescible waste disposal in the Sydney region.

Methane is a greenhouse gas which is released as waste decomposes. It has a global warming potential of 21 times that of carbon dioxide (UNFCCC 1995). Traditional landfills capture methane only when the landfill is filled and capped – the Woodlawn Bioreactor, in contrast, captures methane as the void is being filled, through a system of pipes. This means that it has the ability to capture a greater proportion of the total methane produced.

Chapter 13 Socio Economic

Since commencement of the Woodlawn Bioreactor until the end of 2009, the site has abated 119,490 tonnes of CO_2e through flaring and electricity production. The site has also generated 19,726 Renewable Electricity Certificates (REC's) and 74,167 New South Wales Greenhouse Abatement Certificates (NGAC's) (pers.comm, 18/3/2010) since the site was opened. This rate of production is equivalent to the electricity required to power approximately 1800 houses during the 2009/2010 financial year alone. This level of methane capture enabled by the operation of the Bioreactor results in significant environmental benefits when compared to traditional landfills.

13.5 Impact Assessment

A number of social and economic impacts were identified within the Socio-Economic Impact Assessment which are outlined below. It should be noted that the duration of all impacts identified will be reduced as a result of the increased waste input rates proposed as part of the project.

13.5.1 Odour

Atmospheric dispersion modelling of odour has been undertaken and is presented in **Chapter 9** and **Appendix D** of this EA. The modelling indicates that at all surrounding residences, odour is predicted to be at concentrations less than 4.1 OU as a 99th percentile, 1 second average. The Project specific odour performance goal was assumed to be 6 OU. Comparison with a 'base case' scenario designed to reflect current operating conditions at the site showed no increase in odour impact at surrounding receptors resulting from the increase in surface area of waste.

A worst case scenario was modelled, with all liquid storage areas modelled at capacity and with an active waste tipping area of 2 ha. In reality, leachate (treated and untreated) storage areas are unlikely to be at levels approaching capacity as leachate is used on the waste to encourage degradation of fresh waste. Excessive storage is unlikely and an active waste tipping face of the modelled size should not be required in reality.

Based upon the results of the modelling assessment, it is not considered that the proposed Woodlawn Expansion Project will lead to an exceedance of the odour performance goal.

Current management practices employed at the site to ensure project air quality goals are achieved will be maintained, including:

- traffic would be restricted to designated sealed access roads within and around the site;
- waste within the bioreactor would continue to be covered at days end;
- water carts for dust suppression continue to be utilised as required; and
- air quality monitoring in accordance with the existing AAQMP would continue.

13.5.2 Noise

As described in Section 13.4, impacts associated with train movements through the level crossing in Tarago have been communicated to the rail operator, Pacific National, and the track owner, Australian Rail Track Corporation (ARTC) (Veolia 2009b). Correspondence in relation to these rail operations is included in the Transport Impact Assessment, which is provided as **Appendix H** to this Environmental Assessment. Veolia are committed to minimising impacts due to noise on local residents and have

complied with all Development Consent and Environment Protection Licence conditions since opening the facility and during construction.

The noise assessment provided as **Appendix G** within this EA considered the following potential environmental noise impacts:

- Noise impact of the Woodlawn Bioreactor and Crisps Creek Intermodal Facility as a result of the Woodlawn Expansion Project and extended hour of operation;
- Cumulative impact of noise from the existing Woodlawn Bioreactor, approved Woodlawn Wind Farm, and approved AWT; and
- Traffic noise impact of the total proposed transportation of waste from the Crisps Creek Intermodal Facility, and regional waste to the Bioreactor as well transport associated with the approved AWT facility.

Operational noise emission levels from Woodlawn Bioreactor and the Crisps Creek Intermodal Facility due to the proposed Woodlawn Expansion Project were predicted to meet the relevant project specific noise goals over the extended hours at all existing non-project related residential dwellings surrounding the site.

The cumulative impact of noise from the existing Woodlawn Bioreactor, approved Woodlawn Wind Farm, and approved AWT were predicted to comply with the relevant criteria set in accordance with the INP at residential receivers surrounding the site.

The contribution to traffic noise from heavy vehicles associated with the Woodlawn site, including the additional traffic generated from the Crisps Creek Intermodal Facility (IMF) and the regional waste component was predicted to comply with the ECRTN criteria.

13.5.3 Attainment of waste management objectives

The *Waste Avoidance and Resource Recovery Act 2001 (NSW)* and the *Protection of the Environment Operations Act 1997 (NSW)* (the PEO Act) set out the waste management objectives of the NSW government. These Acts stress the need for environmental protection and ecologically sustainable development. Of particular interest to the Woodlawn Bioreactor are a number of objectives of the PEO Act, namely 'the reduction to harmless levels of the discharge of substances likely to cause harm to the environment' and 'the reduction in the use of materials and the re-use, recovery or recycling of materials' (NSW Government, nd).

The proposal to increase the amount of waste received at the Woodlawn Bioreactor would assist in meeting these objectives because it would assist in reducing the amount of harmful methane released into the atmosphere from decomposing waste. This then can be used as an alternative energy source and assist in reducing the amount of energy required to be produced from unsustainable sources such as coal. Further detail regarding resource recovery initiatives, and alternative waste management measures are detailed in **Chapter 3**.

Limited putrescible landfill capacity has been identified as an immediate concern by the NSW government. In 2008 it commissioned the Wright Review (Wright 2009) to assess landfill capacity and demand in the Sydney region. The Wright Review identified an ongoing need for increased landfill

capacity to address increases in waste received from the Sydney region (**Chapter 3 Project Need and Justification**).

13.6 Economic Impact

13.6.1 Employment

The project is anticipated to result in an additional 11 employees being hired at the Woodlawn site. These are expected to be local hires and therefore lead to increased employment in the region for the life of the site. The additional staff are likely to be required to possess a similar skill mix as current staff (i.e heavy machinery operators and drivers).

13.6.2 Local expenditure

The estimated cost of the proposal is $2.4 million, predominantly to be spent on new equipment. It is expected that this expenditure would be incurred outside the local area. It is assumed that Veolia would continue to spend $3.8 million per year on purchased goods and services for the remainder of the bioreactor life, regardless of the input rate (although in reality this figure is likely to increase). This is in addition to the contributions made to the Veolia Mulwaree Trust which would continue to be used to fund local community projects. To date Veolia have contributed over $3.2million to community projects and will continue to support local initiatives through the Trust.

13.7 Summary of Impacts

Overall, the proposal to increase the maximum input rate of the Bioreactor from 500,000 tpa to 1.13 million tpa and to increase the maximum throughput rate at the Crisps Creek IMF to 1.18 million tpa is identified as bringing forward impacts and/or benefits that would have otherwise occurred, in effect condensing them into a shorter timeframe.

Identified impacts, and benefits will be reduced in duration as a result of the increased input rates. Based on continued implementation of environmental management at the site, the community is likely to benefit overall in the long term. Veolia's contributions towards community facilities, through such groups as the Veolia Mulwaree Trust, and through section 94 development contributions, will continue. Veolia has well established mechanisms in place for addressing community concerns for engaging with the community to assist in the management of issues raised.

14.1 Introduction

Planager Pty Ltd was commissioned by URS Australia Limited to prepare a Preliminary Hazard Analysis (PHA) as part of the Director General's Requirements for the proposed expansion project. The full report prepared by Planager Pty Ltd is presented as **Appendix J** to this Environmental Assessment.

The PHA has assessed the potential for on and off site risks, including fire risk and management, risks associated with gases produced at the facility and risks relating to the storage of hazardous material.

The aim of the PHA is to:

- identify and analyse the hazards and risks associated with all processes involved with the handling and transporting of potentially hazardous material which forms part of the Expansion Project;
- assess the findings against the risk criteria currently in use by NSW Department of Planning; and
- identify opportunities for risk reduction, and make recommendations as appropriate.

In accordance with Department of Planning's HIPAP No. 3 *(Environmental Risk Impact Assessment Guidelines),* the safety assessment process would continue throughout the design, construction and commissioning of a potentially hazardous facility to refine and update the outcome of the development approval / environmental risk process.

14.2 Methodology

14.2.1 Hazard and Risk Screening

A hazard and risk screening has been conducted in accordance with the State Environmental Planning Policy No. 33 — *Hazardous and Offensive Development* (SEPP 33). SEPP 33 represents the approach used in NSW for planning and assessing proposals for industrial development. Through the policy, the permissibility of an industrial proposal is linked to its safety and pollution control performance. SEPP 33 ensures that only those industrial proposals which are suitably located and able to demonstrate that they can be built and operated with an adequate level of safety, can proceed.

SEPP 33 applies to any proposals which fall under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. For development proposals classified as 'potentially hazardous industry' the policy establishes a comprehensive test by way of a PHA to determine the risk to people, property and the environment at the proposed location and in the presence of controls.

The PHA has been conducted in accordance with the NSW Department of Planning's requirements for hazard and risk assessment as detailed in their Hazardous Industry Planning Advisory Paper number 6: *Guidelines for Hazard Analysis*.

The screening procedure is primarily based on the quantity of potentially hazardous materials involved in the proposal and, in some cases, the distance of these materials from the site boundary. The potential for a proposal, in the absence of safeguards, to emit a polluting discharge is assessed as part of the screening process. Further, the quantities of materials (potentially hazardous and/or dangerous goods) transported to and from the facilities are also assessed.

Chapter 14 Preliminary Hazard Analysis

The Woodlawn Bioreactor does not involve the storage or use of substances which are classified as Dangerous Goods under the *Australian Dangerous Goods Code*. With the low levels of risk associated with the Project, this PHA has been kept qualitative and therefore no quantification of any risks has been conducted.

The Crisps Creek IMF & Woodlawn Bioreactor facilities operate under current NSW EPL licences which would have to be reviewed by DECCW as part of the expansion proposal. The PHA considers that the proposal has the potential to be offensive. The document *Applying SEPP 33* indicates that the level of offense would not be considered as significant if relevant licences can be obtained.

14.3 Hazardous Materials

A list of the types and storage quantities of materials that are likely to be found at the proposed site is included in Table **14-1** below. The quantities are indicative only.

Table 14-1 Typical Chemicals & Products Stored on Site

Plant Area / Use	Chemical / Product	Anticipated Storage Qty
Fuel for vehicles	Distillate (Diesel)	70,000L capacity aboveground tank – maximum of 35,000 L stored at any one time; and 10,000L capacity underground tank – maximum of 4,000L stored at any one time
Transformers, pumps, air compressor, lubrication, fire pump	Insulating oil	Maximum of 4,500L stored at any one time
Chemicals for maintenance, repair work or cleaning up	Chemicals typically used in workshops	Various minor quantities of chemicals, managed through standards processes,

14.4 Potential for Hazard Incidents

The PHA identified a number of potential incidents pertaining to the site and the proposed expansion as summarised in **Table 14-2** below. The PHA noted that each of the identified hazards listed below represents existing hazards at the facility, and that management of these hazards has been ongoing since the commencement of operations in 2004.

Table 14-2 Identified Hazards

Number	Hazardous Event Potential
1	Loss of containment of fuel or oil leading to environmental pollution if not properly contained.
2	Fire in land fill (waste, gas)
3	Fire In Waste Haulage Vehicle
4	Fire In Offices / Workshops / Laboratory
5	Fire Involving Site Plant And Equipment
6	Bush fire at site boundary
7	Loss of containment of acid mine drainage waters and leachate
8	Exposure to hydrogen sulphide (H2S) and other potentially harmful or toxic gases (nitrogen, methane, carbon dioxide)
9	Biological hazards

Number	Hazardous Event Potential
10	Geotechnical instability / dam failure or overflow
11	Fire / explosion at the power station
12	Extraction of gas risks
13	Power station risks (High voltage area, low voltage area, generators)
14	Flare operation risks
15	Risks during export of electricity (cable pits, transformers, circuit breaker)
16	Flooding results in process upsets and damage to plant and equipment.
17	Land subsidence, earthquake or mining activity resulting in plant damage.

Six hazards (fire in land fill (waste, gas), fire in waste haulage vehicles, exposure to hydrogen sulphide (H_2S) and other potentially harmful or toxic gases (nitrogen, methane, carbon dioxide), biological hazards, fire / explosion at the on-site power station and extraction of gas risks were considered in further detail. The remaining hazards were considered appropriately managed or as negligible risks providing safeguards and operational procedures followed suitable management strategies.

The detailed risk assessment is presented in **Appendix J** and is summarised in **Section 14.5**.

14.5 Risk Assessment

Hazards and Risks as identified as potentially impacting off-site populations are summarised in **Table 14-3**.

Table 14-3 Hazards and Risks to Off-Site Populations

Hazard	Safeguards	Risk Assessment
Fires and Explosion On-Site		
Landfill gases are generated through decomposition of the waste mass including flammable methane. This can ignite in presence of oxygen and an ignition source. Also a risk of fire though spontaneous combustion of waste material where sufficient oxygen is available. Fires pose obvious hazards of intense heat, open flame and smoke inhalation, and may also release toxic chemicals into environment. Fires may cause damage to equipment and site facilities.	Fire and explosion hazards associated with biogas at the Facility are controlled through the removal of air and the control of ignition sources. Clear emergency access and fire water cart provision. Gas build-up is monitored through on-site gas detectors with associated alarms and personal gas monitoring. Infra Red cameras are used to detect any small fire.	Even though the rate of generation of methane gas on site most likely increases with the expansion of the Facility, the buffer zone between any location at the void or at the power station where flammable gas may be present and the site boundaries is so great that the consequences of a fire or an explosion to off-site populations are negligible.
Fire and Explosion Hazard During Transport		
Methane gas can be generated in the containers during transport to the Woodlawn facility. Methane gas may be ignited though static electricity charges generated through the movement in the containers during transit.	Containers are fitted with vents to minimise the amount of methane that can build up. Transit time for waste is kept below the time needed for the significant formation of methane gas. Railcars are grounded and static electricity is unlikely to occur.	Risk of an explosion occurring during transport of the waste would be minimal even with the associated increase in waste quantities.

Hazard	Safeguards	Risk Assessment
Explosion Due to Migration of Landfill Gas Off-Site		
Risk of flammable gas migrating off site through underground cracks and fissures. Explosions have been known to occur in underground or confined spaces in areas near landfills as the result of build-up of methane	The geology of the mine void is such that migration of flammable gases to any off-site location is extremely unlikely to occur. A gas collection system is installed at the landfill. Further, sub-surface and surface (including accumulation) gas monitoring of methane gas is carried out in accordance with the facility's EPL and Gas Management Plan to ensure no migration offsite.	The increase in waste being transported to the site is not likely to lead to an increase in the risk of migration off-site of landfill gas. The risk of methane gas migrating off site through underground cracks and fissures is extremely small.
Biological hazards - disease		
An effective and efficient waste disposal system significantly reduces the risk of diseases spreading throughout the population. Proper waste disposal is an important component of the public health infrastructure.	Control of pests which can transmit diseases, control of diseases relating to the health and the public and on-site personnel, and control of agricultural pests are described in detail in **Section 21** of the EIS (Woodward-Clyde, 1999).	Pest and disease control are an integral part of landfill operation. With the implementation of correct operating and control procedures, the potential public health risks related to landfills are minimised.

Hazards and Risks as identified as potentially impacting on-site populations are summarised in **Table 14-4**.

Table 14-4 Hazards and Risks to On-Site Populations

Hazard	Safeguards	Risk Assessment
Fire and Explosion Hazards		
Risk of fire at the landfill site due to heat generated during decomposition (leading to spontaneous ignition) and from flammable methane gas being generated in anaerobic conditions. Risk of methane gas leaking from transfer pipes. Ignition of methane may cause fire or explosion.	Generator room is constructed with fire retardant material and fitted with flammable gas detectors. Building is also automatically ventilated. Fire protection system available on site and emergency procedure available to minimise damage from fire. Gas pipes are constructed from adequate material (high density plastic) and laid in sand and then aggregate stone to prevent damage. Gas flow is monitored.	With proper management of change systems, operating procedures and training, the risk to on-site populations from fire or explosion can be reduced to acceptable levels.
Exposure to Toxic and Harmful Gases		
Decomposition generates a number of gases which are harmful to human health (hydrogen sulphide, nitrogen, methane, carbon dioxide). Carbon dioxide and methane gas mainly present hazards from displacing oxygen and possibly rendering atmospheric oxygen deficient. Risk that workers may enter an oxygen deficient area without appreciating the risk. Other gases such as hydrogen sulphide are toxic and extremely harmful to human health in high concentrations.	A gas collection system is installed to minimise build-up of gases. Personnel carry gas monitoring devices and gas detectors are fitted. Confined space permit system is heavily controlled in enclosed areas or below ground level where a build-up of gases may occur. Operational use of crushed hematite on the waste to reduce the release of H2S at the surface.	The listed safeguards are imperative to control the risk of exposure to toxic and/or harmful gases by on-site population.

Hazard	Safeguards	Risk Assessment
Biological Hazards		
Risk of infection such as tetanus from cuts and abrasions when waste is handled. Solid, putrescible waste can also contain varying degrees of other pathogens with the potential to cause illness.	Restricting public access to the tipping face; compacting waste and applying covering material at regular intervals; controlling waste entry; minimising off-site movement of litter. Promoting and ensuring adherence to good hygiene practices and wearing PPE directly handling waste. All employees must have HepA, Hep B and tetanus inoculations.	Careful maintenance of the identified safeguards will ensue that the risk is kept low.
Electrical Hazards		
Power station – High Voltage room, LV room, generators and main corridor areas. Voltages between phases and earth, voltages across open switch contacts.	Access permits or safety clearances required for various electrical situations. Only suitably trained personnel and contractors are allowed to work on electrical equipment. Permit To Work (including HV permit) and isolation and tagging procedures apply. No work allowed during heavy electrical storms.	Provided the safeguards listed are maintained, the risk associated with electrical incidents can be adequately managed.
Safety Hazards		
The site contains a number of safety hazards such as holes, ditches, uneven terrain, heavy vehicles etc.	General safety precautions such as PPE, high visibility vests worn, speed limits, training and procedures apply.	The increase in waste transfer rate is likely to increase the risk of general safety hazards to on-site populations.
Noise		
The effect from noise from heavy equipment and vehicles could lead to the following hazards: Hearing damage; communication interference leading to misunderstanding or confusion or to the inability to warn of a danger; and workers being startled, annoyed or distracted	Hearing guards such as ear muffs or plugs worn in certain high-noise areas (such as at the generators). Visual demarcations are used in conjunction with audible information and alarms.	The increase in waste transfer rate would increase noise generation from heavy machinery and vehicles on-site. The risk of hearing loss is minimal due to the safeguards available and enforced on-site. The risk of communication loss will be managed.
Heat Stress		
Heat is a major hazard especially for workers wearing PPE in hot conditions.	Sensible scheduling of work and rest periods, and frequent replacement of fluids. Control of lone worker.	The risk from heat stress can be reduced to as low as reasonably practicable. Adhere to lone worker procedure.

14.5.1 Conclusions and Key Findings

The PHA carried out for the Project was undertaken in accordance with the Department of Planning's Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 (*Guidelines for Hazard Analysis*). The main hazards associated with the proposed expansion project are associated with fire and explosion (predominantly due to the potential ignition of methane gas) and general safety hazards.

The risk screening carried out for the proposal showed that the site is not considered to be *potentially hazardous*. With the low levels of risk associated with the Bioreactor, the PHA was a qualitative assessment and no quantification of any risks was conducted.

Chapter 14 Preliminary Hazard Analysis

The hazard and risk assessment found that the waste expansion project would not introduce any new hazards to the Bioreactor and that the hazards are all well known and understood by Veolia management and staff.

Further, the assessment found that the expansion project is not likely to increase the severity of the hazards associated with the operation of the landfill site. It is not expected that the risk to off-site populations from an incident on-site would increase due to the waste expansion project. The risk to the off-site population is expected to remain negligible with the maintenance of a large buffer between on-site operations and the site boundaries.

The Bioreactor expansion project does not introduce any new hazards and is not likely to increase the severity of the hazards associated with the operation of the landfill site. The hazards associated with the Woodlawn Bioreactor are well known and understood. Furthermore, the hazards have been managed by Veolia through a number of management and operational plans that are rigorously maintained and monitored in accordance with Veolia integrated management system, legislative and licence obligations.

14.6 Mitigation Measures

A summary of the mitigation measures in terms of hazard is provided in **Table 14-5**.

Table 14-5 Summary of Hazard Mitigation Measures

Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
An assessment of the impact of the increase in methane capture rate on the existing plant. Hazard and Operability (HAZOP) study technique or other similar methodology may be required to assess the impact of the change on plant systems to ensure that the risks associated with the methane handling is reduced to As Low As Reasonably Practicable levels.			✓
A review of the safety-implications of the increased waste transfer on on-site populations and determine whether any further safety measures are required to maintain a low level of safety risk to on-site population			✓

15.1 Introduction

This chapter provides an overview of the final landform and site rehabilitation impacts associated with the Woodlawn Bioreactor. Final landform and site rehabilitation considerations were examined in detail as part of the original Environmental Impact Statement (EIS) carried out for the project in 1999. The Minster's approval in 2000 included specific conditions of consent to address these matters by requiring Veolia to prepare a Post Closure Landfill Rehabilitation Management Plan (PCLRMP) as well as a Rehabilitation Management Plan (RMP).

A comprehensive description of how the site would be progressively rehabilitated and integrated into the surrounding environment is presented in Veolia's PCLRMP *(*which also incorporates the RMP) is presented in **Appendix K**. Key elements of this plan are discussed in this chapter to provide an overview of the methods and options that may be used by Veolia to restore the site once the Bioreactor approaches the end of its operations.

It is important to note that this Major Project Application will not alter any aspects of the final landform or rehabilitation of the Bioreactor site. As outlined earlier in this Environmental Assessment, the Project will not result in any additional excavations within the mine void, nor will the project result in an increase in the overall footprint of the Bioreactor.

The strategies and techniques for rehabilitation are still applicable, irrespective of the proposed increase in the input rate for the Bioreactor. In terms of impacts on final landform and rehabilitation, the Major Project Application will merely bring forward the date of the final rehabilitation of the Bioreactor void. Additionally, while a number of methods and strategies for post closure rehabilitation and remediation have been examined by Veolia, it is important to note that these issues would be investigated in greater detail closer to the end of the Bioreactor's operations.

15.2 Whole of Mine Rehabilitation

Veolia has committed to the funding and execution of "whole of mine rehabilitation", the transfer of the mine assets from the original site operator (Denehurst) was completed in October 2007.

The rehabilitation of the mine site will be carried out in accordance with the Woodlawn Mining Operations Plan (MOP), which was prepared in August 2004. The MOP outlines the process and timing for whole of mine rehabilitation for the parts of Woodlawn which fall outside the Bioreactor consented areas.

It is Veolia's intention to maintain a high standard of environmental protection at Woodlawn in both the Bioreactor operations and the mine post-operational and rehabilitation phase. The MOP sets out a program over a period of twenty years for the rehabilitation of the mine site, while ensuring a high level of environmental protection through the implementation of safeguards and ongoing monitoring activities.

Chapter 15 Landform and Site Rehabilitation

15.3 Existing Environment

15.3.1 Landform of the site and surrounding area

Landform and Elevation

The northern and eastern boundaries of the property are formed by Collector Road and Crisps Creek. The site is situated at the head of the Allianoyonyiga and Crisps Creeks catchments. The watershed of the Wollondilly River/Lake George catchment also traverses the site. Lake George is located approximately 7.5km to the west and Lake Bathurst approximately 8.5km to the northeast of the mine site. The landfill site is situated on a ridge which forms part of the Great Dividing Range.

The natural ground surface surrounding the mine void lies at an elevation of approximately 800 m AHD, with the base elevation of the mine void at approximately 630 m. The mine void in which the landfilling is currently taking place has a depth of about 200m and a volume of approximately 25 million cubic metres.

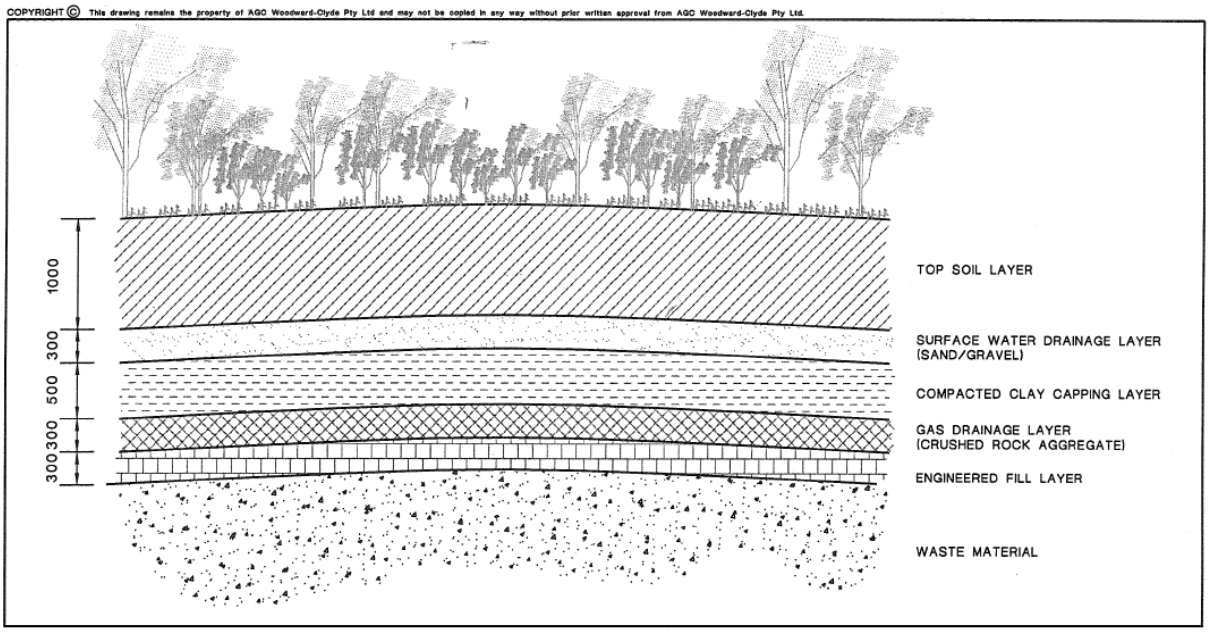
15.4 Background to Original Project Approval

15.4.1 EIS consideration

As originally conceived, the post closure strategy to be carried out across the site would be a progressive rehabilitation strategy involving final capping of the landfill. Monitoring of settlement rates would continue to inform the design of the capping to mitigate unforeseen capping failure and permeability impacts. The height of the capped landfill would vary from around 860 m AHD to 810 m AHD, and as illustrated in **Figure 14-1**, the capping would comprise the following elements;

- An engineered fill layer not less than 300mm thick placed on top of the waste;
- A gas drainage layer of crush rock aggregate not less than 300 mm thick;
- A 500 mm thick compacted clay layer with a permeability no greater than 10^{-8} m/s;
- A 300 mm thick surface water infiltration layer of sand gravel having a permeability not less than 10^{-5} m/s; and
- An uncompacted soil layer of not less than 1000 mm thickness. The soil layer would be vegetated with grasses, shrubs and small trees.

Figure 15-1 Final Landform - As outlined in Woodward-Clyde, 1999



15.4.2 Final Landform and Potential Land Uses

The original EIS prepared by Woodward-Clyde in 1999 for the approval of the Bioreactor considered that once waste placement operations have completely filled the mine void, a final capping layer would be placed over the surface of the landfill to enable alternative site uses such as grazing or cropping.

The final landform would comprise a gently sloping hill grading from southwest to northeast with a grade of 5 – 10% post-effective subsidence at completion.

15.5 Post Closure Rehabilitation Plan

The PCLRMP (**Appendix K**) is the principal management document that addresses final landform and rehabilitation issues for the Bioreactor void.

The primary objectives of this plan are to meet the requirements of Consent Conditions 15 and 22 of the Minsters conditions of consent. It is important to note that the PCLRMP only applies to the area approved by the Minister for Planning for use as a Bioreactor and the EPA Bioreactor Licence (11436).

The plan is based on a continuation of progressive rehabilitation compatible with long term use of the whole site. Site capping and re-vegetation would ensure that the final surface of the bioreactor provides a barrier to the migration of water into the waste, controls emissions to water and atmosphere, promotes sound land management and conservation, prevents hazards and protects amenity. The rehabilitation of the Bioreactor site will involve the establishment of a stable vegetated landform over a compacted capping layer. Post closure management of Evaporation Dam 3 (ED3) will primarily be through evaporation, although further options are identified in the PCLRMP.

Chapter 15 Landform and Site Rehabilitation

It is anticipated that the management strategies and techniques contained in the PCLRMP will not change as a result of this Major Project Application.

15.5.1 Post Closure Environmental Monitoring

As stipulated in the PCLRMP, post closure environmental monitoring will be carried out in accordance with Benchmark Technique 29 (Landfill Closure and Post-Closure Monitoring and Maintenance) of the Landfill Guidelines (EPA 1996). Monitoring and maintenance activities will be provided until the bioreactor no longer poses a threat to the environment. All leachate collection, gas collection, stormwater sediment controls, monitoring and reporting practices will be maintained to a standard equivalent to that employed during the operational life of the bioreactor, and as controlled through existing consent condition and EPL obligations.

- All necessary revegetation works will be completed in accordance with the final design contour plan to ensure erosion protection and stabilisation of eroded drains, ponds and dams.
- At the completion of landfilling activities, the necessary environmental controls regarding stormwater collection and treatment will be installed in accordance with EPA Environmental Guidelines.
- The post closure management of ED3 will be carried out in accordance with Consent Condition 70 of the Development Consent.
- The leachate collection and treatment utilised during the operational phase of the site will continue following closure. The monitoring regime established during the operation of the site will initially be maintained and reviewed as appropriate.

15.5.2 Site Rehabilitation - Post Closure Management

Ongoing management of the site will be undertaken following closure of the facility. This would consist primarily of monitoring of the site and undertaking of required maintenance. The aim of the ongoing monitoring and maintenance program is to demonstrate compliance with licence conditions and ensure management activities are working effectively.

Veolia will ensure that all leachate collection, gas collection, stormwater controls and reporting practices are maintained to the same level employed at the end of the operational life of the Bioreactor. The environmental management measures will continue until Veolia can demonstrate that the Bioreactor does not pose a threat to the environment.

Veolia will ensure that waste materials are not received for disposal at the site after the landfilling operations cease. Any waste materials that are intended for use in the rehabilitation will be documented and reported in the same method used during the operation of the Bioreactor.

Additionally, Veolia will undertake ongoing environmental management responsibilities related to the Bioreactor site such as gas extraction, remedial work on areas of settlement and surface water management and leachate control in accordance with the LEMP.

Regular maintenance of the final landform and landscape will be undertaken in accordance with the LEMP. This will comprise:

- Monitoring of surface water and leachate dams and drains and undertaking repairs where necessary;
- Filling of depressions created by settlement of the filled waste (to ensure shedding of surface water runoff);
- Replacement of vegetation, if necessary, to maintain the vegetation density;
- Repairing erosion scours; and
- Clearing and maintenance of water courses and swales.

The above activities would continue until the bioreactor has been stabilised, and Veolia intends to evaluate the success of its after care management approach on an annual basis. Internal management system audits and supplier audits will be conducted on a regular basis to verify that the site's operations comply with the requirements of this PCLRMP.

15.5.3 Post Closure Strategies

A number of closure strategies have been drafted for inclusion in the PCLRMP. All closure scenarios consider the whole site and surrounding area for which Veolia is responsible. The PCLRMP outlines a number of options for consideration as part of an early closure scenario as well as the final closure scenario. The PCLRMP notes that the schedule for the rehabilitation of the Bioreactor is reliant upon the final landform and proposed end land use of the site, and will, therefore, be determined closer to the time of final rehabilitation.

In terms of early closure of the Bioreactor, three options have been developed including the final closure strategy. These are outlined in the current PCLRMP (**Appendix K**).

15.5.4 Site Rehabilitation Standards and Schedule

The PCLRMP also contains a number of standards in relation to site capping, revegetation and site decommissioning. It is important to note that these standards are generic in nature, with further details and design to be determined closer to the final time of rehabilitation.

15.6 Landform and Rehabilitation Impacts

While the Project includes an increase of the annual input rate of putrescible waste, the size of the void and therefore the total volume of waste that could be received at the facility throughout the life of the site would remain unchanged. The Bioreactor currently has approval to operate for a period of 20 years in accordance with Consent Condition 3 of the 2000 approval.

It is estimated that complete filling of the void at current approved rates per year would require in the order of 55 years. Should the expansion proposal gain approval, the remaining timeframe taken to fill the void would be reduced to approximately 25 years, thereby enabling the remediation of the void itself to be completed in a shorter timeframe than is currently permitted.

Chapter 15 Landform and Site Rehabilitation

The Project would not affect change to the rehabilitation objectives and strategy outlined within the existing management plan for site closure and rehabilitation. Given that the staging of the rehabilitation works is dependent on the proposed filling plan, this element is considered the only change to the strategy already in place.

Veolia has undertaken regular reviews to evaluate the level of compliance and to assist in ensuring that the standards and quality of operations are maintained in accordance with the development consent and Environment Protection Licence conditions. With respect to the Post Closure Landfill Rehabilitation Management Plan, this has been internally and externally reviewed five times since it was first drafted.

As Veolia has taken over ownership of the whole of the Woodlawn property, it is now responsible for the rehabilitation of the entire Woodlawn mine site in addition to the post-closure rehabilitation of the Bioreactor licensed area. The involvement of Veolia in the planning and execution of both the Bioreactor post-closure rehabilitation and the whole-of-mine site rehabilitation will ensure that these rehabilitation efforts across the whole site are fully integrated.

16.1 Introduction

This chapter details the Draft Statement of Commitments in accordance with section 75F (6) of the EP&A Act. The inclusion of appropriate environmental management measures into the Project would minimise adverse impacts on the environment. The proposed adoption of the relevant measures identified in the Draft Statement of Commitments into the suite of Veolia's existing environmental management plans would be an important component of the proposal and reiterates the commitment of Veolia and its contractors to mitigation of environmental impacts identified in this assessment.

The Draft Statement of Commitments describes the existing environmental management and monitoring already in place for the Woodlawn Bioreactor. The preceding chapters of this Environmental Assessment described the potential impacts of the proposed expansion of the Bioreactor from its existing approved maximum assessed capacity of 500,000 tpa to 1.13 million tpa and of increasing the tonnage of waste going through the Crisps Creek IMF to a total of 1.18 million tpa.

Existing environmental management and mitigation measures already in place have been described and assessed in respect to current operations as well as the proposed expansion. This chapter provides a summary of these measures and identifies additional strategies and management tools for monitoring their implementation.

16.2 Environmental Management

Veolia operates both the Bioreactor and the Crisps Creek IMF strictly in accordance with existing approvals issued by the Department of Planning, as well as EPLs issued by DECCW

Chapter 6 within this EA provides an overview of the existing environmental management provisions that are in place for both the Bioreactor and the Crisps Creek IMF.

The Woodlawn Bioreactor Environmental Management Plan (EMP) provides an environmental management tool for the operation of the site and a means of identifying and concentrating on the key environmental, operational and rehabilitation issues for the facility. Some of the main supporting plans include:

- Barrier System and Quality Assurance Plan;
- Geotechnical Stability Monitoring Plan;
- Bioreactor Performance Monitoring Plan;
- Filling Schedule;
- Surface Water Management Schedule;
- Evaporation Dam 3 Management Plan;
- Post Closure Landfill Rehabilitation Management Plan;
- Gas Management Plan;
- Leachate Management Plan;

- Groundwater Monitoring Program;
- Ambient Air Quality Monitoring Plan;
- Noise Management Protocol; and
- Emergency Management Plan.

Performance reporting is undertaken to provide comprehensive and informative reports on the environmental monitoring and operational activities of the Woodlawn Bioreactor and Intermodal facility. Record keeping and auditing procedures are detailed as part of the site EMP.

As outlined earlier, Veolia is not proposing any significant operational, process, construction, or management changes to the Bioreactor or the Crisps Creek IMF as part of the proposed expansion Project. Consequently, it is considered that the existing suite of environmental management tools used by Veolia to manage its existing operations at both the Bioreactor and the Crisps Creek IMF would continue to be rigorously implemented and would be amended in accordance with any approval to increase the maximum input rate for the Bioreactor to 1.13 million tpa and the maximum throughput rate for the Crisps Creek IMF to 1.18 million tpa.

16.3 Summary of Mitigation Measures

The adoption of the mitigation measures discussed in **Chapters 8 - 15** is an important component of the expansion proposal and reiterates Veolia's commitment to mitigation and management of the environmental impacts identified in this EA.

Table 16-1 summarises these safeguard measures as *Draft Statements of Commitment*. These will be updated following the Exhibition of the EA and incorporated into existing operational and management procedures on site should approval be granted.

Table 16-1 Draft Statement of Commitments

Mitigation Measure	Implementation - Operation
General Operation and Maintenance	
Ongoing Environmental Management	
The existing Environmental Management Plan for Bioreactor and the Crisps Creek IMF, including the suite of supporting documents, will continue to be the primary tools in relation to Veolia's ongoing environmental management for all operations. Where required, these management plans will be amended to take into account the provisions of the approval to increase the maximum input rate for the Bioreactor to 1.13 million tpa and the maximum throughput rate for the Crisps Creek IMF to 1.18 million tpa.	✓
Nature of Waste	
The Bioreactor and the Crisps Creek IMF will only receive General Solid Waste (putrescible) as defined by DECCW.	✓
Hours of operation	

Mitigation Measure	Implementation - Operation
Hours of operation for the Bioreactor and the Crisps Creek IMF are 6am to 10pm, Monday to Saturday and no work on Sundays, Good Friday or Christmas Day. Hours of operation may be varied with the written approval of DECCW.	✓
Community Engagement	
Veolia will continue to operate a 24 hour contact hotline for the duration of operations for both the Bioreactor and the Crisps Creek IMF.	✓
Veolia will continue to hold regular meetings with the Community Liaison Committee, so as to provide ongoing information to stakeholders and to resolve any operational issues that may arise from time to time.	✓
Soils, Geology and Water	
Erosion	
Restrict traffic to defined site access roads where possible .	✓
Use a wheel wash to remove soil adhering to the wheels and undercarriage of trucks prior to departure from the landfill site.	✓
Install diversion drains and erosion and sediment control structures around the site to divert clean water from contaminated areas.	✓
Groundwater and Surface water	
Divert rainfall runoff from the sides of the pit before it comes in contact with the waste.	✓
Management of leachate in accordance with the Leachate Management Plan.	✓
Recirculate leachate on top of the waste, ensuring maximum evaporative discharge capacity.	✓
Dewatering of groundwater from the base of the pit in accordance with the Leachate Management Plan.	✓
Maintenance	
Routinely assess rainfall, evaporation, groundwater levels, piezometer levels, pond levels, pump hours, flow meters, surface water chemistry, groundwater chemistry.	✓
Clean any drains that have become blocked through sediment pollution.	✓
Check that drains are operating as intended.	✓
Check that rehabilitated lands have established sufficient groundcover to reduce the erosion hazard effectively and initiate repair as appropriate.	✓
Control emissions of dust from unsealed roads and other exposed surfaces by use of surface sealants and/or water spray carts or other appropriate equipment. Keep surfaces moist rather than wet.	✓
Keep all sediment detention systems in good, working condition.	✓
Dispose of any pollutants removed from sediment basins in areas where further pollution to downslope lands and waterways should not occur.	✓
Construct additional erosion and/or sediment control works as might become necessary to ensure the desired protection is given to downslope lands and waterways.	✓

Chapter 16 Statement of Commitments

Mitigation Measure	Implementation - Operation
Air Quality and Odour	
Odour control and Air Quality Management at the facility is to be carried out in accordance with the existing Ambient Air Quality Management Plan (AAQMP).	✓
Veolia will maintain their established odour incident management system. Should any odour complaints be received, these would be recorded with the details of the location, time, odour character and duration. Details of subsequent corrective actions would be documented.	✓
Truck speed and movements on site is minimised to reduce wheel generated dust emissions.	✓
Traffic is restricted to designated sealed access roads within and around the site.	✓
Waste within the bioreactor is covered at days end.	✓
Water carts for dust suppression continue to be utilised as required.	✓
Existing monitoring and reporting requirements of the AAQMP will continue to operate.	✓
Traffic and Transport	
Update the Traffic Management Plan for the existing operation activities to include the increased hours of operation and increased haulage activities	✓
Assess pavement condition and provide financial contributions to Council for repair of haulage routes	✓
PHA	
An assessment of the impact of the increase in methane capture rate on the existing plant. Hazard and Operability (HAZOP) study technique or other similar methodology may be required to assess the impact of the change on plant systems to ensure that the risks associated with the methane handling is reduced to As Low As Reasonably Practicable levels.	✓
A review of the safety-implications of the increased waste transfer on on-site populations and determine whether any further safety measures are required to maintain a low level of safety risk to on-site population	✓
Landform and Site Rehabilitation	
At the conclusion of operations at the Bioreactor, infrastructure will be removed and the site will be rehabilitated and replanted with pasture species as outlined in the existing Post Closure Landfill Rehabilitation Management Plan.	✓

17.1 Introduction

This chapter of the Environmental Assessment concludes the document by presenting an evaluation of the Project against the principles of Ecologically Sustainable Development, providing a summary of the key findings of the Environmental Assessment and detailing the justification for the projects' approval.

17.2 Ecologically Sustainable Development

The Section 6 (1) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* requires that an Environmental Assessment include:

> *"The reasons justifying the carrying out of the development or activity in the manner proposed having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development."*

The principles of Ecologically Sustainable Development, as listed in the Regulation, are as follows:

> *"The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*
>
> *Conservation of biological diversity and ecological integrity.*
>
> *Improved valuation and pricing of environmental resources."*

17.2.1 Precautionary Principle

To satisfy the precautionary principle, emphasis must be placed on anticipation and prevention of environmental damage. The environmental impact assessment process itself is precautionary in nature, as it provides a public procedure to assess and evaluate uncertainty regarding the environmental consequences of a development prior to a project proceeding.

A range of environmental investigations have been undertaken as part of the project development and associated environmental assessment process. Environmental investigations as described in **Chapters 8 - 15** of the EA have been carried out to ensure that potential impacts are fully understood.

The EA has summarised existing Environmental Management at the bioreactor site. The proposed expanded operations would be carried out in strict accordance with regulatory and current best practice and licence requirements. The existing Environmental Management Plan (EMP) details site monitoring and operational processes currently in place. Ongoing compliance with the Woodlawn EMP would ensure that the site would continue to achieve a high-level of environmental performance.

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17.2.2 Social Equity

Social equity includes both intra- and inter-generational equity. Intra-generational equity requires that the economic and social benefits of development be distributed appropriately among all members of the community. Inter-generational equity requires that the development be managed so that the environment is maintained or enhanced, and future generations are not disadvantaged by long term impacts of the development.

The Project aligns with both elements of social equity as the Bioreactor is a crucial element of waste infrastructure that supports the immediate need for more landfill capacity to service the Sydney metropolitan area and surrounding regions whilst ensuring that the expansion project has minimal adverse impacts on the environment and maintains the opportunity for continued direct and indirect employment and economic activity in the area.

Furthermore, the project is consistent with the strategic direction for waste management in NSW and supports the progressive introduction, diversification and expansion of AWT needed to increase resource recovery and divert valuable materials from landfill.

17.2.3 Conservation of Biological Diversity and Maintenance of Ecological Integrity

The conservation of biological diversity and maintenance of ecological integrity refers to the maintenance of species richness, ecosystem diversity and health, as well as links and process between them. Environmental components, ecosystems and habitat values potentially affected by the proposed development are assessed and described in the EA. Potential impacts are outlined in **Chapters 8 - 15** along with mitigation measures proposed to ameliorate any negative impacts anticipated.

The proposed project utilises existing land and infrastructure. The project will be undertaken in an area in which Veolia have a comprehensive understanding of existing conditions (gained through continuous monitoring, testing and evaluation), providing additional certainty with respect to predicted environmental outcomes. Veolia has committed to the rehabilitation of land degraded by mining. This will ensure that biological diversity will be conserved as a result of the rehabilitation of mine site.

17.2.4 Improved Valuation and Pricing of Environmental Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle of improved valuation and pricing refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment.

The assessment has identified the environmental and social consequences of the Project and identified mitigation measures where appropriate to manage adverse impacts. The operation of the Project would be in accordance with relevant legislation and operational environmental management plans. The implementation of mitigation measures would increase both the capital and operating costs of the Project. This signifies that environmental resources have been given appropriate valuation. The Project has been developed with the objective of minimising impacts on the surrounding environment. This places environmental considerations at the forefront of Veolia's decision making process and demonstrates that an appropriate value has been placed on the environment.

17.3 Environmental Assessment Findings

A summary of the main findings of the Environmental Assessment is presented below.

17.3.1 Water Management

A report examining water balance impacts arising from the Project found that the potential impacts from increasing the filling rate to 1.13 million tpa are negligible. The soils and geology of the site are not expected to be affected given that there are no significant excavations or construction activities generated by the Project (with the exception of the installation of new lighting towers to facilitate night time operations). The existing erosion and sedimentation control measures will continue to be maintained

The change in the rate of filling would not result in a change in the configuration of the final leachate profile post-closure, as this would be dependent on the characteristics of the capping profile and the climatic conditions of the site.

The absence of significant construction means that the impacts on surface water are considered to be negligible. Surface water management techniques already in place provide a suitable level of control for any potential contamination issues arising from the increase in the waste input rate.

17.3.2 Air and Odour

Atmospheric dispersion modelling of odour indicated that at all surrounding residences, odour is predicted to be at concentrations less than 4.1 OU as a 99th percentile, 1 second average. The Project specific odour performance goal was assumed to be 6 OU. Comparison with a 'base case' scenario designed to reflect current operating conditions at the site has shown no increase in odour impact at surrounding receptors resulting from the increase in surface area of waste.

Cumulative particulate matter emissions associated with the proposed Woodlawn Expansion and the approved AWT facility are not predicted to result in exceedances of the adopted criteria for the Project. Dust deposition levels are significantly below the adopted background level and are predicted to result in incremental increases of less than 0.07 g/m^2/month at all receptors. PM_{10} concentrations are predicted to be less than 13 µg/m^3 as a 24-hour maximum and 0.7 µg/m^3 as an annual average at all receptors. Total suspended particulate concentrations are predicted to be less than 0.3 µg/m^3 as an annual average at all modelled receptors.

17.3.3 Greenhouse Gas

The total Scope 1 greenhouse gas emissions for the Project are estimated to be 244 ktCO2-e, which represents 98% of the total estimated emission of 249 ktCO2-e. The fugitive emission of methane from the waste represents approximately 92% of the total estimated emission, while indirect emissions only represent approximately 0.7% of total estimated emissions from the Project. The carbon intensity of the Woodlawn Expansion Project is estimated to be 0.22 ktCO2-e/kt MSW (based upon 249 ktCO2-e/1130 kt MSW).

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Despite the emissions associated with the Project, the total greenhouse gas impacts are to a large extent offset by the electricity generated on site at the Bioreactor. It is estimated that the Project would generate an additional 210,240 MWh of renewable electricity. This renewable electricity represents a GHG offset of approximately 166,347 t CO2-e by replacing electricity generated from fossil fuels.

17.3.4 Noise

The noise assessment provides details of existing noise levels within the Project area and surrounds, determines noise impact criteria based on existing noise levels and the relevant DECCW guidelines, and predicts noise levels that are expected to result from the Project. The assessment identifies that operational noise levels generated at both the Bioreactor and the Crisps Creek IMF are predicted to meet relevant noise criteria at the nearest receivers.

17.3.5 Traffic and Transport

The traffic and transport assessment found that the Project will have a relatively minor impact in terms of traffic generation. The road network can satisfactorily and safely accept the additional traffic generated by the Project. Levels of service for affected roads would be maintained.

The existing access arrangements for the Woodlawn Bioreactor and Crisps Creek Intermodal Facility are adequate to support the proposal. Existing parking provisions at both sites have sufficient capacity to accommodate additional staff vehicles.

17.3.6 Socio Economic Impacts

The analysis shows positive economic and social benefits in terms of contribution to the local economy through the use of local contractors and maintaining local employment opportunities resulting from the continued operation of the Bioreactor. While there are some localised amenity impacts, the independent studies into issues relating to noise, odour, air quality and traffic indicate that these impacts are relatively minor and can be effectively mitigated.

17.3.7 Hazards

The results of the PHA show that the risk associated with this development is very low using highly conservative assumptions. The most stringent risk criteria, as required by the Department of Planning, are adhered to.

17.3.8 Landform and Site Rehabilitation

Final landform and site rehabilitation will not be impacted by the Project. Veolia has in place a detailed Post Closure Landfill Rehabilitation Management Plan that outlines a number of options to address final landform and rehabilitation issues. The Project will not alter the existing strategies and options for final landform and rehabilitation. Rather, the increased input rate will shorten the operational life of the Bioreactor, bringing forward the final site rehabilitation.

17.4 Alignment with the Objects of the Environmental Planning & Assessment Act 1979

Section 5 of the *Environmental Planning and Assessment Act 1979* contains the Objects of the Act. The Objects are:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

For the purpose of the Environmental Assessment, the relevant Objects include (a)(i), (a)(ii), (a)(vi) and (a)(vii). The findings of the specialist reports indicate that the Project is wholly consistent with the relevant Objects of the EP&A Act 1979.

In addition, Clause 123 of Division 23 of the Infrastructure SEPP was changed between the Director-General Requirements being issued and the final submission of this Environmental Assessment. The EA includes consideration of both the old and new requirements under the clause.

In terms of the specific requirements detailed in Clause 123 the facility demonstrates compliance with each criteria. The Bioreactor is designed to encourage high levels of gas capture and conversion of organics to energy (the core of the Bioreactor technology) so allowing for a high level of recovery after waste is placed in the landfill. The facility also allows for waste minimisation before waste is placed in the landfill, by using alternative waste technology (proposed WASP) for the composting of food and garden waste.

The development adopts best practice landfill design and operation in the use of Bioreactor technology, this in turn reduces long term impacts of the disposal of waste, such as greenhouse gas emissions and offsite impact of odours, by maximising landfill gas capture and energy recovery. Methane collection at the Woodlawn Bioreactor has been independently tested at a level of up to 92% capture efficiency, which results in significant environmental benefits when compared to traditional processes.

This high capture efficiency leads to class leading energy recovery. From July 2009 to June 2010 the Woodlawn Bioreactor generated enough electricity to power 1,791 homes for the year.

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The area where the development is located is degraded land. The Woodlawn Bioreactor is located within a disused mine site that operated as a base metals mine throughout the 1980s and 1990s. The Woodlawn Bioreactor is not in conflict with the surrounding land uses and is consistent with the relevant regional planning strategies. Further, the use of long-haul rail transport as an alternative to road freight transport has been chosen to reduce the environmental and social impacts associated with transporting waste to the landfill.

The Project represents the ongoing management of natural and artificial resources. The Project would facilitate the expansion of an important resource that is a crucial part of the waste management infrastructure of NSW, thereby promoting the co-ordination and economic use of land. As a regional putrescible waste landfill servicing Sydney and surrounding regions, the Woodlawn Expansion Project would continue to deliver disposal capacity and the superior environmental outcomes of a bioreactor, whilst addressing the capacity constraints outlined in the 2009 Wright Review.

17.5 Justification for the Project

The justification for the Woodlawn Expansion Project draws on the Wright Review 2009, an independent strategic review of landfill demand and capacity within the Sydney region and estimated take up of Alternative Waste Technology (AWT) as well as analysis of the regional disposal capacity and demand. This justification demonstrates that:

- the proposed Project responds to an urgent need to expand aggregate annual waste input rates to address the chronic shortfall in available annual disposal capacity and meet the continuing need for putrescible waste landfill capacity in the Sydney region. The Project would address approximately 40% of the long term annual shortfall forecast in the Wright Review 2009;
- the Project would satisfy regional demand for reliable, flexible and cost-effective waste management solutions enabling Councils to focus on further resource recovery initiatives and rehabilitation of existing landfills;
- the Project is consistent with the strategic direction for waste management in NSW and supports the progressive introduction, diversification and expansion of AWT needed to increase resource recovery and divert valuable materials from landfill;
- with the current challenge of climate change, the Woodlawn Bioreactor provides an environmentally responsible and sustainable solution that is consistent with existing greenhouse gas strategies;
- the Project utilises existing land and infrastructure, furthermore the project will be undertaken in an area in which Veolia have a comprehensive understanding (gained through continuous monitoring, testing and evaluation) of existing conditions, providing additional certainty with respect to predicted environmental outcomes; and
- the Project is located within the Woodlawn Eco-Precinct, which is consistent with the NSW WARR strategy through environmentally responsible disposal, development of alternative waste technologies and facilitation of regional waste programs such as green waste separation.

Accordingly, there is a clear, demonstrable need for the Project as confirmed through recent independent analysis for the NSW Government.

Other key elements underpinning the justification for the Project are expanded on below.

17.5.1 The Strategic Direction for Waste Management in NSW

The Project would deliver outcomes consistent with state legislation and strategies for sustainable waste management. These include the *Waste Avoidance and Resource Recovery Act 2001*, and the Waste Avoidance and Resource Recovery Strategy 2007. The Project aligns with the philosophy of viewing waste as a resource through using putrescible waste to generate renewable electricity.

The expansion project will deliver increased flexibility, efficiency and integration of putrescible waste management for the Sydney and south and south western regions of NSW, supporting the continued transition to improved waste avoidance and resource recovery practices, including waste diversion to AWT.

17.5.2 Need for Additional Landfill Capacity

This proposal is supported by clear conclusions drawn from an independent public review of putrescible waste landfill capacity and demand for the Sydney region (Wright, 2009), which determined that there is a continuing need for putrescible waste landfill capacity. Furthermore, the current constraints on putrescible landfill input rates are considerably less than the amount of waste sent to landfill, meaning that the gap will increase in future as a result of scheduled cap reductions.

As a regional putrescible waste landfill servicing Sydney and surrounding regions, the Woodlawn Expansion Project would continue to deliver disposal capacity and the superior environmental outcomes of a bioreactor compared with conventional landfilling, whilst addressing capacity constraints outlined in the 2009 Review.

17.5.3 Lack of Suitable Alternatives

At this time, there are no viable new landfill sites for putrescible waste within the Sydney region. Accordingly, given the proven capacity at Woodlawn coupled with the restrictive policy context relating to the development of new landfill sites, other locations were not considered as a realistic alternative to this proposal.

Furthermore, alternative technologies were examined as part of the Environmental Assessment. While AWTs play an important role in the sustainable management of the waste stream in NSW, their performance in diverting waste from landfills has been below industry expectations. Given the substantial lead times related to developing AWT facilities, it is not viable to depend on accelerated AWT take up to deal with increasing putrescible waste streams.

Analysis shows that despite AWT introduction, the amount of putrescible waste continues to increase. Even with successful implementation of AWT, there would still remain a significant component of residual waste to be managed via disposal at putrescible landfills. Consequently, the need for putrescible landfill capacity remains. Increasing landfill input rate at Woodlawn would enable the uptake of AWT facilities to continue at a suitable rate, consistent with their role in a long-term waste and resource recovery strategy.

The Woodlawn Bioreactor has proven environmental benefits on a par with AWT facilities in terms of minimisation of environmental impacts and conversion of organics into a renewable power source. The accelerated timetable for landfilling would advance the timetable for rehabilitation of land degraded by mining at the site.

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17.6 Site Suitability

The former Woodlawn mine has been identified as an ideal location to provide much needed additional landfill capacity to cater for the Sydney Metropolitan area (Woodward Clyde 1999). The characteristics of the mine void allow for the containment and effective management of a number of impacts, such as water management, and air, noise and odour impacts. Additionally, the location of the mine void, within close proximity to a railway line, meant that the site could be accessed by rail, thereby removing a considerable amount of Heavy Vehicle Traffic from NSW roads. The area identified for the Crisps Creek IMF was chosen because of its limited environmental impacts and close proximity to the Bioreactor site. Being located south of Tarago, the IMF removes the need for vehicles to travel through the town centre.

17.7 Conclusion

This Environmental Assessment has considered the potential impacts of the Woodlawn Expansion Project. It has been prepared in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* and the requirements of the Director-General of the NSW Department of Planning.

The Environmental Assessment has documented the potential environmental impacts associated with the Project, considering both potential positive and negative aspects and recommending management and mitigation measures to protect the environment where required beyond the existing environmental management on site.

Environmental investigations were undertaken to assess the potential environmental impacts of the Project. This included specialist assessment and investigations of issues relating to air quality and odour management, traffic and transport impacts, noise, greenhouse gas emissions, surface water management, hazards, and socio economic impacts.

The findings of these specialist investigations indicate that there are no significant adverse environmental impacts associated with the Project assuming the inclusion of appropriate environmental management measures into the Project which would minimise adverse impacts on the environment. The proposed adoption of the relevant measures identified in the Draft Statement of Commitments into the suite of Veolia's existing environmental management plans would be an important component of the proposal and reiterates the commitment of Veolia and its contractors to mitigation of environmental impacts identified in this assessment.

The Project would provide a number of important benefits, including:

- providing a response to the urgent need to expand aggregate annual waste input rates to address the chronic shortfall in available annual waste disposal capacity and meet the continuing need for putrescible waste landfill capacity in the Sydney region;
- the generation of additional renewable electricity at the Bioreactor, and;
- provision of continued and increased employment opportunities for local residents in the region.

In summary, there is a clear and demonstrable need for the Project. The proposal complies with all relevant legislation, environmental planning instruments and government policy, and provides crucial additional landfill capacity to sustainably manage putrescible waste from the Sydney Metropolitan area and for regional NSW.

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