



# Landfill Environmental Management Plan

Armidale Regional Landfill



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Client: Armidale Regional Council

Prepared by

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# **Quality Review Information**

| Landfill Environmental Management Plan |
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|  |

Reviewed by Andrew Kielnacz and Danielle Poirier

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# Abbreviations and Glossary

| Term                                  | Definition   |
|---------------------------------------|--|
| AHD                                   | Australian Height Datum  |
| AHMP                                  | Aboriginal Heritage Management Plan  |
| AI                                    | Aluminium  |
| Alk                                   | Alkalinity   |
| AQMMP                                 | Air Quality Monitoring and Management Plan   |
| ARC                                   | Armidale Regional Council  |
| ARI                                   | Average Recurrence Interval  |
| As                                    | Arsenic  |
| AS                                    | Australia Standards  |
| В                                     | Boron  |
| BOMP                                  | Biodiversity Offset Management Plan  |
| Br                                    | Bromine  |
| Са                                    | Calcium  |
| Cd                                    | Cadmium  |
| CEMP                                  | Construction Environmental Management Plan   |
| CI                                    | Chlorine   |
| СМА                                   | Catchment Management Authority   |
| CO <sub>2</sub>                       | Carbon dioxide   |
| Commercial<br>and Industrial<br>Waste | Wastes generated by businesses and industries and institutions. These include shopping centres, restaurants, offices, schools, hospitals and government offices but exclude any building and demolition waste and municipal waste. |
| Cr                                    | Chromium   |
| Cu                                    | Copper   |
| DI Lands and<br>Water                 | NSW Department of Industries – Lands and Water. Formerly Department of Primary Industries – Water (DPI – Water) and previously NSW Office of Water (NOW).  |
| DO                                    | Dissolved oxygen   |
| DotEE                                 | Commonwealth Department of the Environment and Energy. Formerly Department of Sustainability, Environment, Water, Population and Communities (SEWPaC)  |
| DPE                                   | NSW Department of Planning and Environment   |
| DPI                                   | NSW Department of Primary Industries   |
| EA                                    | Environmental Assessment   |
| EC                                    | Electrical conductivity  |
| Eh                                    | Redox potential  |
| ENM                                   | Excavated Natural Material   |
| Environmental<br>Guidelines           | <i>Environmental Guidelines: Solid Waste Landfills</i> (EPA, 1996). The 2 <sup>nd</sup> edition of the Environmental Guidelines were released by the EPA in 2016   |
| EP&A Act                              | Environmental Planning and Assessment Act 1979   |
| EPA                                   | NSW Environment Protection Authority   |
| EPL                                   | Environment Protection Licence   |

| Term   | Definition   |
|--|--|
| Facility                                     | Premises at which a scheduled activity under Schedule 1 to the Protection of the<br>Environment Operations Act 1997, takes place   |
| Fe   | Iron   |
| FRP  | Filterable Reactive Phosphate  |
| GCL  | Geosynthetic Clay Liner  |
| General Solid<br>Waste<br>(Putrescible)      | <ul> <li>Waste (other than special waste, hazardous waste, restricted solid waste or liquid waste) that includes any of the following:</li> <li>a) household waste that contains putrescible organics</li> <li>b) waste from litter bins collected by or on behalf of local councils</li> <li>c) manure and night soil</li> <li>d) disposable nappies, incontinence pads or sanitary napkins</li> <li>e) food waste</li> <li>f) animal waste</li> <li>g) grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids</li> <li>h) anything that is classified as general solid waste (putrescible) pursuant to an EPA Gazettal notice,</li> <li>i) anything that is classified as general solid waste (putrescible) pursuant to the Waste Classification Guidelines,</li> <li>j) any mixture of the wastes referred to in paragraphs (a)–(i)</li> </ul>  |
| General Solid<br>Waste (Non-<br>Putrescible) | <ul> <li>Waste (other than special waste, hazardous waste, restricted solid waste, general solid waste (putrescible) or liquid waste) that includes any of the following:</li> <li>a) glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal</li> <li>b) paper or cardboard</li> <li>c) household waste from municipal clean-up that does not contain food waste</li> <li>d) waste collected by, or on behalf of, local councils from street sweepings</li> <li>e) grit, sediment, litter and gross pollutants collected in, and removed from, stormwater</li> <li>f) treatment devices and/or stormwater management systems that have been dewatered so that they do not contain free liquids</li> <li>g) grit and screenings from potable water and water reticulation plants that have been dewatered so that they do not contain free liquids</li> <li>f) wood waste</li> <li>i) wood waste</li> <li>j) woaste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions</li> <li>k) containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain free liquids</li> <li>f) drained motor oil containers that do not contain free liquids</li> <li>m) non-putrescible vegetative waste from agriculture, silviculture or horticulture</li> <li>n) building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions, but excluding absets waste</li> <li>p) wirgin excavated natural material</li> <li>q) building and demolition waste</li> <li>r) asphalt waste (including asphalt resulting from road construction and waterproofing works)</li> <li>s) biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the <i>Biosolids Guidelines</i> (EPA 2000)</li> <li>t) cured concrete waste from a batch plant</li> </ul> |

| Term               | Definition   |
|--------------------|--|
|                    | <ul> <li>v) fully cured and dried residues of resins, glues, paints, coatings and inks</li> <li>w) anything that is classified as general solid waste (non-putrescible) pursuant to<br/>an EPA Gazettal notice,</li> </ul>   |
|                    | <ul> <li>anything that is classified as general solid waste (non-putrescible) pursuant to<br/>the Waste Classification Guidelines,</li> </ul>  |
|                    | y) any mixture of anything referred to in paragraphs (a)–(x)   |
| GGMP               | Greenhouse Gas Management Plan   |
| Green Waste        | Organic waste resulting from the trimming, pruning, lopping, cutting or felling of any form of vegetation, such as grass, trees or shrubs  |
| На                 | Hectare  |
| Harm               | Harm to the environment includes any direct or indirect alteration of the environment that has the effect of degrading the environment and, includes any act or omission that results in pollution   |
| Hazardous<br>Waste | <ul> <li>Waste (other than special waste or liquid waste) that includes any of the following:</li> <li>a) anything that is classified as:</li> <li>i. a substance of Class 1, 2, 5 or 8 within the meaning of the Transport of</li> </ul>                                  |
|                    | <ul> <li>a substance to which Division 4.1, 4.2, 4.3 or 6.1 of the Transport of<br/>Dangerous Goods Code applies,</li> <li>containers, having previously contained:</li> </ul>   |
|                    | i. a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or  |
|                    | applies.   |
|                    | from which residues have not been removed by washing or vacuuming,<br>c) coal tar or coal tar pitch waste (being the tarry residue from the heating,<br>processing or burning of coal or coke) comprising more than 1% (by weight) of coal<br>tar or coal tar pitch waste, |
|                    | d) lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes),  |
|                    | e) lead paint waste arising otherwise than from residential premises or educational or child care institutions,  |
|                    | f) anything that is classified as hazardous waste pursuant to an EPA Gazettal  |
|                    | <ul> <li>anything that is classified as hazardous waste pursuant to the Waste Classification Guidelines,</li> </ul>  |
|                    | h) a mixture of anything referred to in paragraphs (a)–(g).  |
| Hg                 |  |
|                    | Industrial Noise Policy (EPA Guidelines)   |
| K                  |  |
|                    | Landfill Closure and Rehabilitation Management Plan  |
| Leachate           | Liquid released by, or water that has percolated through waste material and contains dissolved and/or suspended liquids and/or solids and/or gases.  |
| LEMP               | Landfill Environmental Management Plan   |
| LEP                | Local Environmental Plan   |
| LGA                | Local Government Area  |
| Licensee           | The Licence holder described at the front of an EPA licence  |

| Term               | Definition  |
|--------------------|---|
| Liquid Waste       | <ul> <li>Any waste (other than special waste) that includes any of the following:</li> <li>a) anything that:</li> <li>i. has an angle of repose of less than 5 degrees above horizontal, or</li> <li>ii. becomes free-flowing at or below 60°C or when it is transported, or</li> <li>iii. is generally not capable of being picked up by a spade or shovel,</li> <li>b) anything that is classified as liquid waste pursuant to an EPA Gazettal notice.</li> </ul>   |
| Mg                 | Magnesium   |
| ml                 | Millilitre  |
| ML                 | Megalitre   |
| Mn                 | Manganese   |
| MSW                | <ul> <li>Municipal Solid Waste: Waste consisting of:</li> <li>a) Household domestic waste that is set aside for kerb side collection or delivered by the householder directly to a waste facility;</li> <li>b) Other types of domestic waste, such as clean-up and residential garden waste; or</li> <li>c) Local council generated waste, such as waste from street sweeping, public litter bins or parks</li> </ul>   |
| mtpa               | Million tonnes per annum  |
| Ν                  | Nitrogen  |
| Na                 | Sodium  |
| NH <sub>4</sub>    | Ammonium  |
| Ni                 | Nickel  |
| NMP                | Noise Management Plan   |
| NOx                | Nitrogen oxides   |
| NPWS               | National Parks and Wildlife Service   |
| OC & OP            | Organochlorine and organophosphorus   |
| OEH                | Office of Environment and Heritage  |
| Offensive<br>Odour | The definitions that pertain to NSW <i>Protection of the Environment Operations Act 1997</i> define an "offensive odour" as an odour:<br>that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances:<br>is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or<br>interferes unreasonably with (or is likely to interfere unreasonably with) the comfort<br>or repose of a person who is outside the premises from which it is emitted, or that is<br>of a strength, nature, duration, character or quality prescribed by the regulations or<br>that is emitted at a time, or in other circumstances, prescribed by the regulations |

| v |
|---|
|   |

| Term                      | Definition  |
|---------------------------|---|
| Organics                  | Means natural organic materials of either "waste" or "non-waste" origin, including<br>any of the following:<br>Putrescible organics such as meat, fish, poultry, vegetables, or their cooked or<br>processed products, as well as bioslids and manures and other animal materials;<br>and<br>Non putrescible organics such as timber, garden trimmings, agricultural, forestry or<br>crop materials or natural fibrous organic or other vegetative materials.<br>However the definition does not include any of the following:<br>Human-made organic chemicals such as solvents or industrial, agricultural, mining,<br>commercial or household chemicals, cleansing agents or personal care products; or |
|                           | by human activity such as oil, petrol, diesel or coal tar.  |
| PAH                       | Polycyclic aromatic hydrocarbon   |
| Pb                        | Lead  |
| Perched<br>groundwater    | Unconfined groundwater held above the water table by a layer of impermeable rock or sediment  |
| Phytocaps                 | A phytocap, or "phytoremediation cap" is an alternate capping system sometimes<br>used in the management of finally closed landfill cells. A phytocap commonly<br>incorporates the use of a range of native trees, shrubs and grasses that are tolerant<br>to saline, ammonium-rich leachate and that therefore have the potential to treat<br>leachate on-site. Phytocapping may prove to be a viable alternative capping system<br>to the more commonly used, fully engineered capping systems  |
| Premises                  | The area occupied by the 'site' referred to under a Licence issued under the NSW Protection of the Environment Operations Act 1997. The Licence applies to the specified activity conducted on those premises. Premises may include buildings or structures, land or places, mobile plant, vehicles or vessels  |
| POEO Act                  | Protection of the Environment Operations Act 1997   |
| PVP                       | Property Vegetation Plan  |
| QA                        | Quality Assurance   |
| Regional<br>Landfill Site | The entire section of land encompassing the landfill to which the EA applies. The total land area of the development site is approximately 86 hectares and incorporates the 20 hectares of area required for the actual landfill, including all site buildings, other operational requirements and leachate and stormwater management measures, a site access road from Waterfall Way and a biodiversity offset area of at least 60 hectares.   |
| Recycling                 | The processing of waste materials into a similar non-waste product. Related organic processing includes the conversion of organics into soil conditioners, compost, humus or other products such as mulching, fermentation and digestion. Such processes are carried out under controlled conditions  |
| Residual<br>Waste         | The fraction of the total waste stream remaining after re-use, recycling or recovery of materials, within current economic and technical bounds.  |
| Resource<br>Recovery      | The extraction from waste of potential resources that can then be used in the manufacture of new products. The value of resource recovery initiatives includes the potential production of energy via the use as fuel of various components of waste, the production of a saleable compost material made from the organic fractions of waste and the potential reclamation of land  |
| Restricted<br>Solid Waste | <ul> <li>Any waste (other than special waste, hazardous waste or liquid waste) that includes any of the following:</li> <li>a) anything that is classified as restricted solid waste pursuant to the Waste Classification Guidelines,</li> <li>b) anything that is classified as restricted solid waste pursuant to an EPA Gazettal notice.</li> </ul>  |
| κL                        |   |

| Term                                  | Definition   |
|---------------------------------------|--|
| Run-off                               | The portion of rainwater that drains away as surface flow.   |
| Sb                                    | Antimony   |
| Scheduled<br>Activity                 | An activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997. See Activity (Scheduled)  |
| Se                                    | Selenium   |
| Special Waste                         | <ul> <li>Any of the following:</li> <li>a) clinical and related waste,</li> <li>b) asbestos waste,</li> <li>c) waste tyres,</li> <li>d) anything that is classified as special waste pursuant to an EPA Gazettal notice.</li> </ul>  |
| SO <sub>4</sub>                       | Sulphate   |
| SS                                    | Suspended soilds   |
| t                                     | Tonnes   |
| тсс                                   | Transport Code of Conduct  |
| TKN                                   | Total kjeldahl nitrogen  |
| тос                                   | Total organic carbon   |
| ТР                                    | Total phosphorus   |
| tpa                                   | Tonnes per annum   |
| ТРН                                   | Total petroleum hydrocarbons   |
| TRH                                   | Total recoverable hydrocarbons   |
| TSC Act                               | Threatened Species Conservation Act 1995   |
| TSR                                   | Travelling Stock Route   |
| Turbidity                             | Turbidity is a measure of suspended material in water that can cause it to look discoloured or muddy. Turbidity is commonly measured in Nephelometric Turbidity Units (NTU)  |
| Utilisation<br>Area                   | Area shown as an utilisation area on a map submitted with the application for an EPA Licence   |
| VENM                                  | Virgin Excavated Natural Material  |
| VOC                                   | Volatile organic compounds   |
| Waste                                 | <ul> <li>Waste is defined under the <i>Protection of the Environment Operations Act</i> 1997 in the following manner:</li> <li>(a) Any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or</li> <li>(b) Any discarded, rejected, unwanted, surplus or abandoned substance, or</li> <li>(c) Any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or</li> <li>(d) Any substance prescribed by the regulation to be waste for the purposes of (the) Act.</li> <li>A substance is not precluded from being waste for the purposes of the Act merely because it is able to be processed, re-used or recycled.</li> </ul> |
|                                       | codes used in NSW are from the Controlled Waste National Environmental<br>Protection Measure (NEPM)  |
| Waste<br>Classification<br>Guidelines | Waste Classification Guidelines, Part 1 Classification of Waste issued by the EPA  |

| Term       | Definition   |
|------------|--|
| Waste Type | A categorisation of waste under the Protection of the Environment Operations Act 1997 and associated regulations into general solid waste (non-putrescible), general solid waste (putrescible), hazardous waste, liquid waste, restricted solid waste and special waste. Classification into Waste Type is determined under the procedures stated in the Waste Classification Guidelines published by the EPA. |
| WLMP       | Water and Leachate Management Plan   |
| WQMP       | Water Quality Monitoring Plan  |
| Zn         | Zinc   |

# Preface

This LEMP has been prepared in accordance with the requirements of the *Environmental Guidelines: Solid Waste Landfills* (EPA, 1996), the Conditions of Consent issued by the NSW Planning and Assessment Commission (Development Consent 06\_0220) including Notices of Modification 1 and 2 and the Conditions of Approval (EPBC 2007/3646) issued by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC, now Department of Environment and Energy, DotEE).

In 2016, the EPA updated the Environmental Guidelines (2016 2<sup>nd</sup> edition). This LEMP has considered the 2016 Environmental Guidelines where appropriate, however as the landfill was approved prior to the release of the 2016 Environmental Guidelines and the design process had commenced, the 1996 Environmental Guidelines are still relevant and are referred to.

This LEMP is a working document, and the management strategies outlined are intended for review on an annual basis or where significant changes to site operation are proposed. Where necessary, the LEMP will be modified as new and more appropriate strategies and technologies become available.

The updating and reissuing of the LEMP and any of its sections during the life of the landfill will be undertaken by Council as an internal process.

This version of the LEMP has been issued during the construction stage of the facility. Some aspects of management may be required to be changed following the issue of an Environment Protection Licence (EPL) by the NSW Environment Protection Authority (EPA). This LEMP will also be revised to provide an accurate reflection of the ongoing operation and monitoring requirements required by the EPL.

# 1.0 Introduction

# 1.1 Overview

Armidale Regional Council (Council) was granted approval by the NSW Planning and Assessment Commission and the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment and Energy (DotEE) in 2012 to construct and operate the Armidale Regional Landfill Facility (Armidale Regional Landfill) off Waterfall Way, Armidale, NSW. Council is the owner and operator of the landfill facility and is also responsible for its management throughout the facility's operational life and subsequent rehabilitation and closure phases.

The landfill facility has a design capacity of 750,000 tonnes of general solid waste over the proposed landfill's life span of approximately 50 years. The landfill facility is intended to service the future waste disposal needs of the region.

# 1.2 Scope

This Landfill Environmental Management Plan (LEMP) has been prepared to satisfy the relevant conditions in Development Consent (06\_0220), in particular Condition 2 of Schedule 5 and also to address the conditions attached to the Approval by the Commonwealth DotEE (EPBC 2007/3646). In addition the LEMP has been prepared to reflect:

- Environmental Guidelines: Solid Waste Landfills (NSW EPA, 1996)
- Environmental Guidelines: Solid Waste Landfills (NSW EPA, 2016 2<sup>nd</sup> edition), where appropriate
- Outcomes of and information contained in the Armidale Regional Landfill Environmental Assessment (AECOM, 2010)
- Detailed design of Cell 1 and associated infrastructure pertaining to the landfill
- Feedback received from relevant government agencies as part of the consultation process

Relevant plans and sub-plans to this LEMP are:

- Biodiversity Offset Management Plan (BOMP)
- Aboriginal Heritage Management Plan (AHMP)
- Water and Leachate Management Plan (WLMP) including the Water Quality Monitoring Plan (WQMP)
- Noise Management Plan (NMP)
- Air Quality Monitoring and Management Plan (AQMMP)
- Greenhouse Gas Management Plan (GGMP)
- Landfill Closure and Rehabilitation Management Plan (LCRMP)
- Transport Code of Conduct

The Environmental Management Structure is shown schematically in Figure 1-1 below.



Figure 1-1 Environmental Management Structure

# 1.3 Purpose

This LEMP has been developed to minimise the environmental impacts from the landfill by outlining the framework for environmental management and monitoring across the landfill. As specified by the Development Consent, the LEMP sets out to:

- Include detailed baseline data.
- Incorporate the management plans and programs required by the Development Consent.
- Address the Benchmark Techniques in Appendix 1 of *Environmental Guidelines for Solid Waste Landfills (EPA 1996).*
- Describe the statutory requirements, limits or performance criteria and specific performance indicators used to judge the performance of, or guide the implementation of, the landfill and its management measures.
- Include the protocol for managing and reporting any incidents, non-compliances with statutory requirements and exceedances of limits, performance measures / criteria.
- Include the protocol to inform the local community and relevant agencies about the operation and environmental performance of the landfill; receive, handle, respond to and record complaints; resolve disputes that may arise; and respond to emergencies.
- Describe the role, responsibility, authority and accountability of key personnel involved in the environmental management of the landfill.
- Include the contingency plan to manage unpredicted impacts and their consequences.
- Include the protocol for periodic review of the LEMP.
- Outline the program to monitor and report on the impacts and environmental performance of the landfill and the effectiveness of the management measures.
- Include a program to investigate and implement ways to improve the environmental performance of the landfill over time.

# 1.4 Regulatory Requirements

## 1.4.1 Legislation

Key legislation relevant to landfill environmental management in NSW includes:

- Environmental Planning and Assessment Act 1979.
- Protection of the Environment Operations Act 1997.
- Protection of the Environment Operations (Waste) Regulation 2005.
- Protection of the Environment Operations (Asbestos) Regulation 2018
- Waste Avoidance and Recovery Act 2001.
- Dangerous Goods (Road and Rail Transport) Act 2008.

Other legislation relevant to key environmental issues at the landfill is identified in the respective sub plans to this LEMP.

In addition to the NSW legislation, the following Commonwealth legislation is relevant to the site:

• Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The EPBC Act governs the Commonwealth environmental assessment process and provides protection for matters of National Environmental Significance, including World Heritage properties. The Act defines proposals that are likely to have an impact on matters of National Environmental Significance as a "controlled action" and requires a referral to be made to the Commonwealth Minister for the Environment and Heritage for a determination as to whether or not the action is a controlled action. If the action is considered to be a controlled action, approval from the Commonwealth is also required.

## 1.4.2 Development Consent

Approval under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) was issued by the NSW Planning and Assessment Commission as a delegate for the then NSW Minister for Planning and Infrastructure on the 4 July 2012 (06\_0220) for the construction and operation of a regional landfill providing a waste capacity of 750,000 tonnes over 50 years. The Development Consent permits the following works:

- Associated infrastructure comprising five 211,000m<sup>3</sup> landfill cells, leachate containment and circulation system, internal access road, office and staff amenities and diesel storage.
- Internal access road and access junction at Grafton Road (Waterfall Way).
- Clearing 20.3Ha of land and 61Ha biodiversity offset scheme.
- Subdivision.

A Modification was granted on the 11 August 2015 (MOD 1) to reflect changes to the landfill design identified during the detailed design phase of the landfill. The modification permitted the:

- Amendment of the timing for the submission of the ground and surface water monitoring plan.
- Installation of a new weighbridge.
- Realignment of the internal access road.
- Amendment of the culvert design.
- Removal of the commitment to install a cattle grid.
- Removal of the 'cell cap layer' from the calculation of the maximum cell volume.

A further Modification was granted on the 30 April 2018 (MOD 2) approving the use of alternative landfill and leachate pond liners and leachate drainage system.

As per Development Consent, Schedule 3, Condition 2, the project has to be carried out generally in accordance with the:

- Environmental Assessment (EA) prepared by AECOM for the Armidale Regional Landfill dated April 2010 and the associated Submissions Report (12 April 2011).
- The Statement of Commitments included as Appendix A to the Development Consent.
- Site layout plans and drawings in the EA (as shown in Appendix B to the Development Consent.
- MOD 1, Modification Application including supporting documentation prepared by AECOM dated March 2015.
- MOD 2, Modification Application including supporting documentation prepared by GHD dated 14 February 2018.

This LEMP addresses the requirements of the Development Consent. The consent conditions are appended to this LEMPin Appendix 01.

## 1.4.3 EPBC Approval

A request that a determination be made under the EPBC Act was submitted in 2007 to the (former) Commonwealth Department of Environment and Water Resources (now Department of the Environment and Energy - DotEE) on the basis that the proposed action (the development of the Armidale Regional Landfill) had the potential to have a significant impact on World heritage Properties and National Heritage Places.

The Minister declared in October 2007 that the project was a controlled action under the EPBC Act as it had the potential to have a significant impact on the downstream values of the Oxley Wild Rivers National park which is part of the Gondwana Rainforests of Australia World Heritage Area.

Approval under the EPBC Act was issued for the Armidale Regional Landfill (EPBC 2007/3646) on 30 August 2012 subject to a number of Conditions.

This LEMP addresses the requirements of the EPBC Approval. The approval conditions are appended to this LEMP in Appendix 02.

## 1.4.4 Environmental Protection Licence

Council is in the process of obtaining an EPL under the *Protection of the Environment Operations* (*POEO*) *Act 1997* for the operation of the Armidale Regional Landfill. The licence is required for the following scheduled activities as listed in Schedule 1 of the POEO Act 1997:

- Waste disposal (application to land).
- Waste Storage.

Council will be the licence holder for the EPL.

This LEMP (and relevant sub-plans) will be reviewed following receipt of the EPL to ensure that the requirements of the EPL are reflected. This will include requirements relating to discharge limits, monitoring and reporting requirements.

#### 1.4.5 Environmental Guidelines

The *Environmental Guidelines: Solid Waste Landfills* (EPA, 1996) promoted a performance-based approach to landfill management across NSW by defining environmental goals and setting out Benchmark Techniques to help achieve the specified environmental goals.

The Environmental Guidelines were revised and issued by the EPA in 2016. The 2<sup>nd</sup> Edition of the Environmental Guidelines (EPA, 2016) moves away from the Environmental Goals and Benchmark Techniques approach and instead provides a set of Minimum Standards that apply to the design, construction and operation of landfills in NSW.

The Armidale Regional Landfill was designed to meet the requirements of the 1996 Environmental Guidelines (EPA, 1996) which were in force when the landfill was approved. Some aspects of the 2016 Environmental Guidelines (EPA, 2016) were considered during the design process and are discussed further below.

5

# EPA 1996 Environmental Guidelines – Benchmark Techniques

To address the requirement of Schedule 5, Condition 2, of the Development Consent (06\_0220) which requires that the LEMP address the Benchmark Techniques within the Environmental Guidelines (EPA, 1996), they have been listed in Table 1-1, together with the LEMP section and/or sub-plans in which they are addressed.

| Table 1-1 LEMP compliance with EPA Benchmark Techniques ( |   |  |   |  |  |  |
|---|---|--|---|--|--|--|
|   | EPA Benchmark Technique                 | Primary Environmental<br>Goal                          | Where addressed in this<br>LEMP   |  |  |  |
| 1   | Leachate Barrier System                 | Preventing pollution of water by leachate              | Water and Leachate<br>Management Plan   |  |  |  |
| 2   | Leachate Collection System              | Preventing pollution of water by leachate              | Water and Leachate<br>Management Plan   |  |  |  |
| 3   | Surface Water Controls                  | Preventing pollution of water by leachate and sediment | Water and Leachate<br>Management Plan   |  |  |  |
| 4   | Groundwater Monitoring<br>Network       | Detecting water pollution                              | Water Quality Monitoring Plan   |  |  |  |
| 5   | Groundwater Monitoring<br>Program       | Detecting water pollution                              | Water Quality Monitoring Plan   |  |  |  |
| 6   | Groundwater Assessment<br>Program       | Detecting water pollution                              | Water Quality Monitoring Plan   |  |  |  |
| 7   | Surface Water Monitoring<br>Program     | Detecting water pollution                              | Water Quality Monitoring Plan   |  |  |  |
| В   | Leachate Monitoring<br>Program          | Preventing pollution of water by leachate              | Water and Leachate<br>Management Plan   |  |  |  |
| 9   | Water Contamination<br>Remediation Plan | Remediating water pollution                            | Water and Leachate<br>Management Plan / Water<br>Quality Monitoring Plan                      |  |  |  |
| 10  | Landfill Gas Containment<br>System      | Preventing landfill gas<br>emissions                   | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan<br>This LEMP |  |  |  |
| 11  | Extraction and Disposal of Landfill Gas | Preventing landfill gas<br>emissions                   | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan<br>This LEMP |  |  |  |
| 12  | Fire Prevention                         | Preventing fired                                       | This LEMP   |  |  |  |
| 13  | Controlled Burning                      | Preventing fires                                       | This LEMP   |  |  |  |
| 14  | Site Closure                            | Assuring that the landfill is rehabilitated to an      | Landfill Closure and<br>Rehabilitation Management   |  |  |  |

|    |                                      | rehabilitated to an<br>acceptable standard | Rehabilitation Management<br>Plan (Draft)  |
|----|--------------------------------------|--|--|
| 15 | Subsurface Gas Monitoring<br>Devices | Detecting landfill gas<br>emissions        | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan |
| 16 | Subsurface Gas Monitoring<br>Program | Detecting landfill gas<br>emissions        | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan |
| 17 | Surface Gas Emission<br>Monitoring   | Detecting landfill gas<br>emissions        | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan |
| 18 | Gas Accumulation Monitoring          | Detecting landfill gas<br>emissions        | Greenhouse Gas Management<br>Plan, Air Quality Management<br>and Monitoring Plan |
| 19 | Remediation of Uncontrolled          | Remediating landfill gas                   | Greenhouse Gas Management  |

|    | EPA Benchmark Technique   | Primary Environmental<br>Goal                          | Where addressed in this LEMP                                      |  |
|----|---|--|---|--|
|    | Landfill Gas Emissions  | emissions  | Plan, Air Quality Management and Monitoring Plan                  |  |
| 20 | Assurance of Quality  | Assuring quality of design, construction and operation | Construction Quality Assurance<br>Plan                            |  |
| 21 | Screening of Wastes<br>Received   | Assuring quality of incoming waste                     | This LEMP   |  |
| 22 | Measurement of Quantities<br>of Waste Received                          | Recording of wastes received                           | This LEMP   |  |
| 23 | Recording of the Quantities,<br>Types and Sources of<br>Wastes Received | Recording of wastes received                           | This LEMP   |  |
| 24 | Compaction of Waste   | Minimising landfill space used                         | This LEMP   |  |
| 25 | Recycling   | Maximisation of recycling                              | This LEMP   |  |
| 26 | Financial Assurance   | Remediating landfill after closure                     | This LEMP   |  |
| 27 | Filling Plan / Contours   | Minimising landfill space<br>used                      | This LEMP   |  |
| 28 | Site Capping and Revegetation   | Remediating landfill after closure                     | Landfill Closure and<br>Rehabilitation Management<br>Plan (draft) |  |
| 29 | Landfill Closure and Post-<br>Closure Monitoring and<br>Maintenance     | Remediating landfill after closure                     | Landfill Closure and<br>Rehabilitation Management<br>Plan (draft) |  |
| 30 | Security of Site  | Preventing unauthorised entry                          | This LEMP   |  |
| 31 | Litter Control  | Preventing degradation of<br>local amenity             | This LEMP   |  |
| 32 | Cleaning of Vehicles  | Preventing degradation of<br>local amenity             | This LEMP   |  |
| 33 | Covering of Waste   | Preventing degradation of<br>local amenity             | This LEMP   |  |
| 34 | Dust Controls   | Preventing degradation of<br>local amenity             | Air Quality Management and<br>Monitoring Plan                     |  |
| 35 | Pest, Vermin and Noxious<br>Weed Controls                               | Preventing degradation of<br>local amenity             | Biodiversity Offset Management<br>Plan                            |  |
| 36 | Odour Controls  | Preventing degradation of<br>local amenity             | Air Quality Management and<br>Monitoring Plan                     |  |
| 37 | Noise Controls  | Preventing noise pollution                             | Noise Management Plan   |  |
| 38 | Fire-fighting Capacity  | Adequate fire-fighting<br>capacity                     | This LEMP   |  |
| 39 | Staffing and Training<br>Requirements                                   | Adequate staffing and training                         | This LEMP and all sub-plans                                       |  |

# EPA 2016 Environmental Guidelines: Solid Waste Landfills

The Armidale Regional Landfill has been designed generally in accordance with the benchmark techniques contained within the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 1996). However some of the elements were modified to reflect the *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 2016, 2<sup>nd</sup> edition).

Similarly, environmental management measures have complied with the 1996 Environmental Guidelines that were in force at the time Development Consent was granted but have considered the 2016 Environmental Guidelines where required.

The following elements were adopted from the 2016 Environmental Guidelines:

- Having one leachate sump per waste cell, rather than gravity flow from cell to cell into one landfill down-gradient sump and extending the leachate collection system to the next down-gradient cell, each time a new cell is constructed.
- Increasing the Flexible Membrane Liner thickness from 1.5mm to 2mm based on the superior performance (i.e. thicker means less prone to accidental puncture/tear and a longer life) of a 2mm liner.
- The use of a geosynthetic clay liner (GCL) as an alternative to a compacted clay liner, consisting of a thin layer of bentonite sandwiched between layers of geotextile with a hydraulic conductivity less than 5 x 10<sup>-11</sup> metres per second (m/s). The landfill has therefore incorporated a composite leachate barrier system comprising a GCL and a geomembrane liner covering the entire floor and walls of the landfill cell.

# 2.0 Site Overview

# 2.1 Property Description

The site is located on Waterfall Way (also known as Grafton Road) about 12 kilometres east of the City of Armidale (refer Figure 2-1). The site incorporates portions of two existing properties known as Sherraloy and Edington. Edington is identified as Lot 1 DP 253346. Sherraloy comprises Lot 2 DP 253346 and Lot 1 DP 820271 (refer Figure 2-2). The site has been purchased by Council and is registered as Lot 1 DP 1206469.

A large proportion of the site has been cleared for agriculture, with the exception of a partially protected remnant of good quality native vegetation to the north of the site which forms part of the Gara Travelling Stock Route (TSR). The site includes three existing farm dams and a farm quarry.

The access road into the landfill from Waterfall Way is approximately 1.2 km long and traverses through the TSR and runs parallel to the western boundary fence.

# 2.2 Zoning and Land Use Provisions

The site is currently zoned RU1 Primary Production under *Armidale-Dumaresq Local Environmental Plan 2012* (LEP 2012). The objectives of this zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To allow for non-agricultural land uses that will not restrict the use of other land in the locality for agricultural purposes.

The landfill design, in conjunction with the implementation of appropriate mitigation measures and responsible operation, will ensure that the proposed facility will not restrict the use of other rural land in the locality for agricultural purposes. The employment of a suite of management measures will ensure the proposal has minimal impact on natural ecological systems and processes. In this regard, the proposed landfill facility is considered to be consistent with the zone objectives.

Under LEP 2012, a 'waste disposal facility' or 'waste or resource management facility' is prohibited within the RU1 zone. However, at the time of project assessment and approval, the site was zoned 1(a) General Rural under Armidale Dumaresq Local Environmental Plan 2008 (LEP 2008). Under LEP 2008, a 'waste disposal facility' was permissible with development consent. Further, the Armidale Regional Landfill project is permissible with consent under the provisions of *State Environmental Planning Policy (Infrastructure) 2007.* Consent for the project was granted under the EP&A Act by the former Department of Planning in 2012.

The site is subject of a Property Vegetation Plan (PVP) under the *Native Vegetation Act 2003* made between Council and Local Land Services (LLS), Approval # 1PVP00088. The PVP is legally binding to the land and is supported by a Biodiversity Offset Management Plan (BOMP) which details the offset management measures to be implemented during construction, operation and closure of the landfill. The Biodiversity Offset Area is shown on Figure 2-3.

A licence is required under the *Crown Land Management Act 2016* to maintain an access easement over the TSR which is Crown land. This licence will be obtained by Council prior to operation of the landfill.

# Armidale Regional Landfill Landfill Environmental Management Plan



Figure 2-1 Site location



Figure 2-2 Overview of the Armidale Regional Landfill Site





# 2.3 Existing and Previous Land Use

Land use within a 1km radius of the landfill includes:

- To the north is agricultural land used for grazing stock (sheep and cattle), the TSR and Waterfall Way.
- Gara dam is located to the north Although Gara the pumping station is no longer operational, water is backfed into the site from Armidale using the Gara 'raw' water main.
- To the east land use is predominately agricultural with sheep and cattle grazing the dominate use. The Gara River and vegetated areas are further to the east beyond the Edington Property.
- Land to the south is agricultural, used for grazing sheep and cattle. The Gara Road and vegetated areas are also in this area.
- To the west lies Strathaven. The property is used for grazing stock (sheep and cattle) and contains an olive grove.

Notable land use in the wider area includes the following:

- Oxley Wild Rivers National Park 4 km to the southeast. This park is a World Heritage Area, managed by OEH (NPWS) with gorges and waterfalls including Wollomombi, the highest waterfall in NSW. Cathedral Rock, Cunnawarra and Carrai National Parks are located to the East beyond Oxley Wild Rivers National Park.
- The towns of Armidale and Uralla are approximately 12km to the west and 25km to the southwest of the site respectively. Armidale has a population of around 25,000 people and facilities there include the New England Regional Art Museum and the University of New England. Uralla was established and developed after gold was discovered at Rocky River in 1851 and today has a population of around 6,000.
- The New England Highway is located just beyond Armidale and links the town of Hexham (just north of Newcastle) with Wallangarra on the NSW / Queensland border.

A five class system is used by NSW Department of Primary Industries (DPI) to classify land in terms of its suitability for general agricultural use. The majority of land within a 2km radius of the site is classed as "suitability Class 4", including the land upon which the majority of the landfill footprint is located. Class 4 is described by NSW DPI as *'land suited to grazing but not cultivation. Overall level of production is comparatively low due to major environmental constraints'*. Class 4 land is regarded as being suitable for only rain fed grazing pasture.

The vegetated area situated within the proposed landfill footprint is classified as "suitability Class 5", described by NSW DPI as *'land not suited for agriculture or only light grazing'*. Class 5 land is generally only suited to supporting light native pasture.

# 2.4 Environmental Characteristics

Important environmental features on the site are related to:

- Biodiversity, including endangered and threatened flora and fauna species, and one endangered ecological community occurring on site.
- Habitat connectivity as the proposed biodiversity offset area could act as part of a regional corridor for threatened fauna via the Gara TSR to the Gara River and on the Oxley Wild Rivers National Park.
- Proximity to the Oxley Wild Rivers National Park World Heritage Area.

The following sections provide an overview of the environmental characteristics of the site, including topography, soils and geology, groundwater and surface water, local meteorology and flora and fauna.

## 2.4.1 Topography

The region encompasses a terrain that is characteristic of a flat, plateau like landscape. The elevation of this area varies between 900m to 1100m (AHD) and is representative of area between Armidale (approximately 12km west of the site) and the Wollomombi River located 24km east of the site.

Much of the ambient landscape is representative of cleared, pastoral land and consequently much of the terrain is flat ranging between 0 - 5 degrees in slope. There is however, a sporadic arrangement of gently rolling, irregularly shaped hills and valleys, most measuring between 0 - 5 degrees in slope and which are commonly little more than 50m high.

Located approximately one kilometre west of the site and progressing in a south-easterly direction (eventually turning sharply to the east and to the south of the landfill footprint), lies a ridge with a moderate slope profile ranging between 0 - 5 degrees. The ridge gives rise to several small plateaus along its peaks and also forms the eastern tier of Burying Ground Creek. The ridge ends to the south-east of the site.

# 2.4.2 Soils and Geology

A summary of the geotechnical investigations undertaken for the site to date are shown below.

| Performed<br>By | Date               | Boreholes | Test<br>Pits | Piezometers | ers Geological Laboratory<br>Mapping Testing |                                     | Other        |
|-----------------|--------------------|-----------|--------------|-------------|--|-------------------------------------|--------------|
| EA Systems      | Sep to<br>Nov 2005 | 27        | 9            | 5           | Yes  | AL, PSD, EC, <i>k</i>               | EM<br>Survey |
| PAPGS           | Feb 2006           | -         | -            | -           | Yes  | No                                  | -            |
| RCA             | Oct 2006           | 10        | -            | 5           | Yes  | MC, AL, PSD,<br>EC, CBR, AG &<br>GW | k            |
| RCA             | Apr 2007           | 7         | -            | 5           | No   | GW                                  | к            |
| AECOM           | Oct/Nov<br>2014    | 8         | 32           | 4           | No   | MC, AL, PSD,<br>EC, CBR, k          | -            |
| AECOM           | Oct 2018           | -         | -            | 5           | No   | No                                  | -            |

 Table
 Summary of Previous Geotechnical / Hydrogeological Site Investigations

**Notes:** MC (Moisture Content), AL (Atterberg Limits), PSD (Particle Size Distribution), EC (Emerson Crumb), CBR (California Bearing Ratio), AG (Aggressivity), *k* (Permeability) and GW (Groundwater).

The most recent hydrogeological site investigation (AECOM, 2018) and a review of data from previous work, indicates a weathered profile consisting of a thin veneer of top soil that is underlain by cohesive residual soils that are of medium plasticity with varying amounts of silt and gravel. Along creek lines and gullies some alluvial and colluvial soils were encountered within the upper metre. Drilling indicates the site is underlain by greywacke of late Palaeozoic age that is occasionally intruded by argillite.

Laboratory test results indicate the soils generally comprise medium plasticity clays that are of low permeability (hydraulic conductivity of  $1 \times 10^{-9}$  m/s) and of low dispersion potential. Subgrade California Bearing Ratios range from 2% to 10% along the proposed access road alignment.

The presence of a possible geological north-east to south-west striking geological fault has been previously mapped in the south-eastern corner of the site. However recent field observations, and interpretations of published geological literature and remote sensing imagery, suggests the fault does not exist.

## 2.4.3 Groundwater

Hydrogeological investigations of the site were previously conducted by EA Systems (2005-2006) and RCA (2006-2007) to establish the current hydrogeological conditions across the site. Groundwater and surface monitoring commenced in 2015 to establish a baseline dataset prior to operation of the Landfill.

Groundwater is present as both a series of shallow perched aquifers and within a deeper regional aquifer. The perched aquifer is located at the interface of the gravelly - clayey residual soils and/or weathered bedrock, typically within the upper five metres. The presence of perched groundwater is likely to be intermittent following rainfall until the water either discharges to the Gara River or infiltrates into the deeper regional aquifer, and is likely to form isolated pockets of groundwater above the regional water table. Groundwater contours based on February 2016 data from CodyHart

Environmental and redrawn by AECOM in 2019 confirmed groundwater flow was from the north-east to the south-west.

## Groundwater levels

Groundwater levels within select monitoring wells installed during previous investigations were measured across the site in November 2018. At other sites the most recent groundwater levels have been tabulated from geotechnical/hydrogeological investigations or CodyHart Environmental monitoring. In general, since 2014 groundwater levels have declined across the site reflecting continual below average rainfall since at least 2014. The results along with additional monitoring wells constructed in 2018 are summarized in Table 2-1.

| Borehole<br>Location | Date Installed | Piezometer<br>Depth (m) | Screen<br>Depth (m) | Groundwater<br>Depth (m) <sup>1</sup> | Date<br>Measured |
|----------------------|----------------|-------------------------|---------------------|---------------------------------------|------------------|
| BH4                  | Oct 2006       | 18.1                    | 6.0 – 18.0          | 4.1                                   | Oct 2014         |
| BH4A                 | Oct 2006       | 2.8                     | 1.0 – 2.8           | 2.81*                                 | Oct 2016         |
| BH5                  | Oct 2006       | 9.6                     | 3.6 – 9.6           | 3.1                                   | Oct 2014         |
| BH5A                 | Oct 2006       | 2.5                     | 0.7 – 2.5           | DRY                                   | Oct 2014         |
| BH7                  | Oct 2006       | 1.5                     | 0.5 – 1.5           | 0.9                                   | Oct 2014         |
| BH9                  | Apr 2007       | 59.5                    | 53.5 – 59.5         | 45.0                                  | Nov 2018         |
| BH10                 | Apr 2007       | 47.0                    | 41.0 - 47.0         | 32.5                                  | Oct 2014         |
| BH11                 | Apr 2007       | 36.0                    | 30.0 - 36.0         | 26.22*                                | Nov 2016         |
| BH12                 | Apr 2007       | 40.0                    | 34.0 - 40.0         | 19.99                                 | Nov 2016         |
| BH13                 | Apr 2007       | 22.0                    | 16.0 – 22.0         | 10.9                                  | Oct 2014         |
| P1                   | Oct 2005       | 2.3                     | 0.5 – 2.0           | 1.9                                   | Oct 2014         |
| BH02                 | Oct 2014       | 11.0                    | 5.0 – 11.0          | 7.4                                   | Nov 2018         |
| BH02A                | Nov 2014       | 29.6                    | 23.6 – 29.6         | 7.66                                  | Nov 2018         |
| BH04                 | Nov 2014       | 28.0                    | 22.0 – 28.0         | 5.02*                                 | Nov 2016         |
| BH04A                | Nov 2014       | 8.0                     | 5.0 - 8.0           | 6.7                                   | Nov 2014         |
| ABH13                | Oct 2018       | 29.0                    | 25.0 – 28.0         | Dry                                   | Nov 2018         |
| ABH14                | Oct 2018       | 9.0                     | 5.0 - 8.0           | Dry                                   | Nov 2018         |
| ABH15A               | Oct 2018       | 51.2                    | 47.5 – 50.5         | 15.09                                 | Nov 2018         |
| ABH15B               | Oct 2018       | 36.0                    | 29.0 - 35.0         | 15.39                                 | Nov 2018         |
| ABH15C               | Oct 2018       | 9.0                     | 5.0 - 8.0           | Dry                                   | Nov 2018         |

Note: \* from CodyHart Environmental

Groundwater depth measured in the deeper regional fractured rock aquifer ranges from in excess of forty metres in the higher southern elevations to around ten metres in the flatter central region. The area of elevated topography towards the southern site boundary is likely a local source of groundwater recharge.

#### Groundwater Interaction

Previous hydrological studies indicate that the groundwater within the regional aquifer is significantly deeper than the perched groundwater, but that the two aquifers have hydraulic connectivity.

The deeper regional aquifer is a dual porosity aquifer with groundwater flow in the primary matrix, but predominantly within secondary structural features such as fractures, joints, shears and bedding planes (essentially a fractured rock aquifer). The depth of the regional aquifer is below local rivers and creeks, so discharge from the regional aquifer is unlikely to be local, and may be many hundreds of kilometres down gradient within the basin.

The hydrogeological conceptual model was updated to include three additional aquifers:

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- Shallow aquifer (perched within soil profile above the greywacke bedrock)
- Intermediate aquifer (within the weathered fractured rock aquifer)
- Deep aquifer (within the fresh non weathered greywacke)

The thickness of each aquifer is variable across the site and influenced by local conditions. The shallow aquifer is expected to be deepest higher in the profile thinning down gradient as the perched water becomes closer to ground surface. The shallow aquifer extends from approximately two to ten metres below ground level. The intermediate aquifer occurs within the weathered greywacke and based on previous drilling extends to a depth of around 30 to 35 m below ground level. The deep aquifer was intersected in ABH15A at around 47 metres below ground level within the fresh fractured rock.

## Groundwater Quality

Laboratory pH values are largely neutral for both aquifers; however, these values measured in the laboratory can be unreliable, since pH becomes unstable within six hours of sampling. Cations and anions have been measured and the groundwater is generally dominated by bicarbonate and chloride. Limited groundwater quality data is available from previous sampling and therefore a baseline monitoring program was undertaken from July 2015 to November 2016 as part of a bi-monthly pre-construction ground water quality sampling program. This has further informed the existing groundwater quality and has been used to set reasonable detection monitoring criteria, refer to the Water Quality Monitoring Plan. Overall it was assessed that results were typical of slightly saline groundwater in the Armidale Dumaresq area. CodyHart Environmental, 2016 conclude that metal concentrations were low and total nitrogen compounds and total organic carbon concentrations were also low.

CodyHart Environmental, 2016 note that chloroform was the only organic detected in groundwater at low concentrations in ABH9, ABH11 and ABH12. The source of the chloroform is unknown but could be attributed to impurities introduced during the pump cleaning process or from leaky potable water pipes. It is noted that the Waterfall Way water main is located up-gradient from the monitoring wells.

#### 2.4.4 Surface Water

#### Catchment

There are two major drainage lines relevant to the site: Gara River and Commissioners Waters. Neither watercourse traverses the site. However, two intermittently flowing creeks flow onto the site from the neighbouring Strathaven property to the west. These drainage lines join the Gara River to the north-east of the site. Two farm dams are also located within the site and two small dams are located in the biodiversity offset to the west.

The site is situated within the Gara River sub-catchment, a major catchment within the local area that covers an area of 41,486Ha. Runoff from the site runs to the two intermittent drainage lines described previously, which have a combined catchment area of 370Ha. The Gara River feeds into the Macleay River catchment and is managed by the Northern Rivers Catchment Management Authority (CMA).

The land uses within the region are generally agricultural. Some residential, commercial and industrial areas are concentrated around the major urban centres of Guyra and Armidale. Any water-borne pollution within the catchment would come from a combination of urban, rural and industrial sources.

#### Flooding

Runoff from the site falls to the north towards a tributary of the Gara River. The site is located within the upper reaches of the catchment. No flood studies have been conducted by Council in this area, instead, calculations using Manning's equation were used to estimate the 100 year Average Recurrence Interval (ARI) flow and the 100 year flood level in these creeks. The results of these calculations indicate that the site is well outside the extent of the 100 year ARI flood level.

#### Surface Water Quality

Surface water sampling was previously undertaken at three sites on the Gara River (GARA1, GARA2 and GARA4) and two sites on the gully running through the landfill site (GARA3 and GARA5).

GARA5 has generally been dry at the time of sampling while GARA3 has often had low flow with resulting elevated salinity and degraded water quality parameters. The river sites GARA1, GARA2 and GARA4 share similar water quality parameters and elevated nutrient concentrations reflecting the

nature of the surrounding land use. GARA4, located downstream of the confluence of Commissioners Waters at Blue Water Hole has consistently shown higher total phosphorous (TP) concentrations mainly in the form of filterable reactive phosphate (FRP).



Figure 2-4 Surface Water Monitoring Stations

The five locations have been sampled a total of 15 times since 2008 and are considered adequate for use as baseline. In order to better quantify the impact of the Armidale Sewage Treatment Plant (STP) which discharges treated effluent into Commissioners Waters which flows into the Gara River, an additional sampling site (GARA6) upstream of the confluence of the Gara River and Commissioners Waters has been included in the monitoring program. Sampling is still being undertaken at this site to determine the existing water quality at this location. A detection monitoring program has been identified in the Water Quality Monitoring Program to reflect the data obtained to date, refer to Section 7.2.3.

## 2.4.5 Climate and Meteorology

Average temperature, humidity and rainfall data for the site have been recorded at the Armidale Radio Station (Station number 56002- 1857 until 1997) and Armidale Airport (Station number 56238- 1993-current) (Bureau of Meteorology, 2015). Given the range of data, the average of both sites has been used for the site.

The annual mean maximum and minimum temperatures experienced at Armidale are 19.9°C and 7.3°C respectively. On average January is the hottest month with an average maximum temperature of 26.5°C. July is the coldest month, with average minimum temperature of 0.8°C.

The annual average humidity reading collected at 9am from the Armidale airport site is 68%, and at 3pm the annual average is 47%. The month with the highest humidity on average is June with a 9am average of 80%, and the lowest is November with a 3pm average of 41%.

Rainfall data collected at Armidale shows that January is the wettest month, with an average rainfall of 96.5mm. The average annual rainfall is 778mm. There is a strong seasonal pattern for both temperature and rainfall, with most rainfall occurring in the warmer summer months.

## 2.4.6 Flora and Fauna

EA Systems (now EnviroAg) previously conducted a flora and fauna and habitat assessment of the site in 2006 based on surveys conducted in spring and autumn 2005 and 2006. A final fauna survey was also conducted in November 2009. Further survey was undertaken in spring 2014 in order to confirm the relevance of previous findings and support the finalisation of the BOMP and PVP.

Key biodiversity issues of importance are described in the BOMP include:

- One threatened plant species, Narrow-leaved black peppermint (*Eucalyptus nicholii*) found in the TSR. *E. nicholii* is listed as vulnerable under both the *Threatened Species Conservation Act 1995* (TSC) and EPBC Acts.
- One endangered ecological community (Box-Gum Woodland) which is also listed as critically endangered on the *EPBC Act*, and
- Little Eagle and other threatened fauna species which have been recorded on the site.

# 3.0 Landfill Structure and Operations Overview

# 3.1 Landfill Structure and Operation

The following is a summary of the key factors and assumptions that have been considered in formulation of the landfill detailed design and operating procedures:

- The landfill is to be licensed as a General Solid Waste (putrescible) landfill.
- The gross airspace available in the landfill is approximately 1,055,000 cubic metres.
- Waste received at the facility will originate from the existing waste transfer station at the Waste Management Facility on Long Swamp Road. There will be no direct public access to the landfill facility. At the commencement of landfill operations and at other predetermined times, nominated vehicles will be directed to unload at the landfill under supervision.
- Armidale Regional Council sourced waste (excluding non-certified Excavated Natural Material (ENM) and Virgin Excavated Natural Material -VENM) will be received at the landfill facility at a rate of approximately 15,000 tpa for the life of the landfill.
- Non-certified ENM and VENM may be accepted at the site at the rate of approximately 10,000 tpa.
- Waste from outside the Armidale Regional Council may be received during the life of the landfill depending on demand from neighbouring councils.
- The average density of the compacted waste is estimated to be 0.85 tonnes per cubic metre (t/m<sup>3</sup>).
- The cover material will consume approximately 20% of the gross airspace available in the landfill.
- Majority of the cover material required for the landfill will be excavated from the landfill footprint area prior to cell construction or otherwise an alternative daily cover option (as approved by EPA) will be sourced. Additional ENM may also be delivered to the site from other sources when possible.
- Excavations for the landfill footprint are relatively shallow and above groundwater levels.
- The landfill will take approximately 50 years to fill based upon the landfilling rate of 15,000tpa, waste compaction density of 0.85t/m<sup>3</sup> and 20% cover material.
- In the future bailing of the waste to be landfilled may take place at the existing waste transfer station on Long Swamp Road. Bailing involves compacting the waste and then wrapping the compacted waste in plastic. If bailing occurs, cover material requirements may be reduced and compaction densities of the order of 1.0t/m<sup>3</sup> are likely to be achieved.
- No discharge of contaminated waters (e.g. leachate or sediment laden) is permitted to the surrounding environment. In the event that the volume of the dry basin is exceeded, actions outlined in the Water and Leachate Management Plan will be followed.
- The closed landfill will be rehabilitated to its pre-existing land use condition. The 20 Ha footprint would be revegetated with shallow-rooted native grasses, herbs and shrubs, comprising of species currently present on the site. The final use of the rehabilitated landfill footprint would be determined in consultation with Council and relevant agencies, with the option of a phytocap to promote better ecological outcomes.

# 3.2 Landfill Design

The landfill facility is designed as a conventional landfill constructed above natural ground level. The final landform would be progressively covered, rehabilitated and appropriately landscaped over the life of the landfill in order to complement the existing surrounding topography of the local area.

The landfill will be progressively developed as five operational cells that would each contain approximately 211,000 m<sup>3</sup> of landfill material, comprising both waste and cover materials. At currently proposed filling rates (i.e. without any further re-processing of the putrescible fraction of the existing, non-recyclable waste stream and/or improvements in the amount of recyclable material extracted from

the waste stream) each cell would have an operational life of approximately 10 years. The total landfill development would therefore have an operational life of approximately 50 years.

Landfill Cell 1 has been divided into sub-cells A and B to better manage the landfill waste placement and also for the management of leachate and dirty water during initial operations. This is discussed further in Section 3.2.5.

The landfill facility consists of the following main components:

- Leachate Barrier System.
- Leachate Collection and Conveyance System.
- Leachate Storage Pond.
- Sedimentation Basin.
- Dry Basin.

A description of each design component is provided below.

## 3.2.1 Leachate Barrier System

Schedule 4, Condition 5 of the Development Consent (as Modified by MOD 2) requires that:

Each landfill cell must be construction with a leachate barrier that:

- a) is designed in consultation with the EPA and to the satisfaction of the Secretary;
- b) addresses dispersive soil in the A2 and B soil horizons;
- c) meets independent conformance testing in accordance with the NSW EPA Environmental Guidelines Solid waste landfills (2006); and
- d) includes:

• a re-compacted clay liner at least 900 mm thick **or** a geosynthetic clay liner with an insitu coefficient of permeability of less than 10<sup>-9</sup> metres per second covering the entire floor and walls of each waste disposal cell;

• a flexible membrane liner stabilised against or protected from ultra violet light with a minimum co-efficient of permeability of less than 10<sup>-14</sup> metres per second covering the entire floor and walls of each waste disposal cell; and

• a leachate drainage layer for each landfill cell floor comprising a minimum 300 mm layer of drainage medium:

- with a permeability of not less than  $1 \times 10^{-3}$  metres per second;
- which is chemically resistant to leachate; and
- which is capable of withstanding the weight of overlying waste;
- a leachate layer for the landfill cell sidewalls comprising of a Drainage geocomposite layer:
  - with a permeability of not less than  $1 \times 10^{-3}$  metres per second;
  - which is chemically resistant to leachate; and
  - which is capable of withstanding the weight of the overlying waste.

The leachate barrier system installed at the site conforms with the Conditions of the Development Consent, Benchmark Technique Number 1 of the former Environmental Guidelines (EPA, 1996) and the minimum standard for a leachate barrier system as given in the current Environmental Guidelines (EPA, 2016).

The leachate barrier system, covering the entire floor and walls of the cell, consists of the following:

- A compacted subgrade to provide a smooth, stable surface of high bearing strength on which to install the liner.
- A geosynthetic clay liner (GCL) with a hydraulic conductivity less than 5 x 10<sup>-11</sup> m/s.

 An overlying 2 mm HDPE geomembrane liner with a minimum co-efficient of permeability of less than 10<sup>-14</sup> m/s.

The cell floor (prior to construction of the leachate barrier) has been excavated to a nominal depth of 1.5 m below ground to source suitable clay fill materials for the leachate barrier clay liner and the perimeter embankments. The cell floor has been re-graded to maintain a minimum 1% longitudinal fall of the leachate collection pipes.

# 3.2.2 Leachate Collection and Conveyance System

The leachate collection system conforms to the Benchmark Technique Number 2 of the former Environmental Guidelines (EPA, 1996) and the minimum standard for a leachate barrier system as given in the current Environmental Guidelines (EPA, 2016).

A leachate drainage layer and collection pipes have been installed above the leachate barrier system to effectively drain leachate to a collection sump. The leachate drainage layer consists of 300mm thick gravel layer covering the entire floor and walls of the cell and has a co-efficient of permeability not less than  $10^{-3}$  m/s with a protection geotextile below and a filter geotextile above the gravel layer.

The leachate collection and conveyance system consists of a series of slotted collection pipes within the cells drainage gravel layer draining via gravity to a leachate collection sump. There is access for cleanout via flush points located along the perimeter bund at each end of the main leachate collection pipes. Leachate from the collection sump will be pumped to the Leachate Storage Pond.

## 3.2.3 Leachate Storage Pond

Schedule 4, Condition 7 of the Development Consent (as Modified by MOD 2) requires that:

The leachate storage dam must:

- e) be designed in consultation with the EPA and to the satisfaction of the Secretary;
- f) be designed to address dispersive soil in the A2 and B soil horizons;
- g) allow for the level of leachate in the storage dam to be maintained such that there is no overflow
- *h)* be designed to contain a 100-year ARI 3 day rainfall event and provide 150mm freeboard for wave action, providing a total storage capacity of 14.6 ML;
- include a high-level alarm and/or interlock system configured such that the alarm is activated and any pump or gravity flow of leachate to the dam is automatically shut down prior to dam overflow;
- *j) include a leachate barrier comprising:*

• re-compacted clay or similar material at least 600 mm thick with an in situ co-efficient of permeability of less than 2 x 10-10 metres per second covering the entire floor and walls of the dam/s; and

• a flexible membrane liner stabilised against or protected from ultra violet light with a minimum co-efficient of permeability of less than 10-14 metres per second covering the entire floor and walls of the dam/s.

The Leachate Storage Pond was designed to meet the Conditions of the Development Consent and Benchmark Technique Number 2 of the former Environmental Guidelines (EPA, 1996).

The Leachate Storage Pond is located downstream of the final landfill footprint and immediately upstream of the Sedimentation Basin. It will collect and store leachate from the landfill via a pumped leachate main from the landfill's leachate collection system. The main features and details are summarised below:

- A total leachate storage volume of 14.6ML.
- The maximum operating level allows for a freeboard depth of 400mm to contain a 100 year ARI, 3 day rainfall event (225mm) and an additional 150mm freeboard for wave action.

- The entire internal floor and batters of the pond have been lined using:
  - A compacted clay liner 900mm thick with a minimum in-situ co-efficient of permeability of less than 10<sup>-9</sup> m/s; and
  - an overlying 2mm HDPE geomembrane liner with a minimum co-efficient of permeability of less than 10<sup>-14</sup> m/s.
- A 1m wide concrete lined emergency overflow spillway channel located down the pond embankment with discharge into the downstream Sedimentation Basin.
- An shut-off interlock from the level sensor in the leachate pond to the leachate extraction pumps, which will be activated when the leachate in the pond reaches the maximum operating level.

## 3.2.4 Surface Water Infrastructure

Schedule 4, Condition 10 of the Development Consent requires that:

Stormwater infrastructure must be installed to the satisfaction of the Director General: The design must:

- a) be prepared in consultation with NOW and OEH and to the satisfaction of the Director General;
- b) be approved by Director General prior to the commencement of construction;
- c) direct clean water in overland flow around operational parts of the site;
- d) prevent cross-contamination of clean or sediment laden water with leachate;
- e) direct all sediment laden water in overland flow
- away from the leachate containment system;
- to a sediment basin with capacity for a 5 day 95th percentile storm with a minimum *storage* capacity of 5250m<sup>3</sup>.
- f) include a dry detention basin below the operational parts of the site with capacity for a 100 year ARI 3 day rainfall event with a minimum storage capacity of 30ML;
- g) address stormwater run-off from ancillary parts of the site such as the access road.

The surface water controls for the site have been designed to meet the Conditions of the Development Consent and conform to Benchmark Technique Number 3 of the former Environmental Guidelines (EPA, 1996). They have also been designed in accordance with Landcom's *Managing Urban Stormwater: Soils and Construction – Volumes 1 and 2B (Waste Landfills)* (4th Ed., 2004 (the Blue Book).

Stormwater which falls onto the site is classified as clean surface water, dirty surface water or leachate.

Clean surface water includes all waters which fall on undisturbed areas outside the outer batter of the cell's perimeter or "dirty" water drain and on all other undeveloped areas of the landfill facility. Clean water also includes future surface runoff from finally capped and revegetated landfill cells.

Dirty surface water includes water which falls on the disturbed areas of the landfill, but has not come into contact with waste.

Leachate is liquid which has come into contact with waste and will be pumped directly to the Leachate Storage Pond.

#### Clean Water Management

A clean water diversion drain has been constructed around the active landfill area and associated facilities (hardstand and stockpile areas, offices, access roads and internal dams) to prevent clean surface water entering the landfill from run on or localised flood waters. The clean water diversion drain directs the clean water around the landfill footprint into the existing watercourse to the north of the site.

The eastern arm of the clean water diversion drain outlets to a rock apron designed to reduce potential soil erosion and scouring during high flow events prior to discharging into the existing unnamed
watercourse downstream of the site. The western arm of the clean water diversion drain outlets directly into existing unnamed watercourse downstream of the site, and immediately upstream of the site access road culvert crossing.

Clean water within the site, but outside landfill and disturbed areas, will be collected within existing farm dams (where possible) located within the site to act as water quality dams and also provide a potential source of non-potable water for use during landfilling operations, such as dust suppression.

Clean water will not be treated prior to discharge or re-use.

#### Dirty Water Management

Dirty surface water has the potential to be contaminated with sediments, debris and minor oils/grease. It will be collected in dirty water diversion drains constructed around the landfill cells and directed to the Sedimentation Basin.

The Sedimentation Basin is located immediately downstream of the Leachate Pond and upstream of the Dry Basin. The Sedimentation Basin has been designed in accordance with the Blue Book to meet the following design criteria and storage volumes, Table 3-1.

#### Table 3-1 Sedimentation Basin design criteria and storage volumes

| Design criteria   | Storage volumes                              |
|---|--|
| Designed to treat both Type D (dispersive) and F (fine-grained) soils | Total storage volume = 5.4ML                 |
| Capacity for a 5 day 95th percentile event (50 mm)                    | Sediment storage zone = 1.6 ML (2.0m depth)  |
| Provision of an overflow spillway into the downstream Dry Basin       | Overlying settling zone = 3.8ML (1.5m depth) |

The Dry Basin is located outside the landfill cell area and downstream of the Sedimentation Basin and Leachate Pond. The primary objective of the Dry Basin is to provide emergency containment storage in the event of uncontrolled overflow from the Sedimentation Basin and/or Leachate Pond, thus reducing the risk of potential downstream contamination from the landfill operation.

The Dry Basin has been designed in accordance with the Blue Book to meet the following design criteria and storage volumes, Table 3-2.

#### Table 3-2 Dry Basin design criteria and storage volumes

| Design criteria  | Storage volumes                    |
|--|------------------------------------|
| Capacity for a 100 year ARI, 3 day event (225 mm)  | Total storage volume = 36.3ML      |
| Provision of an overflow spillway channel into the downstream clean water diversion drain  | Effective storage volume = 35.5 ML |
| Provision of an underflow pipeline (via a downstream<br>shut-off valve) to effectively gravity drain the basin<br>storage down to the maximum operation level (in a<br>nominal 3 day period) with discharge to the outlet<br>dissipation basin |                                    |

#### 3.2.5 Cell 1 Sub-cell Bund

As previously described, Landfill Cell 1 has been divided into sub-cells A and B with a sub-cell bund.

Waste will initially be deposited in the eastern sub-cell A and rainfall falling on this area will be pumped to the Leachate Storage Pond. The rainfall on the western sub-cell B will be classified as dirty stormwater and directed into the Sedimentation Pond until sub-cell B starts to receive waste after which time any rainfall infiltration will be treated as leachate and the leachate pipework under the bund will be connected so as to direct the flow to the Leachate Storage Pond.

## 3.3 Site Facilities

#### 3.3.1 Access Road

All vehicular access to the site will be via Waterfall Way. The access road to the landfill site is a two way carriageway for the first 100 m to ensure large vehicles can completely exit the intersection should a vehicle be approaching in the other direction. It is not proposed to allow any routine public access to the landfill site for either waste disposal or other purposes. The access road is bitumen sealed from the wheel wash location near the site offices to the roadway's intersection with Waterfall Way.

The culverts under the access road at creek crossings and drainage lines are designed so as not to impede flows in a 1 in 20 year storm event. In addition to the main access road, a perimeter road is located along the boundary of the landfill footprint to allow access to the active cell and tipping face and for maintenance of the different parts of the landfill.

#### 3.3.2 Fencing and Security

There is a standard stock proof fence around the perimeter of the landfill site with security gates that will be locked outside of normal operational hours, or when the site is unattended. Members of the public will not have direct access into the landfill. Vehicles will only be able to access the site by passing through the site gate.

Separate security fences enclose the leachate pond and the landfill cell.

#### 3.3.3 Signs

The site will display adequate signage to advise that it is a private site, not for public use. Additional signage will include:

- Directional and speed limit signs for vehicles.
- Adequate signage to satisfy Workplace Health and Safety requirements.
- Site owner and 24 hour contact number.

In accordance with Schedule 4, Condition 30 of the Development Consent, advertising signs will not be displayed without the written approval of the DPE.

#### 3.3.4 Site Amenities

Amenities to be provided at the landfill include:

- Toilets.
- Staff lunch room.
- Site office.
- First aid / Workplace, Health and Safety (WH&S) facilities (e.g. eye wash facility, fire extinguishers).
- Associated workshop and storage shed for materials and maintenance equipment.
- Staff and visitor parking.

The amenities will be located adjacent to the access road to the site, on the eastern side to ensure efficient movement on and off the site. The amenities will be located a sufficient distance from the landfill and leachate pond to prevent any potential detrimental impacts from odour or aerosol. The location of the amenities will enable timely access in the event of an emergency.

Electricity and communication services will be provided at the site.

Sewage is to be treated with a septic tank and an underground effluent disposal field.

## 3.4 Landfill Operation

#### 3.4.1 Hours of Operation

The normal operating hours of the landfill are 7am to 5:30pm Monday to Friday and 8am to 1pm Saturdays. The landfill will only operate on Sundays and public holidays in the case of emergencies.

#### 3.4.2 Tipping Face and Landfill Cell Operation

The following tipping face operating overview is based on the waste being placed in the landfill and compacted. This overview would require amendment if and when baling is introduced.

- The open tipping face will be sized according to the needs of the vehicle delivering waste and the operational requirement of Council's waste management practices. It is envisaged the tipping face would not be greater than 20m wide by 6.5m long.
- Daily cover material comprising 150mm of VENM will be applied over the waste at the end of each day. Daily cover will be applied to minimise odour emissions, dust, litter and discourage vermin and scavengers. The previously applied daily cover will be removed or punctured before further filling to facilitate leachate and gas movement and prevent the creation of perched watertables. Alternative daily cover material such as foams, plastic sheeting or tarpaulins may be used as approved by the EPA.
- Intermediate cover of 300mm of VENM will be applied over landfilled surfaces if the area is not worked for more than 90 days. This will typically be applied in sections. The intermediate cover will be applied and compacted in order to restrict rainfall infiltration. Intermediate cover will be removed or punctured prior to recommencement of landfilling over covered areas.
- Waste will be compacted to approximately 0.85 t/m<sup>3</sup> using a waste compactor and/or other machinery and the weight of the waste.

#### 3.4.3 Filling/Staging Plan

The landfill master concept has been designed so that filling will commence in the south of the landfill footprint area (Cell 1) and extend towards the north, with the final landfilling area located at the north of the landfill footprint area (Cell 5). Refer to the landfill staging Cells 1- 5, indicated in the drawings in Appendix B of this LEMP. The actual filling of individual cells will be conducted on a North to South orientation. Note that the items provided below are not necessarily listed in order of when they will be carried out. Also note that this staging is approximate only and whilst the order is likely to remain the same, timing may alter dependent upon volume of waste, e.g. if alternative waste technology is adopted at the existing waste transfer station, volumes of waste landfilled will decrease and the life of the landfill will be extended. Alternatively the landfill could commence accepting waste from other local jurisdictions leading to a decrease in the life of the landfill.

#### 0-5 years:

- Access road and site entrance to be cleared, grubbed and constructed.
- Screening trees planted along the access road.
- Security fence to be installed.
- Temporary sedimentation basin constructed.
- Cell 1 cleared, grubbed and excavated.
- Cover material and clay won from excavation stockpiled separately on the western area of future Cell 2.
- Foundation for Cell 1 prepared.
- Liner and bund for Cell 1 constructed.
- Leachate collection infrastructure (collection pipes, drainage material) for eastern area of Cell 1 constructed.
- Leachate Collection Pond constructed.
- Leachate Collection Sump constructed.

- Leachate collection infrastructure for sub-cell A of Cell 1 connected, i.e. pipes connected to sump, leachate from sump pumped to leachate pond).
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste. If required, leachate can also be tankered off-site to a licensed treatment facility.
- Permanent Sedimentation Basin constructed.
- Filling of eastern area of Cell 1 (Sub-cell A) in 2m lift heights.

6-10 years:

- Intermediate cover applied to eastern area of Cell 1 (Sub-cell A).
- Filling of western area of Cell 1(Sub-cell B) in 2m lift heights.
- Filling of Cell 1 to final landform.
- Intermediate cover applied to all of Cell 1 area.
- Any remaining material stockpiled on future Cell 2 (eastern area) to be moved to future Cell 3 (western area).
- Cell 2 cleared, grubbed and excavated.
- Cover material and clay won from excavation stockpiled separately on future Cell 3 (eastern area).
- Foundation for Cell 2 prepared.
- Liner and bund for Cell 2 constructed.
- Leachate collection infrastructure (collection pipes, drainage material) for eastern area of Cell 2 constructed.
- Leachate collection sump 2 constructed.
- Leachate collection infrastructure for Cell 2 connected.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### <u>11- 15 years:</u>

- Filling of Cell 2 in 2m lift heights.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

16 - 20 years:

- Reinjection of leachate into Cell 1 area continues.
- Intermediate cover applied to eastern area of Cell 2.
- Filling of Cell 2 in 2m lift heights.
- Filling of Cell 2 to final landform.
- Intermediate cover applied to all of Cell 2 area.
- Final capping applied to Cell 1 area.
- Any remaining material stockpiled on future Cell 3 (western area) to be moved to future Cell 4 (western area).
- Cell 3 cleared, grubbed and excavated.
- Cover material and clay won from excavation stockpiled separately on future Cell 4 (western area).
- Foundation for Cell 3 prepared.
- Liner and bund for Cell 3 constructed.

- Leachate collection infrastructure (collection pipes, drainage material) for eastern area of Cell 3 constructed.
- Leachate collection sump 3 constructed.
- Leachate collection infrastructure of Cell 3 connected.
- Leachate collection sumps 1 and 2 connected to permanent leachate pond.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 21-25 years:

- Filling of Cell 3 in 2m lift heights.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 26- 30 years:

- Filling of Cell 3 to final landform.
- Intermediate cover applied to all of Cell 3 area.
- Final capping applied to Cell 2 area.
- Any remaining material stockpiled on future Cell 4 (western area) to be moved to future Cell 5 (western area).
- Cell 4 cleared, grubbed and excavated.
- Cover material and clay won from excavation stockpiled separately on future Cell 5 (western area).
- Foundation Cell 4 prepared.
- Liner and bund for Cell 4 constructed.
- Leachate collection infrastructure (collection pipes, drainage material) for eastern area of Cell 4 constructed.
- Leachate collection sump 4 constructed.
- Leachate collection infrastructure in the eastern area of Cell 4 connected.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 31-35 years:

- Filling of Cell 4 in 2m lift heights.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 36- 40 years:

- Filling of Cell 4 in 2m lift heights.
- Filling of Cell 4 to final landform.
- Intermediate cover applied to all of Cell 4 area.
- Final capping applied to Cell 3 area.
- Any remaining material stockpiled on future Cell 5 (western area) to be moved to outside of the landfill footprint area.
- Cell 5 cleared, grubbed and excavated.
- Cover material and clay won from excavation stockpiled separately outside of the landfill footprint area.
- Foundation for Cell 5 prepared.

- Liner and bund for Cell 5 constructed.
- Leachate collection infrastructure (collection pipes, drainage material) for eastern area of Cell 5 constructed.
- Leachate collection sump 5 constructed.
- Leachate collection infrastructure for the eastern area of Cell 5 connected.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 41-45 years:

- Filling of Cell 5 in 2m lift heights.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.

#### 46- 50 years:

- Filling of Cell 5 in 2m lift heights.
- Filling of Cell 5 to final landform.
- Leachate will be managed through evaporation, irrigation over the waste or reinjection back into the waste.
- Intermediate cover applied to all of Cell 5 area.
- Final capping applied to Cell 4 area.
- Final capping applied to Cell 5 area.

No trees will be planted within the landfill footprint as tree roots can damage the capping layer. All surface runoff from the active areas would be contained and treated as leachate.

Stockpiles of cover material and capping material will be stored one cell ahead of the current disposal area shown on the filling plan, e.g. when cells 1 and 2 are being filled, material will be stockpiled on the footprint of Cell 3.

#### 3.4.4 Landfill Capping

Daily and intermediate capping is discussed under Section 3.4.2.

Application of final capping over the landfilled areas will commence as soon as practicable after the final delivery of waste to a cell. This will occur progressively as cells reach their final landfill height.

The capping system will be designed and constructed in accordance with the Environmental Guidelines (EPA, 2016). Under current rules and regulations the final capping would comprise the following layers from bottom to top. However, see the note at the end of this section.

- A seal bearing surface consisting of rolled and compacted intermediate capping at least 300mm thick, which would already be in place until completion of filling to the maximum height.
- If required a gas collection drainage layer will be installed below the sealing layer to collect gas and convey it to atmosphere. A number of gas vents will be keyed into the gas drainage layer to keep gas near the landfill below its Lower Explosive Limit (LEL) and ensure that any gas is directed in a controlled manner away from the landfill. This drainage layer would comprise 300mm gravel with a saturated hydraulic conductivity to water of greater than 1 X 10<sup>-4</sup>m/s. A separation geotextile would be placed over the upper surface to prevent the ingress of fines from the overlying soil, which can clog the drainage layer.
- A sealing layer comprising of compacted clay 600mm thick with an in situ saturated hydraulic conductivity of less than 10-<sup>9</sup> m/s.
- An infiltration drainage layer (permeability not less than 10<sup>-4</sup> m/s) of gravel of 300mm thick beneath the revegetation layer to drain water that has passed through the revegetation layer away from the sealing layer to prevent ingress into the landfill. A separation geotextile would be placed over the upper surface to prevent the ingress of fines from the overlying soil, which can clog the drainage layer.

• A revegetation layer at least 1000 mm thick comprising clean soils and vegetation. The topsoil layer will comprise topsoil and may include compost to help with vegetation establishment and growth. Given that the final capped landfill will be returned to its pre-existing land use condition post closure (revegetated with native grasses and possibly shrubs), a suitable layer of soil of varying thickness to suit the root depth of any proposed vegetation planed will be required to avoid root damage to the sealing layer. Shallow rooted shrub species will be carefully chosen with this potential in mind.

**Note:** Detailed capping design is generally performed closer to the time at which it is expected to occur. This allows the design to account for progress in technology, e.g. adoption of "phytocaps", which are planted soil covers or any other technologies approved at the time, and also allows the design to capitalise on sources of material that may be available locally at the time of capping. The need for a gas collection drainage layer will be confirmed during the detail design process based on actual landfill gas generation monitoring undertaken during filling of the landfill. As such, this LEMP discusses the requirements of the Environmental Guidelines (EPA, 2016). However, if considered appropriate, EPA approval to vary from these requirements will be sought at the time of detailed capping design.

## 3.5 Waste Screening

#### 3.5.1 Waste Accepted at the Landfill

The material able to be landfilled will be approximately 15,000tpa of General Solid Waste (putrescible) material. This waste will contain putrescibles and other wastes recognised by the EPA as being General Solid Waste.

Non-liquid waste types that are classified in Schedule 1 Part 3 of the POEO Act as General Solid Waste (putrescible) are as follows:

general solid waste (putrescible) means waste (other than special waste, hazardous waste, restricted solid waste or liquid waste) that includes any of the following:

- a. household waste containing putrescible organics,
- b. waste from litter bins collected by or on behalf of local councils,
- c. manure and nightsoil,
- d. disposable nappies, incontinence pads or sanitary napkins,
- e. food waste,
- f. animal waste,
- g. grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids,
- h. anything that is classified as general solid waste (putrescible) pursuant to an EPA Gazettal notice,
- *i.* anything that is general solid waste (putrescible) within the meaning of the Waste Classification Guidelines,
- *j.* a mixture of anything referred to in paragraphs (a)–(i).

It should be noted that car tyres are not currently accepted for landfill disposal at the existing Waste Management Facility on Long Swamp Road. Car tyres must therefore be disposed by other methods, off site. As car tyres are not part of the existing waste stream at the Waste Management Facility, it is unlikely the Armidale Regional Landfill facility would accept any car tyres.

Green waste collected by Council would continue to be composted or mulched at the Long Swamp Road Waste Management Facility and made available for re-use. Green waste will not be disposed of in the Armidale Regional Landfill, except whenever significantly contaminated loads of materials are collected, i.e. contaminated by the inclusion of too high a proportion of "foreign" or otherwise uncompostable matter / objects.

The Long Swamp Road Waste Management Facility will continue to separate all clean, recyclable material from other wastes that would be directed to landfill. All potentially recyclable material that is

separated will continue to be recycled, including glass and plastic bottles, all recyclable metals and "E-waste", electronic waste, mainly consisting of obsolete home or office computing hardware.

Under normal operational conditions waste will be received at the Armidale Regional Landfill on trucks travelling from the Long Swamp Road Waste Management Facility. The exception to this will be during initial filling operations when the trucks of Armidale's garbage collection company will be sent directly to the regional landfill site in order to provide 'fluffy' waste for the first 1.5 metres of fill. All trucks arriving at the Armidale Regional Landfill from the waste transfer station will be weighed at that facility's weighbridge and records will be kept and filed in accordance with the EPA's required waste regulatory system.

Council's weighbridges are not public weighbridges.

The traffic flow to and from the operating Armidale Regional Landfill will be based on the operational and environmental requirements of Council's waste management strategy.

Outside normal operational hours the entrance gate will be locked to prevent any vehicles from entering and exiting the landfill without generating a permanent record.

#### 3.5.2 Procedures for Acceptance of Waste at the Landfill

The key points of the waste screening process are:

- Clear identification and classification of waste materials prior to arrival at the transfer station.
- Fully approved weighbridge at the Long Swamp Road Waste Management Facility, calibrated and stamped annually, to accurately record weights of waste delivered.
- Waste checking procedures at the tipping face to identify non-conforming wastes.
- Systems and procedures to record weights, waste type and disposal location.

The generator, transporter or existing waste transfer station staff will be requested to assess and classify the material prior to its arrival at the regional landfill site. The above information will be reviewed by the Program Leader Waste or delegate, including a check of any analysis used to assist in the classification. Any queries will be referred back to the generator, transporter or waste transfer station staff.

The weighbridge operator will record the following on the site database:

- Date.
- Time.
- Vehicle Registration.
- Customer.
- Gross weight, tare weight, net payload.
- Waste type.

**Note:** the tare weight of transfer station vehicles used for disposal of waste to the landfill will be known and kept on record.

On arrival at the Armidale Regional Landfill, operators will direct the vehicle to the appropriate tipping area. Once the vehicle tips the load in the specified location, the landfill operators will check the load for conformance. Any non-conformance will be reported to the Environmental Officer. The landfill operators will dispose of the load using the appropriate equipment and the deposited waste will be covered in accordance with this LEMP.

#### 3.5.3 Inspection at Disposal Point

Landfill operators will be trained to recognise wastes that are not permitted to be accepted at the site. A list of non-conforming wastes and the methods recommended for handling or movement will be developed prior to landfilling commencing at the site and will form part of the routine working procedures of the operator.

The placement of waste will be monitored at all times to ensure that no liquid, hazardous or medical waste is placed in the landfill.

# 4.0 Roles and Responsibilities

## 4.1 Organisational Structure

Figure 4-1 indicates the staffing and organisational structure implemented for the operation of the landfill.

The structure may be amended to suit the operational requirements of the site as required.

All staff will be made aware of the manner in which the site is to be operated and managed, to ensure compliance with this LEMP, Development Consent conditions, EPBC Approval conditions and the sites EPL (including PIRMP).





## 4.2 Key Personnel

#### 4.2.1 Program Leader Waste

The operation of the Armidale Regional Landfill will be the responsibility of the Program Leader Waste. The Program Leader Waste will work under the directions of Council, or another party on behalf of Council. The Program Leader Waste will be responsible for the organization of daily operation of the landfill to ensure compliance with the EPL, Development Consent conditions, EPBC Approval Conditions, all relevant regulation and this LEMP. The Program Leader Waste will also ensure that all of the monitoring, repairs and maintenance are carried out at the site in accordance with this LEMP.

#### 4.2.2 Waste Coordinator / Environmental Officer

The Waste Coordinator, who will also act as the Environmental Officer, will be responsible for the day to day operation of the landfill, including conducting monitoring on site, or organising and managing any sub-consultants engaged to conduct monitoring. The Waste Coordinator will work with the Program Leader Waste to ensure compliance with the EPL, Development Consent conditions, EPBC Approval conditions, all relevant regulation and this LEMP. The officer will also carry out works as directed by the Program Leader Waste.

## 4.2.3 Landfill Operators

The landfill operators will be responsible for carrying out the operation works including weighing, filling and covering of waste. The landfill operators will report and be directed by the Waste Coordinator.

#### 4.2.4 Council and Consultant Personnel

All other personnel will be responsible for implementing the environmental management and monitoring measures identified within this LEMP and sub plans. Detailed roles and responsibilities for each relevant environmental issue are contained within the relevant sub plan. These responsibilities generally include:

- Undertaking surface and groundwater monitoring.
- Maintenance of the offset area including weed management and bush regeneration activities.
- Monitoring noise and air quality.
- Removal of stray litter.

## 4.3 Training Requirements

#### 4.3.1 Management Strategy

Staffing and training requirements will be in accordance with Benchmark Technique Number 39 – Staffing and Training Requirements.

All staff accessing the landfill will be inducted into the site and hold a General Construction Induction (White Card). Specific training requirements that may be required for personnel are detailed in relevant sub plans.

#### 4.3.2 Training Activities/Frequency

Training will include an introductory induction to the landfill site, fire training, environmentally responsible behaviour, Workplace Health and Safety training and other training as required (e.g. training specific to equipment used by the staff member).

It is expected that the staffing and training requirements will be refined during construction and operation of the landfill (specific Construction training is outlined separately in the CEMP). Consequently, the staffing and training requirements proposed may vary from those provided herein.

As a minimum, staff accessing the site during operation require the following training:

- Site induction
- Induction and understanding of the PIRMP and emergency response procedure

#### Site induction

The site induction will include:

- General site awareness, including site access, hours of work, and any relevant Council policies/rules.
- Environmental emergency response training and incident management and reporting process.
- Health and safety measures.
- Familiarisation with site environmental issues and their controls as identified in the LEMP In particular:
  - Measures pertaining to the Biodiversity Offset Area and key threatened species known to occur on the site.
  - Noise minimisation techniques.
  - Sediment and erosion control measures.

Records of all site induction and training carried out will be retained by the Council for a minimum of five years and will include details on the following:

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- Who was trained/inducted;
- When the person was trained/inducted;
- The name of the supervisor/inductor; and
- A general description of the induction content.

#### 4.3.3 Training Records and Review

The Site Environmental Officer will correlate the details of staffing and training undertaken.

Regular reviews will determine the need for any additional or revised training.

In the event that the landfill is not being managed in an environmentally responsible and safe way, remedial actions will be implemented which may include:

- Internal review and amendment of the staffing and training requirements.
- External review and recommendations of the staffing and training requirements (e.g. conducted by an external consultant or training specialist).
- Additional training for all staff.
- Additional staff employed on site.

# 5.0 Waste Management

## 5.1 Environmental Goals

The following environmental goals as specified by the 1996 Environmental Guidelines have been used to guide the design, monitoring, management and remediation phases of the landfill:

- 1. Assuring quality of design, construction and operation
- 2. Assuring quality of incoming waste
- 3. Recording of wastes received
- 4. Minimising landfill space used
- 5. Maximisation of recycling
- 6. Remediating landfill after closure

## 5.2 Assurance of Quality

#### 5.2.1 Objectives

The objective of quality assurance is to ensure the competency of design, construction, operation, closure and rehabilitation of the landfill.

#### 5.2.2 Management Strategy

The landfill has been designed and constructed in accordance with Benchmark Technique Number 20 – Assurance of Quality which states the following:

To minimise the risk of the landfill having deleterious effects on the surrounding environment, the occupier should construct and operate the landfill to an appropriate quality management system.

Quality assurance during the construction of the landfill was enforced in accordance with a Construction Quality Assurance Plan and a Construction Environmental Management Plan produced specifically for this purpose. This LEMP and its sub-plans provide the operational management measures to be implemented for the landfill, and supports Council's existing environmental management system.

#### 5.2.3 Review and Amendment of the LEMP

This LEMP will be reviewed on an annual basis, or as required, and amended to reflect changed circumstances.

## 5.3 Financial Assurance

Under Part 9.4 of the POEO Act, the EPA can require a licensee (by imposing a condition on a licence) to provide and maintain a financial assurance to secure or guarantee funding for works required under the licence.

## 5.4 Screening of Wastes Received

#### 5.4.1 Objectives

The objectives of the waste screening controls to be implemented are to assure the quality of incoming waste by ensuring that the landfill does not accept wastes that are prohibited from entry.

#### 5.4.2 Management Strategy

The waste screening strategy will be implemented in accordance with Benchmark Technique Number 21 – Screening of Wastes Received, which states the following:

'The landfill occupier should have in place waste acceptance and screening procedures to ensure that the site does not accept wastes that are prohibited from entry'.

'Generally, the following practices will be applied:

- The landfill occupier should ensure that signs clearly indicating the types of wastes that are to be accepted and those that are not to be accepted are prominently displayed at the point of entry.
- The landfill occupier should nominate a program of inspection for incoming waste loads. This may involve directing selected loads to a separate area to dump the load, then closely examining the dumped load for any unapproved wastes.
- The landfill occupier should check that all waste that are controlled under a tracking system have all appropriate documentation prior to acceptance at the site.
- The landfill occupier should have a process to establish that soil and other inert material received is not contaminated according to the relevant EPA guideline. In the case of inert and solid waste landfills, this process must be able to screen out any single amount of hazardous waste greater than 200mL/tonne or 200 g/tonne.
- The landfill occupier should ensure that records of all inspections are maintained for at least four years.
- The EPA's Regional Office should be notified if any unauthorised hazardous wastes have been found onsite, and notified of the identity of any party responsible for dumping hazardous waste with other waste types according to incident reporting requirements in Section 8.4.
- Supervision of tipping activity at the tip face should be maintained when wastes are received at all landfills to ensure the accountability of those depositing unacceptable wastes at the site. Where facilities receive in excess of 500 tonnes per week (25,000 tonnes per annum) this supervision should be undertaken by someone other than the compactor driver.
- All landfill occupiers should ensure adequate training of landfill staff to recognise and handle hazardous or other unapproved wastes'.

The placement of waste will be monitored at all times to ensure that no liquid, hazardous or medical waste is placed in the landfill. The waste screening which will be undertaken is described in Section 3.5 includes detail on inspection at the disposal point and the procedures for waste acceptance.

#### 5.4.3 Performance Indicators

The number of rejected loads from the landfill will indicate if the waste screening controls are being effectively implemented at the site.

#### 5.4.4 Activities/Frequency

Screening of waste will be an ongoing process which will continue until landfill closure.

Training of landfill staff will be conducted as required (refer to Section 4.3), to ensure that all staff are able to recognise and handle hazardous or other unapproved wastes.

#### 5.4.5 Reporting and Review

The waste screening procedure will be reviewed on an annual basis, or as required.

Records of all inspections will be maintained at the landfill for at least four years.

The EPA's Regional Office will be notified if any unauthorised hazardous wastes have been found onsite, and notified of the identity of any party responsible for dumping hazardous waste.

#### 5.4.6 Remedial Actions

In the event that the objectives of the waste screening controls are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the waste screening controls.
- External review and recommendations for amendment of the waste screening controls.

# 5.5 Measurement of Quantities of Wastes Received

#### 5.5.1 Objectives

The objective is to measure the quantities of wastes received at the site.

#### 5.5.2 Management Strategy

The measurement of quantities of wastes received at the site will be undertaken in accordance with Benchmark Technique Number 22 – Measurement of Quantities of Wastes Received, which states the following:

'All landfill operations accepting in excess of 25,000 tonnes per annum of waste should:

- Install a weighbridge.
- Lodge a report on the total quantity of waste received every 12 months, compiled by a registered surveyor or by an alternative method approved by the EPA.

Any weighbridge used should have a valid Calibration Certificate from the Department of Consumer Affairs at all times.

Any weighbridge used should be operational at all times of landfill activity. Should the weighbridge be inoperative, the occupier will notify the EPA immediately and ensure that it is repaired as soon as practicable. While the weighbridge is inoperable, all vehicles will be recorded and tonnages calculated from the relevant applicable truck factors.

Landfills which accept less than 25,000 tonnes per annum of waste will be required to lodge a report every 12 months on the total quantity of waste received and at the facility the previous 12 months. The report is to be compiled by a registered surveyor or by an alternative method approved by the EPA.'

Section 36 of the POEO (Waste) Regulations 2014 states that the occupier of a scheduled waste facility who is required to pay contributions must ensure that there is a weighbridge installed at the waste facility. The Armidale Regional Landfill is exempt from paying contributions as it is outside the regulated area. The weighbridge at the Waste Transfer Station on Long Swamp Road will be used to satisfy the requirements of Benchmarks Technique No.22. Trucks heading for the Armidale Regional Landfill will be weighed at the Waste Transfer Station weighbridge and records will be kept and filed in accordance with the EPA required waste reporting format. The Waste Transfer Station weighbridge will be verified annually to ensure its accuracy and reliability.

#### 5.5.3 Activities/Frequency

The quantity of waste received will be measured continuously throughout the life of the landfill.

#### 5.5.4 Reporting and Review

A report on the total quantity of waste received every 12 months, compiled by a registered surveyor or by an alternative method approved by the EPA will be submitted to the EPA annually, refer to Section 11.3.1.

#### 5.5.5 Remedial Actions

In the event that the objectives for the measurement of quantities of wastes received are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the measurement of quantities of wastes received.
- External review and recommendations for amendment of the measurement of quantities of wastes received.

## 5.6 Recording of the Quantities, Types and Sources of Wastes Received

#### 5.6.1 Objectives

The objective is to record the quantities, types and sources of wastes received at the landfill site.

## 5.6.2 Management Strategy

Benchmark Technique Number 23 – Recording of the Quantities, Types and Sources of Wastes Received, requires that landfill occupants provide data to the EPA each month on the amount, type and source of waste according to the National Waste Classification System.

As discussed further in Section 11.3.1, monthly reporting is not required for waste facilities outside the regulated area.

## 5.6.3 Activities/Frequency

The quantities, types and sources of wastes received at the regional landfill site will be recorded throughout the life of the landfill.

A survey of the landfill will be undertaken by a registered surveyor or by an alternative method agreed to by the EPA on an annual basis.

The perimeter of the landfill facility will be fenced and locked outside of normal operational hours to prevent vehicles from entering and exiting the landfill without generating a permanent record.

#### 5.6.4 Reporting and Review

Records of the quantities, types and sources of wastes received at the landfill site will be provided to the EPA on an annual basis, refer to Section 11.3.1.

The landfill survey will be included in the landfill's Annual Report and submitted to the EPA.

## 5.6.5 Remedial Actions

In the event that the objectives of the recording of the quantities, types and sources of waste received are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the recording of the quantities, types and sources of waste received.
- External review and recommendations for amendment of the recording of the quantities, types and sources of waste received.
- Review and amendment of the site security measures.

## 5.7 Compaction of Waste

## 5.7.1 Objectives

The compaction of waste minimises the landfill void space consumed and hence extends the life of the landfill.

## 5.7.2 Management Strategy

The compaction of waste at the landfill will be undertaken in accordance with the Benchmark Technique Number 24 – Compaction of Waste.

Waste will be placed in the landfill and compacted, in lift heights of approximately 2m. The waste will be compacted to approximately 0.85t/m<sup>3</sup> and daily cover or approved alternative daily cover will be placed over the landfill in accordance with the Benchmark Technique Number 33.

#### 5.7.3 Performance Indicators

The landfill surveys carried out will enable the volume of waste landfilled to be determined. This volume can be compared to the waste acceptance records and, hence the performance of compaction practices can be assessed.

#### 5.7.4 Reporting and Review

Records of the waste compaction achieved at the landfill site will be included in the landfill's Annual Waste Report submitted to the EPA.

## 5.7.5 Remedial Actions

In the event that the objectives of the compaction of waste are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the waste compaction practices.
- External review and recommendations for amendment of the waste compaction practices.

## 5.8 Recycling

#### 5.8.1 Objectives

The objective is to maximise recycling of resources.

#### 5.8.2 Management Strategy

Recycling of waste prior to landfilling will be undertaken per the Benchmark Technique Number 25 – Recycling.

#### 5.8.2.1 Recycling at the Long Swamp Road Waste Management Facility

The majority of wastes received at the landfill will originate from the existing Waste Management Facility on Long Swamp Road. Any recycling and source separation of waste will be undertaken at the Waste Management Facility, not at the Regional Landfill. The Long Swamp Road Waste Management Facility management plan includes the recycling methods, targets and amounts of recyclables collected. Only the residual waste from the Waste Management Facility will be directed to the Regional Landfill for disposal.

## 5.9 Filling Plan/Contours

#### 5.9.1 Objectives

To minimising landfill space used and ensure that the filling of the landfill is undertaken in an orderly and planned way, a filling plan for the landfill has been developed in accordance with the Benchmark Techniques Number 27 – Filling Plan/Contours.

#### 5.9.2 Management Strategy

Filling of the landfill will be undertaken in accordance with Benchmark Technique Number 27 – Filling Plan/Contours.

The landfill concept has been designed so that filling will commence in the south of the landfill footprint area (Cell 1) and extend towards the north, with the final landfilling area located at the north of the landfill footprint area (Cell 5). The proposed staging and filling plan is detailed in Section 3.4.3. A detailed filling plan has been prepared for Cell 1.

#### 5.9.3 Remedial Actions

In the event that the objectives of the Filling Plan are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the Filling Plan.
- External review and recommendations for amendment of the Filling Plan.

# 6.0 Prevention of Hazards

## 6.1 Environmental Goals

The following environmental goals as specified by the 1996 Environmental Guidelines have been used to guide the design, monitoring, management and remediation phases of the landfill:

- 1. Preventing unauthorised entry
- 2. Preventing degradation of local amenity
- 3. Preventing noise pollution
- 4. Adequate fire-fighting capacity
- 5. Adequate staffing and training

Additionally Schedule 4, Condition 3/ of the Development Consent specifies the following:

The Proponent shall:

- install and maintain a perimeter fence and security gates;
- ensure that the security gates are locked whenever the site is unattended.

#### 6.2 Security of Site

#### 6.2.1 Objectives

The aim of the site security is to stop unauthorised access to site, during and outside of normal working hours. While the primary aim is to minimise illegal or uncontrolled dumping of waste on the site, the secondary aim is to ensure the safety of people unfamiliar with the site and the potential risks present on site such as water bodies, passive venting of methane and sloped uneven surfaces.

#### 6.2.2 Management Strategy

The site security system has been designed and constructed in accordance with Benchmark Technique Number 30 – Security of Site.

A perimeter fence will enclose the landfill, the diesel storage tank (required to service on-site equipment), leachate pond and sedimentation and dry basins. The site will have a gate that will be locked outside of normal operational hours, or when the site is unattended. Members of the public would not have direct access into the landfill. Vehicles will only be able to access the site by passing through the site gate. The site's operational area (where the site office is located) and the surrounding area will be monitored by a video system 24/7.

#### 6.2.3 Performance Indicators

The instances of breaches of the site security will indicate if the system implemented is adequate.

#### 6.2.4 Activities/Frequency

The perimeter fence and security gate will be visually inspected by the Waste Coordinator, or delegate, on a regular basis to ensure that it is in good working condition and serving its intended purpose.

#### 6.2.5 Reporting and Review

If the security of the site is being breeched in the same manner on a number of occasions (e.g. intruders are climbing the fence to gain access) then the security system in place will be reviewed and amendments made as required.

The condition of the security system will be documented by the Waste Coordinator on a monthly basis and all amendments made to the system also recorded, including explanatory notes.

The instances of known breaches of the site security will be recorded and documented by the Waste Coordinator.

#### 6.2.6 Remedial Actions

In the event that the objectives of the site security system are not being met, which will be indicated by the instances of unauthorised entry/vandalism/illegally landfilled or dumped waste, remedial actions will be implemented which may include:

- Internal review and amendment of the site security system.
- External review and recommendations for amendment of the site security system.

## 6.3 Litter Control

#### 6.3.1 Objectives

The objective of the litter control system to be implemented at the landfill is to prevent litter from escaping from the landfill, polluting the environment and degrading the local amenity.

#### 6.3.2 Management Strategy

Litter control is generally an operational issue and best managed on a day to day basis, dependent upon location of tipping face, wind conditions and other factors.

Litter will be controlled on the landfill site in accordance with the Benchmark Technique 31 – Litter Control by using a combination of the following litter control system measures:

- Continuous compaction of waste
- The use of portable litter fences around the tipping face.
- Ensuring that all wind-blown litter that leaves the site is retrieved on a daily basis.
- Daily inspection of all litter fences, the perimeter fence and gate around the landfill cell.
- Clearing of litter from fences and gate on a daily basis or as required.
- Signage at the entry gate to advise transport operators that they can be fined for any litter on public roads from the improper transport of waste.

#### 6.3.3 Performance Indicators

The number of complaints relating to litter received will be an indicator or the performance of the litter control system. The visual inspection of the reserve and surrounds will also be a good performance indicator.

#### 6.3.4 Activities/Frequency

The Waste Coordinator will be responsible for organising the daily inspection of the gates, litter and perimeter fences as well as their cleaning as required.

#### 6.3.5 Reporting and Review

Complaints will be recorded as per the general complaint management process detailed in Section 9.0

If litter is not controlled adequately at the site, the litter control system in place will be reviewed and amendments made as required.

The condition of the litter control devices will be documented by the Waste Coordinator on a monthly basis and all amendments/maintenance made to the system also recorded, including explanatory notes.

#### 6.3.6 Remedial Actions

In the event that the objectives of the litter control system are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the litter control measures.
- External review and recommendations for amendment of the litter control measures.

## 6.4 Cleaning of Vehicles

#### 6.4.1 Objectives

Cleaning the undercarriage of vehicles before they leave the site is to be carried out to minimise effects on both local amenity and quality of stormwater run-off.

#### 6.4.2 Management Strategy

Vehicles using landfill sites will inadvertently collect mud and litter on their wheels as they proceed to and return from the active face.

The vehicle cleaning system will be designed and constructed in accordance with Benchmark Technique Number 32 – Cleaning of Vehicles.

Signage will be installed at the landfill, which is clearly visible to vehicles exiting the facility. The sign will inform that it is the vehicle operator's responsibility to ensure that the remnants of their load or the material stuck to the underside of the vehicle or the wheels does not litter public roads.

The undercarriage of vehicles will be cleaned prior to leaving the landfill at the wheel wash facility. Water from the water main or the sedimentation basin will be used in the wheel wash. The water from the wheel wash will be collected and transferred to the leachate pond.

#### 6.4.3 Performance Indicators

Visual inspection of Waterfall Way and the access road will be the best indicator that the vehicle cleaning system in place is meeting the objectives.

#### 6.4.4 Activities/Frequency

Each vehicle which has delivered waste to the landfill will pass through the wheel wash when exiting the facility.

The Waste Coordinator will be responsible for organising the daily inspection of the roads as well as their cleaning as required. The Waste Coordinator will be responsible for organising the weekly inspection of the wheel wash and organising any required maintenance/amendments to the wheel wash.

#### 6.4.5 Reporting and Review

If vehicle cleaning is not controlled adequately at the site, the vehicle cleaning system in place will be reviewed and amendments made as required.

The condition of the wheel wash will be documented by the Waste Coordinator on a monthly basis and all amendments/maintenance made to the system also recorded, including explanatory notes.

#### 6.4.6 Remedial Actions

In the event that the objectives of the vehicle cleaning system are not being met, which will be indicated by the quality of stormwater run-off and effects on Waterfall Way, the management strategy will be assessed and revised. Remedial actions will be determined and implemented in accordance with the Benchmark Technique Number 32 as required.

Should visual inspection show mud/litter at the intersection or on Waterfall Way, the section of road will be cleaned as soon as is practicable.

Remedial actions which may be implemented include:

- Use of road sweeper to remove material from Waterfall Way.
- Internal review and amendment of the vehicle cleaning system.
- External review and recommendations for amendment of the vehicle cleaning system.

# 6.5 Covering of Waste

#### 6.5.1 Objectives

Use of cover material helps to protect the full range of environmental management objectives by limiting run-on and infiltration of water, controlling and minimising risk of fire, minimising emission of landfill gas, suppressing site odour, reducing fly propagation and rodent attraction, and decreasing litter generation.

#### 6.5.2 Management Strategy

The covering practices implemented at the site will be in accordance with Benchmark Technique Number 33 – Covering of Wastes.

The following covering procedures will be implemented at the landfill site:

- Waste will be covered at the end of each day's landfilling activities with 150mm of VENM or alternative daily cover as approved by the EPA.
- Removal or puncturing of daily cover prior to placement of waste.
- Application of intermediate cover of VENM to a depth of 300mm over surfaces which will be exposed for more than 90 days.
- Removal or puncturing of intermediate cover prior to placement of waste.

If in the future, Council decides to bale the waste prior to landfilling, the cover procedures described above may not be necessary and a cover regime agreed to by the EPA will be implemented.

#### 6.5.3 Performance Indicators

The instances of pests accessing the site and the presence of weeds on the site will indicate if the controls implemented are performing in accordance with the pest, vermin and noxious weed control objectives.

Accumulation of litter on the boundary will also indicate if control measures are performing in accordance with the site objectives.

#### 6.5.4 Activities/Frequency

The Waste Coordinator or delegate will conduct a weekly patrol of the site. During this patrol, the Waste Coordinator will look for noxious weeds, pests and vermin or evidence of pests and vermin on the site (e.g. faecal droppings).

#### 6.5.5 Reporting and Review

Noxious weeds, pests and vermin sightings/evidence of animals and complaints relating to animals will be recorded by the Waste Coordinator. Details including location of sighting/evidence, time of sighting and who reported the sighting will be recorded.

#### 6.5.6 Remedial Actions

In the event that the objectives of the covering of waste are not being met, remedial actions will be implemented which may include:

- Internal review and amendment of the covering practices and cover material used.
- External review and recommendations for amendment of the pest, vermin and noxious weed controls (by pest, vermin and noxious weed specialists).

## 6.6 Chemical, Fuel and Oil Management

#### 6.6.1 Objectives

All chemicals, fuels and oils will be stored in a location that does not pose a potential environmental or safety risk.

## 6.6.2 Management Strategy

The storage of chemicals, fuels and oils will be in accordance with Schedule 4, Condition 13 of the Development Consent. Chemicals, fuels and oils will be stored in a purpose made  $2.4 \times 2.0 \times 2.0$  metre self bunded fuel storage container.

## 6.7 Controlled Burning

#### 6.7.1 Objectives

Controlled burning will be undertaken at the site in a manner which does not pose a potential environmental or safety risk.

#### 6.7.2 Management Strategy

The burning of materials at the landfill will be undertaken in accordance with the provisions of the Benchmark Technique Number 13. A Fire Management Plan is provided within the Biodiversity Offset Management Plan which further details the management strategy that will be implemented.

The following controlled burning measures will be implemented:

- Burning will only be undertaken where it does not pose a risk to native vegetation or fauna and within a designated area, and only following prior approval from the EPA and the Rural Fire Service.
- Burning will only be conducted during daylight hours.
- The Waste Coordinator will supervise all controlled burning on site.
- Burning will only be carried out in appropriate weather conditions.
- Burning will not be carried out over areas which have been landfilled, except where extensive landfill gas monitoring has been carried out and approval is granted from the EPA to do so.

#### 6.7.3 Performance Indicators

To demonstrate that controlled burning is being carried out in accordance with the objectives, all burning of materials will be documented and all instances of uncontrolled fires reported.

#### 6.7.4 Reporting and Review

All written approvals/disapprovals from authorities relating to controlled burning, will be retained and filed accordingly.

#### 6.7.5 Remedial Actions

In the event that the objectives of the controlled burning are not being met, which will be indicated by the instances of uncontrolled fires, remedial actions will be implemented which may include:

- Internal review and amendment of the controlled burning measures.
- External review and recommendations for amendment of the controlled burning measures (by a fire specialist).

## 6.8 Fire Prevention and Fire-fighting Capacity

#### 6.8.1 Objectives

To prevent the occurrence of fires and adequately fight fires should they occur to minimise both their impact and any polluting emissions, prevent damage to the environment/ property/ equipment and ensure the safety of staff and the public.

#### 6.8.2 Management Strategy

There are two fire seasons in the region the Armidale Landfill is located. The first season extends from August to November and is associated with the dry westerly winds. The second season extends from February to April and is associated with the high summer temperatures. Under drought conditions

these seasons could extend into the rest of the year. Electrical storms are also common in January and February, and frosts during June and July cause curing of summer and autumn grasses. The NSW Fire Brigade and NSW Rural Fire Service are the fire services in the region.

Bushfire-prone land has been mapped by Council, in consultation with the NSW Rural Fire Service. There are however, no bush fire prone areas within 1km surrounding the proposed landfill site. The site of the proposed landfill is generally clear of vegetation due to the rural land practices that are the dominant land use in the area. Bushfire is therefore not perceived to be a hazard risk to the proposed landfill.

Fire prevention measures to be implemented at the landfill site will include the use of on-site sedimentation basin and dams/tanks as well as the site management practices in compliance with the Landfill Guidelines Benchmark Technique Number 12 – Fire Prevention.

A Fire Management Plan is provided within the BOMP and further details the management strategy that will be implemented. The following fire prevention measures will be implemented at the site:

- The NSW Fire Brigade and NSW Rural Fire Service will be contacted immediately and informed of the nature and location of the fire.
- The local authorities (Police) and emergency services (Ambulance, State Emergency Services) will be contacted immediately and informed of the nature and location of the fire.
- If it is safe to do so, actions will be taken to control/extinguish the fire. Actions may include: use of fire extinguishers, pumping of water from basins, use of water cart, covering fire with dirt/soil.
- Clear signs will be displayed on all storage tanks/drums of flammable liquids required for the operation of the landfill (e.g. diesel storage tank for the on-site machinery).
- The diesel storage tank and any other flammable liquids required for the operation of the landfill shall be located on unfilled land, away from the landfill tipping face. The flammable liquids are to be stored within a bunded area, of 110% capacity of the volume of the liquids stored. No smoking is to be permitted in the vicinity of the flammable liquids storage area.
- The landfill will be covered in accordance with the Benchmark Technique 33 and as outlined in Section 6.5.
- The landfill operators will be trained to inspect the loads at the tipping face for any flammables, sealed containers or drums. Sealed containers/drums will not be permitted for landfilling, unless delivered as a special waste whose contents are clearly identified and suitable for acceptance.
- All staff will be trained in fire management procedures.
- Specific staff members will undergo first aid training.
- Contact numbers for the NSW Fire Brigade and NSW Rural Fire Service, local police and emergency services will be clearly posted in the site office.
- Extinguishers will be available at the site and staff trained in their appropriate use.
- A pump is to be located on site for the use of stormwater for fire fighting purposes.
- Water tanker will be made available for fire fighting water supply.
- Stockpile of clean cover material located away from the tipping face will be available for use to smother landfill fires.
- A dedicated, isolated hot load area tipping away from main tipping face will be provided at which a hot load can be tipped, spread and smothered safely.
- Landfill gas will be controlled.

#### 6.8.3 Performance Indicators

The occurrence and impact of fires at the site may indicate if the fire prevention site management practices implemented are sufficient to ensure that the fire prevention objectives are being met.

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#### 6.8.4 Activities/Frequency

The Waste Coordinator, or delegate, will patrol the site on a weekly basis. As part of this patrol, the Waste Coordinator will visually inspect the site for fire risks and ensure that the fire prevention measures are implemented.

A fire drill will be undertaken on site on an annual basis. The firefighting equipment will be checked and tested on a quarterly basis.

Staff fire training will be carried out as part of the induction process for all new staff and every two years existing staff will undergo a fire training refresher course.

#### 6.8.5 Reporting and Review

Instances of fire will be reported to the authorities as required and a summary provided in the Annual Review. Fire prevention practices will be monitored and reviewed on an ongoing basis.

#### 6.8.6 Remedial Actions

In the event that the objectives of the fire management plan are not being met, which will be indicated by the instances of fire at the site and the impact of fires, remedial actions will be implemented in accordance with the Benchmark Technique Number 12 – Fire Prevention and the following may be carried out:

- Internal review and amendment of the Fire Management Plan.
- External review and recommendations for amendment of the Fire Management Plan, by the NSW Fire Brigade, NSW Rural Fire Service or a fire specialist.
- Additional fire training for all staff.
- Additional firefighting equipment supplied on site.

# 7.0 Environmental Management Implementation

## 7.1 Overview

A series of environmental management sub-plans have been prepared and form part of this LEMP. These plans should be referred to for specific environmental management implementation requirements for key issues and impacts. The plans are identified in Table 7-1.

Table 7-1 Environmental Management Plans

| Plan                                       | Document Number         |
|--|-------------------------|
| Water and Leachate Management Plan         | ARLF-LEMP-RP-0009-WLMP  |
| Water Quality Monitoring Plan              | ARLF-LEMP-RP-0010-WQMP  |
| Air Quality Management and Monitoring Plan | ARLF-LEMP-RP-0006-AQ    |
| Greenhouse Gas Management Plan             | ARLF-LEMP-RP-0003-GGMP  |
| Noise Management Plan                      | ARLF-LEMP-RP-0007-NMP   |
| Biodiversity Offset Management Plan        | 22678.79301             |
| Aboriginal Heritage Management Plan        | ARLF-LEMP-RP-0004-AHMP  |
| Landfill Closure and Rehabilitation Plan   | ARLF-LEMP-RP-0005-LCRMP |
| Transport Code of Conduct                  | ARLF-LEMP-RP-0008-TCC   |

## 7.2 Water and Leachate Management

#### 7.2.1 Environmental Goals

The following environmental goals as specified by the 1996 Environmental Guidelines have been used to guide the design, monitoring, management and remediation phases of the landfill:

- 1. Preventing pollution of water by leachate
- 2. Detecting water pollution
- 3. Remediating water pollution

#### 7.2.2 Water and Leachate Management Plan

Water and leachate management at the landfill facility incorporates a number of water drainage and containment structures for the effective control and management of clean, dirty and leachate water generated within the site during operation. These include:

- Leachate Barrier System
- Leachate Collection and Conveyance System
- Leachate Storage Pond
- Sedimentation Basin
- Dry Basin
- Surface Runoff Diversion Drains
- Leachate Return System.

These are discussed briefly in Section 3.2. The WLMP provides further detail including storage capacities, design failure contingency measures and management requirements.

## 7.2.3 Water Quality Monitoring

Separate monitoring programs have been developed for groundwater, surface water and leachate, and are comprehensively detailed within the WQMP. Provided below is a summary of monitoring requirements.

The monitoring criteria will be finalised in conjunction with the EPA as part of the EPL process. The WQMP will be updated to include the detection monitoring criteria once they have been developed.

#### 7.2.3.1 Groundwater

Baseline groundwater monitoring was undertaken from July 2015 to February 2016 at nine boreholes across the site as part of a bi-monthly pre-construction ground water quality sampling program. Results of the baseline monitoring are presented in the WLMP. From the baseline monitoring, trigger values, were calculated for select analytes. The monitoring frequency, sampling method and analyte is summarised in Table 7-2. The monitoring locations and trigger values are presented in the Water Quality Monitoring Plan, Sections 6.3 and 6.4.

| Analyte/parameter       | Unit of Measure                | Frequency        | Sampling method       |
|-------------------------|--------------------------------|------------------|-----------------------|
| Standing water level    | metres                         | Quarterly        | In-situ               |
| рН                      | рН                             | Every six months | probe                 |
| Redox potential         | milli volts                    | Every six months | probe                 |
| Electrical conductivity | microsiemens per<br>centimetre | Every six months | probe                 |
| Dissolved oxygen        | milligrams per litre           | Every six months | probe                 |
| Iron                    | milligrams per litre           | Every six months | probe                 |
| Lead                    | milligrams per litre           | Every six months | Representative sample |
| Manganese               | milligrams per litre           | Every six months | Representative sample |
| Ammonia                 | milligrams per litre           | Every six months | Representative sample |
| Nitrate + nitrite       | milligrams per litre           | Every six months | Representative sample |
| Nitrogen (Total)        | milligrams per litre           | Every six months | Representative sample |
| TKN-N                   | milligrams per litre           | Every six months | Representative sample |
| Total organic carbon    | milligrams per litre           | Every six months | Representative sample |

#### Table 7-2 Groundwater Monitoring

TKN = total kjeldahl nitrogen

Should the results of any three consecutive monitoring rounds exceed the trigger values for any of the parameters, an investigation into the cause of the exceedance will be undertaken.

#### 7.2.3.2 Surface water

Surface water has been monitored quarterly at six locations both upstream and downstream of the landfill facility, along the Gara river for a range of pollutants to obtain a completed baseline dataset. In order to better quantify the impact of the STP discharge on the water quality of the Gara River, monitoring is still being undertaken at one monitoring site (GARA6) to determine the existing water quality at this location. Detection monitoring at three locations (GARA 5, GARA 3 and GARA 2) will commence upon operation of the landfill as outlined in Table 7-3. Table 7-3 describes the sampling frequency and the laboratory analytical suite for the surface water monitoring program at the site.

#### Table 7-3 Surface Water Monitoring Program

|                    | Baseline monitoring<br>program             | Detection monitoring  | Assessment<br>monitoring   |
|--------------------|--|---|--|
| Sampling<br>points | GARA1<br>GARA2 (GARA3 GARA4<br>GARA5 GARA6 | GARA5 (upstream from landfill)<br>GARA3 (downstream from<br>landfill)<br>GARA2 (1.2 km farther<br>downstream from landfill than | For impacted sampling<br>point : GARA5, GARA3<br>and/or GARA2<br>If GARA2 impacted,<br>add GARA1 and |

|                                | Baseline monitoring program   | Detection monitoring  | Assessment<br>monitoring   |
|--------------------------------|---|---|--|
|                                |   | GARA3)  | GARA6, or more<br>appropriate upstream<br>and downstream<br>substitutes.   |
| Sampling<br>frequency          | Two to six months apart<br>depending if there was<br>flow at GARA3 and<br>GARA5   | Bi-monthly during major<br>construction works<br>Quarterly thereafter   | Determine by review of need  |
| Parameters<br>& analytes       | Field: Depth, volumetric<br>flow, DO, EC, pH, Eh,<br>temp, turbidity, alkalinity,<br>free CO2<br>Laboratory: SS, Cl, SO4,<br>Ca, Mg, Na, K, Hardness,<br>Nutrients (NH4+ as N,<br>TKN as N, NOx as N,<br>Total Phosphorus), Total<br>metals not filtered [Al, As,<br>Cd, Cr, Cu, Ni, Pb, Zn,<br>Mn, Fe, Se, Hg, Fe (II)-<br>GARA6, Br, B, TOC<br>(filtered), UT PAH,<br>OC&OP pesticides,<br>TPH/TRH, speciated<br>phenolics. | Field: Depth, volumetric flow,<br>DO, EC, pH, Eh, temp,<br>turbidity, alkalinity, free CO2<br>Laboratory: SS, Cl, Nutrients<br>(NH4+ as N, TKN as N, NOx as<br>N, Total Phosphorus),<br>Dissolved metals filtered on site<br>with 0.45 µm filter [Al, As, Cd,<br>Cr, Cu, Ni, Pb, Zn, Mn, Fe, Fe<br>(II)], TOC (filtered). | Field: Depth, volumetric<br>flow, DO, EC, pH, Eh,<br>temp, turbidity,<br>alkalinity, free CO2<br>Laboratory: SS, Cl,<br>SO4, Ca, Mg, Na, K,<br>Hardness, Nutrients<br>(NH4+ as N, TKN as N,<br>NOx as N, Total<br>Phosphorus),<br>Dissolved metals<br>filtered on site with 0.45<br>µm filter [Al, As, Cd, Cr,<br>Cu, Ni, Pb, Zn, Mn, Fe,<br>Fe (II)], TOC (filtered),<br>and if sheen, colour,<br>odour indicates it is<br>warranted – test for<br>VOCs, UT PAHs,<br>speciated phenolics. |
| QA samples<br>to<br>laboratory | 1 intra-lab duplicate per<br>10 sampling points/wells   | 1 intra-lab duplicate per 10 sampling points/wells  | 1 intra-lab duplicate per<br>10 sampling<br>points/wells   |

DO = dissolved oxygen, EC = electrical conductivity, Eh = redox potential, temp = temperature  $CO_2$  = carbon dioxide, SS = suspended solids, CI = chlorine, SO<sub>4</sub> = sulphate, Alk = alkalinity, Ca = calcium, Mg = magnesium, Na = sodium, K = potassium, NH4 = ammonium, N = nitrogen, TKN = total kjeldahl nitrogen, NOx = nitrogen oxides, AI = aluminium, As = arsenic, Cd = cadmium, Cr = chromium, Cu = copper, Ni = nickel, Pb = lead, Zn = zinc, Mn = manganese. Fe = iron, Se = selenium, Hg = mercury, Br = bromine, B = boron, TOC = total organic carbon, VOC = volatile organic compounds, OC & OP = organochlorine and organophosphorus pesticides, PAH = polycyclic aromatic hydrocarbon, TPH = total petroleum hydrocarbon, TRH = total recoverable hydrocarbon

A review of the baseline data identified that the geochemical parameters and analytes likely to have at least a 20% immediate increase on the baseline maximum due to landfill leachate intrusion are EC, pH, alkalinity, TOC, total nitrogen, chloride. These were selected due to their early and noticeable response to leachate intrusion in surface water.

Statistically derived trigger values will be calculated for these indicators for the GARA2 sampling point only. The GARA2 indicator statistical trigger values will be calculated using the methodology devised by Hart (2000) in conjunction with a statistician and approved by NSW EPA for the landfill. If GARA2 statistical trigger values, for three or more indicators, are exceeded by 20% or more, then the assessment monitoring program will commence within five working days or sooner.

The data at GARA3 and GARA5 are too variable to devise meaningful trigger values. This is due to their location in the ephemeral stream where sample volumes are limited and often colloidal. On this basis, review of each round's results will be undertaken by a water monitoring specialist.

Trigger values for assessment monitoring as presented in Appendix A of the WQMP include:

• If any three of more of the selected geochemical indicators for GARA2 exceed their statistical trigger value/s by more than 20%

- If either GARA3 and/or GARA5 are determined to be in need of assessment monitoring by a person experienced in water quality review
- If inspection of any other water body in the landfill environs is noted as needing water quality review.

#### 7.2.4 Leachate Management and Monitoring

Leachate is formed from the decomposition of waste and percolation of water through waste. Leachate generation will be minimised through operational practices such as covering waste to minimise rainwater infiltration into the landfill, directing stormwater away from landfill areas and progressively capping and revegetating completed landfill cells.

The landfill has a leachate barrier system to contain leachate and prevent the contamination of surface water and groundwater over the life of the landfill. The leachate barrier system has been designed and constructed to meet the specified requirements, refer to Section 3.2.1. A leachate drainage layer and collection pipes have been installed above the leachate barrier system to effectively drain leachate to a leachate collection sump. From the sump, leachate will be pumped to the leachate storage pond. Refer Section 3.2.3 for further details of the pond.

The stored leachate within the pond will be managed and disposed by way of:

- Surface evaporation;
- Irrigation on to an active landfill cell;
- Re-injection into an active or capped landfill cell; and
- Transportation to a facility licensed to accept such waste.

The leachate storage level within the pond will be monitored on a regular basis by a depth marker, or similar. Depending on the depth, the appropriate rate and method of disposal will be adopted by the landfill operators.

As discussed in Section 3.2.3, in emergency conditions, leachate flows into the leachate pond can be shut down to prevent overflow of the leachate pond. However, should the leachate pond overflow, it will discharge via an emergency overflow spillway channel into the Sedimentation Basin.

#### 7.2.4.1 Leachate Monitoring

Leachate monitoring will be undertaken to provide data on the composition, height levels and volumes of leachate produced by each landfill cell and to record details about any irregular discharges or overflows of leachate from the site.

- Routine composition monitoring. Leachate will be sampled from the leachate collection sump and leachate pond to characterise leachate composition and strength. The sampling frequency and analytical regime is presented in the WQMP.
- Leachate level monitoring. The leachate level will be monitored quarterly in the main leachate sump or riser in each cell to demonstrate that leachate is not accumulating to unacceptable levels above the liner.
- Leachate volume monitoring. Data will be maintained on the volumes of leachate being generated and removed from a landfill cell using continuous pumping or flow records.

| Pollutant  | Frequency  | Sampling method   |
|--|------------|---|
| Electrical conductivity  | Quarterly  | Probe   |
| рН   | Quarterly  | Probe   |
| Standing water level in leachate risers  | Quarterly  | In situ and when not depressed by leachate extraction                                     |
| Volume   | Continuous | From flow meters or pumping<br>records of the amount of<br>leachate transferred from cell |
| Total dissolved solids   | Annually   | Grab sample   |
| Total suspended solids   | Annually   | Grab sample   |
| Major cations and anions (calcium, magnesium, potassium, sodium, chloride, fluoride and sulfate)   | Annually   | Grab sample   |
| Alkalinity (bicarbonate and carbonate)   | Annually   | Grab sample   |
| Dissolved organic matter (total organic carbon,<br>biochemical oxygen demand, chemical oxygen<br>demand)   | Annually   | Grab sample   |
| Ammonia and nutrients (nitrate, nitrite, and phosphorus)   | Annually   | Grab sample   |
| Metals (aluminium, arsenic, barium, cadmium,<br>chromium, cobalt, copper, lead, manganese,<br>mercury, nickel, zinc)   | Annually   | Grab sample   |
| Organic contaminants:<br>• phenols<br>• petroleum hydrocarbons<br>• monoaromatic hydrocarbons (in particular<br>benzene, toluene, ethylbenzene and xylene)<br>• organochlorine and organophosphate pesticides<br>• polycyclic aromatic hydrocarbons. | Annually   | Grab sample   |

Table 7-4 Leachate Sampling Frequency and Analytical Regime

#### 7.2.5 Water Contamination Remediation

The 1996 Environmental Guidelines require that a water contamination remediation plan is developed with the primary goal of remediating water pollution and the related goals of preventing pollution of water by leachate, detecting water pollution and assuring quality of design, construction and operation.

Water contamination remediation is discussed in the WLMP and WQMP.

## 7.3 Air Quality and Landfill Gas Management

#### 7.3.1 Environmental Goals

The following environmental goals as specified by the 1996 Environmental Guidelines have been used to guide the design, monitoring, management and remediation phases of the landfill::

- 1. Preventing landfill gas emissions
- 2. Detecting landfill gas emissions
- 3. Remediating landfill gas emissions

#### 7.3.2 Air Quality Management and Monitoring Plan

The AQMMP details management and mitigation measures relating to dust and odour.

*Benchmark Technique Number 34 – Dust Controls* will be followed where applicable at the site. The following measures will be implemented to minimise generation of dust:

- Sealed roads have been constructed from the public roadway to the gatehouse/waste reception section of the landfill.
- Water spraying is an approved method of dust suppression for unsealed roads and will be employed at the site where required in areas of fine soils and during windy conditions.
- Dust monitoring gauges will be installed, in accordance with AS/NZS 3580.1.1:2007, AS/NZS 3580.10.1:2003 (and as described in this section.
- Sampling and testing will be carried out by a suitably qualified person and a NATA registered laboratory.
- Waste will be covered at the end of each day's landfilling activities as outlined in Section 3.4.2.
- Immediate attention will be given to odorous waste loads received at the landfill. For example, application of cover of thickness greater than 150mm may be applied to particularly odorous waste loads as soon as the load has been applied, rather than at the end of the day.
- Leachate in the leachate pond will be managed to ensure that the leachate pond does not become a source of excessive odour. For example, ponded leachate will be maintained at low levels through application/injection into the landfilled area.
- A meteorological monitoring station has been installed and odour monitoring will be undertaken.

#### 7.3.3 Landfill Gas Management

Landfill gas management practices will be adopted to meet the required outcomes of the 2016 Environmental Guidelines (EPA 2016) to:

- Minimise emissions of untreated landfill gas to air and through sub-surface strata and services.
- Minimise greenhouse gas emissions (methane, the major bulk component of landfill gas, is 20 to 25 times more potent than carbon dioxide).
- Minimise emissions of offensive odour.
- Minimise the explosive risk to humans from gas build-up in confined spaces.
- Ensure that, wherever feasible, landfill gas is sustainably utilised for energy recovery.
- Minimise emissions of air pollutants from the combustion of landfill gas in flaring or electricitygenerating equipment.

The greenhouse gas inventory prepared as part of the EA modelled greenhouse gas emissions including landfill gas generation. The assessment found the installation of a landfill gas extraction system not necessary based on the type and volume of waste to be accepted at the landfill.

The gas generated by the landfill will be contained by the following controls:

- Installation of the leachate barrier system (refer Section 3.2.1)
- Waste covering practices (refer Section 3.4.2)
- Landfill capping and revegetation (Section 3.4.4)

During the initial operational phase of the landfill, its performance with respect to landfill gas production and other associated matters would be assessed and the need for additional landfill gas controls ascertained.

Once the filling of Cell 1 is complete, landfill gas monitoring, surface and subsurface gas testing, would be conducted to determine if gas is being produced and whether the amount of gas produced requires the installation of a gas extraction/control system.

The installation of a gas extraction/control system would be required if perimeter well testing shows methane concentrations that exceed 1.25 percent of methane (measured as volume/volume) or 25 percent of the Lower Explosive Limit (LEL).

Subsurface gas monitoring at the landfill perimeter would initially utilise the existing network of groundwater monitoring wells to detect whether gas migration is an issue, and whether further well development is required. Monitoring of these perimeter wells will commence following the filling and capping of Cell 1.

Methane generation would be monitored to determine whether there is sufficient methane produced to necessitate collection .The monitoring data would be assessed to consider whether the installation of a retro-fitted landfill gas system, is required for electricity generation.

In the event there is insufficient landfill gas to generate electricity but there is sufficient volume to warrant collection, the gas would undergo thermal oxidation, via flaring.

Low volumes of gas are unlikely to warrant collection or flaring and in this instance passive venting would also be investigated as a viable option to manage landfill gas.

Further details relating to landfill gas management and monitoring are included in the GGMP.

## 7.4 Noise Management

#### 7.4.1 Environmental Goals

The following environmental goals as specified by the 1996 Environmental Guidelines have been used to guide the design, monitoring, management and remediation phases of the landfill:

- 1. Preventing degradation of local amenity
- 2. Preventing noise pollution

The Development Consent includes noise emission limits which cannot be exceeded during the construction and operation of the landfill. These are specified by Schedule 4, Condition 16 and summarised in Table 7-5 below.

#### Table 7-5 Noise Emission Limits dB(A)

| Receiver  | Limit                               |
|---|-------------------------------------|
| Residences on privately-owned land during construction                                    | LA <sub>eq(15 minute)</sub> 40dB(A) |
| Residences on privately-owned land during<br>operations                                   | LA <sub>eq(15 minute)</sub> 35dB(A) |
| Residence on privately owned land known as<br>'Sherraloy' during operation of cell 1 only | LA <sub>eq(15 minute)</sub> 38dB(A) |

Notes:  $LA_{eq(15 minute)}$  is the level of noise equivalent to the average of noise levels occurring over the measured period (i.e. 15 minutes).

Modification factors in Section 4 of the NSW Industrial Noise Policy apply to the measured noise levels.

The noise emission limits apply under all meteorological conditions except during rain and wind speeds greater than 3m/s at 10m height; and under "non-significant weather conditions". Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

#### 7.4.2 Management Strategy

Noise generated by the operation of the landfill will be managed and controlled in accordance with the Benchmark Technique Number 37 – Noise Controls so as to avoid and reduce impact to neighbouring residents. Noise management and monitoring measures are contained in the NMP. The measures identified in this plan include:

- Noise attenuation for heavy equipment and use of reversing alarms
- Appropriate housing of fixed equipment
- Appropriate staging of the landfilling to maximise shielding to nearby receivers
- Location of stockpiles where practical to provide additional noise shielding
- Mobile noise barriers where exceedances are identified.

Monitoring of noise will be undertaken using a combination of attended and unattended real time noise monitoring.

Two real time noise monitors will be installed within the landfill site boundary and will trigger an alarm system to notify the Waste Coordinator when the project noise limits are exceeded. The noise monitors will be located within the landfill site, on the southern and western boundaries, closest to the

two nearest receivers. Compliance with the noise limits at the sensitive receivers will require the maximum  $LA_{eq}$  noise levels in Table 7-6 to not be exceeded at the unattended monitoring locations. Table 7-6 LA<sub>eq</sub> Noise Limits at Unattended Monitoring Locations

| Cell in operation | L <sub>Aeq</sub> noise level at unattended monitoring location, dB(A) |            |
|-------------------|---|------------|
|                   | Location 1  | Location 2 |
| Cell 1            | 48  | 42         |
| Cell 2            | 52  | 38         |
| Cell 3            | 59  | 42         |
| Cell 4            | 58  | 40         |
| Cell 5            | 48  | 39         |

Attended measurements will also be undertaken on a biannual basis during the operational phase. The attended monitoring will be used to confirm the noise monitoring approach is accurate and reliable and that noise management measures are effective. If it is determined that operation is showing trends of compliance then yearly attended monitoring would be undertaken, or as otherwise specified by the EPA. Attended measurements will be made at the unattended real time noise monitoring locations and also at nearby sensitive receiver locations.

#### 7.4.3 Remedial Actions

In the event that noise monitoring identifies noise levels above the noise limits the following process is to be implemented by the Waste Coordinator, or delegate:

- 1. Stop work.
- 2. Identify the source/reason for exceedance of the criteria.
- 3. Consult with potentially affected sensitive receivers, where appropriate.
- 4. Outline alternative work methodologies or equipment to mitigate the exceedance or;
- 5. Provide temporary noise barriers (of suitable attenuation) specifications between the works area and the affected receiver until noisy activities are completed.
- 6. Within 7 days of the date of the incident, the Program Leader Waste shall provide the Secretary and any relevant agencies with a detailed report on the exceedance, and such further reports as may be requested.

## 7.5 Biodiversity and Conservation Management

#### 7.5.1 Environmental Goals

The following environmental goal as specified by the 1996 Environmental Guidelines has been used to guide the design, monitoring, management and remediation phases of the landfill; 'preventing degradation of local amenity'.

Measures will be implemented at the landfill to ensure that pests, vermin and noxious weeds are not be present at the site in sufficient numbers to pose an environmental hazard or loss of amenity in the areas neighbouring the site. Measures will be implemented to rehabilitate and conserve vegetation within offset areas and protect native fauna.

#### 7.5.2 Management Strategy

A BOMP has been prepared after consultation between the OEH, Council and EA Systems and provides the management measures for biodiversity and conservation during the life of the landfill. Measures to be implemented include:

- fencing and removal of stock
- revegetation and rehabilitation
- weed and pest control

- relocation of dead wood and trees into the offset area
- enhancing the value of offset for native fauna
- monitoring and reporting.

The BOMP also supports the Property Vegetation Plan in place for the site. The PVP is legally binding and confirms the requirements for offset establishment, maintenance and monitoring.

## 7.6 Aboriginal Heritage Management

#### 7.6.1 Environmental Goals

Council recognises the importance of cultural protocols in the engagement of Aboriginal stakeholders and the Aboriginal community more broadly. Measures will be implemented at the landfill to ensure that Aboriginal heritage items are not impacted, and consultation protocols will provide opportunity for engagement with Aboriginal representatives during the management of Aboriginal heritage items on site.

#### 7.6.2 Aboriginal Heritage Management Plan

The AHMP sets out the procedures for the care and management of Aboriginal sites within the Armidale Regional Landfill site. Specifically the AHMP:

- Ensures all Armidale Landfill Facility personnel and on-site workers are aware of their obligations, responsibilities and the procedures under the *National Parks and Wildlife Act 1974* (NPW Act)
- Establishes a consultation protocol with representatives of the local Aboriginal community
- Provides of a concise set of procedures to enable the conservation of Aboriginal cultural heritage sites artefacts within the proposed Armidale Landfill Facility, including:
  - Fencing of previously recorded Aboriginal sites
  - Provision of Aboriginal heritage inductions & cultural awareness training to Armidale Landfill Facility personnel and on-site workers
  - Management of previously unrecorded Aboriginal sites, including stop work protocols

## 7.7 Landfill Closure and Site Rehabilitation

#### 7.7.1 Environmental Goals

Cell capping, landfill closure and site rehabilitation will adhere to the following goals described in the Landfill Guidelines.

- Remediating landfill after closure.
- Preventing degradation of local amenity

#### 7.7.2 Landfill Closure and Site Rehabilitation

A Landfill Closure and Rehabilitation Management Plan (LCRMP) has been prepared in accordance with the following benchmark techniques:

- Benchmark Technique 14: To ensure the site is closed in a manner that reduces to a minimum the emission of landfill gases. This may involve capping and revegetation designed to have the net effect of decreasing the emission of landfill gas through the surface of the landfill.
- Benchmark Technique 28: To ensure that site capping and revegetation ensures the final surface provides a barrier to the migration of water into the waste, controls emissions to water and atmosphere, promotes sound land management and conservation, and prevents hazards and protects amenity.
- Benchmark Technique 29: To ensure that the landfill continues to be non-polluting and does not cause environmental harm after site closure.

The main final landform and rehabilitation objectives for the site include:

- Final landform designed and rehabilitated to ensure structural stability, revegetation success and containment of wastes.
- Final landform is maintained in a manner that minimises leachate generation.
- Final landform is safe and non-polluting.
- Post-landfill land use compatible with surrounding land uses and returned to Class 4 agricultural land.
- Re-established vegetation communities are self-sustainable, aligned to the site's pre-existing vegetation type and complimentary to the surrounding Stringybark woodland community.
- Improved regional vegetation connectivity through the creation of linkages between the Biodiversity Offset Area and the Gara TSR to the north and existing remnant native vegetation to the west of the site.

Rehabilitation measures detailed in the plan to achieve these objectives include:

- Cell capping
- Growing media establishment
- Revegetation of the disturbed areas of the landfill
- Rehabilitation of the Biodiversity Offset Area

#### 7.7.3 Monitoring

Post-closure monitoring will be implemented for a number of environmental aspects to ensure the landfill does not pose a threat to the environment and to ensure effectiveness of rehabilitation. Aspects to be monitored in the long term include groundwater, surface water, leachate and landfill gas.

# 8.0 Emergency and Pollution Incident Response Procedure

## 8.1 Pollution Incident Response Management Plan

Holders of an EPL are required under the POEO Act to prepare a Pollution Incidence Response Management Plan (PIRMP). Council will prepare a PIRMP to meet the requirements detailed in the POEO (General) Regulations 2009, including:

- Description and likelihood of hazards
- Pre-emptive actions to be taken
- Inventory of pollutants
- Safety equipment
- Communicating with neighbours and the community
- Minimising harm to persons on the premises
- Actions to be taken during or immediately after a pollution incident
- Staff training

The PIRMP will be implemented and tested annually in accordance with the POEO (General) Regulations and reviewed within one month of any pollution incident occurring. This would address any issues with implementing the plan that become known during or following an incident.

## 8.2 Emergency Response

In the event of an emergency at the landfill, the following responsibilities will be followed:

Person Discovering Incident

- 1. Contact Program Leader Waste and inform them of:
  - The nature of the emergency (spill, fire, etc.)
  - The exact location of the incident
- 2. Follow RACE procedure (Table 8-1)
- 3. Carry out emergency duties as directed by the Emergency Controller<sup>1</sup>

**Emergency Controller** 

- 1. Follow RACE procedure
- 2. Stop entry of incoming vehicles (or exit, if emergency is located along the access route)
- 3. Establish and maintain contact with the Emergency Liaison Officer<sup>2</sup>
- 4. Follow the instructions and provide necessary assistance to the external Emergency Services (Police, Fire Brigade, Ambulance)

#### Emergency Liaison Officer

- 1. Maintain contact with Emergency Controller at all times until advised that the emergency has terminated
- 2. Carry out actions agreed with the Emergency Controller
- 3. Inform Program Leader Waste, Media/Promotions Officer, Risk Manager and Site Environmental Officer of emergency
- 4. Implement the PIRMP reporting requirements (refer Section 8.4)

<sup>&</sup>lt;sup>1</sup> Emergency controller to be appointed by the Waste Manager

<sup>&</sup>lt;sup>2</sup> Emergency liaison officer to be appointed by the Waste Manager

# 8.3 RACE Procedures

Table 8-1 RACE Procedures

| Rescue   | Assist persons in immediate danger, if safe to do so   |
|----------|--|
| Alarm    | Notify the Program Leader Waste / site office<br>Alert Program Leader Waste to contact Emergency Services                                    |
| Contain  | Restrict the danger area(s)<br>Attend to the emergency: e.g. fight fire, contain spill, isolate electricity, if safe<br>and trained to do so |
| Evacuate | Evacuate staff to the assembly point if safe   |

## 8.4 Incident Reporting

In accordance with the POEO Act, if a pollution incident causing or threatening material harm to the environment has occurred, each relevant authority will be notified immediately upon becoming aware of the incident.

Harm to the environment is considered to be material under Section 147 of the POEO Act if:

- It involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or
- It results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (or such other amount as is prescribed by the regulations), and
- Loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

Relevant authorities include the EPA, the Ministry of Health, SafeWork NSW and Fire and Rescue NSW. The DPE is also required to be notified in accordance with Schedule 5, Condition 6 of the Development Consent.

EPA notification will be via the EPAs Environment Line Service on 131 555 in the first instance. A detailed report on the incident will be provided to the EPA and DPE within 7 days of the incident.

## 8.5 Contacts

Table 8-2 outlines a list of key industry contacts for the notification of pollution incidents which threaten or cause material harm.

Table 8-2 Contacts for industry notification of pollution incidents causing or threatening material harm

| Contact Name  | Phone          |
|---|----------------|
| Emergency Services (Fire and Rescue NSW, NSW Police, NSW Ambulance Service) | 000            |
| Environment Protection Authority (EPA) Environment<br>Line                  | 131 555        |
| NSW Health (Local Public Health Unit)                                       | (02) 6764 8000 |
| SafeWork NSW  | 13 10 50       |
| Fire and Rescue NSW   | 1300 729 579   |
| Armidale-Regional Council   | 6770 3600      |
| Department of Planning and Environment                                      | 1300 305 695   |

Other useful contact numbers in the event of an emergency include:

#### Table 8-3 Additional emergency contact information

| Agency   | Details   | Phone                                   |
|--|---|---|
| Police   | Armidale Station  | 02 6771 0699                            |
| Fire Brigade   | Armidale Station  | 02 6771 0699                            |
| Ambulance  | Armidale Station  | 13 12 33                                |
| State Emergency Services<br>SES Armidale-Dumaresq Unit | Flood & storms<br>Safety and other information<br>Armidale Unit | 132 500<br>1800 201 000<br>02 6771 1100 |
| Hospital   | Armidale Hospital   | 02 6776 4777                            |

Contact names and phone numbers for the appropriate staff member can be found on Council's website <u>https://www.armidaleregional.nsw.gov.au/</u> under '**Report It**'.

# 9.0 Complaints Management

Complaints may be received via the following methods:

- by phone;
- by e-mail;
- by letter or
- in person at Council's customer service desk

Upon receipt of a complaint, the Waste Coordinator, or delegate, will provide an initial response to the complainant within 24 hours. The Waste Coordinator, or delegate, will undertake further investigation and implement corrective actions as required. Corrective actions may involve supplementary monitoring to identify the cause of the complaint and/or may involve modification of operational techniques to avoid any recurrence or to minimise adverse effects. If requested, the complainant will be contacted to provide feedback on the resolution of the complaint.

Complaints will be recorded and detail the following information:

- The date and time of the complaint
- The method by which the complaint was made
- Any personal details of the complainant which were provided or, if no such details were provided, a note to that effect
- The nature of the complaint
- The action taken by Council in response to the complaint, including any follow-up contact with the complainant
- If no action was taken by Council, the reasons why no action was taken

The Waste Coordinator will record the above details and maintain a Complaints Register. The Complaints Register will be updated monthly and published on the Council's website. A summary of complaints received during the year will be included in the Annual Review.

# 10.0 Compliance monitoring

The Armidale Regional Landfill will be subject to regular audits required by the conditions of approval in addition to the regular site audits and monitoring required as part of this LEMP and its sub plans. Non-conformances will be recorded and recommendations for corrective action will be made and implemented. Where a non-compliance with statutory requirements is identified, the non-compliance will be reported to the Secretary as outlined in Section 11.3.5.
### 10.1 Independent Environmental Audit

Schedule 5, Condition 8 of the Development Consent requires that Council commission an Independent Environmental Audit within a year of the commencement of operations and every 3 years thereafter. The audit must:

- Be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.
- Include consultation with the relevant agencies.
- Assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant EPL, including any plan or program required under these approvals.
- Review the adequacy of any plans or programs required under these approvals; and, if appropriate;
- recommend measures or actions to improve the environmental performance of the landfill, and/or any plan or program required under these approvals.

The audit report and Council's response to any recommendations contained in the audit report must be submitted to the DPE within 6 weeks of completing the audit and be published on Council's website.

It is also noted that records held by Council may be subject to an audit by the DotEE or an independent auditor in accordance with section 458 of the EPBC Act. Summaries of these audits will be posted on the DotEE's website, and may also be publicised through the general media, as stated in Condition 8 of the EPBC approval.

## 11.0 Record Keeping and Reporting

#### 11.1 Record Keeping

Council will maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans required by the project approval.

This includes any monitoring and reporting requirements required under the LEMP sub plans.

Records will also be kept of any incident/spills and measures implemented to remediate the incident.

Records are also to be kept of the following:

- Any audits which have been undertaken;
- Full records of all monitoring and maintenance activities undertaken; and
- Recommendations resulting from monitoring and review programme, and subsequent actions taken.

#### 11.2 Publicly Available Information

In accordance with condition 10 of Schedule 5 of the Development Consent, the following will be made publically available on Council's website.

From the commencement of the construction of the project, the Proponent shall make the following information publicly available on its website as it is progressively required by the approval:

- a. a copy of all current statutory approvals;
- b. a copy of the current plans and programs required under this approval;
- c. a summary of the monitoring results of the Project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
- d. a complaints register, which is to be updated on a monthly basis;
- e. a copy of the Annual Reviews (over the last 5 years);

- f. a copy of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit; and
- g. any other matter required by the Secretary.

#### 11.3 Reporting Requirements

#### 11.3.1 Annual Waste Report

Under Section 22 of the POEO (Waste) Regulation 2014, occupiers of a scheduled waste must provide the EPA with a waste contribution monthly report which includes the quantities and waste types received at the waste facility during the month. However this reporting requirement does not apply to waste facilities outside the regulated area of NSW unless the facility receives waste generated in the regulated area. Armidale and the surrounding regional area is located outside the regulated area and is therefore exempt from monthly reporting.

Licensed landfills outside the regulated area are however required to submit an Annual Waste Report to the EPA. The Annual Waste Report will be completed online via the EPA's Waste and Resource Reporting portal.

Council will provide an Annual Waste Report to the EPA as required by any licence under the *Protection of the Environment Operations Act 1997* (POEO Act).

#### 11.3.2 Annual Return

In accordance with an EPL issued for the facility, an Annual Return will be completed for each reporting period and submitted to the EPA using the approved form.

#### 11.3.3 Annual Review

Schedule 5, Condition 5 of the Development Consent, requires Council to complete an Annual Review one year after the commencement of operations and annually thereafter which will:

- a. Describe the operations that were carried out in the past year
- b. Analyse the monitoring results and complaints records of the landfill over the past year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the EA.
- c. Corroboration of leachate and stormwater monitoring results with baseline conditions;
- d. Identify any trends in the monitoring data over the life of the landfill;
- e. Identify any non-compliance over the last year, and describe what actions were, or are, being taken to ensure compliance; and
- f. Describe what measure will be implemented over the next year to improve the environmental performance of the project.

Condition 9 of the EPBC Approval also requires an annual report to be published on Council's website by the 31 December each year after the commencement of the action. The report is required to address compliance with the conditions of the EPBC Approval over the previous 12 months, including implementation of any management plans specified in the conditions.

Council will prepare one Annual Review report which addresses the requirements of both the Development Consent and the EPBC Approval and submit this report to the DPE and DotEE as well as place it on Council's website by the 31 December each year.

#### 11.3.4 Regular Reporting

In accordance with Section 66(6) of the POEO Act, holders of an EPL are required to make pollution monitoring data that is required to be collected by a licence condition publicly available on its website within 14 working days of obtaining the data. Along with the data, licensees are required to provide a

meaningful summary of the data including information regarding when and to what extent emission limits specified in the licence were not met and why.

The regular reporting of pollution monitoring data required by the POEO Act, will also satisfy the requirement of Schedule 5, Condition 7 of the Consent for regular reporting on the environmental performance of the project.

#### 11.3.5 Reporting of Non-compliances

In addition to the requirement for reporting incidents causing or threatening material harm, Schedule 5, Condition 6 of the Development Consent requires that the DPE is notified upon detecting an exceedance of the limits / performance criteria in the Consent. The Consent includes the following limits / performance criteria:

- Limits of approval: maximum volume for each landfill cell
- Ground and surface water: Discharge limits set by an EPL
- Noise emission limits

An exceedance of the above limits / performance criteria will be notified to the DPE as soon as practicable after the detection of the exceedance and a detailed report provided to the DPE within 7 days.

Non-compliance with any of the conditions of the EPBC Approval will be reported to the DotEE at the time of completion of the Annual Review.

#### 11.3.6 Summary of Reporting Requirements

Table 11-1 summarises the reporting parameters, frequency of reporting, and items to be included in the reports which are required to be submitted to the relevant Government agencies.

| Frequency                                       | Type of Report  | Receiver  |
|---|---|---|
| Immediately                                     | Pollution incident causing or threatening material harm | EPA Environment Line,<br>Ministry of Health,<br>SafeWork NSW,<br>Fire and rescue NSW &<br>DPE |
| As soon as<br>practicable                       | Exceedance of limits / performance criteria             | DPE   |
| Within 7 days                                   | Pollution incident causing or threatening material harm | EPA & DPE   |
|   | Exceedance of limits / performance criteria             | DPE   |
| Monthly   | Complaints Register update                              | Website   |
|   | Pollution monitoring data & summary                     | Website   |
| Annually  | EPA Annual Return                                       | EPA   |
|   | Annual Waste Report                                     | EPA   |
|   | Annual Review   | DPE, DotEE &<br>Website   |
| One year after<br>commencement<br>of operations | Independent Environmental Audit                         | DPE & Website   |
| 3 yearly  | Independent Environmental Audit                         | DPE & Website   |

Table 11-1 Summary of Reporting Requirements

## 12.0 Review of this LEMP

This LEMP and sub plans will be reviewed and if necessary revised in accordance with Schedule 5, Condition 5, within three months of submitting the Annual Review, an independent Environmental

Audit report or an incident report to the DPE. The revised Plans will be re-submitted to the DPE for confirmation that the Secretary is satisfied with the revisions.

## 13.0 References

AECOM Australia Pty Ltd (AECOM), 2010, Armidale Regional Landfill Environment Assessment

Environment Protection Authority (EPA), 2016, *Environmental Guidelines: Solid Waste Landfills*, January 2016, available online:

http://www.environment.nsw.gov.au/resources/waste/envguidIns/solidlandfill.pdf

CodyHart Environmental, 2016; Baseline Groundwater & GARA6 Monitoring for June, October & late November. Armidale Regional Landfill prepared for Armidale Dumaresq Council, dated 27 December.

# **Appendix A**

## **Project Approvals**

Appendix A1 Development Consent (06\_0220)

Appendix A2 EPBC Approval (2007/3646)

## **Appendix B**

Filling Plan

Appendix B Filling Plan