Jindabyne Regional Waste Management Facility

Landfill Environmental Management Plan

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December 2011

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Snowy River Shire Council

Minchem (Canberra) Pty. Ltd.
ABN 85 008 558 218
Suite 8, 3rd Floor, 161 London Circuit
Civic Square ACT 2608
PO Box 3830 Manuka, ACT 2603
Email:
bob.thompson@minchem.com.au
www.minchem.com.au
Tel: + 61 2 6230 4992
Fax: + 61 61620761
Mob: 0418 217 648

MINCHEM **Environmental & Planning Consultants**

The Plan has been prepared by:

Mr Bob Thompson
MEnv&LgovLaw,MPIA,MRMIA,CPP
Certified Practising Planner

Mr Syed Kabir
B.Sc & M.Sc, MEnvEng
Environnemental Scientist.

MINCHEM (CANBERRA) PTY LTD
Suite 8, 3rd Floor
161 London Circuit, Civic
PO Box 3830,
MANUKA ACT 2603

Ph: (02) 6230 4992
Mob: 0418 217648
Fax: (02) 6126 0761

Email: bob.thompson@minchem.com.au
Web: www.minchem.com.au

DOCUMENT CONTROLS

Report No: BT010112011

DOCUMENT STATUS						
Rev. No	Comment	Author	Reviewer	Approved for issue (Project Manager)		
				Name	Signature	Date
0A	Draft					

Document Distribution				
Rev. No	Copies	Format	Issued To	Date
01	1			
01	1			

Controlled Copy No:

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1. Introduction

This Landfill Environmental Management Plan (LEMP) sets out the existing and proposed operating and management procedures for the Jindabyne Regional Waste Management Facility ("the facility"). It includes details of all related consents, monitoring requirements and external controls on the facility. This LEMP also describes the characteristics of the environment within and around the site and the strategies that are currently implemented, and proposed for the future, to protect the environment and assist in meeting the Environmental Goals for landfill operation as identified in the NSW Office of Environment and Heritage's (1996) *Environmental Guidelines: Solid Waste Landfills* ("the Landfill Guidelines").

The facility is located to the south of the township of Jindabyne. It is owned and operated by the Snowy River Shire Council ("the Council"). The site commenced operation in 1979. Prior to this, Snowy hydro used the site for excess rock fill and dumping of obsolete machinery from quarry operations. The landfill has been in continual operation and originally from anecdotal evidence there was a gully running through the centre of the site. This has subsequently filled with in with waste.

The types of waste since 1979 have typically included putrescibles, construction and demolition waste, organics, inorganics, green waste, bottles and plastics.

The current zoning is zone 1(a), General Rural and includes a disused rock quarry, the existing landfill. The existing landfill is a solid waste landfill, now receiving more than 5,000 tonnes per annum and therefore is governed by the Protection of the Environment Operations Act 1997 (POEO Act) and associated regulations, which provides the legislative framework for regulation of solid waste landfilling within NSW. Relevant regulations include the Protection of the Environment Operations (Waste) Regulation 2005 and the Protection of the Environment Operations Amendment (Schedule Activities and Waste) Regulation 2008.

Under the POEO Act, the facility is classified as a scheduled activity that requires an Environment Protection Licence (EPL) from the Office of Environment and Heritage (OEH). Information contained in this Plan is aimed at supporting an application to OEH for a Class 1 Solid Waste Landfill Licence. The plan is expected to be updated to conform to any Licence obligations imposed by OEH with respect to operational, monitoring and reporting conditions.

The facility currently includes the following main components:

- fully lined landfill which includes a leachate collection and treatment system;
- revolve and recyclables drop-off area;

Figure 1 below shows the general layout of the facility.

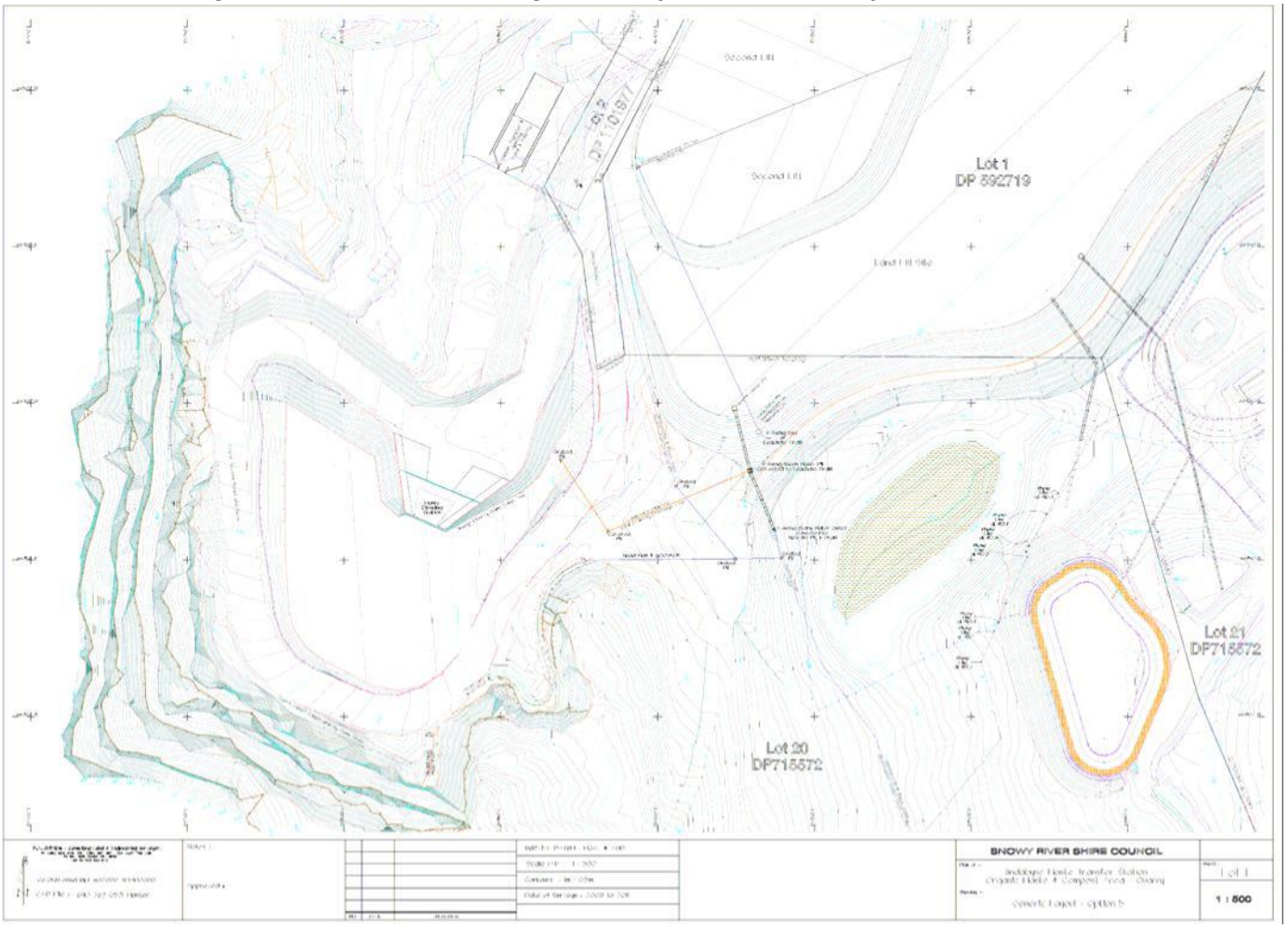

Figure 1 Landfill general layout

Additional components of the facility are planned for and these will need to be included in this plan as they come on-line.

Base line information for this plan was obtained from a large body of previous studies including the Statement of Environmental Effects (dated 2005) prepared by Purdon and Associates (Report version number 5) and the Environmental Impact Statement (EIS) prepared by PPK Environmental Consultants in February 2001 and supplementary information from ESAB Consultancy Pty Ltd.

2 Purpose and Goals of the Landfill Environmental Management Plan

This LEMP is a definitive reference document for all personnel with responsibility for undertaking activities at the facility, the Snowy River Shire Council and regulatory authorities. The LEMP is regularly updated to accurately reflect current operating conditions and requirements. A controlled copy of the LEMP is maintained on-site at all times. Controlled copies of the LEMP are distributed to appropriate parties. Council, as owner of the facility, is responsible for ensuring that the currency of the LEMP is maintained. Revisions require re-issue of parts, or all, of the LEMP.

Through the implementation of this LEMP, the Snowy River Shire Council intends to achieve full compliance Protection of the Environment Operations Act 1997 (NSW) and all conditions associated with the forthcoming licence issued under this Act.

The Environmental Guidelines: Solid Waste Landfill 1996 (the Guidelines) outlines a performance-based approach to achieving environmental outcomes. The priority for existing landfills is to ensure that the facilities are operated in a manner that minimises environmental impact, and achieves effective site remediation. Within this performance based approach, a number of environmental goals were set for which landfill design, monitoring, management and remediation must comply with. These goals are geared towards:

- preventing water pollution;
- preventing air pollution;
- promoting responsible land management and conservation; and
- preventing hazards and loss of amenity.

Therefore, the Guidelines do not set down specific design criteria such as liner thickness or the types of leachate collection system or gas collection system. Instead, they put forward benchmark techniques which provide guidance on possible solutions for effectively achieving the primary goals outlined above.

There are 39 Benchmark techniques outlined in the Guidelines which relate to the leachate barrier and collection system, surface

water and groundwater, gas drainage, fire prevention, site closure, recycling, monitoring in coming waste, noise, dust and many others.

The mechanism for regulation of landfilling operations is based around licensing those facilities which have the greatest potential to cause environmental impact. All licensed landfills are required to have a detailed Landfill Environmental Management Plan (LEMP),which describes the strategy and measures for managing the landfilling operation and achieving the environmental goals as defined in the Guidelines. Operation of the landfill must then comply with the LEMP, and operators are required to report annually to OEH who checks the performance of the operation against the commitments made in the LEMP.

This LEMP has been prepared taking into account the requirements of these Guidelines.

Environmental Goal

1. Water Pollution
1.1Preventing pollution of water by leachate
1.2.Detecting water pollution
1.3.Remediating water pollution
2. Air Pollution,
2.1 Preventing landfill gas emissions
2.2 Detecting landfill gas emissions
2.3 Remediating landfill gas emissions
3. Land Management and Conservation
3.1 Assuring quality of design, construction and operation
3.2 Assuring quality of

	gas emissions
	6.3 Remediating landfill gas emissions

3 Regulatory Control

3.1 Federal Obligations

Carbon Pollution Reduction Scheme:

As at the time of preparing this Plan, the Carbon Pollution Reduction Scheme (CPRS) was due to be passed by the Upper House of Parliament and is due to commence from 1 July 2012. Under the legislation landfills that emit more than 25,000 tonnes of CO2 equivalent greenhouse gas per annum (CO2-e) will be required to purchase pollution permits for the emissions from these facilities.

It is currently unclear whether the landfill facilities operated by Council will be "captured" by the new legislation, especially if Council proceed with current plans to reduce waste to landfill by composting etc.

3.2 State Government Obligations

Resource Recovery:

The Waste Avoidance and Resource Recovery Act 2001 imposes on the NSW Government an obligation to develop a state-wide waste strategy. This strategy (the WARR strategy), which is to be reviewed every two-years, is binding on councils in NSW, including SRSC.

The 2007 WARR strategy revision contains targets for recycling, particularly for commercial and industrial (C&I) wastes and construction and demolition (C&D) wastes. Although there are no specific directives with respect to Council, it would be prudent for Council to actively support the WARR strategic direction.

The facility is operated in accordance with current statutory requirements. Specifically, the facility is directly required to operate in accordance with the requirements of the Protection of the Environment Operations Act 1997 (NSW) which now requires that an Environment Protection Licence be obtained. Accordingly the facility would be required to operate under the conditions of the

Environment Protection Licence [INSERT LICENCE NUMBER] in accordance with Sections 43b, 48 and 55 of the Protection of the Environment Operations Act 1997 (NSW).

Associated regulations also provide the legislative framework for regulation of solid waste landfilling within NSW. Relevant regulations include the Protection of the Environment Operations (Waste) Regulation 2005 and the Protection of the Environment Operations Amendment (Schedule Activities and Waste) Regulation 2008.

33 Other

Council will comply with all relevant requirements of:

- . WorkCover Authority of NSW;
- any ordinances, regulations, by-laws,orders and proclamations in force in NSW; and
- Carbon Pollution Reduction Scheme – Australia's Low Pollution Future

4 Description of the Facility

4.1 Site Overview

The facility is located approximately two kilometres to the west of Lake Jindabyne and approximately two kilometres to the south of the township of Jindabyne. Jindabyne is located 61 kilometres from Cooma and 462 kilometres south-west of Sydney.

The site covers an area of approximately 25 hectares. Snowy River Local Environmental Plan 1997 applies to land within the shire. The site is zoned 1(a) – General Rural. The site covers an area of approximately 25 hectares and consists of two lots: Lot 20 DP715572; and Lot 1 DP592719. Both lots are located in the Parish of Clyde, County of Wallace, NSW.

The facility is owned and operated by the Snowy River Shire Council.

The facility is expected to be licensed [INSERT LICENSE NUMBER] by the NSW Office of Environment and Heritage (EPA) now operated by the NSW Office of Environment and Heritage under the provisions of the Protection of the Environment Operations Act 1997 (NSW). The facility is expected to be licensed as a Class 1 Solid Waste landfill and will accept over 5,000 tonnes per annum of solid and inert waste. It is planned to implement composting infrastructure in the near future. When approved this LEMP will be updated to included relevant details any requirements pursuant to Development Approval Consent conditions imposed.

The site is bounded by open tussock and pasture to the north, west and south. Access to the site is gained from Kosciuszko Road. Jindabyne Sewage Treatment Works is located adjacent to the eastern boundary of the site.

Landfill operations are undertaken between the hours of 8.00 am and 5.00 pm on weekdays with the facility being open to the public from 10.00am to 3.00pm.Weekend operations and opening times for the public are from 10.00 am to 3.00 pm. The facility is closed on all gazetted public holidays. Waste materials cease to be received one hour before closing time to allow compaction to be completed and the application of daily cover to take place.

The following types of equipment are used at the facility:

- garbage compacters;
- front end loader with backhoe; and

- steel drummed 26 tonne Tana Landfill compactor.

4.2 Ownership

The facility is owned by the Snowy River Shire Council and consists of two lots: Lot 20 DP715572; and Lot 1 DP592719. Both lots are located in the Parish of Clyde, County of Wallace, NSW.

The access road which traverses the site is owned by the Snowy Mountains Hydro-Electric Authority and the Crown.

4.3 Principal Features

Figure 1 shows the layout of the facility. Key existing features of the facility includes:

- a leachate collection system;
- gate house;
- weighbridge;
- amenities and plant building;
- revolve facility;
- recyclables storage facility (transfer station);
- public waste drop-off facility;
- trafficable and parking areas;
- noise bund (Rock wall);
- site fencing and gates;
- fire fighting facilities;
- landscaping;
- water, sewer, effluent and electricity supply and telecommunications.

4.4 Gatehouse and Site Amenities

The gatehouse and weighbridge is situated at the site entrance (refer Figure 1). The gatehouse access road is the only heavy vehicle access to the site. The gatehouse is staffed at all times when the facility is open to accept waste.

An amenities and plant building is located just inside the internal gate. The building is utilised for servicing and maintenance of equipment and to provide facilities for site personnel. The building is provided with a separate secure compound (1.8 metre high anti-personnel fence) with facilities for stores, workshop, amenities and an office.

All buildings are steel framed and clad with colourbond steel.

The water supply is derived from Council water supply system with an additional one megalitre storage tank that services the lower areas of Jindabyne and the sewage treatment works. This service is sufficient for the waste facility. On the adjacent revolve facility there is a 22,500lt rainwater tank for use on the site.

A telephone service is currently maintained at the administration office and other site amenities are maintained in good order and condition. Electricity supply is also provided. The amenities block and revolve shed provided at the facility are connected to the Jindabyne sewage system.

4.5 Facility Management

The facility is operated Snowy River Shire Council.

It is the Council's ultimate responsibility to ensure that the operation of the facility is in accordance with the requirements of the Environment Protection Licence, other relevant permits and environmental controls and the current Landfill Environmental Management Plan.

4.5.1 Access and Traffic Control

Access to the site is off Koscioszko Road (Main Road 286) on the north-western corner of the site.

All vehicles entering the facility are required to obey all current transportation laws, road and traffic laws and by-laws in force. They are also required to be fully enclosed or have their loads secured so that waste is contained within the vehicle.

All vehicles entering the site pass through double lockable gates (1.8 metres in height) across the main access road and pass the gatehouse and weighbridge. Entry to the weighbridge is controlled by traffic lights and boomgates to enable trucks and other heavy vehicles to be safely weighed on entry and departure.

Cameras are also fitted to the weighbridge to capture images of transactions for greater accountability and for security measures.

Approved vehicles entering the site are directed to the landfill, which is monitored area, composting receival area (Future plans) or other areas for waste stream separation, such as recycling drop off area, scrap steel timber concrete and greenwaste and other recyclable materials.

4.5.2 Staffing, Training and Occupational Health and Safety

A minimum of two trained personnel are in attendance at the facility at all times. Personnel at the site would include the facility Supervisor and gatehouse attendant, landfill attendant and buyback facility operator. When the landfill is open, the gatehouse is staffed and the active tipping face supervised as a minimum.

Staff training is undertaken to ensure that:

all operators of compaction or earthworks equipment are skilled at undertaking all tasks required of them;

all those who operate gas testing, water sampling or water testing apparatus are familiar with required testing and sample retention protocols; and

all those who are to inspect incoming materials are skilled at identifying unacceptable wastes and are accurate at data recording.

Staff Responsibility:

- the facility supervisor who is employed full time at the site and has responsibility for ensuring that appropriate procedures are implemented to control the types of waste deposited at the landfill, directing vehicles to appropriate disposal areas and that operations are carried out in a smooth, efficient and safe manner. The facility supervisor is also responsible for operation of plant to ensure waste compaction, placement of daily cover and maintenance of trafficable surfaces; and

- the gatehouse attendant who is responsible for recording data regarding wastes received at the facility, directing vehicles to appropriate disposal areas, controlling entering and existing traffic, undertaking random vehicle inspections and collecting any fees.

- The landfill attendant is to supervise the landfill face and to carry out daily works as directed by the landfill supervisor.

- The buyback facility operator is to operate the revolve facility and to scavenge the landfill site for materials that can be sold at the shop diverting it from landfill.

SRSC takes all responsible steps to safeguard the health and safety of all employees, and any person within the facility.

SRSC is responsible for implementing, maintaining, and monitoring the occupational health and safety policy and procedures outlined herein and ensuring they are adhered to on-site. All staff are responsible for following the occupational health and safety policies and procedures for their work area. They must take action to minimise or avoid hazards of which they are aware and to advise their supervisors or safety representative of the existence of such hazards. At all times proper use is made of appropriate safeguards, safety devices, and personal protective equipment provided.

Routine training sessions are carried out at a maximum interval of 12 months, but any new staff will receive safety training as part of their induction procedure, within 2 days of commencing employment at the site. All site staff will be trained regularly in the content of this LEMP, with particular reference to safety procedures. This training will include familiarisation with the location and use of first aid, fire fighting equipment and emergency response.

All operations personnel are equipped with safety clothing including gloves, hard hats, safety shoes and goggles, which they are required to wear at all appropriate times. Personnel are trained in proper landfill management and operating procedures with most staff having completed a a TAFE certificate 2 or higher in waste management. All staff are trained in first-aid procedures and in handling emergencies.

A St. Johns First Aid kit is kept in the administration office and revolve shed, with fire extinguishers are provided in the administration centre, waste holding facility, and within all plant on site. All staff on-site have a current First Aid Certificate are able to render first aid to personnel and the public when required. An area in the administration office has been designated as the First Aid room.

4.5.3 Maintenance Programs

It is the responsibility of all staff to ensure that plant and installations are well maintained and serviceable. Any faults or signs of wear are to be reported immediately. SRSC is responsible for ensuring that all facilities and plant are maintained to their manufacturer/design requirements.

In terms of operating the landfill on a daily basis the most critical plant item is the landfill compactor, which undergoes regular maintenance as per manufacturers servicing schedules to prevent unscheduled down time.

All plant has a maintenance record compiled in logbooks to allow

analysis of equipment's performance and scheduling of maintenance to be undertaken.

4.5.4 Complaints Management

Contact details are displayed at the entrance to the site. All complaints are registered. Details of the complaint and the person reporting the complaint are recorded. All complaints are dealt with promptly. Any action resulting from a complaint is recorded and reported back to the person making the complaint.

The complaints register is available to the NSW Office of Environment and Heritage for review upon request and all complaints are reported in the Annual Review.

4.5.5 Assurance of Quality

Quality assurance has been incorporated into all procedures developed as part of this LEMP and other procedures maintained by SRSC, which are relevant to the operation of the landfill. This has been done to assist in ensuring that the risk of operations at the facility having negative impacts on the surrounding environment is minimised.

It is not considered necessary to implement a formal quality management system, given the nature and extent of the landfilling operation. However, in implementing the LEMP, SRSC will undertake a review of all quality assurance procedures to ensure that all aspects of the operation, which have actual or potential impacts on the environment, are prevented.

4.5.6 Financial Assurance

Funding for the landfill operations and closure is provided by Snowy River Shire Council. Sufficient funds are been set aside each year of operation to cover the relatively high capital expenditure required to implement the rehabilitation and post-closure plan as per the guidelines.

4.5.7 Landfill Life

The life of the existing site will be dependent on the rate of waste receival, which will be dependent on population trends, the success of the recycling service and other waste reduction initiatives. It is also dependent on the waste deposition practices and compaction ratios achieved at the facility.

4.6 Environmental Context

4.6.1 Topography

The topography of the site has been greatly altered by both quarrying and past operation of the former Jindabyne landfill. The study area is located on moderately sloping terrain falling towards the south-east. The original valley running north to south has been filled by the former landfill and sewage treatment works resulting in a terraced landform across the north-east of the site.

4.6.2 Geology

The Bega 1:250 000 Geological Series Sheet and field testing indicate that the site is underlain by Devonian Age, Jindabyne Granite of the Kosciuszko Batholith. This material typically

comprises medium to coarse grained leucocratic granite with an equigranular texture.

Bedrock found beneath the quarry floor is fresh, high strength, slightly fractured to unbroken, medium grained granite with a low potential for leakage.**4.6.3 Soil**

Natural soils were removed from the proposed landfill site during quarrying operations. Soils around the quarry are generally shallow (less than one metre), moderately to well drained earthy sands. They are characterised by their high permeability and dispersivity with sheet and gully erosion risk. Accumulation of colluvium has occurred in localised areas down slope of the quarry.

4.6.4 Surface Water

Most of the stormwater that does not come into contact with the active waste recieval area is diverted off site and drains to the south-east into Cobbin Creek. Cobbin Creek has a relatively low flow during much of the year. Cobbin Creek then flows into the Snowy River approximately one kilometre downstream of the facility.

All stormwater that has come into contact with the landfilling face and surrounding area is dircted to a central pit located to the south east of the site where it joins the leachate catchment system an retained in a clay lined pond at the base of the rock wall on lot 20.

Flood Potential

The site is high and steep and considerably above the 1:100 flood level. There is no flushing action from flooding events in this section of the Snowy River (Department of Public Works, 1992).

Local storm events cause minor inundation of the site, particularly adjacent to watercourses which traverse the area.

4.6.5 Groundwater

The tightly interwoven crystal structure of granite typically results in very low rock permeability. However, groundwater flow rates are variable as a result of discontinuity's, such as localised jointing, fracturing and shear zones.

Overlying soils are likely to be relatively conductive to surface water infiltration and groundwater flow; however, infiltration rates would be dependent on the composition and thickness of the strata. It is expected that groundwater would flow at greater rates within the near surface materials than at depth in bedrock.

Groundwater exists within the fracture granite at depths of 1.12 metres to 8.08 metres at boreholes 1, 4 and 5 (located outside the void area, to the east). The direction of the groundwater flow below the proposed waste facility is anticipated to be from the topographic high in the north-west down gradient towards the south-east and Cobbin Creek.

In the past (Douglas Partners, 1999.) Groundwater boreholes have been monitored at several locations across the site (refer Figure 2). Groundwater information obtained at the planning phase indicated that groundwater exists at the site at differing levels as demonstrated below in Table 4.1.

Table 4.1: Groundwater Levels Located during Planning Phase

Borehole Number	Depth to Groundwater (metres)	Groundwater Level (metres AHD)
BH1	8.8	929.57
BH3	dry	–
BH4	1.12	929.19
BH5	8.07	915.56
BH6	dry	–
BH7	dry	–
BH8	dry	–

(Source: Douglas Partners, 1999.)

It is proposed to reinstate Bore Hole monitoring well number 5 for the purpose of monitoring landfill leachate over the life of the landfill.

4.6.6 Meteorology

Climatic information is recorded at the Cooma Meteorological Station. The annual average maximum and minimum temperatures experienced are 19.2 degrees Centigrade and 4.1 degrees Centigrade. The maximum monthly average temperature is recorded, on average, in January at 26.7 degrees Centigrade. July is the coldest month on average, with an average minimum temperature of -2.9 degrees Centigrade.

The annual average humidity reading collected at 9.00 am is 73 percent. The month with the highest 9.00 am humidity on average is June, with a reading of 85 percent. The annual average humidity at 3.00 pm is much lower at 45 percent. The month with the highest 3.00 pm humidity on average is June with 57 percent.

Rainfall data show that November is the wettest month on average, with a mean rainfall reading of 62 millimetres. The average number of rain days for November is 11. August is the driest month with an average rainfall of 23 millimetres. The average annual rainfall is 550 millimetres and the average number of rain days is 107.

Wind Speed and Direction

The closest meteorological station containing data that may be representative of the meteorological conditions experienced at Jindabyne is located at Cooma, approximately 50 kilometres to the north-east of the proposed site. On an annual basis, winds are predominantly from the north, west–north-west and south–south-west. This pattern is evident in most seasons with significantly lighter winds in winter and less contribution from southerly winds in summer.

4.6.7 Flora and Fauna

Flora

The site is located within the Monaro region, which is primarily a pastoral district. Vegetation communities in the locality are dominated by savannah woodland with an alliance of white sally (Eucalyptus pauciflora) and black sally (E.stellulata). Interspersed within the savannah woodland were isolated areas of heath with an alliance of stunted she oak (Casuarina nana) and woolly tea tree (Leptospermum lanigerum) and wet sclerophyll forest (an alliance of alpine ash (E.delegatensis) and mountain gum (E.dalrympleana)).

As a result of past and present land use including quarrying, grazing and the construction of the Jindabyne Sewage Treatment Works, most of the site has been completely cleared of native vegetation. The remaining vegetation is savannah woodland E.pauciflora–E.stellulata alliance which now exists as disturbed woodland with a wide variety of weed species, principally herbs, grasses and shrubs with native species interspersed. The remaining trees of the savannah woodland have been isolated to the south-western boundary of the site. Areas of similar woodland within close proximity to the site occur to the east of the treatment works.

Typical weed species include saffron thistle (Carthamus lanatus), Linaria arvensis, common sowthistle (Sonchus oleraceus), great mullein (Verbascum thapsus), viper's bugloss (Echium vulgare), scotch thistle (Onopordum acanthium), couch (Cynodon dactylon), yorkshire fog (Holcus lanatus), Chilean needle grass (Nassella neesiana), blackberry (Rubus discolor), haresfoot (Trifolium arvense), sweet briar (Rosa rubiginosa) and firethorn (Pyracantha angustifolia). Serrated tussock (Nassella trichotoma) has been identified.

Introduced trees on the site include pines (Pinus radiata) along the north-western boundary of the quarry and silver poplars (Populus alba) scattered around the perimeter of the existing landfill.

The dominant native grasses on the site are Poa meionectes and P.sieberiana. Other species include kangaroo grass (Themeda australis), common wheatgrass (Elymus scaber var. scaber) and niggerheads (Enneapogon nigricans). Native herbaceous species include oxalis (Oxalis perennans), common woodruff (Asperula conferta), kidney weed (Dichondra repens) and native geranium (Geranium solanderi).

There are not many native shrub species in the area. The most common are silver wattle (Acacia dealbata) and currajong bush. Apart from these, there are few other native shrubs.

Fauna

Previous disturbance (in particular, clearing of the woodland) of the site has produced an environment with little habitat value for native species, particularly mammals and arboreal species. The site lacks trees (in particular, natives), fallen timber and flowering shrubs.

On the whole, the site offers little significance as native fauna habitat. It may offer an area of transient visitation by fauna, but it is unlikely that it contains significant habitat for more sensitive species.

There are two areas of isolated remnant woodland on the site including the western and southern sides of the quarry. These are isolated from areas of woodland in the locality and provide little as fauna habitat. In addition, they have been fenced making it difficult for fauna, particularly the larger macropods such as the eastern grey kangaroo (Macropus giganteus) to gain access. Some of the trees may offer hollows suitable for nesting for avians and mammals but there are areas in much better condition to the east of the site along Cobbin Creek.

The grassy understorey potentially provides habitat for small mammals such as yellow-footed antechinus (Antechinus flavipes), snakes, and lizards such as wall lizard (Cryptoblepharus virgatus), White's skink (Egernia whitii), eastern tiger snake (Notechis Scutatus) and eastern brown snake (Pseudonaja textilis).

Little diversity of birds was present in this area perhaps owing to the degraded nature of the site and presence of a large population of Australian ravens (Corvus coronoides) and silver gulls (Larus novaehollanidae), which pose a nuisance to other bird species, and, in the case of the Australian raven, are fiercely territorial.

5. Types and Quantities of Waste Accepted

51 General

The Jindabyne Regional Waste Facility is to be licensed as a Class 1 Solid Waste Landfill. As such, the facility will be able to accept all types of solid and inert waste as defined by the Landfill Guidelines. Waste classified as “industrial” or “hazardous” within the guidelines is not accepted at the facility. At present, approximately 6500 tonnes of waste is accepted annually. This quantity is expected to rise with population growth in the area.

The majority of waste entering the site is delivered by compactor and received directly from the residents of Jindabyne Township and surrounding villages and Berridale Township, the Kosciuszko National Park or the transfer station at Berridale. Waste entering the site directly from any transfer station is subject to prior sorting, recycling and classifying by the residents. Privately tipped waste is transported in on an adhoc basis by cars and station wagons or utes, vans, trailers and trucks. Private vehicles, except for large trucks, are not permitted at the tipping face and are required to place waste materials in the appropriate skip at the public waste drop-off facility.

Only Permitted Wastes shall be accepted for disposal at the facility. Permitted Wastes are those not defined as Excluded Wastes and include putrescible and non-putrescible wastes from domestic, commercial and industrial sources within the Region.

All waste from commercial and industrial sources must be in a solid form and shall comply with the requirements for landfill disposal of restricted solid wastes.

The wastes that would be licensed as acceptable are shown in Table 5.1.

Table 5.1: Types of Inert or Solid Waste Accepted at the facility

Waste Type or Stream	Classification
Virgin excavated natural material (such as clay, gravels, sand, soil and rock) not mixed with any other type of waste and that: - has been excavated from areas of land not contaminated with human-made chemicals as a result of industrial, commercial, mining or agricultural activities and do not contain sulfidic ores or soils, or - consists of excavated natural materials that meet such criteria as may be approved.	Inert
Building and demolition waste (for example, bricks, concrete, paper, plastics, glass, metal, timber) being material resulting from the demolition, erection construction, refurbishment or alteration of buildings or from the construction, repair or alteration of infrastructure-type development such as roads, bridges, dams, tunnels, railways, and airports and that: - is not contaminated or mixed with any other type of waste, and - does not contain any asbestos waste.	Inert
Asphalt waste (for example, resulting from road construction and water proofing works).	Inert
Office and packaging waste (such as paper, plastics, glass, metal and timber) not contaminated or mixed with any other type of waste.	Inert
Biosolids categorised as Unrestricted Use, or as Restricted Use 1 in accordance with such criteria as may be approved.	Inert
Used, rejected or unwanted tyres.	Inert
Wastes contaminated with lead from domestic premises and education/child care institutions.	Solid
Cleaned pesticide, biocide, herbicide or fungicide containers.[1]	Solid
Drained and mechanically crushed oil filters and rags and oil absorbent materials (not containing free liquids) from automotive workshops.	Solid
Non-chemical waste generated from manufacturing and services (including metal, timber, paper, ceramics, plastics, thermosets and composites).	Solid
Municipal waste, being household domestic waste set aside for kerbside collection, other types of domestic waste (for example, domestic clean-up, and residential garden waste), or local council generated waste (for example, waste resulting from street sweeping, litter bins and parks). It should be noted that the State Government is proposing to stop garden wastes being disposed to landfills.	Solid
Biosolids categorised as Restricted Use 2 or 3 or in accordance with such criteria as may be approved, manure and night soil.	Solid
Nursing home waste (excluding infectious waste, bulk blood, cytotoxic waste, laboratory chemicals, poisons, recognisable body parts and sharps).	Solid
Food waste generated by businesses involved in the preparation of foods, or from the manufacturing of foods and grocery products.	Solid
Vegetative waste generated from agriculture and horticulture.	Solid

Note 1: The cleaning method used should be as good as or better than the triple-rinsing method developed by AVCARE (National Association for Crop Protection and Animal Health).

Source: *Environmental Guidelines: Assessment, Classification, and Management of Liquid and Non-Liquid Wastes*, NSW Office of Environment and Heritage 1999, Tables 1 and 2.

Asbestos

In accordance with clause 42 of the Protection of the Environment Operations (Waste) Regulation 2005 (as amended by the Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008),the following requirements, with respect to asbestos wastes received at the Facility, will be adhered to when unloading and disposing of asbestos waste,

- the waste must be unloaded and disposed of in such a manner as to prevent the generation of dust or the stirring up of dust; .
- the asbestos waste must be covered with VENM: initially at the time of disposal to a depth of at least 0.15m, and at the end of each day's operation, to a depth of at least 0.5m, and finally, to a depth of at least 1 metre (in the case of bonded asbestos waste or asbestos-contaminated soils)

52 Recycling

The types of materials that are separated and evaluated for reuse or recycling are:

- tyres;
- masonry and concrete;
- oils;
- whitegoods;
- metals;
- glass;
- plastics;
- clean fill;
- paper products;
- timber;
- building materials;
- batteries; and
- reusable or repairable items.

Where practicable, these materials are sorted and placed in the revolve and recyclables facility for the public to purchase or to be collected by a recycling business.

Green waste is mulched and could be used for Council's landscaping needs, sold or utilised in the production of compost when the compost facility becomes operational.

SRSC is expected to participate in a composting process at the facility under what is known as Groundswell. Under the POEO Act, a composting facility becomes a scheduled activity if:

- it processes over 200 tonnes/year of putrescible organics.

- . it processes over 200 tonnes/year of putrescible organics such as animal and food wastes, sludge or biosolids, or

- . it processes over 5,000 tonnes/year of non-putrescible organics

such as wood and garden waste or natural fibrous material.

It is likely that the proposed composting facility will require a separate licence and LEMP will be updated accordingly.

6 Current Operations and Future Actions to Meet Environmental Goals

The basic structure of this outline LEMP is based on the Landfill Guidelines issued by the NSW Office of Environment and Heritage. The benchmark techniques included in the Landfill Guidelines relate predominantly to landfilling operations. The facility also includes additional facilities such as the revolve facility and public drop-off facility.. Therefore the environmental management protocols included in the sections below are focussed on management of the landfill rather than the additional facilities, although management measures are included for the additional facilities where available.

61 Leachate Management

Any liquid that comes into contact with the landfill is considered to be leachate and is treated as such. The primary objective of leachate management is to minimise leachate generation and therefore minimising entry of “clean” water into the landfill area is a key priority. Hence, run-off from land upslope of the landfill is diverted away from the landfill using open drains and bunds.

6.1.1 Leachate Barrier

Existing Situation

Leachate has the potential to move through the bottom of the landfill into the underlying geology and groundwater. In 2005 the landfill was modified by constructing a rock-faced earth wall to expand the landfill. The expansion included sealing off the face of the existing landfill with a “Bentofix” liner.

A collection system is installed on top of the liner to ensure that leachate does not pond and subsequently filter through the membrane. The leachate collection system is comprised of the following components:

- layers of select fill at the base of the liner to facilitate free drainage of the leachate to the collection pipes:
- A 100 millimetres layer of selected fill (free of rocks, stones, hard nodules, roots, sharp particles and the like), placed over the membrane on the landfill side slopes. The use of a high

friction membrane on the side slopes aids in keeping the protective layer in place.

- A further 300 millimetres thick granular collection layer, comprising non-calcareous aggregate (rounded gravel, smooth, relatively uniform and greater than 20 millimetres in size) placed over the protective geotextile fabric on the landfill base; leachate collection pipes at the base of the landfill:

- A main 450 millimetre diameter leachate collection pipe is placed with a fall of approximately one vertical to one hundred horizontal towards the leachate dam via a 600mm collection pit.

The main collection pipe is connected to the discharge pipe that discharges via gravity feed to the leachate collection pond; a concrete leachate collection chamber and clay lined leachate pond:

The leachate pond has been designed for a 1 in 10 yr 72 hr storm event.

6.1.2 Monitoring Program

The leachate monitoring program is aimed at characterising the leachate generated by the landfilled waste. This assists with interpreting both groundwater and surface water monitoring results as well as provide a picture of the degradation process occurring within the landfill and determine when the waste has stabilised. The monitoring also allows assessment of the leachates suitability for irrigation onto completed areas of the landfill.

Samples are taken from the leachate pond every six months, or [IN ACCORDANCE WITH THE REQUIREMENTS OF THE ENVIRONMENT PROTECTION LICENCE] and the samples are analysed for those parameters listed in Appendix C. Refer to Appendix D Water Management Plan.

Further, to allow initial characterisation of the leachate, the first four quarterly samples collected from the leachate chamber are to be analysed for aromatics, volatiles, halogenated hydrocarbons and base, neutral and acid extractable organic contaminants. This would include screening for monocyclic aromatics, halogenated hydrocarbons, phenols, organo chlorinated pesticides, organophosphate pesticides, Polychlorinated Biphenols and Polycyclic Aromatic Hydrocarbons.

An estimate of the quantity of leachate generated is also made.

Future Actions

No future actions to report.

6.2 Surface Water Controls

Existing Situation

Undisturbed run-off upslope of the landfill is prevented from entering the landfill by diversion banks, which direct run-off to the adjacent natural watercourses. Drainage provisions include:

- a diversion drain extends across the upper face of the old quarry to capture run-off originating from up gradient of the quarry. The diversion drain extends down to the granite rock to intercept any through flow in addition to capturing overland flow. The drain is 200 millimetres in depth, 1,000 millimetres wide at the top and 500 millimetres wide at the base with side batters of one vertical to two horizontal;

- rainfall to the north and south of the site naturally runs away from the old quarry as a result of the fall of slope; rainfall falling on the active tipping area and waste disposal areas is collected and discharged through the leachate collection drains to the leachate collection system (refer Section 6.1.2);

- Collection of rainfall within the landfill can only occur following intermediate capping of filled areas. Run-off from the capped areas would require diversion to a temporary collection drain feeding into a temporary storage pond. The temporary drains would comprise 200–300 millimetre U-shaped polyvinylchloride flexible drains; and

- Run-off from the gatehouse, waste holding facility, administration office and denuded areas adjacent to these facilities is contained within the landfill.

Monitoring Program

- The stormwater monitoring program is implemented to identify and characterise the quality of the surface water generated on-site and to assess the impacts of any discharge on local surface water.

- Surface water quality will be monitored every six months, with reports submitted to the NSW Office of Environment and Heritage annually as part of the Annual Return.

The surface water sampling location is shown in the site plan (tbd) and will be signposted at the site. Sampling will undertaken during or immediately after wet weather, where possible. If no discharge occurs from the site at the time of monitoring, or it was not possible to sample a discharge event in any given period, samples are taken from the stormwater ponds.

Analysis of the surface water samples is for those parameters listed in Appendix C. Surface water samples are sent under chain of custody protocol to a NATA certified laboratory for analysis in accordance with the procedures detailed in Appendix E.

Surface water samples will also be collected from the nearby water course (Cobbin Creek) every six months [IN ACCORDANCE WITH THE REQUIREMENTS OF THE ENVIRONMENT PROTECTION LICENCE] and the samples are analysed for the parameters listed in Appendix C.

If monitoring data indicates that contamination of surface water courses has occurred, the affected sampling locations are re-sampled as soon as possible after identification of the possible contamination. If the contamination is confirmed by the re-sampling, the NSW Office of Environment and Heritage would be notified in writing within 14 days. Within 28 days of the written notification, a surface water assessment program would be prepared. The plan would be submitted to the NSW Office of Environment and Heritage for approval prior to implementation. Information collected during the surface water assessment program would be used to determine necessary remedial drainage measures and to prepare a surface water remediation plan, if required.

The stormwater and sediment and erosion control system is inspected on a weekly basis staff as well as within 24 hours of heavy rainfall. Where maintenance of the system is required, SRSC will initiate a program of repair immediately.

Future Actions

Following an initial period of two years, the surface water monitoring program will be reviewed and amended if appropriate in consultation with the NSW Office of Environment and Heritage.

63 Groundwater

Existing Situation

The greatest potential for impacts on groundwater is from the operation of the landfill. Groundwater is protected by the incorporation of the leachate management system into the landfill (refer Section 6.1).

Monitoring Program

A groundwater monitoring program would be implemented to provide a means of checking for leachate migration from the landfilled areas and to identify and characterise the impact of any leachate on the groundwater system.

Groundwater quality would be monitored (Bore hole 5 *to be confirmed see figure below*) on a regular basis, comprising the following:

- measurement of the depth to the water table; and
- analysis of groundwater samples for the parameters listed in Appendix C and in accordance with the procedures outlined in Appendix D.

Following initial sampling and testing, the suite of parameters could be reduced depending on the findings of the analysis and to meet the requirements of the Environment Protection Licence.

Should monitoring indicate that contamination of groundwater has occurred, the affected bore(s) would be resampled as soon as possible following identification of the possible contamination. If the contamination is confirmed by the resampling, the NSW Office of Environment and Heritage would be notified in writing within 14 days. Within 28 days of the written notification, a groundwater assessment program would be prepared, which aims to identify the specific contaminants and extent of pollution of the groundwater. This plan would be submitted to the NSW Office of Environment and Heritage for approval prior to implementation. Information collected during the groundwater assessment program would be used to prepare a groundwater remediation plan, if required.

Future Actions

Following an initial period of two years, the groundwater monitoring program will be reviewed and amended if appropriate in consultation with the NSW Office of Environment and Heritage [IN ACCORDANCE WITH THE REQUIREMENTS OF THE ENVIRONMENT PROTECTION LICENCE].

64 Landfill Gas Control

No specific landfill gas extraction or treatment system has been installed in the landfill, however on-going management measures to reduce the potential generation of landfill gas over the operational life of the landfill include:

- implementation of the leachate management system;
- covering and compaction of waste; and
- use of capping.

Monitoring Program

While landfill gas has not considered to be an issue in the first five years of operation, monitoring should now to be considered to ensure that there is minimal risk of hazards associated with landfill gas. The monitoring program should include:

- quarterly atmospheric monitoring; and
- quarterly gas accumulation monitoring inside any buildings and enclosed structures within 250 metres of the landfill site.

Sampling and analysis is to be undertaken in accordance with requirements specified in the Landfill Guidelines. Monitoring of landfill gas consists of measuring the percentage of Lower Explosive Limit and the gas composition. Particular attention is paid when low pressure fronts pass over the site as a rapidly falling barometric pressure results in an increase in gas migration.

Future Actions

If evidence is found of a build up of landfill gas or any leakage paths are identified, monitoring bores would be placed in appropriate locations around the site.

Should monitoring indicate levels of methane in excess of 1.25 percent (v/v) the NSW Office of Environment and Heritage would be notified within 24 hours and further monitoring undertaken within 14 days to assess the hazards presented by the emissions. If the assessment shows the need, an appropriate gas extraction/control system may be implemented. This may encompass the installation of a series of temporary gas extraction wells to permit flaring of the gas. Flaring of the gas extracted from the landfill would destroy the odorous traces associated with the gas.

However, this should be reviewed in the light of impending CPRS legislation and future cells constructed with the concentration and capture of landfill gas in mind. In this way Council will be able to offset any liability to purchase carbon pollution permits.

6.5 Screening, Measuring and Recording of Wastes

Existing Situation

All incoming and outgoing vehicles are subject to weighbridge operational procedures. The weighbridge is located just inside the security gates (as shown in Figure 1). Vehicles pass over the weighbridge and vehicle details, waste details and gross weight are processed and recorded on the computer by the gatehouse operator. All loads are inspected upon entry are also undertaken and documented by the gatehouse operator to verify the waste type and source. CCTV is installed at the weighbridge to enable visual monitoring and recording of all loads recieved.

A copy of the documentation specifying the waste stream, transfer station, and a unique load number is required before vehicles are permitted to enter the tipping area. Public vehicles are directed to either the public waste drop-off facility, revolve and recycle area,

green waste or mulching area or recycling drop-off areas. The vehicles unload the waste materials and leave the facility via the weighbridge for outgoing processing by the gate house keeper.

When exiting the facility, vehicles are required to pass either through the weighbridge or via a boomgate if weighing is not required. The computer calculates the difference between the vehicle's incoming gross weight and the unladen tare weight. When applicable, the gatehouse operator provides a computerised copy of the weighbridge docket to the vehicle operator. Small vehicles such as private cars, utes and cars with trailers are charged upon weight or counted items.

All privately tipped waste, including construction and demolition waste is classified in accordance with the requirements of the Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (NSW Office of Environment and Heritage, 1999). Recyclable materials not subject to a kerbside or village drop-off bank collection, are collected on site and sent of to the MRF for processing.

Monitoring Program

Random load inspections are carried out at the working face or at the gatehouse or monitored by closed circuit television to facilitate compliance with permitted waste protocols. The information recorded during random inspections includes:

- date/time;
- inspector name;
- waste transporter/driver's name;
- vehicle registration number;
- waste generator (waste source);
- description of waste;
- a unique load identifier and approval number;
- details of waste classification analysis;
- acceptance/rejection of the load; and
- any special comments by the load inspector.

The drivers of vehicles carrying rejected loads are provided with a copy of the inspection report and could be subject to fines or refusal of future entry. They would then be directed to an appropriate alternative disposal facility if appropriate.

Records of wastes received are maintained by the computerised weighbridge management system. The gatehouse operator forwards copies of all transactions relating to weighbridge activities for processing by Council on a regular basis. Receipts are sent to customers detailing loads received at the facility.

Future Actions

No future actions to report.

6.6 Filling, Contour Management, Covering and Compaction

Existing Situation

Waste is unloaded from trucks at the active work face and compacted and covered by on-site plant. A steel-drummed compactor with blade is used to place the unloaded waste. The plant operator uses the compactor to spread the waste in layers ensuring maximum compaction over the working face, compact the waste, place cover material over the waste and spread out and compact the cover material.

Compaction involves three to four passes per waste layer to achieve a compaction density of approximately 650 kilograms per cubic metre for putrescible material and 1,000 kilograms per cubic metre for inert waste.

At the end of the working day the active face is covered either with a flexible cover or cover material. In the case of the latter, daily cover material from the previous days operation would be generally removed to expose the active face at the commencement of daily activities. One day per week, the previous days cover remains in place to form intermediate cover. SRSC is in the process of seeking approval from the OE&H for an alternative landfill daily cover material comprising of special polymers and recycled fibres (brand name Envirofix).

Adequate compaction of the working face and integrity of the cell liner is facilitated by monitoring and managing waste materials to ensure that:

that the maximum void size within any waste material would be less than one cubic metre; and

the maximum vertical height of any item placed would be 1.5 metres.

Other factors that improve waste compaction to be included in operational procedures are:

- compacting upslope (wheels of the machine grind the waste);
- moisture content in the waste;
- thickness of the waste (layers of waste would be no more than 0.5 metres thick); and
- number of compaction passes (a minimum of four passes would be undertaken).

The plant operator is responsible for ensuring that the tipping area is clear and all waste is compacted at the end of each day. The plant operator is also responsible for ensuring that all compacted waste is covered with a minimum of 150 millimetres of cover material and is finished to a slope of one vertical to two horizontal on the working face or a suitable cover that can be easily placed is used. Daily cover material would be stockpiled on the site.

Future Actions

No future actions to report.

6.7 Fire Prevention

Existing Situation

The following measures are implemented to minimise the potential for fire to enter the site, or ignite at the site and spread to surrounding areas:

- The perimeter buffer zone is maintained to ensure that there is a minimum 10 metre fuel-free zone and a 30 metre fuel-reduced zone;
- designated fire access trails are maintained;
- regular liaison with local fire authorities;
- fire fighting equipment and a pressurised water supply is always available at the site (near the landfill entrance gate) ;
- implementation of effective fire training programs;
- ensuring that appropriate equipment is available for fire-fighting and that appropriate signage is erected at the entrance to the facility;

- erection of non-smoking signage; and landfill compactor is fitted with appropriate fire fighting equipment.

In the event that a fire should ignite at the site, appropriate control measures would be implemented. If a fire was to develop, cover materials could be applied and if possible, compacted to prevent an ongoing supply of oxygen to fuel the fire. In addition, fire fighting equipment including a water cart, fire hydrants and portable fire extinguishers fitted to compacting equipment are available at the facility. In the event of a fire, the local fire authority is contacted immediately for assistance.

Open burning of green waste is undertaken in accordance with the requirements of the Environment Protection Licence.

Future Actions

No future actions to report.

6.8 Site Security

Existing Situation

All vehicles and people entering the site are required to pass through the gate house and weighbridge facilities. The weighbridge is fitted with traffic lights and boomgates to regulate incoming and outgoing traffic movements. A register of visitors to the site is maintained. Visitors without a legitimate purpose at the site are not admitted. The site access is provided with motion detector lighting for security purposes. A 1.8 metre chain mesh fence and gate are provided around the perimeter of the facility.

Scavenging is not permitted at the landfill itself. Staff would ensure that this requirement is enforced.

A sign is posted at the site entrance identifying the facility and the type of operation.

Future Actions

No future actions to report.

69 Litter Control

Existing Situation

Control methods which are implemented to minimise litter being transported off-site include:

- restricting the size of the working face of the landfill;
- shaping the landfill profile to minimise the potential for waste to be entrained by wind;
- the presence of the perimeter fence;
- erecting portable litter control fencing of at least two metres in height around the tip face to capture any windblown litter and removing litter from these screens on a regular basis;
- evaluating wind conditions continuously to ensure that control methods are appropriate; and
- retrieval of windblown litter emanating from the site on a regular basis via the use of and industrial vacuum.

Garbage compactors are washed periodically with a high pressure hose. This is undertaken in the controlled drainage area to minimise the potential for transportation of sediment, weeds, litter and other pollutants from the landfill. All compactors leaving the landfill are required to be sealed.

Signs are provided advising users of the facility to cover and adequately secure loads, as well as ensuring that all waste, particularly light weight plastics and paper, is removed from vehicles prior to leaving. Offenders are subject to fines for non-compliance.

Monitoring program

Regular inspections of all fences and the sewage treatment ponds at the adjacent works are undertaken to determine if windborne material from the landfill is being deposited in the ponds. If this is seen to be a problem, the Snowy River Shire Council would investigate the possibility of placing netting over the ponds.

Future Actions

Should litter be transported off-site, existing management protocols would be evaluated and adjusted accordingly. Litter patrols would be implemented to clean up any litter problems.

6.10 Dust Control

Existing Situation

A water cart is used on site to suppress any dust generated from landfill operations.

Climatic conditions, in particular wind speed are monitored throughout each day. Dust generating activities are ceased during high wind and dry conditions to minimise generation and transportation of dust.

Exposed areas of the landfill not part of the current disposal operations are either covered or vegetated to minimise dust generation. Cover and revegetation works are managed to ensure that areas are not left denuded for periods longer than 40 days.

Monitoring Program

Dust will be monitored by dust deposition gauges which have been installed at [INSERT LOCATIONS] (refer Figure XX). The gauges will be installed and are managed in accordance with AS 2471.1–1984 Ambient Air Particulate Matter, Part 1: Determination of Deposited Matter Expressed as Insoluble Solids, Ash, Combustible Matter, Soluble Solids and Total Solids.

The total deposited mass of dust emanating from the operation is compared to the guideline level of 4g/m2 per month (as an annual mean). Should this level be exceeded additional dust suppression measures as outlined above will be implemented. The results from dust monitoring are also compared to the conditions specified in the Environment Protection Licence. Sampling and testing is undertaken by a suitably qualified person and samples are analysed by a National Association of Testing Authorities registered laboratory.

Monitoring results will be reported to the NSW EPA as part of the Annual Return.

Future Actions

No future actions to report.

6.11 Cleaning of Vehicles

Existing Situation

A washdown area for plant items and garbage compactors is planned for the facility. The facility will be is used to washdown

plant used on site and garbage compactors as required. The wash down bay will consist of a controlled drainage area with a pollutant trap(s). A wheel wash facility will be also provided for all vehicles exiting the site.

Future Actions

No future actions to report.

6.12 Pest, Vermin and Noxious Weed Controls

Existing Situation

Typically pests at landfills include rats, seagulls, pigeons, ravens and other bird species such as ibis and starlings. If the face is not covered regularly, flies can also be a problem. Feral cats and foxes are often found within the perimeter of landfills.

The most appropriate method of controlling pests at a landfill is by constant supervision and management. The tipping face is well defined and tightly controlled, and completed areas are promptly capped with intermediate layers of cover 300 millimetres thick.

Waste is compacted and regularly covered and the tipping face covered each night. This effectively limits the availability of materials for vermin that may scavenge at the landfill. Access to the waste by pests would be difficult if the cover is properly applied.

Highly odorous wastes are covered as soon as possible upon delivery to the site to limit vermin attraction and infestation.

Site personnel are trained to observe and identify the first signs of the presence of vermin. Any problems are generally eradicated by site personnel. If necessary, contractors qualified in vermin control may be contracted to undertake significant vermin infestations.

Future Actions

No future actions to report.

6.13 Odour Control

Existing Situation

Odours from landfill operations can be significantly reduced by effective site management. Principal management control methods adopted at the facility include:

- adequate compaction and covering of wastes over correct working face gradients to minimise water ingress;
- immediate deposition of wastes on delivery; and
- immediate cover of highly odorous wastes.

All personnel receive training to identify odours and report all unusual, concentrated or significant odours so that appropriate measures can be implemented.

Landfill gas is monitored in accordance with Section 6.4. Should significant odour arise from landfill gas generation, suitable landfill gas collection and extraction methods would be employed.

Future Actions

Should odour become a significant issue (for example, when complaints are received) actions that could be implemented include:

- application of hydrated lime over newly deposited waste prior to covering;
- use of deodorisers; or
- increasing the thickness of cover or using different cover materials.

6.14 Noise Control

Existing Situation

Noise may be generated as a result of the on-going placement and coverage of waste, including winning of daily and intermediate cover, and all ancillary works associated with on-going landfill operation.

Based on the findings of noise monitoring done as part of the EIS (2001) for the landfill and a supplementary Noise Impact Assessment (2002), it was predicted that noise levels at the nearest residence will generally be within acceptable levels during operating hours.

Existing noise mitigation strategies at the site are:

- selecting the quietest available plant and fitting noise kits to minimise noise emissions;
- ensuring plant is well maintained and operated in an efficient manner;

- working within the designated operating hours; and
- implementing the monitoring program.

Monitoring Program

Noise monitoring would be undertaken on an annual basis at the boundary of the site and at the nearest potential receptor beyond the site. Monitoring data would be assessed and used to:

- determine the accuracy of noise levels predicted during the planning stages;
- forecast from the monitoring at what stage noise limits would be exceeded;
- apply barrier treatments as required to meet the recommended noise limits; and
- maintain progressive monitoring and apply additional treatments in response to projected exceedances of noise limits.

Future Actions

Based on the outcomes of monitoring, operational protocols may be altered to minimise the impact of noise on sensitive receptors.

Over time, as the site is filled, noise emissions from the site are expected to increase due to the increase in height of the noise source. The actual level of noise exceedances would depend on the noise emission levels of the plant selected and current operational conditions.

If operational noise levels exceed the acceptable limits, a noise barrier would be erected on the southern side of the quarry to screen the activities from the residences to south of the site. The barrier may be up to five metres high and 100 metres long.

7. Site Capping, Rehabilitation and Potential Re-use

7.1 Objectives

The objectives of site restoration and rehabilitation are to:

- ensure that the final landfill surface remains in a stable condition, which is suitable for the post-closure landuse ;and
- ensure that the site does not have any impact on the surrounding environment.

7.2 Overview

Existing Landfill

Once landfill cells are completed in the new landfill area, the area would require capping and rehabilitation. This would be done progressively as cells and lifts are completed.

7.3 Factors Affecting Rehabilitation

7.3.1 Settlement

A key aim of landfill construction is to ensure that settlement occurs evenly throughout the landfill. Regular visual inspection (6 monthly intervals) of completed sections of the landfill will indicate the presence of localised settlement that may cause ponding of rainwater. Settlement markers are an effective method of monitoring these movements.

Generally differential effects due to uneven settlement are dealt with by adding additional topsoil locally, re-grading and revegetation as necessary. If differential settlement is too extensive either spatially or in height to make this practical, and then the affected areas of cap will need to be stripped of topsoil, re-graded using additional cover material, compacted and then restored as necessary.

7.3.2 Leachate

The objective will be to minimise long term leachate generation by providing a dense low permeability capping and by maintaining the cap in a stable, vegetated, crack-free condition. The final landform will provide maximum run-off from the site and reduce leachate generation. The performance of the leachate treatment system will be monitored.

7.3.3 Landfill Gas

Once a landfill is fully capped, gas pressures within the landfill may increase and lateral movement of gas is likely to occur. Following the completion of landfilling operations on the site, but prior to undertaking any further capping or revegetation at the site, surface monitoring for landfill gas will be undertaken to determine how effectively the existing cover material is controlling the emission of gas. If surface monitoring indicates methane concentrations exceed the levels specified in the Landfill Guidelines (1.25% volume/volume), further capping may be required and gas extraction may be required. The NSW Office of Environment and Heritage would be notified.

Extraction of gas and venting would ensure that a slight negative pressure exists in the landfill. This will minimise the potential for gas penetration through capping material and forced oxygen displacement.

Before any further capping is undertaken, subsurface gas concentrations would also be monitored within existing groundwater monitoring bores. This would enable the concentrations of gas at various locations to be determined and indicate whether off site migration is occurring. It will also assist in assessing the need for gas extraction.

There is also the potential for gas to accumulate beneath existing buildings and structures at the site. Therefore these areas would be monitored for landfill gas accumulation.

7.3.4 Stormwater/Sedimentation

The objective is to minimise the ponding of stormwater on the cap and provide by design, a mechanism for the collection and management of stormwater and sediment. This may involve directing stormwater to a temporary sedimentation basin, which is designed to receive such contaminated water and permit settlement of sediments.

7.4 Rehabilitation of the Old Landfill

7.4.1 Capping and Rehabilitation

Rehabilitation of the old landfilled areas would involve, among other things, capping of the surface. A discussion of the possible capping construction is provided below. The Rehabilitation and Management Plan would include further details of capping requirements. The final cap would consist of the following:

- soil cap of silty sand at least 500 millimetres in depth; and
- a wearing surface of gravel of not less than 100 millimetres thickness.

A number of gas vents and monitoring piezometers would also be placed at appropriate locations around the site following the application of the capping layer. Additional measures would be taken if the monitoring program indicates that gas accumulation exceeds safe limits. This would include the installation of additional vents where the gas is accumulating.

A landfill gas drainage layer is not considered necessary at this stage as:

- the site has been operating for 30 years without an impervious cap allowing the gas to vent to the surrounding area;
- the landfill is comparatively small;
- the area has a relatively low rainfall and the recirculation of leachate does not take place, minimising gas generation; and
- the nearest private residence is located one kilometre from the landfill.

Revegetation is not proposed at this stage except around the boundary of the area and adjacent to the site entrance.

Monitoring of the old landfill site would continue beyond the completion of filling and the construction of the cap and until the NSW Office of Environment and Heritage has approved the certified statement of completion. At that time, maintenance and monitoring of the site can cease.

The monitoring program would include:

- landfill gas monitoring to show that concentration levels have fallen to less than one percent methane (v/v) and less than 1.5 percent carbon dioxide for a period of 24 months;

- groundwater monitoring to show that no threat of pollution exists as a result of the landfill;
- landfill cap stability and drainage; and
- preparation of documentary evidence to show that all relevant components of the Remediation Plan have been completed.

This program could be combined with that of the new landfill. However, it may be appropriate for it to remain separate due to the much longer life of the new facility.

7.4.2 Potential End Use

There are three main factors which would influence the kind of structures that could be located on that part of the area comprising the completed facility. These are:

- the effect on future uses on the surface of any contamination resulting from the old landfill;
- impacts of large differential settlements expected, particularly in the first years following closure; and
- avoidance of any risks associated with landfill gas generation, migration and concentration.

The combination of these factors leads to the following conclusions:

- the cap would provide a suitable barrier between the waste in the landfill and any proposed activities on the surface;
- no enclosed or heavy structures could be located on the landfill area itself although open bins or lightweight open structures would be feasible;
- landfill gas vents would be provided around the perimeter of any structures to minimise the possibility of build-up in enclosed spaces;
- any utility services required in the area should be sealed to avoid the creation of drainage paths for landfill gas; and
- landfill gas monitoring should be capable of detecting gas in sufficiently low concentrations to ensure that migration is not taking place.

75 Rehabilitation of the Existing Landfill

7.5.1 Capping and Rehabilitation

A discussion of the possible capping construction is provided below. The Rehabilitation and Management Plan would include further details of capping requirements.

Limited rehabilitation would occur on an ongoing basis during the life of the landfill. After the landfill has reached its ultimate capacity and is closed, a cover of not less than 1,000 millimetres of silty sand would be placed on top of the waste to reduce the potential for water infiltration and generation of leachate.

Closure activities would include final cover placement and a leachate monitoring program would be implemented.

Vegetation to be used in both interim and final rehabilitation would be determined during the operation of the landfill. A nursery area is proposed to assess the suitability of particular plant species for use in rehabilitation. The species used for rehabilitation would need to have particular characteristics, including:

- compatibility with on-site soils;
- low depth of penetration of the root system;
- ability to control erosion;
- low maintenance; and
- compatibility with final land use.

Where possible, species used for revegetation would be selected from those native to the site surrounds.

7.5.2 Landscaping and Restoration

The objectives of re-vegetating the landfill surface are to:

- minimise erosion of the final cap;
- provide an aesthetically pleasing final appearance; and
- provide a final surface suitable for use in the long term.

The revegetation of the landfill will comprise topsoiling and grass

seeding.

Planting around the perimeter of the landfill will be designed to reflect natural vegetation structure and composition. Seedlings will be sourced from local seed banks. Planting of the perimeter areas should commence as soon as practical. Regular maintenance of rehabilitated areas shall be undertaken along with irrigation if necessary.

Once the revegetation program has been completed, the revegetated area will be inspected periodically (but not exceeding annually) to ascertain the general success of the program and to identify those species and individual plants which are thriving and to replace those plants which may have died or are not prospering.

All planted areas will need to be checked periodically by Snowy River Shire Council for the presence of weed species. Where encountered, weeds will be removed (refer Section 8.6.3 for further information on post-closure care).

Dense vegetative cover will also be maintained along the side slopes of diversion drains. These measures will prevent erosion damage to drain banks and minimise subsequent sedimentation of local waterways.

The irrigation and drainage of the planted areas will be checked throughout the summer period. This will involve checking the system for damage and to ensure adequate watering of all revegetated areas.

During the winter months monitoring will need to focus on the drainage of revegetated areas to ensure that ponding is not occurring. Remedial drainage works will be required in any areas that are consistently waterlogged.

7.5.3 Potential End Use

End usage of the site is likely to be for passive recreational activities. Community consultation will be undertaken to determine how the rehabilitated site might be utilised.

8. Post Closure Management

8.1 Purpose

A management plan would be prepared defining a framework for post-closure care. The plan would cover each aspect of post-closure care and is intended to demonstrate what is envisaged in terms of post-closure care at the time of facility opening. It is expected that as the rehabilitation of the landfill progresses and further experience is gained with site conditions, requirements in respect of some aspects of post-closure care may change. Furthermore, as the local community becomes involved, further options for the specifics of the site's end use may be identified, and may lead to some modifications to the final planting and landscaping arrangements, provided these are to the satisfaction of the regulatory authorities and Snowy River Shire Council.

In accordance with the Section 76 of the POEO Act, the plan will be submitted to the NSW Office of Environment and Heritage by the last licensee within three months of completion of the landfill's waste receipt operations.

8.2 Objectives

The objectives of the plan are:

- to provide a framework of maintenance, monitoring and reporting activities which will ensure proper engineering and environmental performance of the facility following the completion of landfilling and closing off of the final cover layer;
- to ensure that all parties have a measure of certainty as to the final appearance and landscaping of the facility at the outset of the project; and
- to detail routine ground and landscaping maintenance activities which will ensure that the closed landfill facility will both remain attractive, thereby adding to the amenity value of the surrounding area, and be available as an accessible, well maintained recreational area for the residents of the district.

In order to meet these objectives, specifically the plan will:

- specify the steps to be taken in closing and stabilising the premises concerned and the time frame for doing so;

- ensure that all stormwater sediment controls, monitoring and reporting practices are maintained at a standard equivalent to that employed during the operational life of the landfill;

- ensure that neighbouring residents are advised of contact persons to discuss any problems. The plan will provide for records of these complaints to be kept in the same manner as approved as during operation of the facility;

- ensure that waste materials not received for disposal by the facility after landfill operation ceases. Any waste materials that are intended for use in the remediation should be documented and reported in the same way as for the operating facility;

- detail parties which are to be responsible for the post-closure care including post-closure monitoring, supervision, maintenance and reporting. It should also detail the frequency of the monitoring and reporting periods; and

- detail any specific maintenance requirements which would be required in order to maintain the former landfill in manner satisfactory to the regulatory authorities, Snowy River Shire Council and local residents. Such specific requirements may include:
  - inspection and maintenance of fencing;
  - inspection and maintenance of planting, growth areas and irrigation systems;
  - inspection and maintenance of monitoring systems; and
  - inspection and maintenance of the final capping layer.

83 Management

Monitoring of the site will be undertaken throughout the post closure period. This will consist primarily of continuing to monitor the site and any remedial action should this be required. Monitoring will continue for a period of two years after the delivery of the last load of waste to the site. Surface water and groundwater will be monitored annually with reports submitted to Snowy River Shire Council and the NSW Office of Environment and Heritage. A supervisor will be appointed by Snowy River Shire Council to manage the site during the post-closure period.

84 Monitoring

Monitoring of groundwater, surface water and landfill gas would be carried out on a quarterly, six monthly or as otherwise required during the post-closure period. Results of these activities would be documented and if necessary the need for remedial work would be identified. Measures that may be undertaken as examples of remedial works include:

- introduction of active landfill gas management as a result of observed gas migration;
- implementation of a groundwater clean-up program due to localised migration of leachate; and
- repair or reinstatement of the erosion and sedimentation control structures if serious erosion is observed.

Leachate recirculation may continue during the post closure period, depending on the monitoring results. Once the decomposition processes that produce landfill gas and leachate have slowed and stabilised, the site may be closed. The decomposition process usually stabilises within a period of about 30 years.

A regular inspection program would be carried out on the closed site. The minimum inspection schedule would be annual. However more frequent inspections may be made when the facility has only been closed for a short time. During the inspection, observations of the surface site conditions would be made to identify the need for maintenance work such as eliminating leachate seeps, replacing final cover soil in areas with excessive erosion or settlement, repairing perimeter fencing, reseeding areas on the final cover as required and removing sediment from ponds and ditches.

Liability for maintenance and monitoring of the site during the operational, post closure and site closure periods would ultimately rest with the landowner. This liability would be transferred under contract to the landfill operator during at least the operational and agreed post-closure periods.

85 Landscaping and Planting

It is intended that this landscaping program will be progressively implemented throughout the perimeter and filled areas at the point of final closure.

8.6 Maintenance of Grounds and Approach Roads

8.6.1 General

Maintenance activities related to maintaining the facility grounds and surrounds will be established at the time in which final closure occurs. Generally these activities will be subject to maintenance contracts.

The following sections summarise regular maintenance activities and requirements, with specific requirements for the cell areas identified as appropriate.

8.6.2 Fencing and Security

All fences will be maintained in good condition during the post-closure period, until they are deemed to be no longer required. Inspection of fencing will be undertaken three-monthly and following significant storms.

8.6.3 Planting

All planting will be maintained, fertilised and watered as necessary to avoid excessive plant die off and any general degradation of the overall planting concept. The following inspections shall be undertaken:-

Three-Monthly

Inspection of all main planting areas and irrigation systems. During the summer season (December to March), this frequency may be increased to fortnightly. Determination of any weed control or plant replacement requirements.

Annually

Detailed inspection of all plant growth and assessment of fertiliser and ongoing irrigation requirements for all areas.

8.6.4 Grassed Areas

All grassed areas will be slashed when required (at intervals to suit weather conditions and growth rates). Grass cover will be inspected on a 3-monthly basis and any requirements for re-seeding of bare areas, fertilising or weed control will be regularly scheduled so as to maintain a dense, continuous grass cover on the final cap.

Grass growth on the cover of the final cell areas to be closed, will be subject to regular monitoring and maintenance by way of topsoil replacement and fertiliser applications as necessary.

8.6.5 Access Road

The access road will be inspected on an annual basis and remedial works programmed to address any defects which may develop, with particular attention to:

- maintenance of the surface on the access road; and
- maintenance of roadside drains.

9 Reporting

Each year, an Annual Return accompanied by an Annual Report shall be provided to the NSW Office of Environment and Heritage in accordance with the EPL. These documents must be supplied to the NSW Office of Environment and Heritage by registered post no later than 60 days after the licence anniversary date (TBA) of each year. The Annual Return shall be in the form provided annually by the NSW Office of Environment and Heritage,

The Annual Return shall be in the form provided annually by the NSW Office of Environment and Heritage. The Annual Report shall include the following:

- Tabulated results of all monitoring data required by the Facility's EPL collected over the year.
- . A graphical presentation of all monitoring data. Any statistically significant variations or anomalies should be highlighted or explained;

an analysis and interpretation of all monitoring data; .

- an analysis and response to any complaints received; . identification of any deficiencies in environmental performance identified by the monitoring data, trends or incidents and or remedial action taken or proposed to be taken to address these deficiencies; and. recommendations on improving the environmental performance of the facility.

Appendix A Environment Protection Licence

TBC

Appendix B Development Approval

Table C1: Monitoring Parameters

Field Measurement	**Unit**
Electrical Conductivity[1]	µs/cm
Dissolved oxygen[1]	mg/litre
pH[1]	
Temperature[1]	degrees Centigrade
Redox potential[1]	mV
Laboratory Analysis	
Total dissolved solids	mg/litre
Suspended solids[1]	mg/litre
Bicarbonate	mg/litre
Carbonate	mg/litre
Biological oxygen demand	mg/litre
Chemical oxygen demand	mg/litre
Total organic carbon[1]	mg/litre
Nitrite as nitrogen	mg/litre
Nitrate as nitrogen	mg/litre
Ammonia – nitrogen[1]	mg/litre
Total Kjeldahl nitrogen	mg/litre
Total phosphorus	mg/litre
Arsenic	mg/litre
Aluminium	mg/litre
Iron[1]	mg/litre
Zinc	mg/litre
Copper	mg/litre
Cadmium	mg/litre
Chromium[1]	mg/litre
Absorbable organic halogens[1] (or suitable alternative)	mg/litre
Total alkalinity[1]	mg/litre
Calcium[1]	mg/litre
Chloride[1]	mg/litre
Fluoride[1]	mg/litre
Magnesium[1]	mg/litre
Manganese	mg/litre
Mercury	mg/litre
Laboratory Analysis	**Unit**
Total phenolics[1]	mg/litre
Potassium[1]	mg/litre
Sodium[1]	mg/litre
Sulfate[1]	mg/litre

Note 1: Parameters specified in *Environmental Guidelines: Solid Waste Landfills* (NSW Office of Environment and Heritage 1996).

Appendix C Monitoring Parameters

Appendix D Water Management Plan

Refer to separate file

Appendix E Testing and QCQA Plan

Refer to separate file

Appendix F Odour Management Plan

Refer to separate file

Appendix G Incident Management Plan

Refer to separate file

Appendix H Auditing Management Plan

Refer to separate file