SITA Australia

Lucas Heights Resource Recovery Park Project

Environmental Impact Statement

VOLUME 5 – APPENDICES

October 2015

SITA Australia is changing brand to SUEZ

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VOLUME 5 – APPENDICES

Appendix J – Leachate assessment

SITA Australia

Lucas Heights Resource Recovery Park Project

Leachate Assessment

September 2015

Executive summary

This report provides an assessment of the potential leachate impacts of the proposal. The assessment has been undertaken in accordance with the requirements of Secretary's Environmental Assessment Requirements which specify that the leachate assessment include:

- the proposed leachate management system including the capacity of the system to treat and dispose of leachate

This report deals specifically with leachate from the landfill operation while other aspects which may be impacted by leachate from the proposal, including air quality, are dealt with in other specialist reports. This report provides a cumulative assessment of the leachate impacts considering all sources of water being treated by the Lucas Heights 1 treatment plant and disposed to sewer at the Lucas Heights 1 site. This includes the landfill leachate from the LHRRP landfill, Harrington's quarry and Lucas Heights 1. It does not consider water from the existing and proposed GO and ARRT facilities.

The report describes the existing environment, the existing sources of leachate and the systems currently in place to contain, collect, treat and dispose of that leachate.

A prediction of future leachate generation is then made and a leachate water balance undertaken. The water balance indicates that the existing leachate management system has the capacity to manage the volumes of leachate estimated to be generated in the modelled average rainfall and wet rainfall years through the use of emergency leachate containment in the double lined emergency leachate containment dam. On occasion there may be some temporary leachate level fluctuation in Cell 5.2 and Cell. 5.3. These containment structures were designed for this purpose.

The following is recommended throughout the development of the proposal:

- Ongoing monitoring of leachate volumes extracted from LHRRP landfill and other sources
- Periodic review of the leachate water balance model
- Monitoring of groundwater and surface water quality, as required by the site EPL

It is further recommended that SITA seeks to increase the average leachate treatment plant capacity to 870 kL/day and the daily trade waste limit to 1,200 kL/day. This additional safeguard is recommended to be obtained by early 2017.

This report addresses the Secretary's Environmental Assessment Requirements and concludes that the proposal would meet the following objectives:

- Prevention of groundwater pollution by leachate
- Prevention of surface water pollution by leachate
- Prevention of the degradation of local amenity

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Glossary

Term	Definition
ANSTO	Australian Nuclear Science and Technology Organisation
ARRT facility	Advanced Resource Recovery Technology facility
Disturbed Runoff	Runoff from unsealed areas where mobilisation of sediment is likely
EIS	Environmental Impact Statement
EPA	New South Wales Environment Protection Authority and any successor body
EP&A Act	*Environmental Planning and Assessment Act 1979*
Currently approved landform	The currently approved landform heights and contours outlined in the 1999 EIS
GIS	Geographic Information Systems
GO facility	The Garden Organics facility at LHRRP, that undertakes composting of waste including green and garden waste, but excluding waste types such as food waste and biosolids
Landform reprofiling	Proposed changes to currently approved landform at the LHRRP.
LHRRP	Lucas Heights Resource Recovery Park
Mitigation	The application of techniques to reduce environmental impacts arising from the proposal
OEMP	Operational Environment Management Plan and all relevant future documents, these will be provided for the landfill, GO and ARRT and will detail how these projects can be managed to meet the environmental outcomes for the site
PCYC Mini-Bike Club	The mini-bike club operated by the Police and Community Youth Clubs NSW Limited (PCYC).
SSC	Sutherland Shire Council
SEAR	Secretary's Environmental Assessment Requirements (formerly known as Director-General's Requirements or DGRs)
SICTA	Sydney International Clay Target Association and any successor body
SITA	SembSITA Australia Pty Ltd (SembSITA) is the holding company for the SITA Australia (SITA) group of companies in Australia. SembSITA is the parent company of both SITA and WSN Environmental Solutions Pty Ltd (WSN). WSN owns part of the land on which the LHRRP is situated, and leases the remainder from ANSTO. SITA holds the environmental protection licence (EPL), and so is the operator of the facilities at LHRRP. For simplicity, the term 'SITA' is used to refer to all of these organisations in this report.

1. Introduction

1.1 Purpose of this report

SITA Australia (SITA)[1] is proposing a number of activities at the Lucas Heights Resource Recovery Park (LHRRP) in Lucas Heights (referred to in this report as 'the proposal'). This report has been prepared by GHD Pty Ltd on behalf of SITA to provide an assessment of leachate impacts associated with the proposal as an input to the environmental impact statement. Due to the existing operational arrangements at LHRRP, Sutherland Shire Council (SSC) is a joint applicant for the proposal. SITA is the proponent of the proposal and the environmental impact statement is being prepared by GHD in accordance with the requirements of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (the EP&A Act).

The report addresses the requirements of the Secretary of the NSW Department of Planning and Environment (the Secretary's Environmental Assessment Requirements (SEARs No SSD-6835) dated 3 February 2015.

In addition to addressing the SEARs requirements, this report provides an assessment of how well the proposal meets SITA's objectives of having no significant impacts on the community or environment. Environmental management and mitigation measures related to leachate management are proposed (where necessary) to mitigate potential impacts and ensure that they are managed in accordance with statutory requirements, regulations and community expectations.

Other aspects which may be impacted by leachate from the proposal, including air quality, are dealt with in other specialist reports.

1.2 Objectives

The following objectives have been identified:

- Prevention of groundwater pollution by leachate
- Prevention of surface water pollution by leachate, including Mill Creek
- Prevention of the degradation of local amenity
- No significant impacts on the community and the environment

1.3 Proposal overview

The LHRRP consists of approximately 205 hectares (ha) in two ownerships. 89 ha is owned by SITA and 116 ha owned by Australian Nuclear Science and Technology Organisation (ANSTO) and leased to SITA for waste management or other agreed purposes. The following activities are proposed at the LHRRP and are collectively referred to as 'the proposal'. The proposal would not have a significant impact on the community. In addition to the proposal detailed below, SITA is committed to better environmental outcomes by the application of best practice prevention, mitigation and rectification measures:

[1] SembSITA Australia Pty Ltd (SembSITA) is the holding company for the SITA Australia (SITA) group of companies in Australia. SembSITA is the parent company of both SITA and WSN Environmental Solutions Pty Ltd (WSN). WSN owns part of the land on which the LHRRP is situated, and leases the remainder from ANSTO. SITA holds the environmental protection licence (EPL), and so is the operator of the facilities at LHRRP. For simplicity, the term 'SITA' is used to refer to all of these organisations in this report.

- **Reprofiling of existing landfill areas to provide up to 8.3 million cubic metres of additional landfill airspace capacity.** This is equivalent to approximately 8.3 million tonnes of waste, assuming 1 tonne of waste utilises 1 cubic metre of waste disposal airspace. As the process of reprofiling would include removal and replacement of capping material over previously landfilled waste and augmentation of gas and leachate collection systems, the environmental performance of the site would be ultimately improved by reducing the infiltration of stormwater into the landfill (resulting in reduced landfill leachate in the longer term) and increase the overall amount of landfill gas recovered from the site.

  As part of the proposal, SITA is seeking permission to increase the approved quantity of waste landfilled at the site from 575,000 to 850,000 tonnes per year. This would enable the reprofiling of the site to be completed in 2037.

- **Relocation and expansion of the existing garden organics (GO) facility**. The existing garden organics facility would be relocated to the western side of the site adjacent to Heathcote Road. Approval is being sought to increase the approved capacity from 55,000 to 80,000 tonnes of green waste and garden waste received per year at the facility. The new facility would include the partial enclosure, active aeration and covering of the first four weeks of the active composting process, which coincides with the period of highest potential for odour generation, to enable more effective control of odour . Relocation of the facility would result in increased separation distances from the current nearest occupied land at ANSTO, existing residential areas and the proposed new residential area at West Menai.

- **Construction and operation of a fully enclosed advanced resource recovery technology (ARRT) facility**. The ARRT facility would be located on the western side of the site adjacent to the GO facility and would process and recover valuable resources from up to 200,000 tonnes of general solid waste per year, reducing the amount of waste disposed to landfill to approximately 60,000 tonnes per year. This would divert up to 140,000 tonnes of waste per year from landfill. SSC and other councils would have the opportunity to have their municipal waste processed by the ARRT facility.

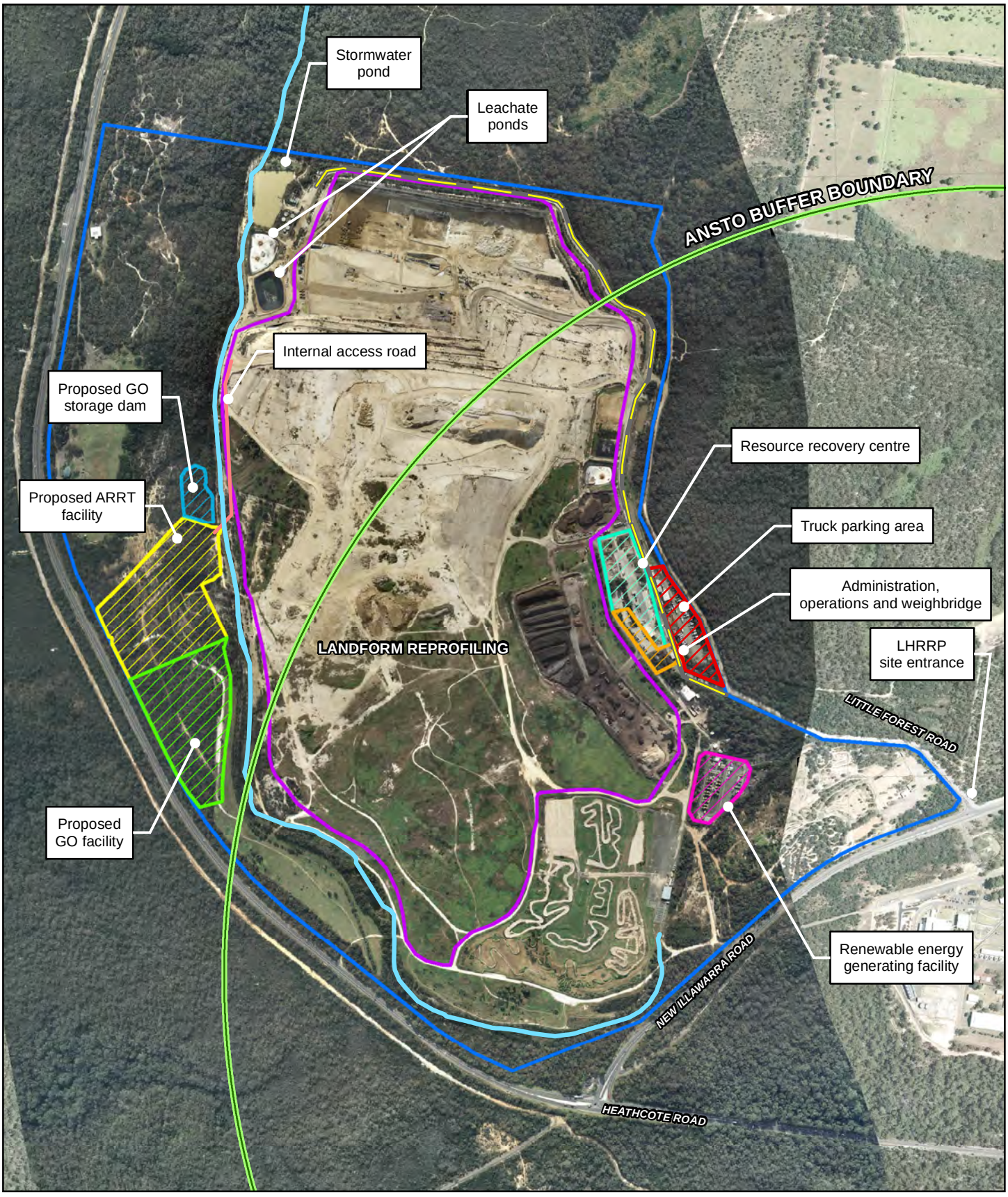
- **Community parkland**. The landfill reprofiling would increase the area available for future passive recreation following site closure from 124 ha (existing approved parkland) to a total of 149 ha, an increase of approximately 25 ha. Landfilling would cease in 2037 after which time the site would be rehabilitated and converted to a community parkland, with capping and landscaping to be completed and the site made available for community use in 2039.

As part of the proposal SITA has committed to entering into an agreement with SCC in the form of a Voluntary Planning Agreement which includes ‘environmental undertakings’. In addition operational environmental management plans have been prepared for the landfill, GO facility, ARRT facility and post closure measures to manage potential environmental impacts, reflect regulatory requirements and provide guidance for site operators to undertake activities in an environmentally sound manner.

A Planning Proposal is being submitted in parallel with this State Significant Development Application. The Planning Proposal seeks to include new local provisions on the LHRRP site within the Sutherland Local Environmental Plan 2015 (SLEP), which would allow the proposal (a waste or resource management facility) to be undertaken on the proposal site.

The expansion of the LHRRP which is outlined in this EIS would permit the proposed future use of the land for recreational purposes, which is currently approved and would occur when the existing facility ceases operation in 2025. The proposal would however extend the timeframe for which the land would be unavailable for recreational purposes until 2037, due to the extension of operations at the proposed LHRRP.

These key components of the proposal are shown on Figure 1.1. The proposed final landform and preliminary masterplan for the parkland is shown in Figure 1.2.



LEGEND

- ANSTO buffer boundary
- Mill Creek
- Internal access road
- Existing access road
- Proposed GO facility
- Proposed ARRT facility
- Resource Recovery Centre
- Administration, operations and weighbridge
- Renewable energy generating facility
- Lucas Heights Resource Recovery Park boundary
- Landform reprofiling boundary
- Truck parking area

Paper Size A4

0 100 200 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

SITA Australia
Lucas Heights Resource Recovery Park

Job Number 21-23482
Revision A
Date 28 May 2015

Key existing infrastructure and proposed facility layout

Figure 1.1

N:\AU\Sydney\Projects\21\23482\GIS\Maps\MXD\21-23482-Z046_KeyProposedInfrastructure.mxd 15/133 Castlereagh Street Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

Aerial Imagery: ESRI, 2014. Works: GHD/SITA, 2014. Roads: NSW LPMA, 2012. Created by:jrichardson

Paper Size A4

NOT TO SCALE

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GHD

SITA Australia
Lucas Heights Resource Recovery Park

Job Number 21-23482
Revision A
Date 24 June 2015

Proposed parkland master plan **Figure 1.2**

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

N:\AU\Sydney\Projects\21\23482\GIS\Maps\MXD\21-23482-Z058_Parkland_Master.mxd

Data source: Taylor Brammer Landscape Architects Pty Ltd. Created by:jrichardson

1.4 Definitions

The following terms are used within this report when referring to the proposal site and surrounding areas:

- The 'LHRRP' refers to the entire Lucas Heights Resource Recovery Park. The boundary of the LHRRP is shown as the blue line on Figure 1.3.
- The 'proposal site' refers to the areas where the activities described in Section 1.2 would be located. The boundary of the proposal site is shown as the red line on Figure 1.3.

1.5 Location of the proposal

1.5.1 Existing

The proposal would be located within the boundary of the existing LHRRP. The LHRRP is located within the Sutherland local government area, approximately 30 kilometres (km) south west of the Sydney city centre. The site is bound to the west by Heathcote Road and New Illawarra Road to the south.

Specifically, the proposal would be located on:

- Lot 101 DP 1009354
- Lot 3 DP 1032102
- Lot 2 DP 605077

It is noted that the proposal directly affects only a portion of each of these lots. There is minimal encroachment into the SICTA leased land (part of Lot 3 DP 1032102).

The proposal site, within the boundary of the LHRRP, is shown on Figure 1.3.

The site is currently accessed from Little Forest Road, off New Illawarra Road.

Current facilities at the LHRRP include:

- Landfill
- Resource recovery centre and waste collection point
- GO facility for processing garden organics
- Renewable energy production (operated by Energy Developments Ltd)
- Truck parking area
- Community use areas (mini bike area at the southern extent of the site run by the Sutherland Police Citizens Youth Club and the Sydney International Clay Target Association (SICTA) leased land on the north western side of the site)

There are also several ancillary buildings and structures (e.g. weighbridge, machinery workshop, administration offices, stormwater and leachate dams).

The following land uses are located in the immediate vicinity of the LHRRP:

- Bushland areas that form part of ANSTO's exclusion zone (to the east and south)
- ANSTO's facilities (to the east on the opposite side of New Illawarra Road)

Land uses in the surrounding area include:

- Holsworthy Military Reserve (to the west, northwest and southwest)

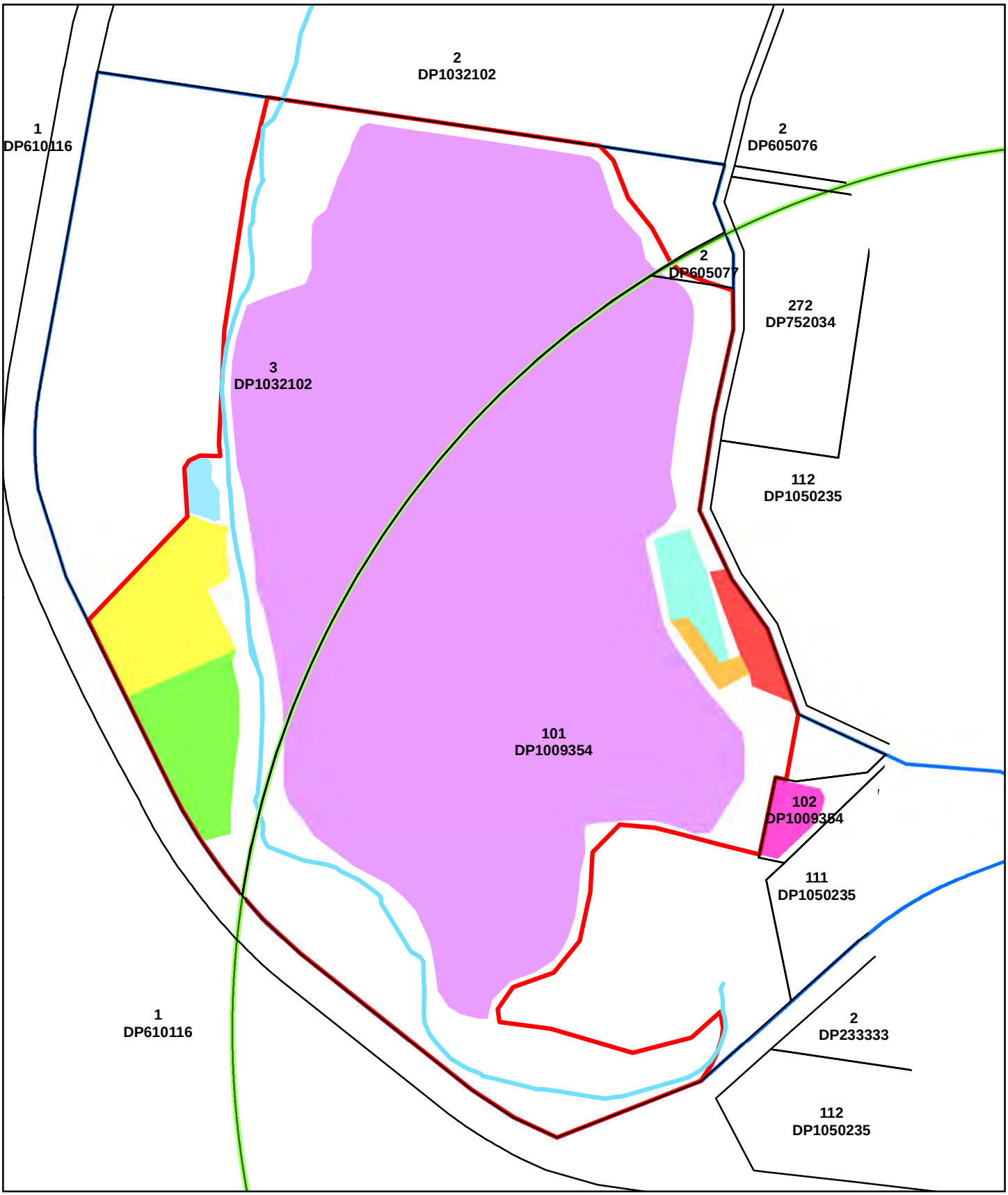
- The Ridge Sports Complex, a major regional sporting facility being developed on the site of the former Lucas Heights Waste and Recycling Centre (approximately 2.5 km to the north east)
- Lucas Heights Conservation Area (immediately to the north of the LHRRP)
- The suburbs of North Engadine (approximately 2 km to the east) and Barden Ridge (approximately 3 km to the north east)

Figure 1.4 shows these key areas.

1.5.2 Potential future surrounding land uses

The Gandangara Local Aboriginal Land Council (GALC) is proposing a development in the West Menai area. The West Menai State Significant Site contains 849 ha of mostly undeveloped land, covering parts of Menai, Barden Ridge and Lucas Heights.

The western boundary of the proposed development is Heathcote Road and the site extends east across Mill Creek to the edge of the existing Menai residential area close to New Illawarra Road. The location of the proposed West Menai State Significant Site is shown on Figure 1.4.



LEGEND

- ANSTO buffer boundary
- Mill Creek
- Cadastre
- Proposal site boundary
- Lucas Heights Resource Recovery Park boundary
- Truck parking area
- Proposed GO facility
- Proposed ARRT facility
- Resource Recovery Centre
- Administration, operations and weighbridge
- Renewable energy generating facility
- Landform reprofiling boundary

Paper Size A4

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

SITA Australia
Lucas Heights Resource Recovery Park

Job Number	21-23482
Revision	A
Date	25 Jun 2015

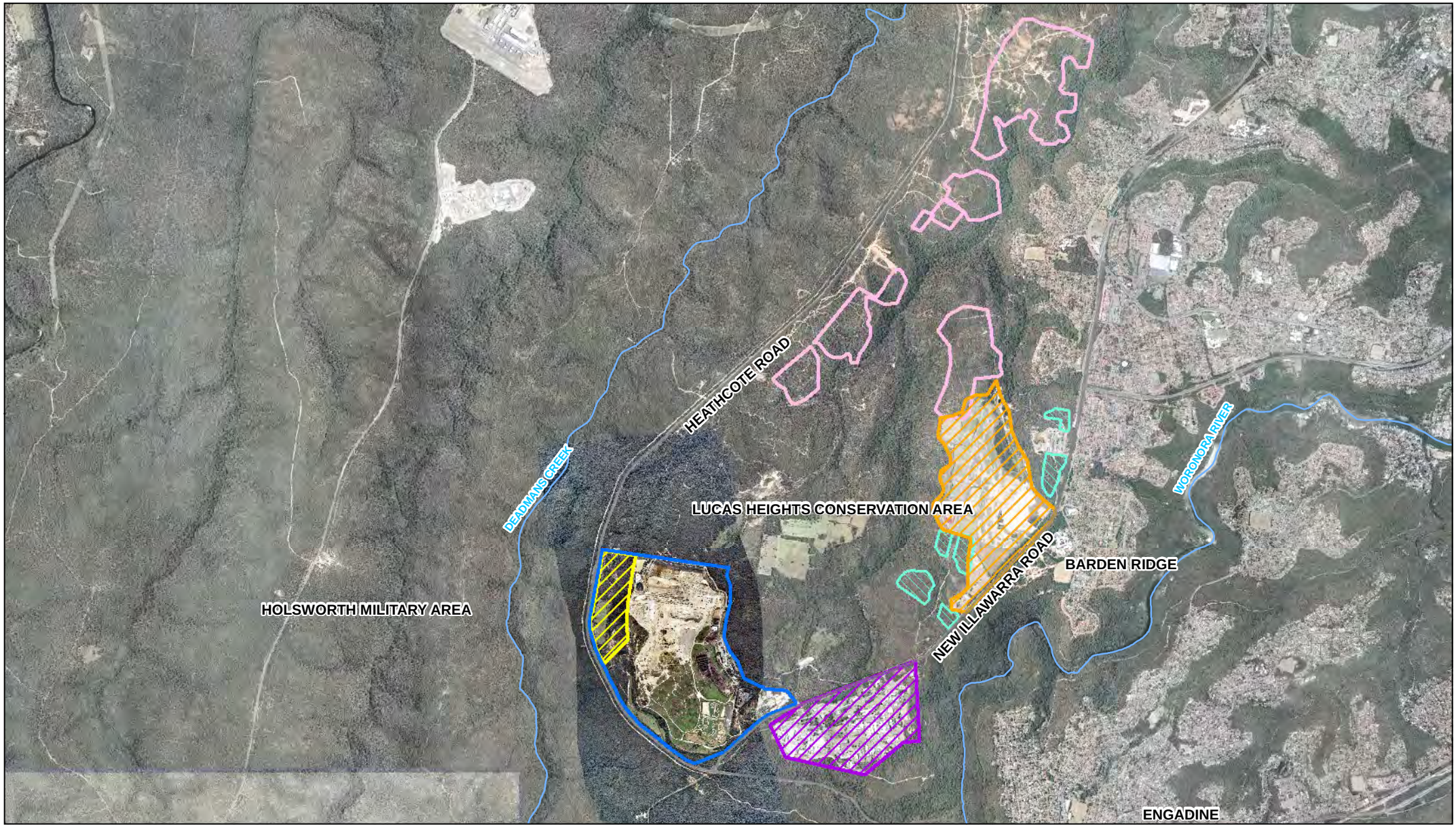
The proposal site

Figure 1.3

G:\21\23482\GIS\Maps\MXD\21-23482-Z059_TheProposalSite.mxd

15/133 Castlereagh Street Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

Aerial Imagery: ESRI, 2014. Works: GHD/SITA, 2014. Roads: NSW LPMA, 2012. Created by:afoddy



Paper Size A4

0 250 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Legend

- LHRRP boundary
- SICTA boundary
- ANSTO
- Barden Ridge Sports Complex
- Potential future receptors
- Future receptors – Residential

SITA Australia
Lucas Heights Resource Recovery Park

Job Number 21-23482
Revision B
Date 14 Aug 2015

Surrounding landuses

Figure 1.4

N:\AU\Sydney\Projects\21\23482\GIS\Maps\MXD\21-23482-Z063_SurroundingLandUses_Fig4-3.mxd

15/133 Castlereagh Street Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com

Aerial Imagery: SITA, 2014. Works: GHD/SITA, 2014. Roads: NSW LPMA, 2012. Created by:apmiller

1.6 Secretary's Environmental Assessment Requirements

The specific Secretary's Environmental Assessment Requirements (SEARs) addressed in this report are summarised in Table 1.1.

Table 1.1 Secretary's Environmental Assessment Requirements

Assessment requirements	Where addressed in report
The EIS must address the proposed leachate management system including the capacity of the system to treat and dispose of leachate	Sections 2.1.2 and 5.6
Agency requirements	
NSW EPA	
Outline pollution control measures relating to storage of materials, possibility of accidental spills (e.g. preparation of contingency plans), appropriate disposal methods, and generation of leachate.	Sections 5.6, 5.7 and 5.8.
Future parkland: Water and Leachate, and gas management, and who is responsible for the ongoing monitoring to ensure compliance with relevant standards of use and how will they achieve this	Section 6.2

1.7 Scope and structure of the report

1.7.1 Scope of report

This report provides an assessment of the potential leachate impacts of the proposal. The assessment has been undertaken in accordance with the requirements of Secretary's Environmental Assessment Requirements which specify that the leachate assessment include:

- the proposed leachate management system including the capacity of the system to treat and dispose of leachate

This report deals specifically with leachate from the landfill operation while other aspects which may be impacted by leachate from the proposal, including air quality, are dealt with in other specialist reports. This report provides a cumulative assessment of the leachate impacts considering all sources of water being treated by the Lucas Heights 1 treatment plant. This includes the landfill leachate from the LHRRP landfill, Harrington's quarry and Lucas Heights 1. It does not consider water from the existing and proposed GO and ARRT facilities.

The proposed GO and ARRT facilities are a separate system to the landfill leachate management system. These are not covered within the scope of this report and have been reviewed separately in the Surface Water Assessment Report (GHD, 2015a).

1.7.2 Structure of report

- **Chapter 1 – Introduction** – This chapter introduces the proposal, the proponent and describes the proposal area
- **Chapter 2 – Existing environment** – This chapter describes the existing environmental values of the proposal site relevant to leachate and the assessment
- **Chapter 3 – Methodology** – This chapter identifies the methodology for assessment
- **Chapter 4 – Potential impacts** – This chapter examines the potential leachate impacts associated with the proposal
- **Chapter 5 – Mitigation measures** – This chapter identifies mitigation measure relating to leachate

- **Chapter 6 – Conclusions** – This chapter provides a summary of assessment conclusions
- **Chapter 7 – References** – This chapter provides a reference list

2. Existing environment

2.1 General

This section provides an overview of the existing LHRRP environment and the system currently in place for the containment, collection, treatment and disposal of leachate.

2.2 Historical land-use

LHRRP is located within a forested area. The nearest residential areas are Menai and Lucas Heights located approximately 3 to 4 km to the north east of the LHRRP. The area surrounding the LHRRP has had historical landfilling activities associated with municipal and industrial waste disposal. Previous landfill sites are listed below:

- Harrington's Quarry landfill which is understood to have briefly operated in 1987 and received municipal waste (NSW WAMC, 2012).
- Industrial Waste Collection (IWC) Landfill which operated between 1968 and 1976 and received liquid industrial wastes.
- Night Soil and Sludge Landfill which operated between 1965 and 1980 and received sludge and night soil from sewage treatment activities.
- Little Forest Burial Ground, which operated between 1958 and 1968 and was in filled with waste from ANSTO.

The LHRRP originally opened in 1987 (Mitchell Mccotter & Associates Pty Ltd, 1991) based on a development consent received in 1985 permitting waste disposal operations. A development application was submitted and approved in 1999 which permitted the expansion of waste disposal operations and also the development of composting and other resource recovery operations at the site. The final land-use was approved to be parkland over the majority of the site with potential on-going composting and other resource recovery operations located on the eastern side of the site.

Landfilling has occurred across the site in stages. More detail is contained in Section 2.10.1.

Table 2.1. Details of the LHRRP landfill stages

Stage	Date of Commencement	Overtopping Commencement	Date of Completion	Lining and leachate collection system
Stage 1A	1988 - 1989	1999	2001	In-situ low permeability geological barrier with leachate collection system
Stage 1B	1990 - 1995	1999	2001	
Stage 1C	1988 - 1991	1999	2001	
Stage 2	1990 - 1996	2002	2003	
Stage 3	1993 - 1998	2004	2006	
Stage 4	1995 - 1998	2006	2010	Engineered clay liner including leachate collection
Stage 5-1	Approx 2010	N/A	2011	

Stage	Date of Commencement	Overtopping Commencement	Date of Completion	Lining and leachate collection system
				system
Stage 5-2A	Approx 2012	N/A	Capacity available (current approval to 31 December 2024)	
Stage 5-2B	Filling commenced 2013	N/A	Capacity available (approval to 31 December 2024)	Geomembrane and compacted clay including leachate collection system
Stage 5-3A	Filling commenced 2014	N/A	Capacity available (approval to 31 December 2024)	
Stage 5-3b & C	5-3b to commence in approx. June 2015	N/A	Capacity available (approval to 31 December 2024)	Not constructed – geomembrane and compacted clay proposed

2.3 Climate

Review of data from Bureau of Meteorology (BOM, 2014) and data from Queensland Government Department of Science, Information Technology, Innovation and the Arts (DSITIA, 2014) suggests that a warm temperate climate with strong maritime influence is experienced in the Lucas Heights area. Mean daily temperatures range from 26.0 ^{0}C to 17.0 ^{0}C in February and from 15.8 ^{0}C to 6.6 ^{0}C in July. Frost is not experienced in this area.

Seasonal variations occur in rainfall with a greater proportion being received during summer months. A generally even rainfall distribution is experienced over the region with a mean annual rainfall of 1015 millimetres (mm).

2.4 Topography

The LHRRP represents a gently undulating plateau, 200-1000 metres (m) in width, dissected by two ridges. The ridges run parallel to Heathcote Road and form a shallow valley in between. The gradients of the site are typical of a dissected plateau, with the slopes becoming steeper close to Mill Creek. Mill Creek itself has a slope of 2% as it travels through the site.

Approximately one-third of the site has a slope of 5%, while half the site has slopes of 10% or greater. The highest part of the site is 170 m Australian Height Datum (AHD) towards the south

of the site, near the intersection of New Illawarra Road and Heathcote Road. The site's lowest point of 90 m AHD is at the northern part of the site.

2.5 Hydrology

Most of the site lies within the Mill Creek catchment. Mill Creek originates from the LHRRP and flows north along the western boundary towards Georges River. The gradients of the LHRRP are typical of a dissected plateau, with the slopes becoming steeper close to Mill Creek. Mill Creek itself has a slope of 2% as it travels through the site. Baseflow for the perennial rivers and streams are generally sourced from seeps and springs derived from groundwater.

The majority of the site, the landfilled portion, constitutes runoff to Mill Creek. An area around the administration facilities is a tributary to Bardens Creek. As this area is not impacted by this proposal, impact to Bardens Creek is not accessed in this impact assessment.

There are a number of surface water management features currently in place at the site. Surface water diversion drainage is constructed around the rim of each active waste disposal cell to control surface water runoff flowing into or from the cells. The drainage typically comprises open channel drains on the outer edge of earthen bunds. Surface water is collected in drains, swales and ponds and diverted to sediment dams. The dams are designed to allow for settlement of suspended solids before discharging offsite following large rainfall events when stormwater has reached capacity.

Most of the LHRRP lies within the catchment area of Mill Creek, with the exception of the area bounded by New Illawarra Road and Little Forest Road in the south-east, which drains to Bardens Creek. Mill Creek originates from within the site and flows in a northerly direction through approximately the centre of the site, covering most of the length of the site. Towards the origin of the creek, the channel is not always clearly visible. Apart from small overflows, flooding is not expected to occur over the site because the gradients of the site allow good drainage.

Refer to Soils and Surface Water Assessment Report (GHD, 2015a) for further details.

2.6 Geology and soils

Extensive geological characterisation has been completed at the LHRRP as part of previous investigations. This included, review of regional geological data, site drilling investigations, seismic surveys and geological mapping of jointing on exposed surfaces. The findings of these investigations are summarised below.

The LHRRP site is located on the Woronora Plateau which is primarily comprised of Triassic aged Hawkesbury Sandstone of thicknesses approximating 200 m (DP & CPI, 1994). The Hawkesbury Sandstone is comprised of cross bedded massive sandstones, laminates and occasional black shale and claystone lenses (DP & CPI, 1992). The sandstone matrix is often well cemented.

Environ (2006) reported two layers of laminate (2 m thick) and siltstone (2.5 m thick) at elevations of 60 m AHD and 84 m AHD respectively.

DP & CPI (1994) provided the following summary of site conditions after drilling investigations:

- Surficial Clayey SAND/Sandy CLAY ranged in depth from 0 to 2.8 m bgl.
- Very low strength weathered Sandstone extending from ground surface or beneath unconsolidated sediments to depths of up to 6.1 m bgl.
- Medium to high strength slightly fractured to unbroken Sandstone extending from the base of the low strength sandstone to depths of 60 m bgl (the maximum depth of characterisation). Laminate and siltstone layers were noted in some bores.

Geological mapping suggested that locally shale layers tended to dip to the north at between 2 and 5 degrees, however, the regional dip of the geology is considered to be to the north at an overall slope of 1.5 to 2 degrees (DP & CPI, 1994). Regional jointing systems have also affected this environment with surface drainage developing along well developed and relatively continuous jointing systems at spacings of 300 to 400 m (DP & CPI, 1994).

It is inferred that these jointing systems have resulted in the development of the primary surface water features including Mill Creek and Deadmans Creek and Woronora River. On a more local scale jointing spacing of between 1 and 3 m common and can be laterally extensive (up to 100 m being common), however, vertical continuity is generally limited to less than 20 m (DP & CPI, 1994). Geological mapping undertaken by DP & CPI (1992) suggest that local jointing is orientated in NNE and ESE directions.

Surface weathering of the bedrock in the vicinity of LHRRP is generally considered to be less than 2 m (DP & CPI, 1994). DP & CPI (1992) reported that the Hawkesbury Sandstone had been subject to lateritic weathering and that the extent and depth of the weathering is variable across the site. This was confirmed with seismic surveys which also suggested the presence of two to four distinct layers that reflected variation in the type and depth of weathering. Generally, the weathered layers were deeper on the ridges and shallower in the valleys.

Soil at the surface of the landfilling areas and capped areas appears to be representative of natural soil and sandstone conditions described above as the extracted sandstone is crushed on-site and used as cover material.

2.7 Hydrogeology

The Hawkesbury Sandstone is generally well-cemented by authigenic quartz and siderite and is infilled with varying proportions of clay. The unweathered sandstone has a very low primary or intergranular permeability. The formation has a complex aquifer system due to sub-vertical joints and sub-horizontal bedding planes and the lithology associated with variable weathering.

Perched water tables, ‘leaky’ aquifers and pressurised zones are a feature of the hydrogeological environment due to the discontinuous shale and clay layers (Thom & Knight, 1995). Weathering has produced spatially and vertically variable aquifer material which influences the groundwater flow paths and hydraulic conductivity in different layers and areas.

Refer to the EIS Groundwater Assessment Report (GHD, 2015b) for a detailed description of the local hydrogeology.

2.8 Existing regulatory requirements

2.8.1 Consent

The following conditions included in the Determination of Development Application DA 11-01-99 pertaining to leachate management, disposal and maintenance are provided in the table below.

Table 2.2 DA 11-01-99 Leachate Management, Disposal and Maintenance Conditions

Clause	DA condition
18	The Applicants shall undertake monitoring of surface water, leachate, landfill gas, groundwater, dust, noise and any other environmental performance indicators in accordance with the amended EMPs and the requirements of the relevant EPA licences. (EPA GTA)
61	Accumulated sludge and sediment formed during leachate storage or treatment at LH1 and LHWMC shall be disposed of to a special waste area at LHWMC.
67	Leachate shall not pollute groundwater at the LHWMC, unless otherwise permitted

Clause	DA condition
	by the EPA licence. A groundwater contamination remediation action plan shall be prepared and incorporated into the amended EMP for the LHWMC site. Leachate and groundwater at the LHWMC shall be managed in accordance with the amended EMP and the requirements of the EPA licence. (EPA GTA)
68	Leachate shall not be reinjected into the waste at LHWMC in a manner that exceeds the capacity of the leachate management system. (EPA GTA)
69	The volume of leachate that is be generated at LHWMC and the volume of leachate collected shall be modelled. The modelling methodology and the results shall be provided to the EPA within 1 (one) year of commencement of this consent. (EPA GTA)
70	Once the excavation in any phase of Stage 5 is complete, the excavation shall be left for a minimum of 3 months prior to commencement of placement of the base liner to allow for stress relief of the underlying strata.
71	The base liner installed in Stage 5 shall extend across the entire base of the excavation. Where significant lateral groundwater flows are encountered, the base liner shall be extended up the walls of the excavation in order to intercept such flows, unless otherwise approved by the EPA.

2.8.2 EPL requirements

The following conditions included in the current EPL 5065 (version dated 5 Nov 2014) pertaining to leachate management, disposal and maintenance are provided in the table below.

Table 2.3 EPL Leachate Management, Disposal and Maintenance Conditions

EPL Clause	EPL Condition
O5.12	Landfill leachate must not be irrigated except as expressly permitted by a condition of this licence.
O5.13	The licensee must not inject leachate back into the landfill waste.
O5.14	Leachate must be disposed of to sewer or removed by tanker to a premises which may lawfully receive the leachate for treatment
O6.1	The licensee must manage any groundwater extracted from groundwater depressurisation works in the same manner as leachate if the ammonia concentration in the groundwater is greater than 1 mg/L.
M1.4	The licensee must record the date, duration and volume of any leachate discharge to surface water.
M8.3	The licensee must record the date, duration and volume of any leachate discharge to surface water.
R4.2	In the event that monitoring detects ammonia in groundwater at a concentration above 1 mg/L in any of the points 4, 7, 8, 16, 17, 18 and 19 the licensee must send written notification to the EPA within 14 days of the monitoring results becoming available.

2.9 Landfill Environmental Management Plan

A Landfill Environmental Management Plan (LEMP) was prepared for the LHRRP. The latest version is dated 15 February 2012 and describes the operational activities on site that have, or are likely to have, an impact on the environment and measures to be undertaken to minimise those impacts. information regarding the site. In particular, it contains management strategies, performance indicators, management responsibilities and review / reporting requirements for a range of topics. Leachate is one of the key issues addressed in the LEMP.

As part of preparation of the EIS, draft Operations Environmental Management Plans (OEMPs) have been prepared for different aspects of the site, including for the landfill, relocated GO facility and proposed ARRT facility. An additional draft Environmental Management Plan (EMP) has also been prepared for the management of post-closure activities. These draft documents

would be finalised after preparation of the EIS and would supersede the current LEMP and prescribe a appropriate site management, monitoring and mitigation measures. Details are described in section 5.

2.10 Leachate generation

A conceptual model (Figure 2.2) was developed to illustrate the various aspects which currently contribute to the Lucas Heights 1 treatment plant and sewer connection.

The primary sources of leachate are:

- LHRRP (Lucas Heights 2)
  - Landfilled waste
  - Groundwater collection system
  - Leachate impacted surface water
- Lucas Heights 1 landfilled waste
- Harrington's quarry

Locations of these sources are identified in Figure 2.1.

In addition to these primary sources, additional leachate is also generated by rain falling onto the leachate dams.

Other site facilities which generate waste water utilise a separate treatment/disposal system. This includes general site facilities and the existing garden organics facility. The performance of the Lucas Heights 1 treatment plant and sewer connection are not impacted by these other facilities.

Refer to Section 3 for the description of the modelling methodology and other aspects considered.

LEGEND

- Lucas Heights Resource Recovery Park boundary
- Harringtons Quarry
- Roads
- Lucas Heights 1

Paper Size A4

0 250 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

SITA Australia
Lucas Heights Resource Recovery Park

Job Number 21-23482
Revision A
Date 09 Jun 2015

Landfill leachate sources

Figure 2.1

15/133 Castlereagh Street Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

G:\21\23482\GIS\Maps\MXD\21-23482-Z062_Leachate.mxd

Aerial Imagery: Google, 2014. LHRRP Boundary: GHD, 2014. Roads/Suburbs: NSW LPMA 2012. Location Data: GEOSCIENCE AU 2014. Created by:afoddy

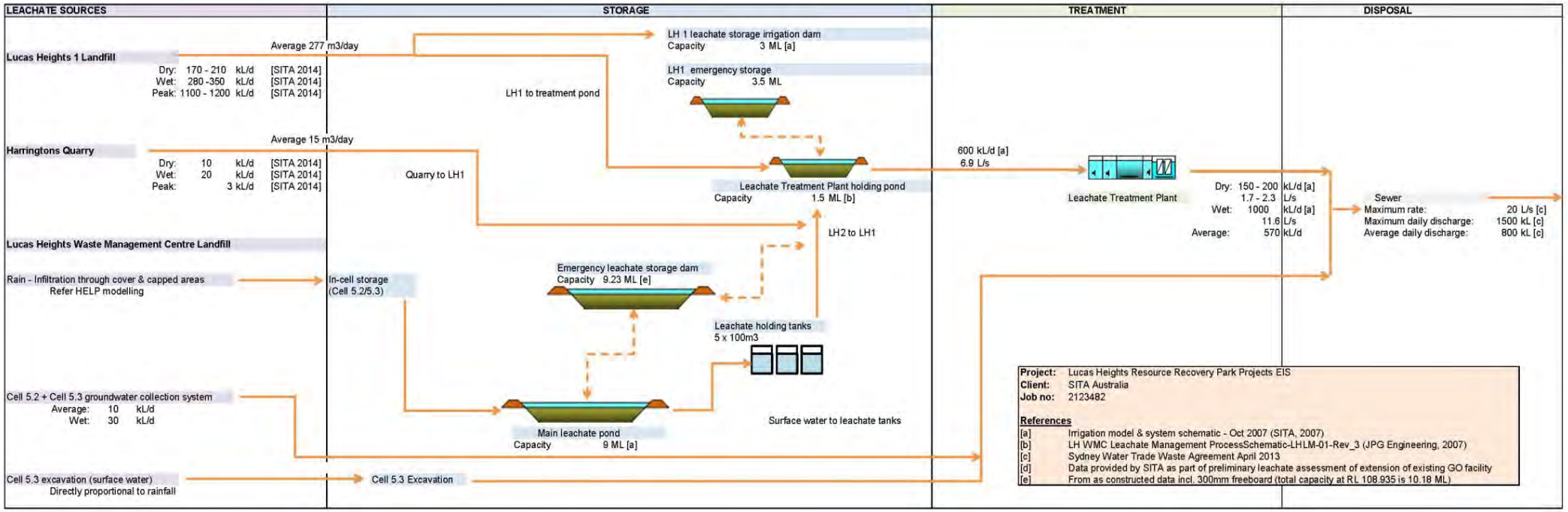


Figure 2.2 Conceptual leachate system

2.10.1 LHRRP landfilled waste

Leachate is predominantly generated by infiltration of rainwater through the waste. The existing landfilled areas were developed in a phased manner with each area constructed into cells with leachate management systems.

Infiltration through cover systems

There are three existing types of waste cover, as outlined in Table 2.4. The areas where these cover systems extend are illustrated in Appendix A.

Table 2.4 Existing cover systems

Cover system	Profile (Top to Bottom)	Areas
Final cap	1800 mm (typ.) compacted crushed sandstone	Southern parts of the landfilled area which have been revegetated
Intermediate cover	500 mm (typ.) compacted crushed sandstone	Central parts of the landfill, south of the existing active landfilling area
	300 mm (min.) compacted crushed sandstone	Waste batters and areas of the active landfill cell where no waste would be placed within 90 days
Daily cover	150 mm (min.) crushed sandstone or tarp	Active landfill cell where waste would be placed within 90 days

Containment and collection

The leachate containment and collection system varies throughout the site as described below:

- Stages 1-3

Leachate is collected through 300 mm concrete slotted leachate drainage pipes on the floor of the landfill under the waste that run from the south end of the site to the leachate dam situated in the north western corner of the site.

Leachate collection is facilitated by the construction of leachate collection trenches that have a maximum spacing of 100 m and are arranged in a grid layout. This minimises the potential for leachate to perch within waste lifts. The trenches are graded at 1% and drain to the boundary bund where a second leachate trench directs the leachate through a 300 mm slotted HDPE leachate collection pipe and to the leachate dam.

Leachate collection trenches also help eliminate ponding of leachate on the covered waste and evenly distribute the leachate through the waste layers enhancing leachate absorption and waste decomposition.

Following the 1999 expansion approval and prior to overtopping of Stages 1-3 with waste, a series of 2 m diameter holes were excavated through the existing cover material into the waste. Vertical, slotted leachate re-injection pipes were inserted into the holes and backfilled with rubble.

In areas of where waste overtopping occurred additional leachate drains were constructed around the perimeter to collect leachate and gravity feed it to the leachate dam.

Leachate is substantially contained above the natural low permeability sandstone that underlies the site.

- Stage 4

Leachate is managed via a set of leachate pipes laid within every lift of waste (inter-lift leachate extraction). The leachate collection pipes connect to a main HDPE leachate pipe servicing the eastern side of Stage 4 via a vertical riser, which then flows to the leachate dam.

Containment in Stage 4 is via the natural low permeability sandstone.

- Stage 5 – Cell 5.1 and Cell 5.2A

Cell 5.1 and Cell 5.2A were developed prior to SITA operating the site.

The leachate barrier for these cells consist of a 900 mm thick engineered clay layer with 10^{-9} m/s permeability sitting on an engineered subgrade layer underlain by the naturally low permeability sandstone base.

The leachate extraction system includes HDPE leachate pipes surrounded by 500 mm of protective aggregate ranging between 20-40 mm constructed within each waste lift. The leachate pipes connect to leachate main risers from which the leachate is pumped to the leachate dam.

In addition to inter-lift leachate collection, leachate is conveyed through parallel basal leachate collection trenches, typically spaced at 50 m and draining west at a grade of 1%.

In Cell 5.2A, the base of the landfill liner was graded with a longitudinal grade of 1% and a transverse grade of 0.5%.

- Stage 5 – Cell 5.2B and Cell 5.3

Cell 5.2B and Cell 5.3A have been constructed by SITA. These cells have been constructed with groundwater, leachate barrier and leachate collection systems.

Refer to Section 2.10.2 for a description of the groundwater collection system. The leachate barrier for these cells consists of 900 mm low permeability compacted clay overlain by 2.5 mm HDPE geomembrane (double liner). The leachate barrier system is continuous along the base and the sidewalls of these cells, to 10m above the base of the cells and above this height the leachate barrier would consist of the 900 mm low permeability compacted clay liner in accordance with the EPA's requirements. The double lined design exceeds NSW EPA guideline for landfill liner systems and provides significantly more environmental protection. The additional geomembrane barrier was voluntarily installed by SITA and was approved by the EPA.

Cell 5.2B was graded to the north and west with a temporary leachate sump. The entire base contains a 300 mm blanket of leachate drainage aggregate and perforated HDPE leachate collection pipes placed within aggregate filled trenches. To promote leachate drainage over the lined sidewalls, a tri-planar drainage geocomposite was installed over the sidewall liner. Internal bund walls were removed to allow leachate from surrounding cells (Cell 5.2A and 5.1) to drain into Cell 5.2B.

In Cell 5.3A the base grades to the south and west and a leachate sump and risers constructed at the middle of the western batter for leachate extraction. The drainage layer has the same arrangement as Cell 5.2B. SITA voluntarily undertook leak location survey to identify any damage holes in the geomembrane liner and undertook repairs prior to placing waste in this cell.

The remainder of Cell 5.3 would be constructed as the landfill airspace is required and would be constructed to be continuous with and to the same standard as Cell 5.3A.

In addition to the leachate collection system located in the base of each stage, leachate is removed from a series of gas extraction wells which have been installed within the waste mass. The leachate is extracted using air lift pumps, flowing by gravity to the leachate collection dam via a perimeter leachate ring main. SITA continue to install gas extraction wells across the site and leachate is extracted from these as required.

Historical leachate volumes

Recorded annual total leachate volumes are summarised in Table 2.5.

Table 2.5 Historical leachate collection – LHRRP landfill

Period	Total leachate collected (m^3)	Rainfall (mm)	Days	Average leachate collected (m^3 /day)
01/01/08 to 31/12/08	111,568	1,082	366	305
01/01/09 to 31/12/09	98,480	805	365	270
01/01/10 to 31/12/10	97,173	929	365	266
01/01/11 to 30/06/11	56,518	653	181	312
01/07/11 to 30/06/12	155,557	1296	365	426
01/07/12 to 30/06/13	130,303	623	365	357
01/07/13 to 05/06/14	119,765	489	340	352

2.10.2 LHRRP groundwater collection system

A groundwater collection system was installed as part of the construction of Cell 5.2B and Cell 5.3A. To err on the side of conservatism, the water being collected and extracted from this system is pumped directly to sewer for disposal.

The groundwater system is constructed below the liner system (as described in Section 2.10.1 and protects the liner from possible uplift damage from the groundwater below. It comprises of trenches cut into the natural rock subgrade which drain to sumps located along the western boundary of the cells. These trenches contain perforated pipe and are backfilled with aggregate to promote flow to the sump, from which any collected water can be extracted for treatment and disposal.

Three separate systems have been installed - one below the interface between Cell 5.2 and Cell 5.2B, one around the perimeter of the base of Cell 5.2B and one around the perimeter of the base of Cell 5.3A. These systems were designed and constructed as hydraulically independent systems to minimise mixing of different water sources. To date, the system has been partly constructed. The remainder of the system would be constructed progressively with the remaining cells.

The water in this system is likely to come from two sources:

- Groundwater from the small recharge catchment to the east and south of the site and travelling beneath the existing waste into the Cell 5.2 and Cell 5.3 area. Water consistent with this source was observed during the construction of Cell 5.2B. Based on the average annual recharge rate of 0.06 m (GHD, 2015b) per year, it was estimated that up to 25 m^3/day of groundwater could be entering the groundwater system from the south.
- Water recharging from the west directly into the batter of Cell 5.2 and Cell 5.3. Some dampness was noted on the western batter of these cells prior to lining. Based on the average annual recharge rate of 0.06 m (GHD, 2015b) per year, it was estimated that between 1 m^3/day and 4.5 m^3/day of groundwater could be entering the groundwater system from the west.

GHD was engaged to undertake the Construction Quality Assurance (CQA) works for the construction of Cell 5.2 and Cell 5.3A and verify that the constructed works were undertaken in accordance with design documentation and EPL conditions (GHD, 2013 and 2014a).

2.10.3 LHRRP potential for leachate influenced surface water

In the event that surface water in the Cell 5.3 excavation were to be affected by leachate from batter seeps this water is managed in the leachate management system and not released to the surface waters at the site. To date, when this has occurred it has been treated as leachate when monitoring indicates that this is the appropriate course of action. SITA have advised that the frequency of this circumstance and the quality of this water has significantly improved in the last few years and it is currently being managed as follows:

- Accumulated water is tested
- If found to not be leachate affected (NH_3 < 2.5 mg/L, based on Condition L2.4 of site EPL), that the surface water is pumped out of the excavated void into the surface water management system.
- If found to be leachate affected (NH_3 > 2.5 mg/L, based on Condition L2.4 of site EPL), it is transferred directly to the LH1 disposal system or to the leachate dam before being transferred to LH1.

2.10.4 Lucas Heights 1 landfilled waste

Lucas Heights 1 landfill is located to the east of the site, as shown in Figure 2.1 and was closed in 1987.

The leachate from the closed and rehabilitated Lucas Heights 1 landfill is treated by the same leachate treatment facility as leachate from LHRRP landfill. The leachate from the Lucas Heights 1 landfill risers is pumped directly to the treatment plant holding dam.

Recorded annual total leachate volumes are summarised in Table 2.6.

Table 2.6 Historical leachate collection – Lucas Heights 1 landfill

Period	Total leachate collected (m^3)	Rainfall (mm)	Days	Average leachate collected (m^3 /day)
01/01/08 to 31/12/08	98,709	1,082	366	270
01/01/09 to 31/12/09	85,923	805	365	236
01/01/10 to 31/12/10	86,319	929	365	236
01/01/11 to 30/06/11	50,738	653	181	280
01/07/11 to 30/06/12	119,326	1296	365	327
01/07/12 to 30/06/13	97,090	623	365	266
01/07/13 to 05/06/14	80,698	489	340	237

2.10.5 Harrington's Quarry

Harrington's Quarry was temporarily used for landfilling for 8 months during 1987 (Mitchell Mccotter & Associates Pty Ltd, 1991) and is located near the north eastern boundary of the site, as illustrated in Figure 2.1. Approximately 250,000 tonnes was landfilled at Harrington's Quarry.

Leachate from the closed Harrington's Quarry landfill is treated by the same leachate treatment facility as leachate from LHRRP landfill.

Historically, 10 kL/day leachate is collected during dry periods and 20 kL/day in wet periods.

2.11 Leachate containment and transfer

The main containment for leachate is within a HDPE geomembrane lined dam, located in the north west corner of the site. The main leachate dam has a containment capacity of 9,000 ML and includes mechanical aeration. This dam is aerated.

A double lined (900 mm compacted clay and HDPE geomembrane) emergency leachate containment dam was constructed adjacent to the main dam in mid-2014 by SITA. This dam has a design containment capacity of 9.2 ML. The total capacity, including within the freeboard volume, is 10.2 ML.

There are also five 100 kL leachate tanks adjacent to the main leachate dam.

At the Lucas Heights 1 site, there are three leachate containment dam:

- A lined leachate holding dam adjacent to the leachate treatment plant (capacity approximately 1,500 m^3)
- An emergency leachate dam (capacity approximately 3,500 m^3)
- A leachate containment irrigation dam (capacity approximately 3,000 m^3)

Refer to Air Quality Assessment (GHD, 2015) for assessment of the odour associated with these leachate containment structures.

Leachate can be readily transferred between the available leachate containment locations. The pipeline transferring leachate from LHRRP to LH1 has a best practice automated monitoring system which immediately shuts down the transfer of leachate in the unlikely event that a leak should develop and triggers an alarm to inform SITA of the leak.

The design and construction of Cell 5.2B and Cell 5.3 included both compacted clay and HDPE geomembrane barriers in the base of the cells. This double lined system exceeds the EPA guideline design requirements and provides significantly more environmental protection. This double lined system was installed to allow for temporary leachate fluctuations within in the base of the cell following extreme wet periods, further increasing the containment capacity of the site.

2.12 Leachate treatment and disposal

The existing leachate treatment system is a sequencing batch reactor (SBR) treatment system that discharges directly to sewer at Lucas Heights 1.

The treatment process biologically oxidises the ammonia in the leachate, converting it to nitrate and nitrate species. Two reactors work in parallel with independent diffused air systems, pH controls and decant systems, allowing shut down for maintenance and to provide a more uniform plant throughput through staggered cycles.

This system has a current average leachate treatment capacity of 570kL/day. The current annual average sewer discharge limit is 800 kL/day at a maximum daily discharge of 1,500 kL, in accordance with the Trade Waste Agreement contained in Appendix B (Sydney Water, 2013). SITA can discharge other waters with concentration of substances below the agreed limits without it first passing through the leachate treatment plant. SITA has advised that it would increase the treatment plant capacity to 870 kL/day and the average daily sewer discharge limit to 1,200 kL/day by early 2017.

Irrigation is not proposed to be used as a method of leachate disposal at the Lucas Heights 1 landfill or the LHRRP.

3. Methodology

3.1 General

The following sections detail the methodology undertaken to assess the proposed development in relation to its ability to manage estimated volumes of generated leachate.

3.2 Prediction of leachate generation

An initial review of water and the potential for leachate generation across the Site and associated facilities was undertaken to identify the activities which may potentially influence the management of leachate from the proposed development.

This indicated that all sources of water being treated by the Lucas Heights 1 leachate treatment facility and disposed of through the Lucas Heights 1 sewer connection, as described in Section 2.12, should be considered.

The volume of leachate generated by the various sources described in Section 2.10.1 are estimated across various stages of the proposed development, as described in the sections below.

Measures to reduce the generation of leachate are identified and described below in this Report.

3.2.1 LHRRP landfilled waste

The primary mechanism for leachate generation is by rainfall infiltrating into the landfilled waste.

Prediction of the volumes of leachate generated by the landfill requires an understanding of:

- The cover and cap types which would be over the waste
- The amount of rainfall which would infiltrate through each of the cover types during different rainfall scenarios
- The areas of each cover type as the project progresses

Climate scenarios

Historical climate data was gathered, interrogated and used to assess leachate generation in both average rainfall and wet years.

The climate data required to the assessment includes daily rainfall, evaporation and temperature data.

Estimation of infiltration

The Hydrologic Evaluation of Landfill Performance (HELP) model is widely used (particularly in the USA) and is an industry accepted hydraulic modelling tool. It was developed for the United States Environmental Protection Agency to predict the hydraulic performance of differing landfill designs using site specific data.

The various cover and cap types would be modelled in HELP using the full set of historical climate data.

The results of the HELP model tend to overestimate infiltration (ANZECC, 1999) due to the use of daily instead of hourly data, which has the effect of reducing storm intensities and associated runoff quantities. There have been some concerns about using the HELP model in Australia, particularly in semi-arid to arid conditions, due to an under-estimation of evaporation rates in

these climates. This under-estimation of evaporation rates tends to result in an overestimate of infiltration rates but for the purpose of this assessment, some conservatism in the computed infiltration flows is appropriate.

3.2.2 Leachate impacted surface water

It has been conservatively assumed that all stormwater in the northern excavated void would be leachate impacted and would require the disposal to sewer.

3.2.3 Staging

Indicative staging plans of the re-profiling works have been developed to form the basis of the assessments (refer Appendix A).

The staging has been developed to:

- Maintain surface water drainage
- Allow for effective surface water diversion
- Maximise the capped and revegetated areas

These considerations, along with increasing the slope of the final landform, assist in reducing leachate generation.

Initially, all stages of the proposal were considered to identify critical phases of the development. These critical phases are further considered in the leachate water balance.

3.3 Leachate water balance

The containment and treatment capacity of the site was assessed against the expected volumes of leachate generated in two climate scenarios.

Two years, representing the 50% and 10% annual exceedance probability (AEP) years, would be used as test cases for the leachate water balance. The aim of the balance would be to assess if:

- Over an average year, the system can support peaks in leachate generation and at the end of the year has managed to treat all leachate generated
- There is sufficient containment capacity to support the leachate collected in a high rainfall year (10% AEP rainfall year).

No specific guidance for the method used to undertake the leachate water balance was provided in the SEARs (Table 1.1). Undertaking a leachate water balance in the 50% and 10% annual exceedance probability (AEP) years is a standard industry approach for predicting leachate containment and disposal needs.

The water balance considers:

- The leachate collected from:
  - LHRRP (Lucas Heights 2) landfilled waste, groundwater collection system, and surface water if leachate impacted (as a conservative assumption)
  - Lucas Heights 1 landfilled waste
  - Harrington's quarry
- Rainfall into all leachate dams
- Incidental evaporation from all leachate dams
- Treatment plant and sewer disposal capacity

- Capacity of general use (operational) leachate dams
- Capacity of the emergency leachate containment dam
- Temporary fluctuations of leachate within Cell 5.2 and Cell 5.3

3.4 Other facilities

The existing GO facility has not been considered as the contact water from the existing facility is part of a separate system and does not impact on the site landfill leachate containment system or the LH1 treatment system.

The proposed GO and ARRT facilities are also part of a separate system. Any excess leachate generated by the proposed GO facility is discharged to a separate sewer connection and the proposed ARRT facility is a net consumer of water with all waste water generated by the facility being reused within the process. These facilities have been reviewed separately in the Surface Water Assessment Report (GHDa).

4. Potential impacts

4.1 General

A preliminary evaluation of risks associated with leachate management at the site was undertaken using a source, pathway, receptor approach.

4.2 Source

The following sources were identified:

- Leachate generated by infiltration through the cover materials
- Leachate generated due to groundwater intrusion
- Leachate generated due to waste compression and waste decomposition
- Leachate contained in dams adjacent to Mill Creek
- Leachate being transferred from LHRRP and Harrington's quarry to LH1 treatment plant

LH1 is not part of the proposal as no changes are proposed to the generation, storage or disposal of leachate for this site. The existing GO and proposed GO and ARRT facilities are also not included as they are part of separate systems.

4.3 Pathways

The following pathways were identified:

- Leachate runoff from active landfilling/tipping area into surface water drainage system and then into local water course.
- Seepage through landfill batter slopes into surface water drainage system and then into local water course.
- Subsurface migration into local groundwater due to the head on underlying sandstone caused by the uncontrolled buildup of leachate in the landfill. It is noted that the areas where leachate may be contained have been specifically designed with a double barrier system (2.5 mm HDPE geomembrane and 900 mm compacted clay) to reduce the migration of leachate out of the cells. To ensure this higher level of protection, SITA undertook leak location survey of the Cell 5.3A liner at the time of construction to confirm that the liner was watertight.
- Subsurface migration into local groundwater due to generation of leachate in unlined portions of the landfill. A review of groundwater monitoring data has found the landfill has not had an impact on groundwater above criteria off-site to date.
- Overflow from main leachate containment dam or emergency leachate containment dam in high rainfall events. All leachate dams are maintained with a minimum freeboard of 500 mm to contain direct rainfall.
- Overflow from main leachate containment dam or emergency leachate containment dam due to flooding of Mill Creek. A review of flood extents in a 100 year ARI event found that the leachate dams would not be impacted by this extreme weather event.

4.4 Receptors

The following receptors were identified:

- The local groundwater. A review of groundwater monitoring data has found that the landfill has not had any impact on any groundwater off-site to date; and
- The local surface water courses, in particular Mill Creek and the Georges River.

4.5 LHRRP landfill cover and cap scenarios

Seven cover and cap profiles were identified and are described in Table 4.1.

Table 4.1 Cover and cap scenarios

Cover profile	Materials	Description
Existing final cap	1800 mm (min.) compacted crushed sandstone	Southern parts of the existing landfilled area which have been revegetated with grasses
Intermediate cover	300 mm (min.) compacted crushed sandstone	Central parts of the landfill, waste batters and areas of the active landfill cell where no waste would be placed within 90 days
Daily cover[2]	150 mm (min.) crushed sandstone	Active landfill cell where waste would be placed within 90 days. SITA generally maintains this area at less than 10,000 m^2
Tip face	No cover	Areas of active landfilling. SITA maintains the active tip face with maximum area of approx. 2,500 m^2
Stripped cap	300 mm compacted crushed sandstone	Areas within the proposed re-profiling area which currently have existing final cap or intermediate cover. Existing soils would be partly removed for use on site and to promote leachate movement into the existing leachate collection system. The area of cover material removed would be limited to 20,000 m^2 or at least 2 weeks in advance of the active tip face
Proposed final cap (or equivalent)	100 mm topsoil 250 mm revegetation layer 500 mm subsoil layer 600 mm compacted clay barrier 300 mm seal bearing	Once re-profiled and at final levels, each area would be capped with a low permeability cap and revegetated with grasses
Proposed post-closure cap (or equivalent)	100 mm topsoil 400 mm revegetation layer 500 mm subsoil layer 600 mm compacted clay barrier 300 mm seal bearing	Once the landfilling has ceased at the site, the site would be rehabilitated. The revegetation layer would be thickened over almost a quarter of the re-profiled area to support growth of larger plants. The post-closure cap is outlined in the rehabilitation landscape plan.

The existing landfill batter slopes typically grade at 1 in 3 (vertical to horizontal). The existing platform areas are relatively flat with some ponding of water observed on the surface. The revegetated areas are typically sloped at around 2% and the intermediate cover areas around 5%.

[2] Tarps have been trialled and are proposed to be used as an alternate daily cover. The crushed sandstone has been considered in the modelling as it is expected to be more permeable.

The proposed re-profiled final landform would have a minimum grade of 5% to allow for adequate shedding of surface water (as per NSW EPA's Environmental Guidelines: Solid Waste Landfills (the landfill guidelines)). This minimum grade is maintained along the plateau area of the landform, whilst an average grade of 1 in 6 (approximately 17%) is maintained along the batter areas.

4.6 Climate data

GHD has gathered a comprehensive set of daily climate data to represent the site. Patched point data was collated by SILO, an enhanced climate data bank hosted by The Science Delivery Division of the Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Patched point data uses real historical data, where available, and patches missing or suspect data with interpolated data.

Data from the Lucas Heights (ANSTO) Bureau of Meteorology weather station (number 66078) was utilised for the years 1959 to 2013. For this period, rainfall data was generally historically available. Other parameters have been interpolated, mostly from nearby daily data. The SILO data was compared to the available onsite data (provided by SITA) and it was determined that the SILO data is representative of the onsite conditions. Refer Table 4.2.

Table 4.2 Comparison of SILO and SITA rainfall data (2000 - 2013)

Daily rainfall	SILO (Lucas Heights ANSTO)	SITA site
10th percentile 24hr rain event (mm)	0.2	0.2
50th percentile 24hr rain event (mm)	2	2
90th percentile 24hr rain event (mm)	19.0	19.2
Average 24hr rain event (mm)	6.94	6.56

An assessment of the 54 years of SILO daily rainfall data was undertaken (Figure 4.1) to identify years which approximately represent the 50% (average) AEP rainfall year and 10% AEP (wet) rainfall year. These years (2008 and 1988 respectively) have been utilised in the modelling of leachate generation by infiltration through the landfilled waste and the subsequent leachate water balance.

It is noted that the data selected to represent an average year contains one particularly wet month (February 2008) and the data selected to represent a wet year also has one wet month (April 1988). In particular it is noted that within the 54 years of data assessed:

- 355 mm in February 2008 is the twelfth wettest month within the data set
- 398 mm in April 1988 is the seventh wettest month within the data set
- 59.3 mm is the median monthly rainfall within the data set

These extreme rainfall months have had an effect on the results of the leachate prediction.

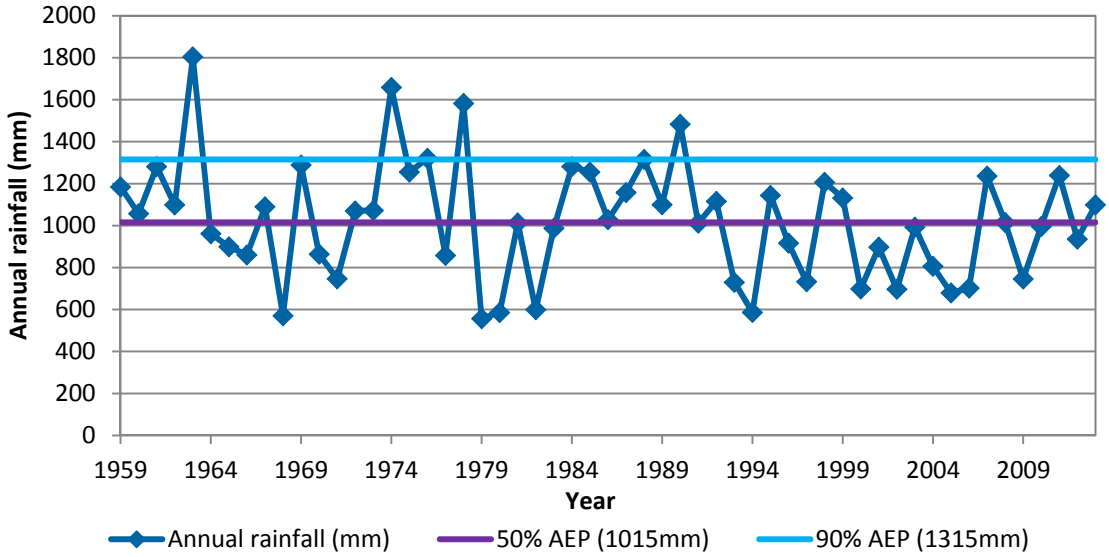


Figure 4.1 Annual rainfall for Lucas Heights (ANSTO) with 50% and 10% AEP rainfall years

4.7 Prediction of leachate generation

4.7.1 General

Leachate generation is considered in two parts:

- Leachate from infiltration through the LHRRP cap and cover materials and landfilled waste as identified in Section 2.10.1, as described in Section 4.7.2 and summarised in Table 4.3; and
- From the other sources of leachate as identified from Section 2.10.2 to Section 2.10.5, and estimated as described in Section 4.7.3 and Table 4.4.

4.7.2 LHRRP landfilled waste

As discussed in Section 2.10.1, HELP modelling was undertaken to estimate the volumes of leachate which would be generated for each cover type for each climate scenario based on a 1 hectare area with the results able to be scaled for larger areas. Results are contained in Appendix B and a summary provided in Table 4.3.

Table 4.3 Estimate of infiltration through cover profiles at LHRRP landfill

	50% AEP rainfall year		10% AEP rainfall year	
Precipitation (mm)	1,015		1,315	
Actual evaporation (mm)	1,319		1,469	
Cover profile	**Infiltration (mm)**	**Infiltration (% rainfall)**	**Infiltration (mm)**	**Infiltration (% rainfall)**
Tip face	487	48%	697	53%
Daily cover	396	39%	523	40%
Existing final cap - platform	177	17%	295	22%
Existing final cap - slopes	118	12%	224	17%
Stripped cap	151	15%	227	17%
Intermediate cover -platform	73	7%	119	9%
Intermediate cover - slopes	46	5%	85	6%

	50% AEP rainfall year		10% AEP rainfall year	
Proposed final cap - platform	65	6%	67	5%
Proposed final cap - slopes	64	6%	64	5%
Post closure cap - platform	65	6%	67	5%
Post closure cap - slopes	64	6%	65	5%

It is noted that the results indicate that:

- There is more leachate generation in the modelled wet year than the average rainfall year
- There is generally more leachate generated in platform areas than on batters
- There is significant leachate generation through the existing final cap profile (12% – 22% infiltration
- There would be significantly less infiltration (5% - 6%) through the proposed final cap profile (or equivalent)
- The thickened areas of the post closure cap may generate 5% – 6% infiltration

Of particular note, the difference between the infiltration through the existing final cap and the proposed final cap is of significance. It indicates that the proposed works would provide significant improvement for the completed site. For the landfill area (113 ha) the existing final cap is predicted to generate leachate in the order of 133,300 m^3/yr in a 50% AEP year and 252,700 m^3/yr in a 10% AEP year, the proposed final cap (including post closure areas) is predicted to generate 88,400 m^3/yr and 105,700 m^3/yr, respectively. These are illustrated in Figure 4.2.

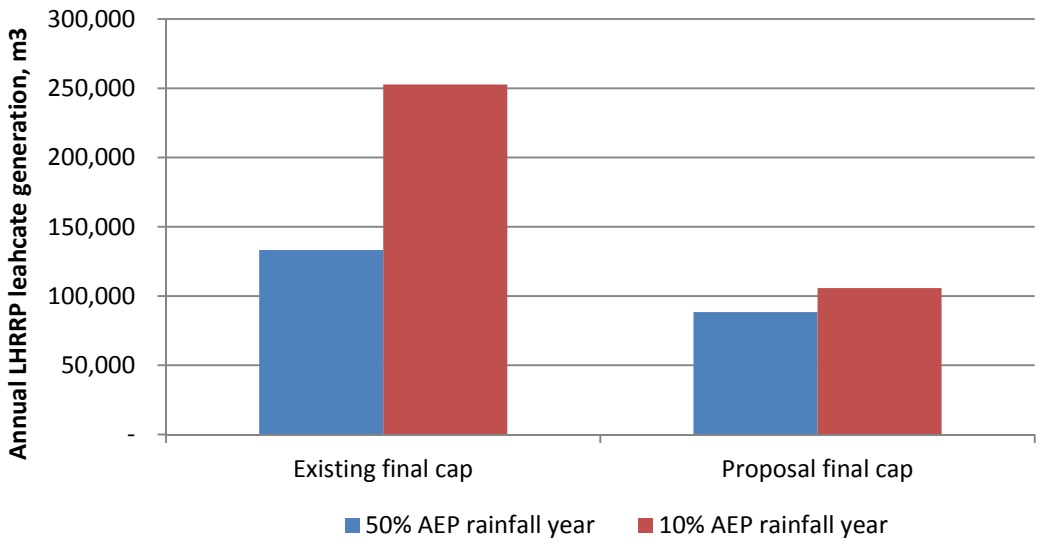


Figure 4.2 Comparative leachate generation for LHRRP landfill

The results of the HELP model were used to estimate the volume of leachate generated through leachate infiltration through the LHRRP landfill surface for each of the proposed stages of the development, as summarised in Figure 4.3.

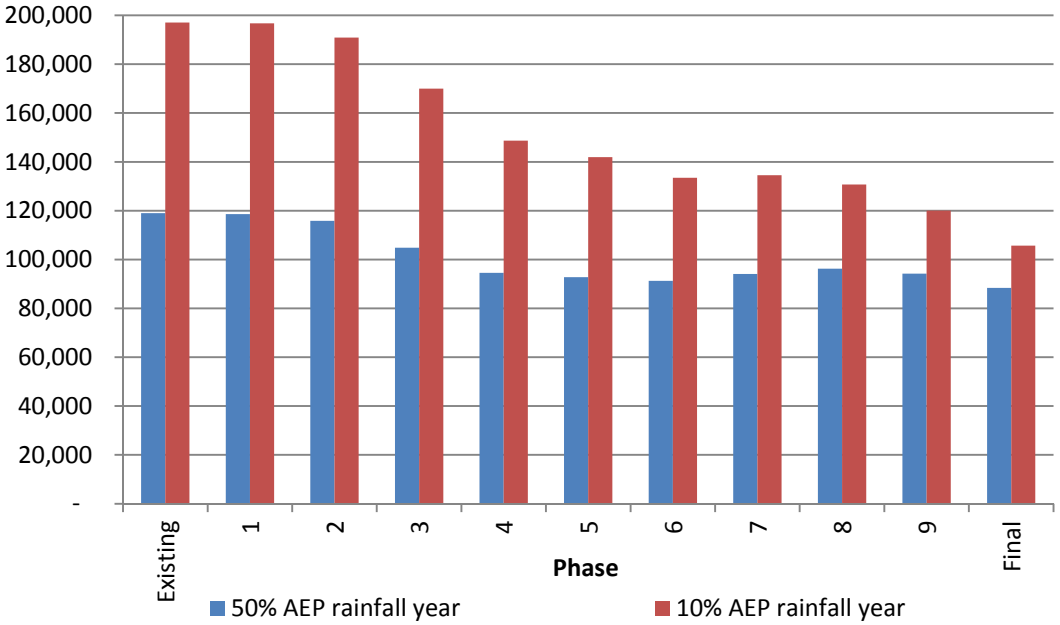


Figure 4.3 Predicted leachate generation for proposed development of LHRRP landfill

Four key stages were identified for the remaining stages of the assessment of leachate generation:

- The existing (representing June 2015) arrangement of the site (to take into account Cell 5.3B which would is about to be built and is expected to be operational by about June 2015);
- The Phase 1 arrangement of the project, when filling ceases in the Cell 5.2/Cell 5.3 area and re-profiling works commence, when leachate generation from LHRRP landfill is expected to be slightly greater than the existing arrangement. After Phase 1 the potential for leachate to be generated would decrease;
- The Phase 5 arrangement of the project when filling is completed in the south western areas and they have been capped. The current Garden Organics Facility would be decommissioned and landfilling having commenced in the area; and
- The final rehabilitated landform, including the closure capping works required for the planting of trees as outlined by the final landscaping plan for the future parklands.

When considered over the projected life of the landfill, and as illustrated in Figure 4.4, it can be seen that the works proposed would have a significant impact on the volumes of leachate expected to be generated at the LHRRP landfill. In particular, the reshaping and capping works over Phases 1 to 6 of the proposal, from 2014 to 2021, would reduce the volume of expected leachate being generated by at least 25% in the modelled weather scenarios.

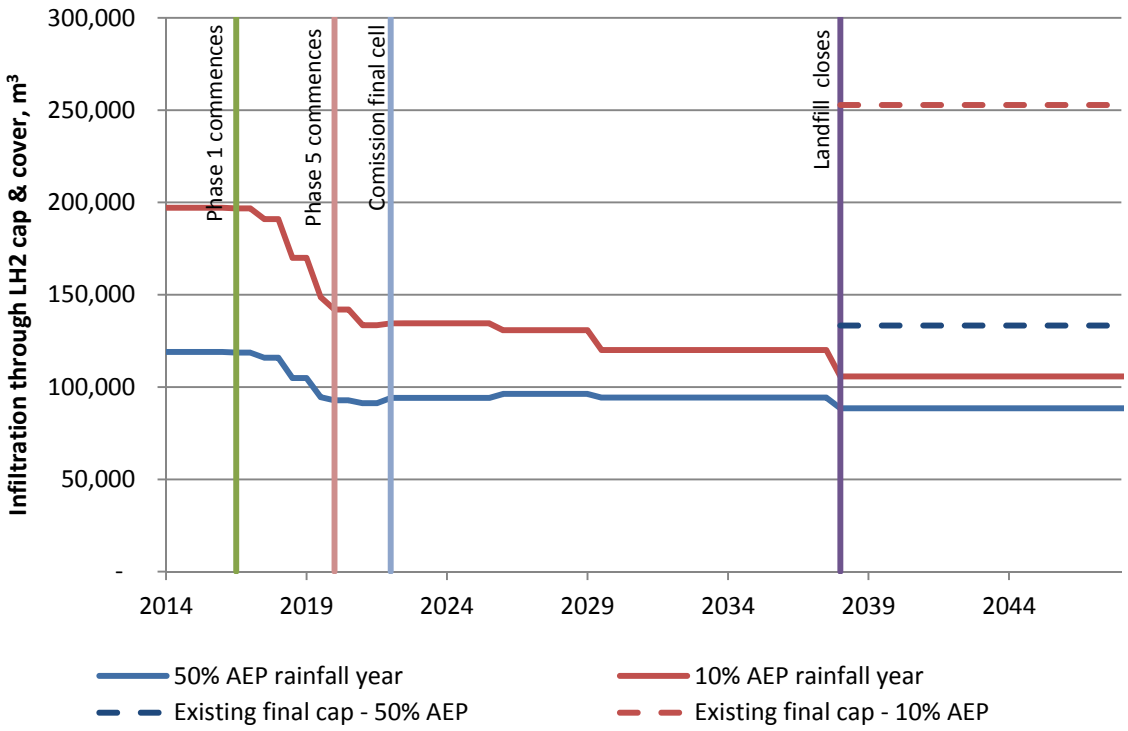


Figure 4.4 Estimation of leachate generated by infiltration at LHRRP landfill

4.7.3 Other leachate sources

No changes are expected to occur which would affect the generation of leachate from the other sources of leachate identified in Section 2.10.1. A summary of the assumed generation rates are outlined in Table 4.4.

Table 4.4 Estimate of leachate generation for other leachate sources

Leachate source	50% AEP Rainfall year	10% AEP rainfall year
LH1 landfilled waste (m^3/day)	270	327
Harrington's quarry (m^3/day)	15	20
Groundwater collection system (m^3/day)	10	30

For LH1 landfilled waste, recorded historical leachate collection data (refer Table 2.6) was used to generate the figures shown in Table 4.4. The following assumptions were made:

- The actual recorded daily average leachate volume of 270 m^3/day for 2008 is applied for the 50% AEP year
- The daily average leachate generation of 327 m^3/day of leachate collected in 2011/2012 (1296 mm rainfall) was scaled to 327 mm for the 10% AEP year (1,315 mm rainfall)

Harrington's Quarry and groundwater sources of leachate generation are discussed in Section 2.10.5 and Section 2.10.2, respectively.

4.8 Leachate water balance model

The leachate water balance provides an estimate of the volume of leachate which may need treatment at the Lucas Heights 1 treatment plant and disposed to sewer. A summary of the net generated leachate for all sources is contained in Table 4.5.

Table 4.5 Estimate of net leachate generation for treatment

Scenario	Estimated Leachate Generation for 50% AEP Rainfall year			Estimated Leachate Generation for 10% AEP Rainfall year		
	Average Monthly (kL/month)	Peak Month (kL/month)	Total for Year (kL)	Average Monthly (kL/month)	Peak Month (kL/month)	Total for Year (kL)
Existing	19,000	50,000	228,000	28,000	56,000	334,000
Stage 1	19,000	51,000	228,000	28,000	56,000	334,000
Stage 5	17,000	36,000	202,000	23,000	41,000	279,000
Final Landform	16,000	28,000	198,000	20,000	29,000	243,000

A balance of the net leachate generation and the available treatment capacity provides an indication of the required leachate containment capacity.

The average daily treatment capacity is assumed to be:

- 570 kL/day until early 2017 (existing scenario and beginning of Phase 1)
- 870 kL/day from early 2017 (Phase 1 onward)

The average daily sewer discharge capacity is assumed to be:

- 800 kL/day until early 2017 (existing scenario and beginning of Phase 1)
- 1,200 kL/day from early 2017 (Phase 1 onward)

In the cases where all above ground containment is at capacity, excess leachate can temporarily fluctuate in level in the base of Cells 5.2 and Cell 5.3. This leachate would be preferentially extracted for treatment to reduce the levels as quickly as possible.

A summary of the containment requirements are summarised in Table 4.6 and Table 4.7, where:

- Average monthly containment is the average of the volume of leachate contained in the system in each month, over the modelled year
- Peak monthly containment is the largest volume of leachate contained in the system in any month
- Peak in-cell temporary leachate level is the largest level of temporary leachate fluctuation in Cell 5.2 and Cell 5.3 in any month

Table 4.6 Estimate of leachate containment requirements – 50% AEP year

Scenario	Average daily leachate treatment capacity (kL/day)	Containment requirements for 50% AEP Rainfall year		
		Average monthly containment (kL)	Peak monthly containment (kL)	Peak in temporary leachate level (kL)
Existing	570	44,000	67,000	40,000
Stage 1	570	44,000	67,000	40,000
Stage 1	870	11,000	39,000	12,000
Stage 5	870	3,000	15,000	0
Final Landform	870	0	1,000	0

Table 4.7 Estimate of leachate containment requirements – 10% AEP year

Scenario	Average daily leachate treatment capacity (kL/day)	Containment requirements for 10% AEP Rainfall year		
		Average monthly containment (kL)	Peak monthly containment (kL)	Peak in-cell leachate level (kL)
Existing	570	72,000	133,000	106,000
Stage 1	570	72,000	133,000	106,000
Stage 1	870	36,000	66,000	40,000
Stage 5	870	10,000	30,000	3,000
Final Landform	870	0	4,000	0

4.8.1 In-cell leachate fluctuations

Leachate fluctuations within the base of the double lined new cells are dependent on both the dimensions of the void and the porosity of the waste and drainage system. GHD have assumed a porosity of 40% for leachate level fluctuation assumptions (Qian et al. 2002).

The existing levels are associated with the void within Cell 5.2, Cell 5.3A and Cell 5.3B which were specially designed for this purpose. When the remainder of Cell 5.3 is constructed additional capacity is gained. This is illustrated in Figure 4.5.

A review of the available capacity for temporary leachate fluctuations within the existing cells, which are double lined to a height of 10 m from the base of the cell, confirmed that there is sufficient capacity within the cells to manage excess leachate.

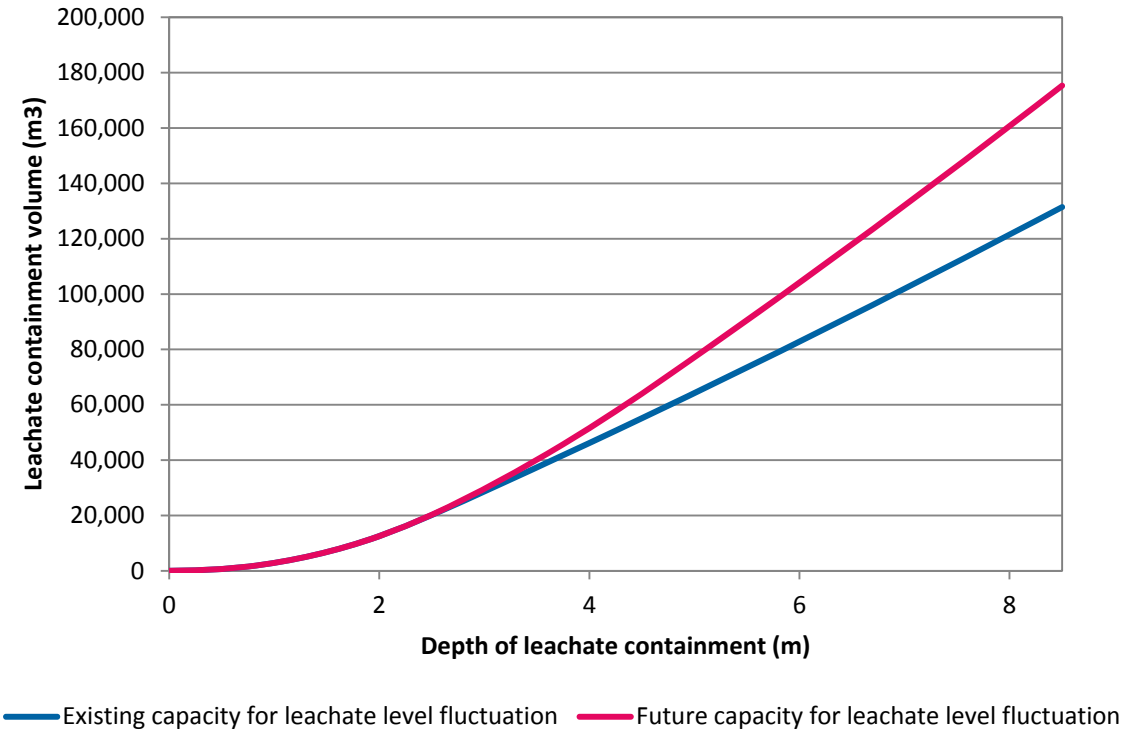


Figure 4.5 Leachate fluctuation capacity for Cell 5.2 and Cell 5.3

4.9 Sensitivity

4.9.1 Wet year followed by an average year

For the highest leachate generating scenario (Phase 1), the time for the leachate containment capacity to be returned to within operational containment only was estimated for a 10% AEP year followed by a 50% AEP year. As the average daily leachate treatment capacity and sewer discharge limit are proposed to be increased by the second year of operation of Phase 1, 570 kL/day treatment capacity and 800 kL/day disposal rate was assumed for the first year and 870 kL/day treatment capacity and 1,200 kL/day disposal rate applied to the second year of the water balance.

The results, as illustrated in Figure 4.6, indicate that leachate containment capacity would be almost fully restored in the first year of the higher rate of leachate treatment and disposal. The volume of containment is significantly affected by the large rainfall events in the February and March of the second year. More evenly distributed rainfall could be better managed.

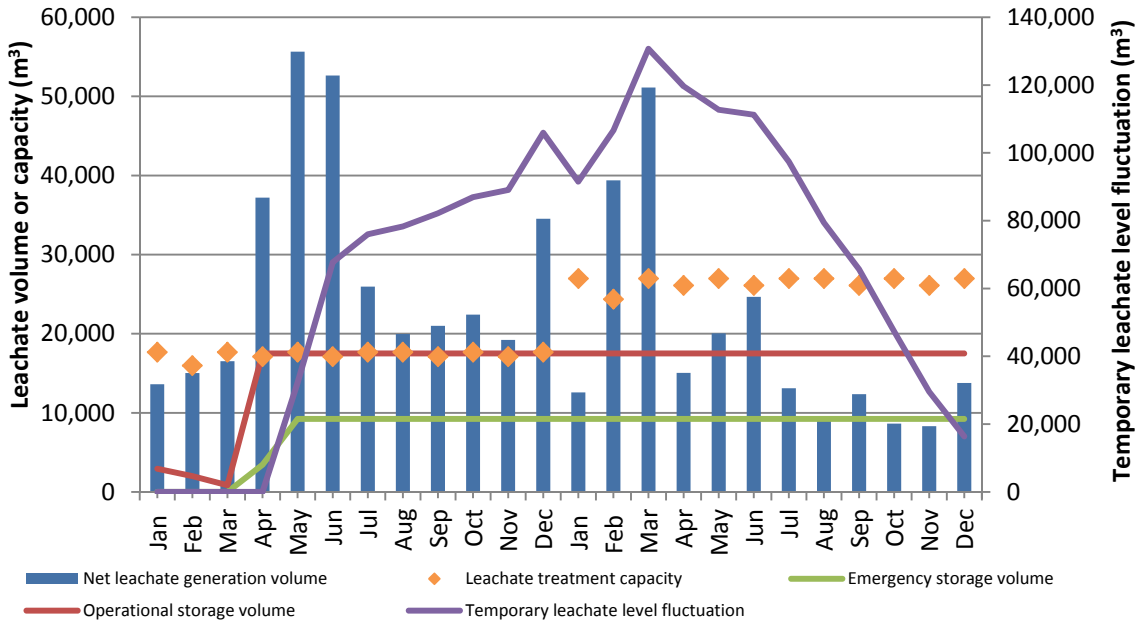


Figure 4.6 Phase 1 average and wet year leachate containment estimate

4.9.2 Consecutive wet years

Consecutive wet (10% AEP) years for the highest leachate generating scenario (Phase 1) were also investigated. Again, 570 kL/day treatment capacity and 800 kL/day disposal rate was assumed for the first year and 870 kL/day treatment capacity and 1,200 kL/day applied to the second year of the water balance to represent the proposed future increase in disposal capacity. The results are illustrated in Figure 4.7.

With two consecutive wet years the volume of leachate which needs to be treated is greater than for a wet year followed by an average year. It is important to note that Phase 1 is predicted to continue for 14 months and so the modelled scenario represents an extreme case which is unlikely to occur. As illustrated in Figure 4.4, the volumes of leachate expected to be generated is estimated to fall quite rapidly in the first few years of the reprofiling works. With the reduction in leachate, the leachate treatment plant and disposal capacity would be utilised at a lower rate. This is confirmed by the results of the water balance modelling for Stage 5 (approx. 2020) where, in a wet year, it is estimated that almost all leachate would be able to be treated and disposed of within the monthly time step of the model.

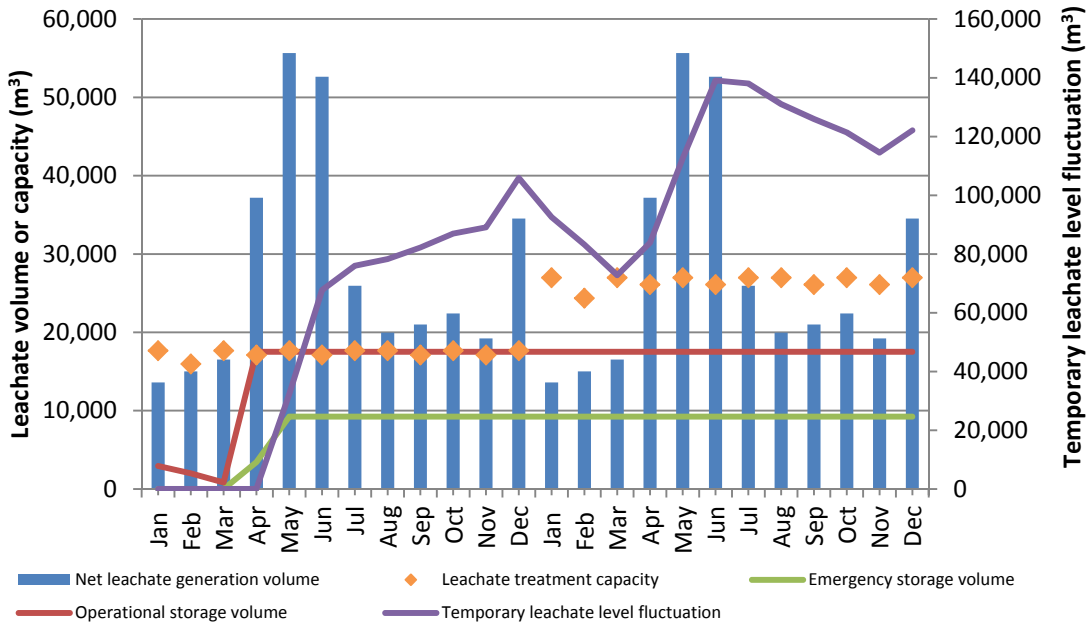


Figure 4.7 Phase 1 consecutive wet years leachate containment estimate

4.10 Conclusions

Key findings of the leachate water balance are:

- In all stages of the proposal, less leachate is required to be contained in the modelled 50% AEP rainfall year than the modelled 90% AEP rainfall year
- In all stages of the proposal, the containment and treatment capacity of the site is sufficient to manage the leachate generated in the modelled 50% and 10% AEP rainfall years
- In all stages of the proposal, the containment capacity of the site is sufficient to contain the leachate generated beyond the monthly disposal capacity.

Detailed leachate water balance results are contained in Appendix D.

4.11 Recommendations

It is recommended that SITA maintain monitoring and records of the volumes of leachate being collected from various sources to allow ongoing calibration of the leachate model and to allow the capacity of containment, treatment and disposal to be adjusted as required to appropriately contain and manage leachate at the site and associated facilities.

It is further recommended that SITA increase the leachate treatment plant capacity to 870 kL/day and seek to increase their average daily trade waste limit to 1,200 kL/day which is within their current maximum daily discharge limit. It is recommended that this increase be obtained by early 2017.

5. Mitigation measures

5.1 Mitigation measures for proposal

A number of measures are used to:

- Limit leachate generation by providing separation of waste and water to minimise the opportunities for water to infiltrate through the landfilled waste
- Minimise the risk of groundwater and surface water being impacted by leachate

The mitigation measures presented here are limited to the landfill leachate at the site. Lucas Heights 1 and Harrington's Quarry are not discussed. Measures for the GO and ARRT facilities can be found in the surface water assessment report (GHD,2015).

Measures in relation to odour are discussed in the Air Quality Assessment Report (GHD,2015d).

5.1.1 Containment and collection

Existing

Currently containment achieved through:

- The natural low-permeability geology
- Compacted clay lining in Cell 5.1 and Cell 5.2A
- Double lining of Cell 5.2B, Cell 5.3A and future cells with compacted clay and HDPE geomembrane
- Active landfill areas are bunded to contain potentially-leachate influenced surface water.

The leachate collection and extraction system was extended as the landfill has developed. The system provides extraction within each stage and has been constructed in such a way that excess leachate can flow from one stage into the next. The result is a system where all leachate can travel to the double-lined sump located in Cell 5.3A (see Figure 5.1).

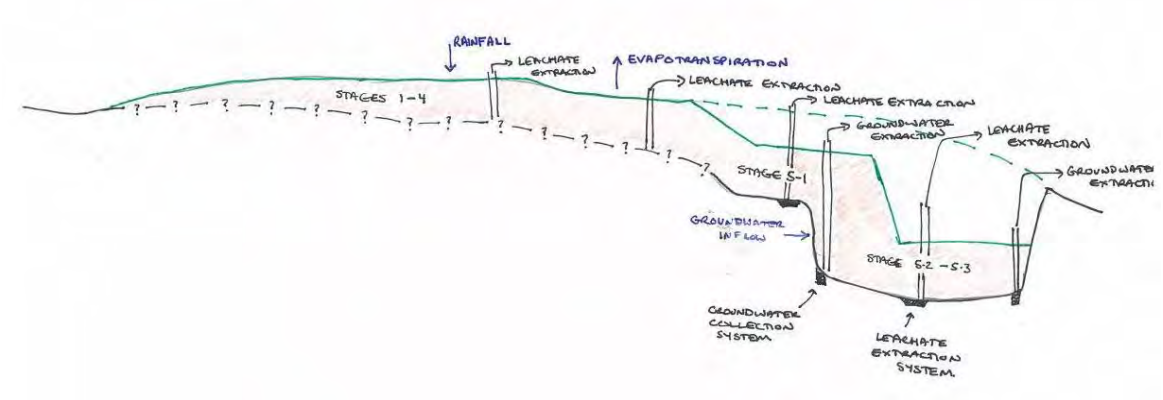


Figure 5.1 Conceptualisation of leachate cell containment

SITA also continues to install additional dual gas / leachate extraction bores across the site as required.

The total quantity of leachate contained within the landfill is kept to a minimum through extraction, containment in dedicated leachate dams and treatment as required for discharge to sewer. Capacity for temporary leachate fluctuations is available in the double lined Cells 5.2B and Cell 5.3.

Additional proposed

The existing containment and collection system described above would manage the leachate from existing waste and proposed future landfilling areas. The existing leachate extraction risers and gas wells would require extension with the placement of additional waste.

In areas to be re-profiled, the existing cover and capping system would be stripped back to promote leachate percolation from the new waste into the existing waste and to the existing leachate collection system. In undertaking the stripping works, leachate would be prevented from entering the surface water by the construction of separation bunds.

To intercept any sideways movement of leachate and providing additional extraction points, a dual gas/leachate management trench would be constructed near the perimeter of the re-profiling area. Sections of trench would be constructed as landfilling progresses.

The purpose designed trench would consist of a nominally 1.5 – 2 m deep trench within the existing waste mass backfilled with site-generated crushed sandstone and perforated pipe. The typical arrangement for the trench is illustrated in Figure 5.2. This trench would act as an extraction point for any sideways movement of leachate, should it occur. Extraction risers would be located along the length of the trench, to allow leachate to be extracted and transferred to the existing leachate ring main. Detailed design of the system would be undertaken prior to installation and would include consideration of the predicted leachate flows, settlement and strength requirements. A construction environmental management plan would be required to manage potential impacts to surface water during the installation of the system.

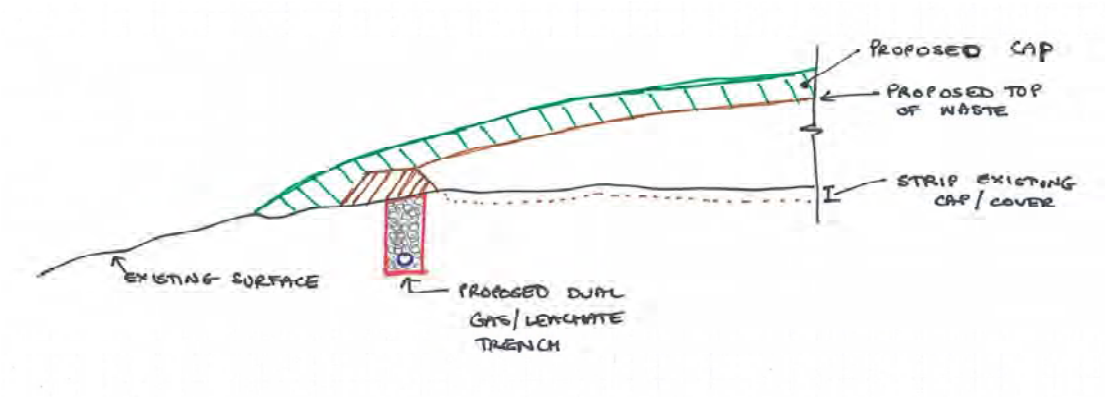


Figure 5.2 Proposed dual gas/leachate trench typical arrangement

5.1.2 Grading of the landfilled areas

Existing

The existing landform grades vary significantly depending on the location and the age of the area. Areas where landfilling was completed some time ago has undergone settlement, with some areas of localised differential settlement causing ponding of surface water in depressions.

Standing water enhances infiltration of water through the waste and increases leachate generation.

Additional proposed

The proposal would allow further filling works to be undertaken in these older areas of the site. Settlement analysis (GHD, 2015c) was undertaken to ensure that the proposed shape of the re-profiled final landform would provide adequate drainage after the expected levels of settlement have taken place.

The increased grades have been shown to reduce rainfall infiltration (Table 4.3) and hence leachate generation.

5.1.3 Cover and capping of waste

Existing

Following compaction of the waste, SITA apply approved daily cover or Alternative Daily Cover (ADC) to the areas of active filling and intermediate cover is placed in areas which are not planned to receive waste within 90 days.

Final cap at the southern parts of the site has been revegetated with grass.

Additional proposed

A revised final cap design is part of the proposal and would include a low permeability compacted clay layer (or equivalent).

Following closure of the site, further rehabilitation works have been proposed to support the landscaping plan which includes treed areas.

The results of infiltration modelling, as summarised in Table 4.3 within Section 4.7.2, indicates that the proposed final cap and post-closure cap allow significantly less infiltration of surface water than the existing final cap profile.

The capping of the landfill would be undertaken progressively as areas of the landfill as it reaches the final levels, as illustrated through the staging plans contained in Appendix A. This would provide ongoing reduction of leachate generation into the future, as shown in Figure 4.3 (Section 4.7.2).

5.1.4 Minimise operating areas

Existing

SITA currently maintain the active tip face to less than 2,500 m^2 and the area of daily cover to approximately 10,000 m^2 in order to minimise the potential for leachate generation through the thinner cover soils.

Additional proposed

As the re-profiling areas are developed:

- The area of existing cover or capped area to be stripped would be approximately 2Ha or at least two weeks in advance of the active tip face. The stripped areas won't be excavated to waste until the day of reprofiling the area (2,500 m^2)
- Low-permeability final cap would be placed in a staged manner, as areas reach final levels

5.1.5 Surface water diversion

Existing

The site incorporates storm water diversion infrastructure to minimise off-site storm water run-on as well as to divert onsite generated storm water around landfill areas. Temporary bunds and stormwater channels are used to divert stormwater from active fill areas in order to minimise potential leachate generation.

Additional proposed

Surface water diversion infrastructure would be established around each phase across the re-profiling area prior to stripping works being undertaken.

5.1.6 Containment, treatment & disposal

Existing

The site currently has a range of leachate containment and emergency containment infrastructure, as described in Section 2.11. Leachate is extracted from these containment facilities for treatment and disposal as soon as practical and is actively managed so that there is sufficient capacity to cope with leachate arising from wet weather events.

The site currently has capacity to treat 570 kL/day. The current average sewer discharge limit is 800 kL/day at a maximum daily discharge of 1,500 kL.

Modelling indicates that the site has sufficient treatment and disposal capacity to manage leachate with the use of containment in the emergency leachate containment dam and within Cell 5.2 and Cell 5.3 in extreme wet weather events. This modelling takes into account the recommended increased average daily treatment capacity of 870 kL and increased average daily discharge limit of 1,200 kL.

Additional proposed

SITA would increase the average daily treatment capacity to 870 kL and increased average daily discharge limit to 1,200 kL.

Modelling indicates that while in the short term leachate generation may increase slightly, leachate generation over the remainder of the proposed site life is expected to decrease significantly.

If ongoing monitoring of leachate collection volumes and calibration of leachate models indicate that additional containment, treatment or disposal capacity is required, an assessment of management options should be undertaken. Additional containment capacity may be provided, or other measures to reduce leachate generation could be introduced.

5.2 Voluntary Planning Agreement and Operations Environmental Management Plan

In recognition of the critical role that the LHRRP plays in managing Sydney's waste, SITA would enter into a Voluntary Planning Agreement (VPA) with SSC in accordance with the requirements of the EP&A Act. The Minister for Planning would consider the VPA along with the Development Application (DA) and EIS and would be the consent authority for the proposal. All SITA entities (SembSITA, WSN Environmental Solutions and SITA Australia) and SSC would be signatories to the VPA.

Under the VPA, SITA is committing to meet a number of environmental commitments in terms of actions it would take based on the site's environmental performance. As mentioned in section 2.9, revised OEMPs are being developed as part of the EIS preparation for the:

- LHRRP
- Proposed ARRT facility
- Relocated GO facility

A separate EMP is also prepared for the post-closure activities at the LHRRP.

The abovementioned OEMPs and EMP form part of the VPA.

As an additional level of safeguard, *Schedule 1D – Environmental Undertaking and Reporting* of the VPA prescribes the external audit process that applies to the LHRRP. Schedule 1D details the reporting requirements and there is a significantly higher level of rigour associated with the data reporting in comparison with current practices at LHRRP and industry practice.

In addition, SITA and SSC have established an Agreed Methodology for assessing complaints. It would be reviewed every two years and at the request of any party, but any changes to the Agreed Methodology would only be made by agreement between the parties. The Complaint Investigation and Rectification Process is included in Appendix S of the LHRRP OEMP.

5.3 Operational mitigation measures

A comprehensive list of prevention, mitigation and rectification measures has been identified and they are detailed in the LHRRP OEMP (SITA Australia, 2015). The identified mitigation and rectification measures would be implemented as required and their exact details would be based on a case by case situation depending on the issue and technical solutions available at the time.

Examples of key measures that are included in the OEMPs are provided below

- Ongoing monitoring of surface water and leachate as required by EPL
- Daily review of leachate levels
- Daily site inspections and pumping/discharge records
- Update of standard operating procedures as site develops
- Maintain relevant emergency procedures
- Take action as leachate volumes and levels increase
- Document corrective and preventative actions taken
- Undertake regular inspections and repairs of infrastructure including removal of sludge from dams and maintenance of pumps and aerators
- Compact and cover with daily and intermediate cover material to minimise infiltration of stormwater and further leachate generation
- Remove leachate from a number of gas extraction wells using air lift pumps, flowing by gravity to the leachate collection dam
- Maintain the leachate collection dam (holding capacity of 10 ML) to allow for the collection of leachate from the western ring main, central ring main, eastern ring main, Area 5-1 and Areas 5-2/5-3
- Maintain further emergency leachate containment dam (containment capacity of 9.2 ML) to contain leachate in extended wet weather events
- Actively manage leachate levels in the containment dams so that they are have sufficient capacity to cope with leachate arising from wet weather events

6. Conclusions

6.1 Summary

The results of the water balance model indicate that the proposal would:

- Provide a final landform which increases the proportion of rainfall which would run off the surface
- Provide a final landform which would decrease the proportion of rainfall which would infiltrate into the waste
- Overall, generate less leachate than the current site arrangement

Through the reduction in leachate generation and the improvement of the cap and final landform, the proposal would also reduce the potential to impact the environment through surface water and groundwater.

6.2 Conclusions and recommendations

The existing leachate management system has the capacity to manage the volumes of leachate estimated to be generated in the modelled average rainfall and wet rainfall years through the use of emergency leachate containment in the double lined emergency leachate containment dam and Cell 5.2 and Cell. 5.3. These containment structures were designed for this purpose.

The following is recommended throughout the development of the proposal:

- Ongoing monitoring of leachate volumes extracted from LHRRP landfill and other sources
- Periodic review of the leachate water balance model
- Monitoring of groundwater and surface water quality, as required by the site EPL

It is further recommended that SITA seek to increase the average daily leachate treatment capacity to 870 kL/day and the trade waste limit to 1,200 kL/day which is within their current maximum daily discharge limit. It is recommended that this increase be obtained by early 2017.

6.3 Meets identified objectives

This report addresses the SEARs requirements (section 1.6) and concludes that the proposal would meet the following objectives as identified in section 1.2:

- Prevention of groundwater pollution by leachate
- Prevention of surface water pollution by leachate, including Mill Creek
- Prevention of the degradation of local amenity
- No significant impacts on the community and the environment

7. References

The following information has been relied upon:

- Australian and New Zealand Environment and Conservation Council (ANZECC, 1999) Guidelines for the Assessment of On-site Containment of Contaminated Soil
- CMPS&F Pty Limited (1998) Lucas Heights Waste Management Centre Extension, Landfill Technical Report
- Daily weather data from onsite weather station, Jan 2008 - April 2013 (received 6/6/14)
- Determination of Development Application Under Section 88 of the Environmental Planning and Assessment Act 1979 (DA 11-01-99, modified 2014)
- Douglas Partners (1998) Report on Hydrogeology and Leachate Management, Lucas Heights No 2 Landfill
- Douglas Partners and Coffey Partners (DP&CPI,1992); Interim Report on Hydrogeological Investigation Proposed Extension Regional Waste Depot, Lucas Heights.
- Douglas Partners and Coffey Partners (DP&CPI,1994); Report on Hydrogeology and Groundwater Monitoring, Waste Depot Lucas Heights, Volume 1 – DP 14780.
- ENVIRON (2006); Lucas Heights Groundwater Monitoring Network Review – Letter to WSN Environmental Solutions.
- GHD (2006a) Design of leachate dam undertaken by GHD for WSN (ref. 21/14694/C001 - C019)
- GHD (2006b) Review of existing landfill capping and leachate management techniques for WSN (ref. 21/13939/113504)
- GHD (2009) Water Management Review for WSN (ref. 21/17933/144755)
- GHD (2013) Constructions Quality Assurance (CQA) Report Cells 5.2
- GHD (2014a) Constructions Quality Assurance Report Cell 5.3A
- GHD (2014b) Emergency Leachate Storage Dam design and Construction Quality Assurance Report
- GHD (2015a) Lucas Heights Resource Recovery Park: Surface Water Assessment
- GHD (2015b) Lucas Heights Resource Recovery Park: Groundwater Assessment
- GHD (2015c) Proposed Final Landform Modelling, Settlement Analysis and Mass Balance (Including Cover and Capping Material) (ref. 21/23396/199779)
- GHD (2015d) Lucas Heights Resource Recovery Park: Air Quality Assessment
- JPG Engineering (2007) LH WMC Leachate Management Process Schematic-LHLM-01-Rev_3
- National Environmental Consulting Services (NECS, 1999) Environmental Impact Statement, Lucas Heights 1, Lucas Heights Waste Management Centre, Lucas Heights Conservation Area
- NSW Government Waste Assets Management Corporation (NSW WAMC). 2012. Harringtons Quarry. [ONLINE] Available at: http://www.wamc.nsw.gov.au/sites/harringtons_quarry

- Qian et al. (2002) Geotechnical aspects of landfill design and construction. Prentice Hall
- Queensland Government Department of Science, Information Technology, Innovation and the Arts (DSITIA) and Bureau of Meteorology (BOM) (2014), SILO weather data (http://www.longpaddock.qld.gov.au/silo) accessed 10 June 2014
- SITA (2009) Leachate Management standard operating procedure SOP036
- SITA (2010) Irrigation model & system schematic (received 6/6/14)
- SITA (2014a) Leachate Generation Rev 2 (received 6/6/2014)
- SITA (2015) LHRRP Operational Environmental Management Plan
- SITA (2015) GO Facility Operational Environmental Management Plan
- Sydney Water (2013) Trade Waste Agreement April 2013 (received 6/6/14)
- Thom & Knight (2005) The Effects of Waste Disposal on Groundwater Quality in the Triassic Age Rocks in Sydney
- Mitchell McCotter & Associates Pty Ltd (1991) Waste Processing and Disposal Centre Lucas Heights Environmental Impact Statement
- WSN (2004) Plan - existing leachate collection system - stages 1 to 4

8. Limitations

This report: has been prepared by GHD for SITA Australia and may only be used and relied on by SITA Australia for the purpose agreed between GHD and the SITA Australia as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than SITA Australia arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

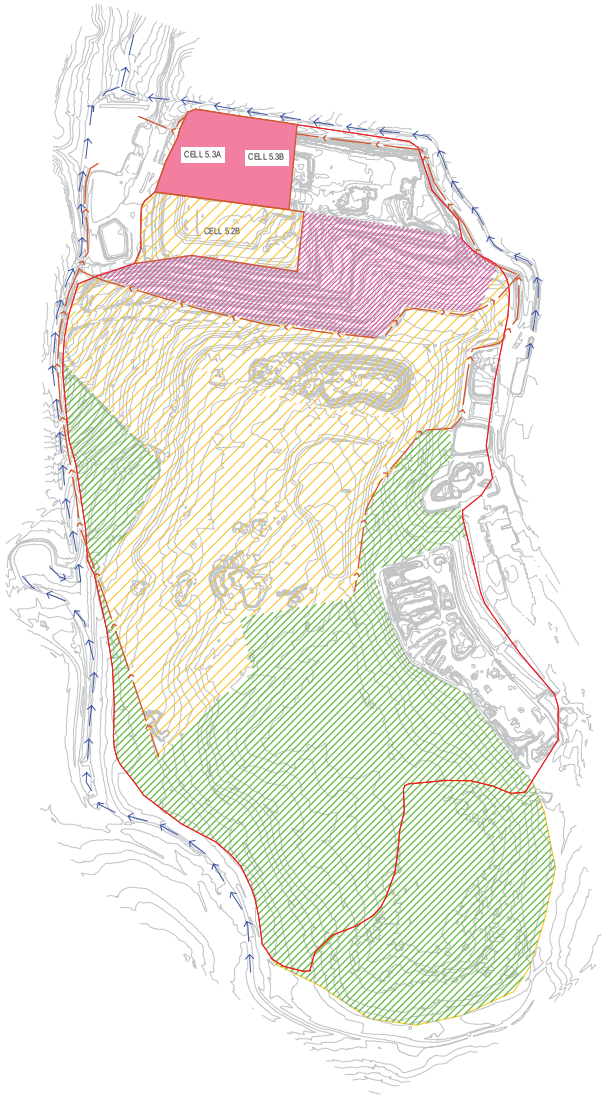
The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by SITA Australia and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Appendices

Appendix A – Indicative staging plans



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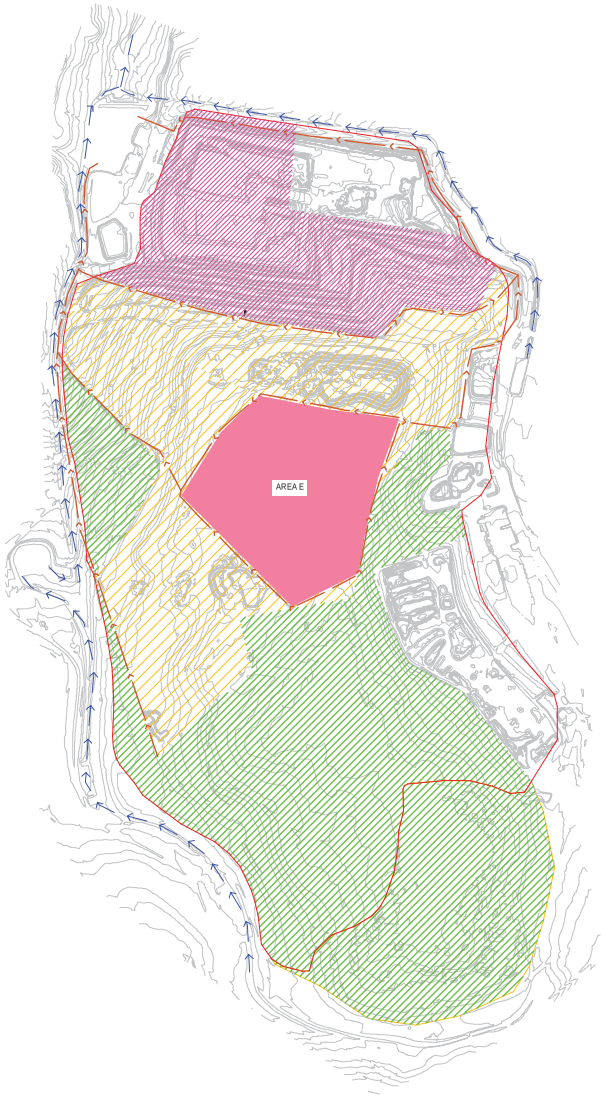

PHASE 1

LEGEND:

- PROPOSED RE-PROFILING BOUNDARY
- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
- INTERMEDIATE COVER - SLOPES
- EXISTING CAP
- PROPOSED FINAL CAP - PLATFORM
- PROPOSED FINAL CAP - SLOPES
- PROPOSED POST-CLOSURE CAP - PLATFORM
- PROPOSED POST-CLOSURE CAP - SLOPES
- INDICATIVE SURFACE WATER DIVERSION DRAIN
- INDICATIVE SURFACE WATER COLLECTION DRAIN

N

0 50 100 150 200 250m

SCALE 1:5000 AT ORIGINAL SIZE

PRELIMINARY

rev	description	app'd	date
B	REVISED		05.03.15
A	INITIAL ISSUE		17.12.14

SITA AUSTRALIA
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scale 1:5000 for A1 | job no. 21-23482
date MAR 2015 | rev no. B

approved (PD) SK011

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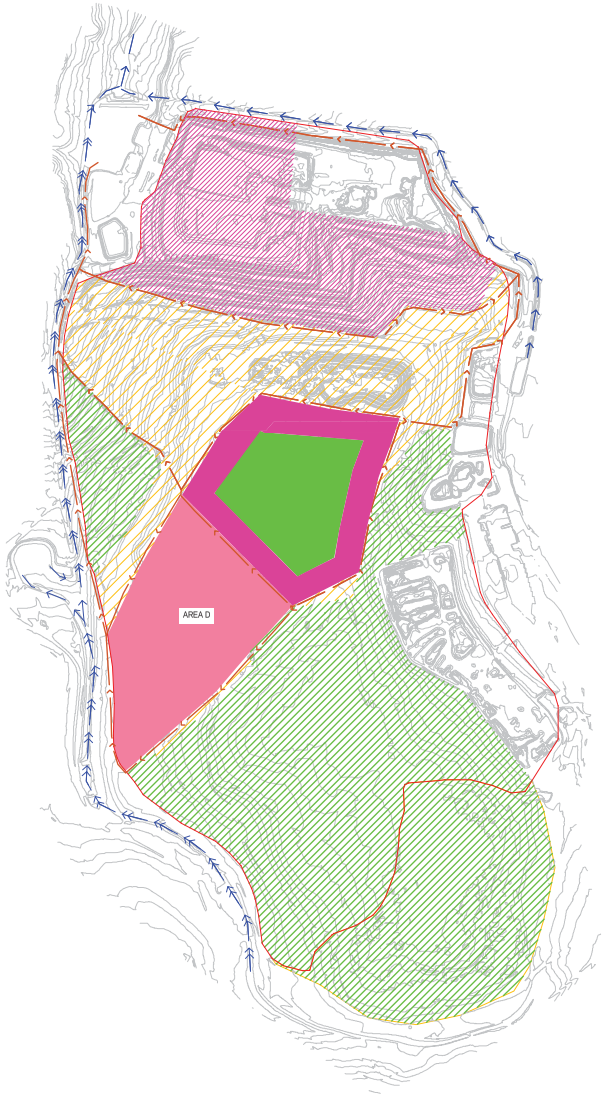

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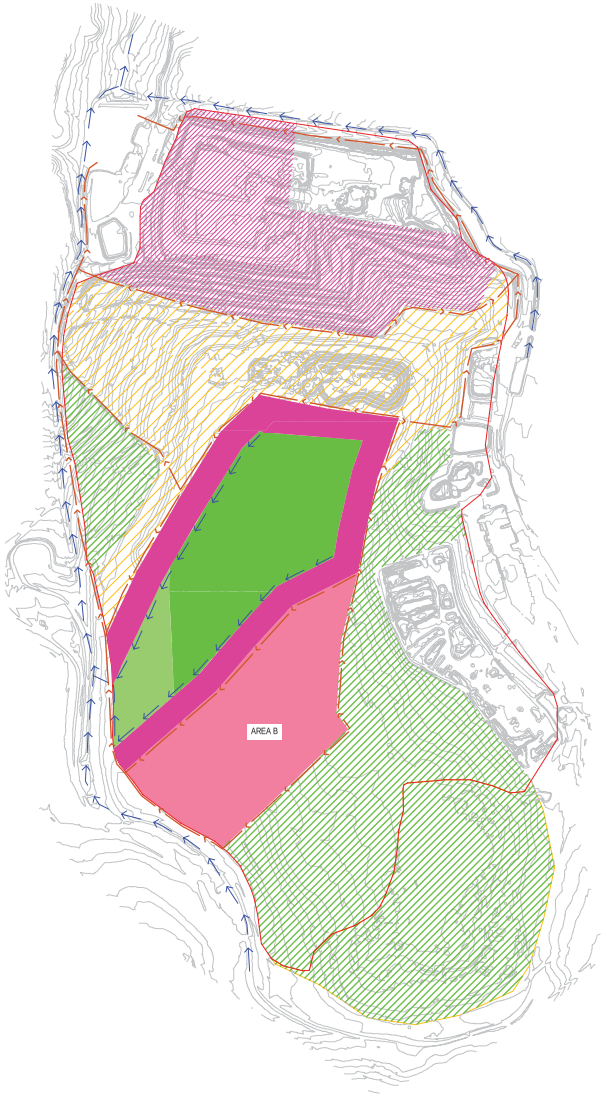

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LEGEND:

- PROPOSED RE-PROFILING BOUNDARY
- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
- INTERMEDIATE COVER - SLOPES
- EXISTING CAP
- PROPOSED FINAL CAP - PLATFORM
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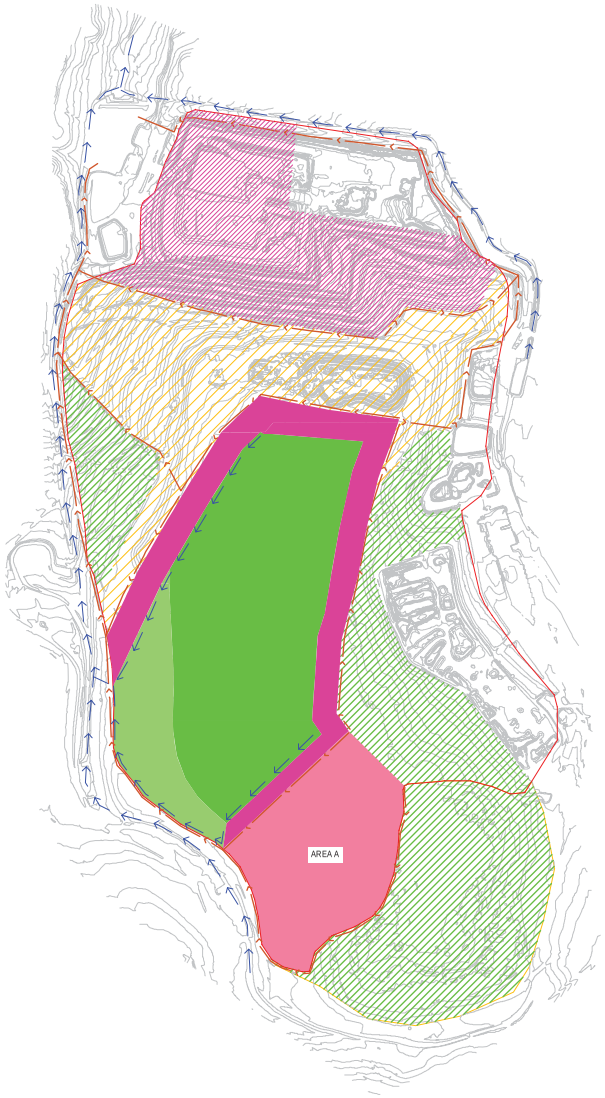

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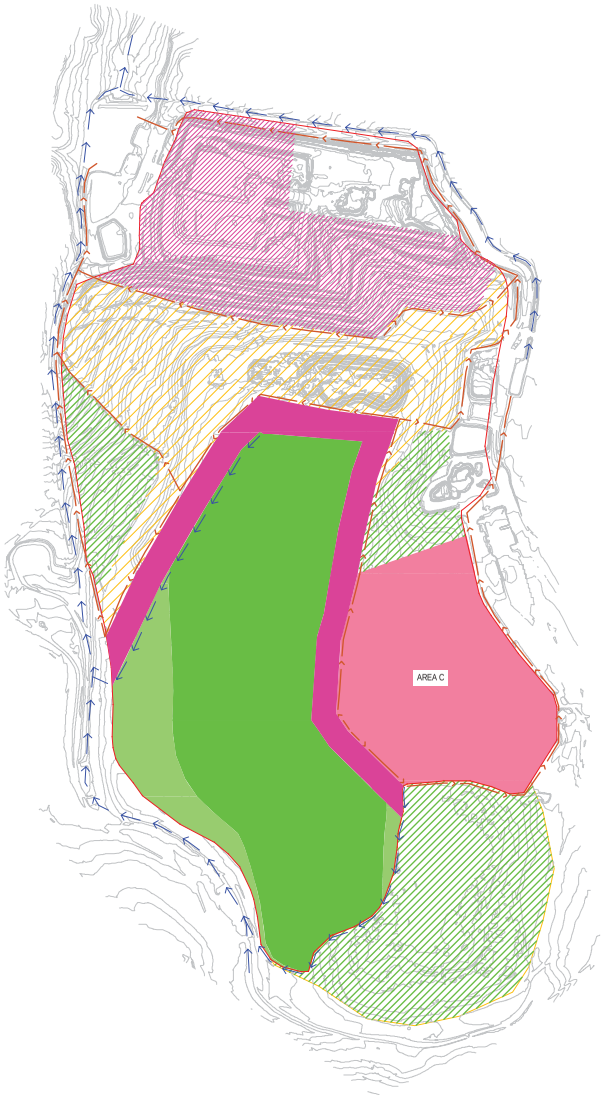

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LEGEND:

- PROPOSED RE-PROFILING BOUNDARY
- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
- INTERMEDIATE COVER - SLOPES
- EXISTING CAP
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- INDICATIVE SURFACE WATER DIVERSION DRAIN
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N

0 50 100 150 200 250m

SCALE 1:5000 AT ORIGINAL SIZE

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- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
- INTERMEDIATE COVER - SLOPES
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- PROPOSED POST-CLOSURE CAP - SLOPES
- INDICATIVE SURFACE WATER DIVERSION DRAIN
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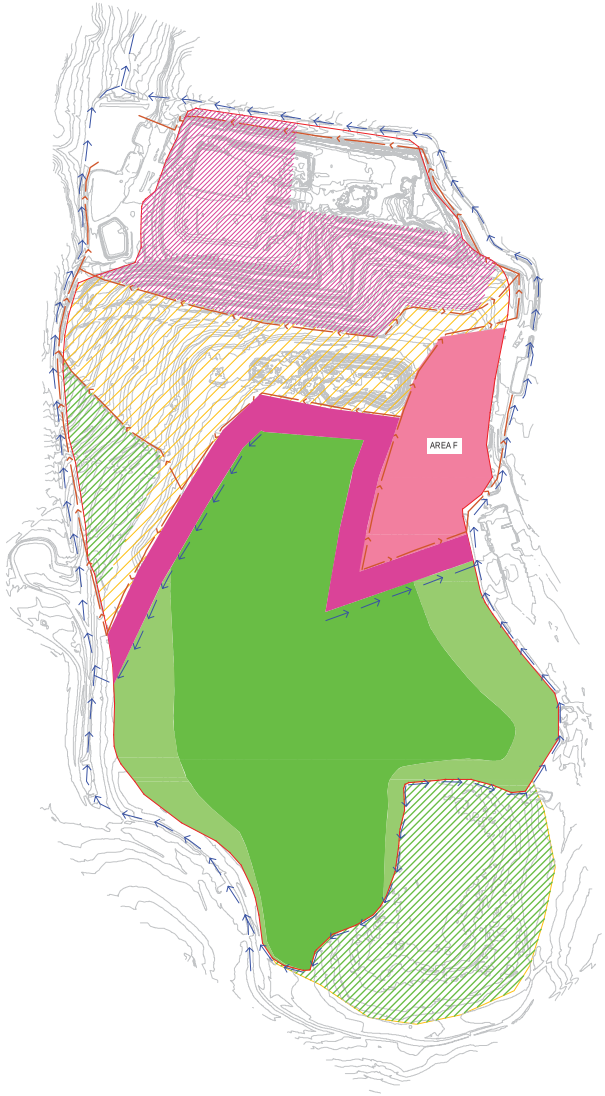

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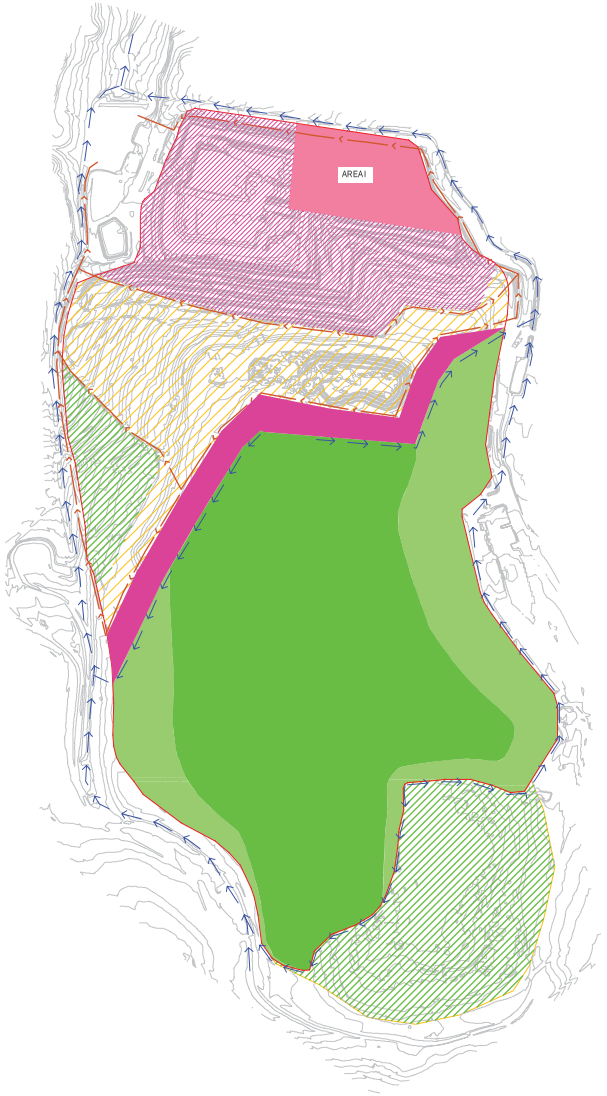

PHASE 7

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SCALE 1:5000 AT ORIGINAL SIZE

PRELIMINARY

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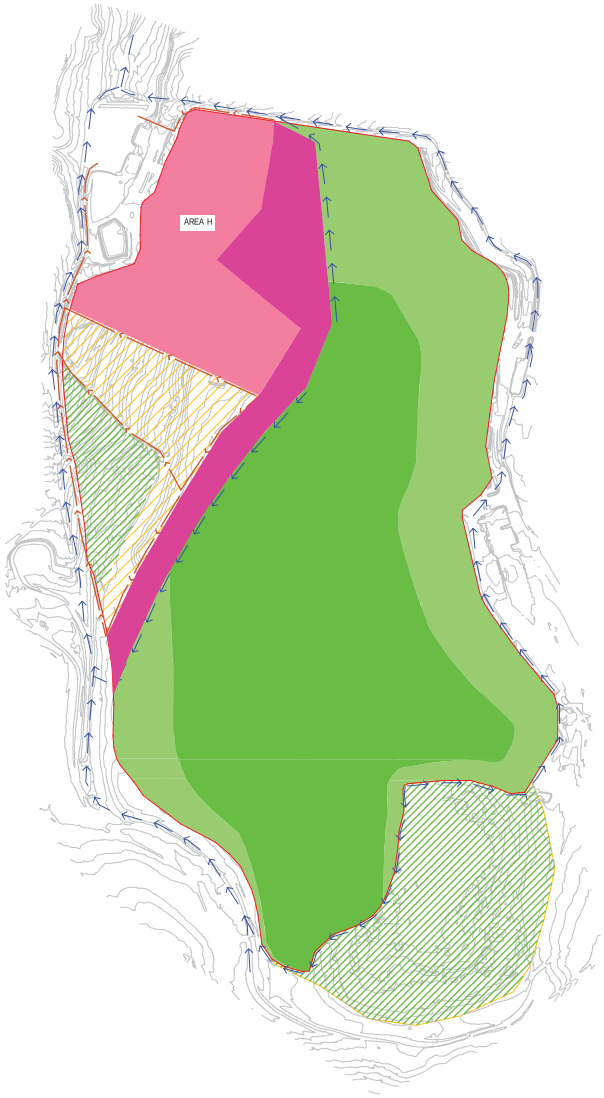

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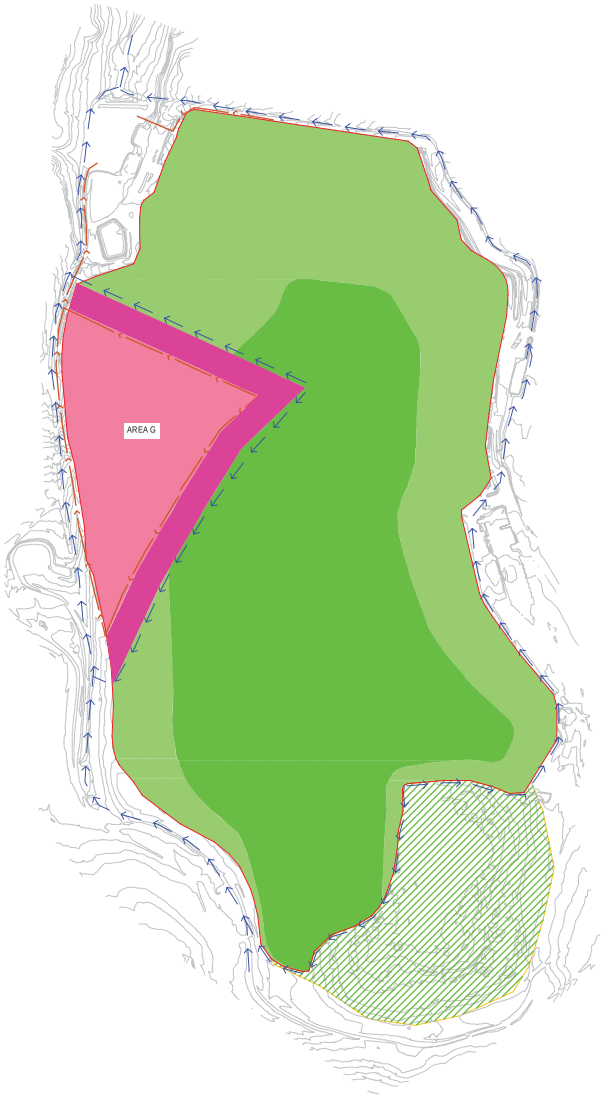

PHASE 9

LEGEND:

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- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
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N

0 50 100 150 200 250m

SCALE 1:5000 AT ORIGINAL SIZE

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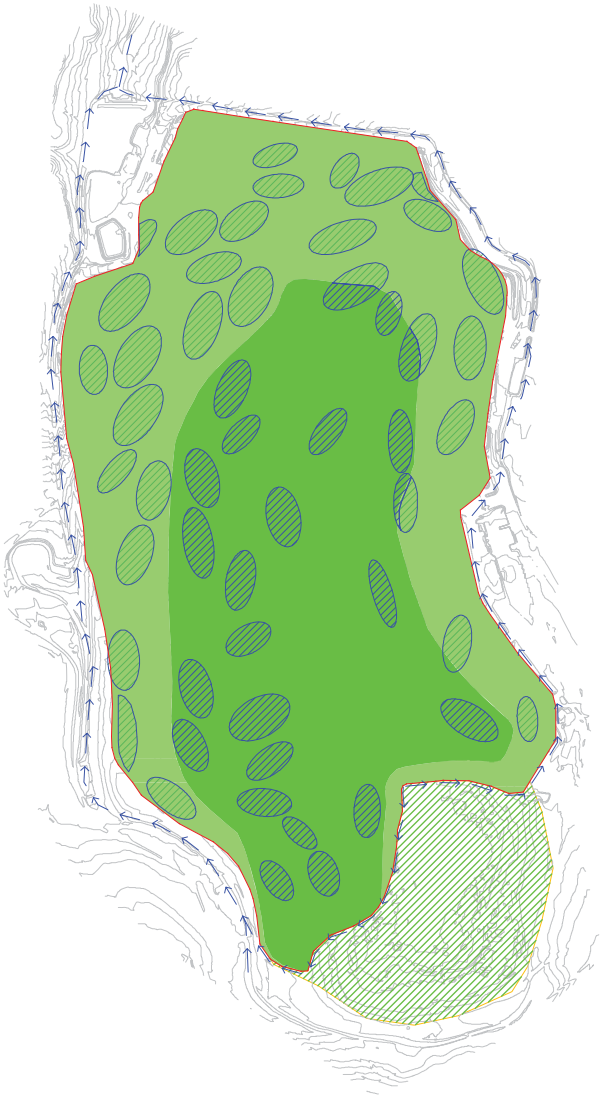
date MAR 2015 rev no. B

approved (PD) SK015

Plot Date: 5 March 2015 - 5:04 PM Plotted by: Alison Horlyck Cad File No: G:\21\23482\CADD\Drawings\21-23396-SK011-SK016.dwg



FINAL POST-CLOSURE

LEGEND:

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- ACTIVE CELL
- INTERMEDIATE COVER - PLATFORM
- INTERMEDIATE COVER - SLOPES
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SCALE 1:5000 AT ORIGINAL SIZE

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date MAR 2015 rev no. B

approved (PD) SK016

Plot Date: 5 March 2015 - 5:04 PM Plotted by: Alison Horlyck Cad File No: G:\21\23482\CADD\Drawings\21-23396-SK011-SK016.dwg

Appendix B – Sydney Water Trade Waste Agreement

Consent to Discharge Industrial Trade Wastewater

SYDNEY WATER CORPORATION

and

SITA AUSTRALIA PTY LTD
A.C.N. 002 902 650
Trading as

SITA ENVIRONMENTAL SOLUTIONS

A.B.N. 70 002 902 650

ACTIVITY: GARBAGE TIP (GE06)

RISK INDEX: 03

CONSENT NO: 35034

CONNECTION NO: 1

PROPERTY NUMBER: 5465017

This **CONSENT** is made on day: 8th month: April year: 2013

Executed for and on behalf of Sydney Water Corporation

By

.....
(Signature)

Philip Halkyard
Manager Business Customer Delivery

In the presence of:

Witness

.....
(Signature)

SHERRYN CABARDO
(Print name of witness)

Executed for and on behalf of the Customer:

.....
(Signature)

By

Andrew Kosciuszko
(Print name and position of person signing)
who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness

.....
(Signature)

.....
(Print name of witness)

This consent must be executed by the Customer prior to execution by Sydney Water and submitted by the Customer to Sydney Water for its consideration. Submission of a consent executed by the Customer under no circumstances obliges Sydney Water to enter into or complete the consent. Submission of an executed consent by the Customer constitutes an application for a consent which Sydney Water may in its reasonable discretion reject, or with the consent of the Customer modify any of the proposed terms thereto.

SCHEDULE 1

(SUBJECT TO PUBLIC DISCLOSURE)

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

(a) The Customer may discharge trade wastewater into the Sewer in a manner whereby the substance characteristics of the trade wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.

(b) The Customer must not discharge trade wastewater into the Sewer in a manner whereby the trade wastewater discharged;

(i) contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.

(ii) is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.

SUBSTANCE	LTADM (kg/day)	MDM (kg/day)	Standard (mg/L)
AMMONIA (AS N)	55.00000	95.00000	100.000
BIOCHEMICAL OXYGEN DEMAND	215.00000	450.00000	
SUSPENDED SOLIDS	240.00000	500.00000	600.000
TOTAL DISSOLVED SOLIDS	5000.00000	9000.00000	10000.000
BARIUM	0.30000	0.75000	5.000
IRON	8.50000	20.00000	50.000
ZINC	0.30000	1.80000	5.000

RECONCILIATION PROCEDURES:

LONG TERM AVERAGE DAILY MASS:

The Long Term Average Daily Mass is a twelve month arithmetic average of ALL daily mass discharges as calculated for each composite sample. The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Long Term Average Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24 hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Long Term Average Daily Mass does not constitute a Breach.

ACCEPTANCE STANDARD:

The Composite Sample Concentration is to be determined for each of the above substances, and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach and will also incur an increased Quality Charge as detailed in Schedule 3.

The Discrete Sample Concentration is to be determined for each of the substances identified at Schedule 2, 2 (b) and checked against the above Acceptance Standard (mg/L) for each sample obtained. Exceeding the Acceptance Standard constitutes a Breach.

MAXIMUM DAILY MASS:

The Daily Mass discharged is to be calculated for each of the above substances, and checked against the above Maximum Daily Mass (kg/day) on the basis of average concentrations of substances discharged (mg/L) over any 24 hour period as determined from composite samples, obtained by either the Customer (in accordance with Schedule 2) or Sydney Water, or a combination of sample results by both.

This average concentration (mg/L) is to be multiplied by the total discharge (kL) as recorded by the Customer's discharge flow meter over the 24hour period in order to calculate the Daily Mass of substances discharged (kg). Exceeding the Maximum Daily Mass constitutes a Breach.

2. The trade wastewater discharged must at all times have the following properties:

Temperature	-	Not to exceed 38 degrees Celsius.
Colour	-	Determined on a system specific basis
pH	-	Within the range 7.0 to 10.0.
Fibrous material	-	None which could cause an obstruction to Sydney Water's sewerage system.
Gross solids (other than faecal)	-	A maximum linear dimension of less than 20 mm, a maximum cross section dimension of 6 mm, and a quiescent settling velocity of less than 3 m/h.
Flammability	-	Where flammable and/or explosive substances may be present, the Customer must demonstrate to the satisfaction of Sydney Water that there is no possibility of explosions or fires occurring in the sewerage system. The flammability of the discharge must never exceed 5% of the Lower Explosive Limit (LEL) at 25° Celsius.

3. Rate of discharge of waste to sewer:

(a) Instantaneous maximum rate of gravitated discharge 20.00 litres per second

(b) Maximum daily discharge 1500.0 kilolitres

(c) Average daily discharge 800.0 kilolitres

RECONCILIATION PROCEDURE:

The data obtained from applying these procedures is to be checked by the interface of a chart recorder to the Customer's flow metering equipment, or by the installation of flow metering equipment by Sydney Water, for a minimum of 7 days.

SCHEDULE 2

(SUBJECT TO PUBLIC DISCLOSURE)

SAMPLING, ANALYSIS, FLOW RATES AND VOLUME DETERMINATION

1. The Customer must provide and make available for the purpose of sampling and analysis;
   (a) Sampling point located at pretreat.discharge excl. domestic sewage prior to the point of connection to the Sewer.
   (b) Equipment necessary to allow collection of composite automatic samples on either a flow proportional or a time basis.
2. The Customer is to undertake collection and analysis of samples in accordance with the schedule detailed below:
   (a) Composite samples are to be obtained:
      (i) over one full production day by combining equal volumes taken at 10 kilolitre intervals. The volumes are to be such that at least 5,000 millilitres are obtained over the full day. The reading of the Flowmeter meter is to be obtained at the commencement and conclusion of the sampling day.
      (ii) on 9 April 2013 and every 4 days thereafter. If trade wastewater is not discharged on this day, then the sample is to be taken on the next day that trade wastewater is discharged. Trade wastewater includes all non-domestic wastewater discharged to sewer from the premises, including cleaning waste.
   (b) Discrete samples are to be obtained as detailed below, and analysed according to the procedures and methods specified in Sydney Water's published analytical methods, to determine the concentrations or levels of the following substance characteristics:

pH	at the start and finish of each sample day
AMMONIA (AS N)	**at the finish of each sample day**

   (c) Composite samples are to be analysed according to the procedures and methods specified in Sydney Water's published analytical methods, or methods otherwise agreed to and detailed hereunder, to determine the concentrations or levels of the following substance characteristics

AMMONIA (AS N)
BIOCHEMICAL OXYGEN DEMAND
SUSPENDED SOLIDS
TOTAL DISSOLVED SOLIDS
BARIUM
IRON
ZINC

   (d) The Customer, or the laboratory contracted by the customer, is to submit results of analyses to Sydney Water within 21 days from the date the sample was taken. All analysis results are to be submitted on the sample analysis report provided as appendices 1 and 2 to this Consent OR in such format as may be specified from time to time by Sydney Water.
   (e) All data requested on the sample analysis report must be provided.
   (f) Sydney Water must be notified in writing within 7 days of;
      (i) any failure to obtain samples in accordance with the provisions of Schedule 2; or
      (ii) any loss of any analytical data.

      Where data is unavailable, lost or not provided, the Quality Charge, as detailed in Schedule 3, will be assessed on the basis of the highest Composite Sample concentration recorded in the 12 months prior to the date of the missing sample data.

3. The volume of wastewater discharged must be obtained from the reading of the total flow on the Customer's flowmetering system.

   The rate of waste discharged is to be obtained by the reading of the instantaneous flow rate indicator on the Customer's flowmetering system, or from any chart recorder interfaced to the Customer's flowmetering system.

   The flowmetering system is to be calibrated at least annually at the Customer's expense, by a person or company approved by Sydney Water and a copy of the calibration certificate supplied to Sydney Water within one month of such certificate being received by the Customer.

   If the Customer's flowmetering system fails to record data for any period, Sydney Water is to be advised in writing by the Customer within 7 days of any such failure becoming known by the Customer. An estimate of any data not recorded is to be made as follows:

   Average of the waste discharged, registered for the four weeks before and/or after the failure to record.

SCHEDULE 3

(SUBJECT TO PUBLIC DISCLOSURE)

PAYMENTS

The charges are effective from 5 April 2013 and will continue until otherwise advised by Sydney Water.

All trade waste fees and charges are subject to CPI adjustments from 1 July each year in accordance with Determination No 1, 2012 made by the Independent Pricing and Regulatory Tribunal (IPART).

1. CHARGES FOR TRADE WASTEWATER DISCHARGE

Sydney Water will conduct a reading of the Customer's discharge meter at approximately 90 day intervals. The volume of trade wastewater discharged for the period since the previous reading will be calculated.

Charges are based on the Daily Mass calculated from composite samples and corresponding meter readings for each sampling day in the billing period, and calculated in accord with (c), (d), (e), and (f) below. The charge for each sampling day is then multiplied by a flow weighting factor to give a flow weighted charge. The total charge for each substance for the billing period is equal to the sum of the flow weighted charges for the billing period.

Total Charge = the sum of the flow weighted charges for the billing period

Flow Weighted Charge = (charge for all sample days) x (flow weighting factor) and:

$$\text{Flow Weighting Factor} = \frac{\text{(total volume discharged during billing period)}}{\text{(sum of volumes discharged during all sample days during billing period)}}$$

In this formula volume discharged refers to the volume of trade wastewater discharged.

(a) Mass Discharged:

For each substance, the Mass Discharged is calculated by multiplying the Composite Sample concentration by the Trade Wastewater discharge for that sample day.

(b) Chargeable Tradewaste Mass:

(i) For the following substances, the Chargeable Tradewaste Mass is equal to the Mass Discharged:

SUBSTANCE
BARIUM
IRON
ZINC

(ii) For the following substances, the Chargeable Tradewaste Mass is calculated by subtracting the Equivalent Domestic Mass from the Mass Discharged. The Equivalent Domestic Mass is defined as the Domestic Concentration multiplied by the Trade Wastewater discharge.

SUBSTANCE	DOMESTIC CONCENTRATION mg/L
AMMONIA (AS N)	35.000
BIOCHEMICAL OXYGEN DEMAND	230.000
SUSPENDED SOLIDS	200.000
TOTAL DISSOLVED SOLIDS	450.000

If the resulting Chargeable Tradewaste Mass is zero or negative, then no Quality charges will apply for that substance for that sample day.

(c) Quality Charge:

(i) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate for that substance:

SUBSTANCE	STANDARD MASS CHARGING RATE $ per kg
AMMONIA (AS N)	0.0000
SUSPENDED SOLIDS	1.0840
TOTAL DISSOLVED SOLIDS	0.0000
BARIUM	0.0000
IRON	0.0000
ZINC	0.0000

(ii) For the following substances, the Quality Charge is determined by multiplying the Chargeable Tradewaste Mass by the Rate, where the Rate is a function of the composite sample concentration recorded for that sample day.

SUBSTANCE	STANDARD MASS CHARGING RATE $ per kg
BIOCHEMICAL OXYGEN DEMAND	[[1.09700] + {[0.05100] x (BOD / 600.000)}]

(d) Concentration Breach Charge:

Where the Composite Sample concentration is greater than the Acceptance Standards specified in Schedule 1 (with the exception of sulphate), any charges calculated in (c) above will be doubled for that sampling day.

(e) Failure to collect required samples:

Where the Customer fails to collect and analyse samples in accord with this consent the above charges will be assessed on the basis of the highest composite concentrations recorded for any billing period within the previous 12 months and the average daily discharge for the current billing period.

(f) pH and Temperature charges:

Sydney Water regularly assesses its wastewater networks to determine if a system is affected by accelerated odour and corrosion. Where Sydney Water declares a wastewater system to be affected by accelerated odour and corrosion, the temperature and pH charge will only apply if the customer is not committed to or not complying with an effluent improvement program.

2. CHARGES FOR INSPECTIONS

(a) If, in the opinion of Sydney Water, it is necessary for a Customer Service Representative to exercise rights under clause 6.1, the Customer will incur no liability for payment for any such exercise unless Customer Service Representative has already exercised rights under clause 6.1 on 13 occasions within a period of one year.

(b) If it is necessary, in the opinion of Sydney Water, to carry out more than 13 occasions within a period of one year, the additional inspections will be charged at the current inspection rate.

(c) Any inspection required following up an alleged breach or a default notice will result in a fee payable even if the number of inspections nominated in paragraph 2 (a) has not been exceeded.

(d) For the purposes of 2 (a) and 2 (b), above, one year is defined as the period from 1 July to 30 June the following year.

3. CHARGES FOR ADMINISTRATION OF TRADEWASTE CONSENT

A consent fee of $1835.00 per quarter is payable from 5 April 2013.

4. CHARGES FOR VARIATION OR RENEWAL OF TRADEWASTE CONSENT

Where a Variation is made to the Consent a fee of $512.80 will be payable. There will be no charge for renewal.

5. CHARGES FOR PROCESSING GREASE TRAP WASTE

Charges for processing grease trap waste under the 'Wastesafe' Management System are as follows:
Not applicable

6. PAYMENT OF FEES AND CHARGES

An account will be issued for all fees and charges. Any fees or charges payable by the Customer must be paid by the Customer within 30 days of the receipt by the Customer of the account detailing those fees and charges.

SCHEDULE 4

ADDITIONAL REQUIREMENTS

1. EFFLUENT IMPROVEMENT PROGRAM

N/A

2. WASTE MANAGEMENT PLAN

The existing pre-treatment will result in the generation of 1.0 tonne per annum of waste substances in the form of a sludge containing generally solids. The waste substances are, and will continue to be disposed of, in compliance with the requirements of The Environment Protection Authority.

3. OTHER REQUIREMENTS

BACKFLOW PREVENTION CONTAINMENT POLICY

1. Backflow Containment Device must be installed and maintained at the water meter outlet/property boundary in line with Sydney Water's Backflow Policy.

2. Backflow individual/zone protection is required on any tap located within 5m of the trade waste apparatus.

DISCHARGE FLOW RATE

A maximum instantaneous flow rate of 20 L/Sec and a maximum discharge volume of 1500 kL is permitted over a 24 hour period in dry weather conditions only.

RAIN EVENTS

A rain event is defined as a minimum of 1 mm per hour measured by the tipping bucket rain gauge. During rain events the discharge pumps must restricted to 5 L/sec. The reduced rate applies for one hour after each and subsequent measured rain event.

SCHEDULE 5

APPARATUS, PLANT AND EQUIPMENT

EXISTING:

4 megalitre dam
4.5 megalitre storage pond
Sequential batch reactor 600 kilolitres per day
Tipping bucket rain gauge & rainfall sentry
Pump control panel
ABB Magmaster flow meter
Methane detector and alarm system
Pump well with exhaust fans
2 x submersible pumps
Rising main with sample valve

PROPOSED: N/A

SCHEDULE 6

SPECIAL CONDITIONS

1. DANGEROUS DISCHARGES

In this Schedule, the term "may pose a danger to the environment, the Sewer or workers at a sewage treatment plant";

(a) means an occurrence whereby matter is discharged to the Sewer which either alone or in conjunction with other matter discharged cannot be adequately treated or may cause corrosion or a blockage, explosion or the production of dangerous gases in the Sewer or may adversely affect the operation of a sewer or sewage treatment plant; and

(b) includes, but not so as to restrict the generality of paragraph (a), matter or substances, which is or are

(i) toxic or corrosive;
(ii) petroleum hydrocarbons;
(iii) heavy metals;
(iv) volatile solvents;
(v) phenolic compounds;
(vi) organic compounds.

2. UNINTENDED DISCHARGES

(a) For purposes of avoiding unintended discharges to the Sewer or the stormwater drainage system, all matter and substances on the Premises must be processed, handled, moved and stored in a proper and efficient manner.

(b) Any substance on the Premises which, if discharged to the Sewer, may pose a danger to the environment, the Sewer or workers at a sewage treatment plant or may harm any sewage treatment process must be handled, moved and stored in areas where leaks, spillages or overflows cannot drain by gravity or by automated or other mechanical means to the Sewer or the stormwater drainage system.

3. NOTIFICATION

In the event of a discharge of matter to the sewer that poses or may pose a danger to the environment, the Sewer or workers at a sewage treatment plant the Customer must immediately notify:

(a) 24 HOUR SYDNEY WATER CONTACT TEL: 13 20 90

(b) **BUSINESS CUSTOMER SERVICES** (8AM TO 5PM MON TO FRI) TEL: (02) 9616 2485

BUSINESS CUSTOMER SERVICES EMERGENCY CONTACT (24 HOURS) TEL:

SOUTH WEST TEL: 0419 277 289

BUSINESS CUSTOMER SERVICES - DELIVERY EMERGENCY CONTACT

ALTERNATE CONTACT TEL: 0419 461 387

4. PROVISION OF SAFE ACCESS

The Customer shall provide safe access to Sydney Water employees visiting the site. In the event that unsafe conditions are identified the Customer must take reasonable steps to correct unsafe conditions and create safe access.

5. ELECTRONIC REPORTING OF SAMPLE ANALYSIS RESULTS

Sydney Water reserves the right to vary this consent to specify the option of reporting by electronic mail as outlined in Schedule 2, 2 (d).

SCHEDULE 7

1. **Premises for which Consent is granted**

   TIP NEW ILLAWARRA RD, BARDEN RIDGE NSW 2234

2. **Industrial or other commercial activities for which Consent granted**

   GARBAGE TIP (GE06)

3. **Discharge point for which Consent granted**

   MANHOLE 200 METRES NE OF PUMP WELL

4. **The date for purposes of clause 3.1 is 5 April 2013**

5. **The period for purposes of clause 3.2 is 12 months.**

6. **The receiving Treatment Plant is CRONULLA Sewage Treatment Plant**

SCHEDULE 8

NOTICES AND COMMUNICATION ADDRESSES

SYDNEY WATER:	BUSINESS CUSTOMER REPRESENTATIVE BUSINESS CUSTOMER SERVICES PO BOX 399 PARRAMATTA NSW 2124	TEL: (02) 9616 2485 FAX: 1300 364 403 A.H: 132 090
CUSTOMER:	KIM ROSS LANDFILL OPERATIONS MANAGER SITA AUSTRALIA PO BOX 1002 MENAI CENTRAL NSW 2234	TEL: (02) 8525 4100

SCHEDULE 9

AUTHORISED OFFICERS

SYDNEY WATER:	MANAGER BUSINESS CUSTOMER SERVICES BUSINESS CUSTOMER SERVICES PO BOX 399 PARRAMATTA NSW 2124	TEL: (02) 9616 2485 A.H: 132 090
Email:	andrew.kirkwood@sydneywater.com.au	
CUSTOMER:	KIM ROSS LANDFILL OPERATIONS MANAGER SITA AUSTRALIA NEW ILLAWARRA ROAD LUCAS HEIGHTS NSW 2234	TEL: (02) 85254100
Email:	kim.ross@sita.com.au	

SCHEDULE 10

NOMINATED REPRESENTATIVES

SYDNEY WATER:	MANAGER BUSINESS CUSTOMER DELIVERY - SOUTH BUSINESS CUSTOMER SERVICES PO BOX 399 PARRAMATTA NSW 2124	TEL: (02) 9616 2485 FAX: 1300 364 403
CUSTOMER:	KIM ROSS LANDFILL OPERATIONS MANAGER SITA AUSTRALIA NEW ILLAWARRA ROAD LUCAS HEIGHTS NSW 2234	TEL: (02) 8525 4100

APPENDIX 1 (Example)
SAMPLE ANALYSIS REPORT (COMPOSITE) DISCHARGE METER

Consent Number:	35034
Company Name:	SITA AUSTRALIA PTY LTD, SITA ENVIRONMENTAL SOLUTIONS
Company Address:	TIP NEW ILLAWARRA RD, BARDEN RIDGE NSW 2234

Sample Type:

☐ 6 (composite, manual time based)
☐ 7 (composite, manual flow proportional)
☐ 8 (composite, automatic time based)
☐ 9 (composite, automatic flow proportional)

Start date: ___/___/___
Finish date: ___/___/___
Start time: ____:____ am/pm
Finish time: ____:____ am/pm

grabs taken in sample period: _____
sample intervals min/kL _____
mL per grab: _____

Initial meter reading: _____kL
Final Meter reading: _____kL
Volume discharged: _____kL

Laboratory:

	Acceptance Standard	Measured Units
Substance	**Acceptance Standard (mg/L)**	**Measured Concentration(mg/L)**
AMMONIA (AS N)	100.000	
BIOCHEMICAL OXYGEN DEMAND		
SUSPENDED SOLIDS	600.000	
TOTAL DISSOLVED SOLIDS	10000.000	
BARIUM	5.000	
IRON	50.000	
ZINC	5.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ___/___/___
Designation: _____

OFFICE USE ONLY

TERRITORY: L3

Sample No: | | | | | |

EMAIL TO:
businesscustomers.labdata@sydneywater.com.au

APPENDIX 2
SAMPLE ANALYSIS REPORT (DISCRETE SAMPLE)

Consent Number:	35034
Company Name:	SITA AUSTRALIA PTY LTD, SITA ENVIRONMENTAL SOLUTIONS
Company Address:	TIP NEW ILLAWARRA RD, BARDEN RIDGE NSW 2234

Sample Type: DISCRETE
Date
Time

Laboratory:

Substance	Acceptance Standard (units or mg/L)	Measured Units or Concentration.
pH at start	7 - 10	
pH at finish	7 - 10	
NH3	100.000	

COPY OF ORIGINAL ANALYTICAL LABORATORY REPORT TO BE ATTACHED
NOTE: LABORATORY REPORT MUST CERTIFY NATA REGISTRATION FOR EACH ANALYSIS

Comments: _____

Customer Signature: _____ Date: ___/___/___
Designation: _____

OFFICE USE ONLY
TERRITORY: L3
Sample No: | | | | | |

EMAIL TO:
businesscustomers.labdata@sydneywater.com.au

Appendix C - Results of HELP modelling

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*******************************************************************************
*******************************************************************************
**                                                                           **
**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                    USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                           **
**                                                                           **
*******************************************************************************
*******************************************************************************


PRECIPITATION DATA FILE:    \LH2RAIN.D4
TEMPERATURE DATA FILE:      O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE:  O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA:    O:\LHDAILY.D11
SOIL AND DESIGN DATA FILE:  O:\LHWASTE.D10
OUTPUT DATA FILE:           O:\LHWASTE.OUT


TIME:   9: 8     DATE:  12/11/2014


*******************************************************************************

     TITLE:  LUCAS HEIGHTS BARE WASTE

*******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  18
          THICKNESS                    =    500.00   CM
          POROSITY                     =      0.6710 VOL/VOL
          FIELD CAPACITY               =      0.2920 VOL/VOL
          WILTING POINT                =      0.0770 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.2905 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC




                   GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                   ---------------------------------------

          NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                   SOIL DATA BASE USING SOIL TEXTURE #19 WITH BARE
                   GROUND CONDITIONS, A SURFACE SLOPE OF  1.% AND
                   A SLOPE LENGTH OF   50. METERS.
```

SCS RUNOFF CURVE NUMBER	=	80.10	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	15.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	1.155	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.065	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.155	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	145.269	CM
TOTAL INITIAL WATER	=	145.269	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Lucas Heights(ANSTO) NSW

STATION LATITUDE	=	-34.05 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	275
END OF GROWING SEASON (JULIAN DATE)	=	91
EVAPORATIVE ZONE DEPTH	=	15.0 CM
AVERAGE ANNUAL WIND SPEED	=	10.40 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.80 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.30 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	58.50 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	61.30 %

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW
WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW
WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
EVAPOTRANSPIRATION	86.32	65.05	28.98	62.14	44.95	49.50
	47.78	10.57	56.44	19.01	41.02	91.03

PERCOLATION/LEAKAGE THROUGH	22.867	13.156	16.889	77.106	194.138	107.512
LAYER 1	86.586	40.496	11.948	50.935	8.410	67.252

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	602.800	6028.004	45.84
PERC./LEAKAGE THROUGH LAYER 1	697.293701	6972.937	53.02
CHANGE IN WATER STORAGE	15.006	150.058	1.14
SOIL WATER AT START OF YEAR	1464.427	14644.271	
SOIL WATER AT END OF YEAR	1479.433	14794.329	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0003	-0.003	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
EVAPOTRANSPIRATION	43.43	62.59	43.86	59.73	28.97	46.11
	28.78	42.46	44.44	33.81	24.95	65.56
PERCOLATION/LEAKAGE THROUGH	10.105	132.789	129.806	38.859	30.983	50.345
LAYER 1	29.845	14.246	18.507	0.612	0.000	30.747

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT

PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	524.690	5246.900	51.69
PERC./LEAKAGE THROUGH LAYER 1	486.844940	4868.449	47.97
CHANGE IN WATER STORAGE	3.465	34.649	0.34
SOIL WATER AT START OF YEAR	1431.136	14311.358	
SOIL WATER AT END OF YEAR	1434.601	14346.008	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.002	0.00

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**   **
**   **
**   HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE   **
**   HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)   **
**   DEVELOPED BY ENVIRONMENTAL LABORATORY   **
**   USAE WATERWAYS EXPERIMENT STATION   **
**   FOR USEPA RISK REDUCTION ENGINEERING LABORATORY   **
**   **
**   **
****
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHDAILY.D11
SOIL AND DESIGN DATA FILE: O:\LHDAILY.D10
OUTPUT DATA FILE: O:\LHDAILY.OUT

TIME: 10: 6   DATE: 12/11/2014

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     TITLE: LUCAS HEIGHTS DAILY COVER

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     NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                              LAYER 1

               TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER 58
          THICKNESS   =   15.00   CM
          POROSITY   =   0.4000 VOL/VOL
          FIELD CAPACITY   =   0.3660 VOL/VOL
          WILTING POINT   =   0.2880 VOL/VOL
          INITIAL SOIL WATER CONTENT   =   0.2880 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   = 0.499999987000E-05 CM/SEC

                              LAYER 2

               TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER 18
          THICKNESS   =   500.00   CM
          POROSITY   =   0.6710 VOL/VOL
          FIELD CAPACITY   =   0.2920 VOL/VOL
          WILTING POINT   =   0.0770 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 1.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	96.80	
FRACTION OF AREA ALLOWING RUNOFF	=	50.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	15.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	4.320	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	6.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.320	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	150.320	CM
TOTAL INITIAL WATER	=	150.320	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	=	-34.05 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	275
END OF GROWING SEASON (JULIAN DATE)	=	91
EVAPORATIVE ZONE DEPTH	=	15.0 CM
AVERAGE ANNUAL WIND SPEED	=	10.40 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.80 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.30 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	58.50 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	61.30 %

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	13.42	18.98	1.74	139.55	40.30	5.59
	51.52	2.04	31.40	0.00	36.86	22.04
EVAPOTRANSPIRATION	59.84	31.10	31.96	53.74	28.49	37.31
	25.23	10.37	44.91	3.71	41.93	65.79
PERCOLATION/LEAKAGE THROUGH	35.062	18.233	20.891	52.075	115.024	89.407
LAYER 2	55.091	11.643	18.282	33.413	10.181	64.159

ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	363.437	3634.367	27.64
EVAPOTRANSPIRATION	434.385	4343.850	33.03
PERC./LEAKAGE THROUGH LAYER 2	523.462402	5234.624	39.80
CHANGE IN WATER STORAGE	-6.184	-61.840	-0.47
SOIL WATER AT START OF YEAR	1527.828	15278.283	
SOIL WATER AT END OF YEAR	1521.644	15216.443	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0005	-0.005	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	12.96	128.60	5.92	14.20	0.05	37.82
	10.48	2.56	9.80	3.68	6.63	22.03

EVAPOTRANSPIRATION	28.13	47.58	37.23	55.35	12.50	38.91
	22.78	17.20	33.58	26.61	15.30	28.35
PERCOLATION/LEAKAGE THROUGH	9.373	85.526	92.395	27.346	20.384	49.478
LAYER 2	10.668	18.934	22.695	10.699	8.150	40.463

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	254.717	2547.172	25.10
EVAPOTRANSPIRATION	363.526	3635.258	35.82
PERC./LEAKAGE THROUGH LAYER 2	396.111298	3961.113	39.03
CHANGE IN WATER STORAGE	0.646	6.458	0.06
SOIL WATER AT START OF YEAR	1502.590	15025.904	
SOIL WATER AT END OF YEAR	1503.236	15032.362	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.001	0.00

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**   **
**   **
**   HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE   **
**   HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)   **
**   DEVELOPED BY ENVIRONMENTAL LABORATORY   **
**   USAE WATERWAYS EXPERIMENT STATION   **
**   FOR USEPA RISK REDUCTION ENGINEERING LABORATORY   **
**   **
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHFIN.D11
SOIL AND DESIGN DATA FILE: O:\LHEXFINF.D10
OUTPUT DATA FILE: O:\LHEXFINF.OUT

TIME: 10: 6   DATE: 12/11/2014

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     TITLE: LUCAS HEIGHTS EXISTING FINAL CAP ON PLATFORM

****

     NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                              LAYER 1

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER 58
          THICKNESS   =   180.00   CM
          POROSITY   =   0.4000 VOL/VOL
          FIELD CAPACITY   =   0.3660 VOL/VOL
          WILTING POINT   =   0.2880 VOL/VOL
          INITIAL SOIL WATER CONTENT   =   0.3463 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   = 0.499999987000E-05 CM/SEC

                              LAYER 2

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER 18
          THICKNESS   =   500.00   CM
          POROSITY   =   0.6710 VOL/VOL
          FIELD CAPACITY   =   0.2920 VOL/VOL
          WILTING POINT   =   0.0770 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2939 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 300. METERS.

SCS RUNOFF CURVE NUMBER	=	89.60	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	50.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	14.400	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	20.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	14.400	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	209.273	CM
TOTAL INITIAL WATER	=	209.273	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 2.00	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 50.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	5.83	9.56	0.00	175.96	45.58	0.79
	56.76	0.00	25.43	0.00	30.62	8.56
EVAPOTRANSPIRATION	85.85	74.51	37.35	61.01	55.19	49.01
	58.74	11.79	54.88	30.00	41.17	92.32
PERCOLATION/LEAKAGE THROUGH	1.126	3.032	12.466	10.622	63.284	91.297
LAYER 2	21.144	21.150	5.625	23.198	4.232	37.492

ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	359.103	3591.027	27.31
EVAPOTRANSPIRATION	651.820	6518.198	49.56
PERC./LEAKAGE THROUGH LAYER 2	294.668121	2946.681	22.41
CHANGE IN WATER STORAGE	9.509	95.093	0.72
SOIL WATER AT START OF YEAR	2114.673	21146.730	
SOIL WATER AT END OF YEAR	2124.182	21241.824	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.004	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	6.27	163.79	0.84	8.74	0.00	37.65
	3.85	0.00	5.06	0.12	0.85	14.39

EVAPOTRANSPIRATION	52.85	69.56	49.83	58.89	40.95	46.19
	43.19	51.03	55.61	33.13	29.83	73.16
PERCOLATION/LEAKAGE THROUGH	6.946	17.987	89.838	3.204	22.464	19.655
LAYER 2	8.244	0.000	2.573	0.000	0.000	5.851

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	241.574	2415.736	23.80
EVAPOTRANSPIRATION	604.219	6042.194	59.53
PERC./LEAKAGE THROUGH LAYER 2	176.761139	1767.611	17.41
CHANGE IN WATER STORAGE	-7.554	-75.540	-0.74
SOIL WATER AT START OF YEAR	2094.615	20946.152	
SOIL WATER AT END OF YEAR	2087.061	20870.611	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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**   HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE   **
**   HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)   **
**   DEVELOPED BY ENVIRONMENTAL LABORATORY   **
**   USAE WATERWAYS EXPERIMENT STATION   **
**   FOR USEPA RISK REDUCTION ENGINEERING LABORATORY   **
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHFIN.D11
SOIL AND DESIGN DATA FILE: O:\LHEXFINS.D10
OUTPUT DATA FILE: O:\LHEXFINS.OUT

TIME: 10: 6   DATE: 12/11/2014

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TITLE: LUCAS HEIGHTS EXISTING FINAL CAP ON BATTERS

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
       COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	=	180.00	CM
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3660	VOL/VOL
WILTING POINT	=	0.2880	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3463	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-05	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	500.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 10.% AND A SLOPE LENGTH OF 150. METERS.

SCS RUNOFF CURVE NUMBER	=	90.30	
FRACTION OF AREA ALLOWING RUNOFF	=	90.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	50.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	14.421	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	20.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	14.400	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	208.320	CM
TOTAL INITIAL WATER	=	208.320	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	=	-34.05 DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	275
END OF GROWING SEASON (JULIAN DATE)	=	91
EVAPORATIVE ZONE DEPTH	=	50.0 CM
AVERAGE ANNUAL WIND SPEED	=	10.40 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.80 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.30 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	58.50 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	61.30 %

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	6.47	12.00	0.00	208.85	54.99	0.93
	69.24	0.02	32.71	0.00	38.95	11.60
EVAPOTRANSPIRATION	85.86	73.64	38.98	59.35	55.26	49.02
	58.75	11.70	54.88	30.25	41.18	92.33
PERCOLATION/LEAKAGE THROUGH	1.223	3.359	10.211	10.652	48.100	66.431
LAYER 2	19.747	7.467	2.799	19.008	0.982	33.587

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	435.760	4357.605	33.14
EVAPOTRANSPIRATION	651.205	6512.051	49.52
PERC./LEAKAGE THROUGH LAYER 2	223.566681	2235.667	17.00
CHANGE IN WATER STORAGE	4.568	45.676	0.35
SOIL WATER AT START OF YEAR	2114.867	21148.672	
SOIL WATER AT END OF YEAR	2119.435	21194.348	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0002	-0.002	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	8.31	200.32	1.28	11.48	0.00	46.92
	5.20	0.02	7.42	0.25	1.34	18.55

EVAPOTRANSPIRATION	52.59	69.55	49.42	58.80	40.98	46.19
	43.17	49.77	53.72	34.69	29.87	72.86
PERCOLATION/LEAKAGE THROUGH	2.948	12.611	59.559	0.617	19.474	14.493
LAYER 2	4.416	0.000	0.598	0.000	0.000	3.161

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	301.087	3010.875	29.66
EVAPOTRANSPIRATION	601.612	6016.124	59.27
PERC./LEAKAGE THROUGH LAYER 2	117.877647	1178.776	11.61
CHANGE IN WATER STORAGE	-5.577	-55.774	-0.55
SOIL WATER AT START OF YEAR	2090.723	20907.230	
SOIL WATER AT END OF YEAR	2085.146	20851.457	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHSTRIP.D11
SOIL AND DESIGN DATA FILE: O:\LHEXSTRP.D10
OUTPUT DATA FILE: O:\LHEXSTRP.OUT

TIME: 10: 7 DATE: 12/11/2014

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TITLE: LUCAS HEIGHTS EXISTING FINAL CAP STRIPPED

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	=	30.00	CM
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3660	VOL/VOL
WILTING POINT	=	0.2880	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2880	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-05	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	500.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2919 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 300. METERS.

SCS RUNOFF CURVE NUMBER	=	96.60	
FRACTION OF AREA ALLOWING RUNOFF	=	75.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	30.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	8.640	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	8.640	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	154.579	CM
TOTAL INITIAL WATER	=	154.579	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 0.00	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 30.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	20.36	30.61	2.51	223.57	60.80	7.49
	75.97	2.21	47.98	0.00	60.59	32.26
EVAPOTRANSPIRATION	79.12	46.52	27.58	62.13	41.88	49.16
	37.91	9.10	56.32	11.10	39.37	87.37
PERCOLATION/LEAKAGE THROUGH	9.299	10.305	0.608	34.655	80.109	13.283
LAYER 2	22.139	0.000	11.522	11.281	9.368	24.761

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	564.359	5643.585	42.91
EVAPOTRANSPIRATION	547.564	5475.645	41.64
PERC./LEAKAGE THROUGH LAYER 2	227.332611	2273.326	17.29
CHANGE IN WATER STORAGE	-24.155	-241.553	-1.84
SOIL WATER AT START OF YEAR	1575.618	15756.178	
SOIL WATER AT END OF YEAR	1551.462	15514.624	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0008	-0.008	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	20.25	200.48	9.37	23.35	0.04	58.85
	15.32	3.11	15.55	5.70	9.50	30.89
EVAPOTRANSPIRATION	39.00	58.49	39.46	58.58	24.50	45.89

	26.87	28.94	45.97	29.77	23.77	50.01
PERCOLATION/LEAKAGE THROUGH	6.848	42.219	39.076	7.574	8.371	23.918
LAYER 2	1.178	1.047	7.809	0.000	0.000	13.040

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	392.423	3924.233	38.66
EVAPOTRANSPIRATION	471.239	4712.389	46.43
PERC./LEAKAGE THROUGH LAYER 2	151.080963	1510.810	14.88
CHANGE IN WATER STORAGE	0.257	2.568	0.03
SOIL WATER AT START OF YEAR	1546.277	15462.769	
SOIL WATER AT END OF YEAR	1546.534	15465.336	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.002	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHSTRIP.D11
SOIL AND DESIGN DATA FILE: O:\LHINTF.D10
OUTPUT DATA FILE: O:\LHINTF.OUT

TIME: 10: 7 DATE: 12/11/2014

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TITLE: LUCAS HEIGHTS INTERMEDIATE COVER ON PLATFORM

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	=	30.00	CM
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3660	VOL/VOL
WILTING POINT	=	0.2880	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-05	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	500.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2919 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	97.00	
FRACTION OF AREA ALLOWING RUNOFF	=	90.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	30.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	8.760	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	8.640	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	154.698	CM
TOTAL INITIAL WATER	=	154.698	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	=	-34.05 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	275
END OF GROWING SEASON (JULIAN DATE)	=	91
EVAPORATIVE ZONE DEPTH	=	30.0 CM
AVERAGE ANNUAL WIND SPEED	=	10.40 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.80 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.30 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	58.50 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	61.30 %

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	27.20	39.52	4.01	277.69	74.79	9.88
	92.40	3.29	64.49	0.00	77.76	42.43
EVAPOTRANSPIRATION	67.55	44.32	26.43	60.74	41.72	47.83
	36.09	8.20	44.06	10.49	29.12	82.41
PERCOLATION/LEAKAGE THROUGH	4.066	7.386	0.000	31.152	29.380	0.000
LAYER 2	7.676	0.000	13.046	5.239	10.042	11.463

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	713.468	7134.678	54.25
EVAPOTRANSPIRATION	498.970	4989.703	37.94
PERC./LEAKAGE THROUGH LAYER 2	119.450943	1194.509	9.08
CHANGE IN WATER STORAGE	-16.789	-167.892	-1.28
SOIL WATER AT START OF YEAR	1568.833	15688.328	
SOIL WATER AT END OF YEAR	1552.044	15520.437	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0002	-0.002	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	25.54	245.63	13.80	29.90	0.12	72.32
	20.18	4.47	24.17	7.21	13.50	38.47

EVAPOTRANSPIRATION	35.19	58.76	33.87	57.92	24.10	46.10
	25.71	27.00	38.46	31.48	18.91	48.57
PERCOLATION/LEAKAGE THROUGH	1.873	38.509	1.967	8.051	2.608	10.499
LAYER 2	0.000	0.000	5.067	0.000	0.000	4.878

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	495.306	4953.064	48.80
EVAPOTRANSPIRATION	446.078	4460.778	43.95
PERC./LEAKAGE THROUGH LAYER 2	73.451508	734.515	7.24
CHANGE IN WATER STORAGE	0.164	1.643	0.02
SOIL WATER AT START OF YEAR	1546.581	15465.808	
SOIL WATER AT END OF YEAR	1546.745	15467.451	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHSTRIP.D11
SOIL AND DESIGN DATA FILE: O:\LHINTS.D10
OUTPUT DATA FILE: O:\LHINTS.OUT

TIME: 10: 7 DATE: 12/11/2014

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TITLE: LUCAS HEIGHTS INTERMEDIATE COVER ON SLOPES

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	=	30.00	CM
POROSITY	=	0.4000	VOL/VOL
FIELD CAPACITY	=	0.3660	VOL/VOL
WILTING POINT	=	0.2880	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3017	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-05	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	500.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.2919 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #27 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 33.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	97.10	
FRACTION OF AREA ALLOWING RUNOFF	=	95.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	30.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	9.050	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	12.000	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	8.640	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	154.989	CM
TOTAL INITIAL WATER	=	154.989	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 0.00	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 30.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	29.22	41.90	4.59	292.51	79.45	10.34
	98.07	3.68	70.29	0.00	83.63	46.84
EVAPOTRANSPIRATION	67.64	43.32	26.49	60.26	41.77	46.17
	36.13	7.88	42.08	10.27	28.98	73.33
PERCOLATION/LEAKAGE THROUGH	1.538	4.203	0.000	29.835	13.835	0.000
LAYER 2	1.499	0.000	13.852	0.623	13.247	6.467

ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	760.500	7605.004	57.83
EVAPOTRANSPIRATION	484.338	4843.378	36.83
PERC./LEAKAGE THROUGH LAYER 2	85.097565	850.976	6.47
CHANGE IN WATER STORAGE	-14.836	-148.358	-1.13
SOIL WATER AT START OF YEAR	1567.934	15679.338	
SOIL WATER AT END OF YEAR	1553.098	15530.980	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.004	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	26.13	259.90	14.65	31.37	0.16	76.73
	22.09	4.96	25.39	8.60	14.69	40.83

EVAPOTRANSPIRATION	41.38	57.45	34.83	57.74	24.29	44.79
	24.89	25.88	38.27	28.36	20.48	48.44
PERCOLATION/LEAKAGE THROUGH	0.000	25.931	0.608	7.044	0.000	7.684
LAYER 2	0.000	0.000	3.766	0.000	0.000	1.325

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	525.498	5254.981	51.77
EVAPOTRANSPIRATION	446.806	4468.061	44.02
PERC./LEAKAGE THROUGH LAYER 2	46.358997	463.590	4.57
CHANGE IN WATER STORAGE	-3.663	-36.631	-0.36
SOIL WATER AT START OF YEAR	1550.411	15504.111	
SOIL WATER AT END OF YEAR	1546.748	15467.480	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.001	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHFIN2.D11
SOIL AND DESIGN DATA FILE: O:\LHFINF.D10
OUTPUT DATA FILE: O:\LHFINF.OUT

TIME: 17:43 DATE: 9/14/2015

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TITLE: LUCAS HEIGHTS NEW CAP ON PLATFORM

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 54

THICKNESS	=	10.00	CM
POROSITY	=	0.6500	VOL/VOL
FIELD CAPACITY	=	0.4300	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2279	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999989000E-02	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 59

THICKNESS	=	25.00	CM
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4100	VOL/VOL
WILTING POINT	=	0.3600	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.3964 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 57

THICKNESS	= 50.00	CM
POROSITY	= 0.4270	VOL/VOL
FIELD CAPACITY	= 0.4100	VOL/VOL
WILTING POINT	= 0.3600	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.999999997000E-06	CM/SEC

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	= 60.00	CM
POROSITY	= 0.4270	VOL/VOL
FIELD CAPACITY	= 0.4180	VOL/VOL
WILTING POINT	= 0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.100000001000E-06	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	= 30.00	CM
POROSITY	= 0.4000	VOL/VOL
FIELD CAPACITY	= 0.3660	VOL/VOL
WILTING POINT	= 0.2880	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.3660	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.499999987000E-05	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	= 500.00	CM
POROSITY	= 0.6710	VOL/VOL
FIELD CAPACITY	= 0.2920	VOL/VOL
WILTING POINT	= 0.0770	VOL/VOL
INITIAL SOIL WATER CONTENT	= 0.2919	VOL/VOL
EFFECTIVE SAT. HYD. COND.	= 0.100000005000E-02	CM/SEC

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #22 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	87.50	
FRACTION OF AREA ALLOWING RUNOFF	=	90.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	35.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	12.189	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	17.175	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	11.100	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	216.099	CM
TOTAL INITIAL WATER	=	216.099	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	=	-34.05	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.50	
START OF GROWING SEASON (JULIAN DATE)	=	275	
END OF GROWING SEASON (JULIAN DATE)	=	91	
EVAPORATIVE ZONE DEPTH	=	35.0	CM
AVERAGE ANNUAL WIND SPEED	=	10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW

WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6
	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	4.02	3.11	0.00	284.20	67.78	3.92
	87.73	0.00	30.55	0.00	44.68	29.11
EVAPOTRANSPIRATION	87.83	75.05	49.73	59.65	54.02	47.56
	57.93	24.46	56.16	42.88	41.54	92.54
PERCOLATION/LEAKAGE THROUGH	5.855	5.208	4.618	5.876	6.087	6.055
LAYER 4	6.047	4.951	5.388	5.108	5.048	6.251
PERCOLATION/LEAKAGE THROUGH	5.761	5.915	4.386	5.840	6.613	6.100
LAYER 6	5.313	5.423	4.922	5.534	5.189	5.534

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	71.158	64.718	43.449	76.031	76.356	80.164
TOP OF LAYER 4	75.473	50.913	64.720	54.432	56.850	80.036
STD. DEVIATION OF DAILY	6.266	13.115	8.038	16.824	7.520	2.374
HEAD ON TOP OF LAYER 4	7.423	3.857	16.221	11.768	25.262	2.868

ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	555.092	5550.920	42.21
EVAPOTRANSPIRATION	689.336	6893.359	52.42
PERC./LEAKAGE THROUGH LAYER 4	66.492462	664.925	5.06
AVG. HEAD ON TOP OF LAYER 4	661.9160		
PERC./LEAKAGE THROUGH LAYER 6	66.530891	665.309	5.06
CHANGE IN WATER STORAGE	4.141	41.410	0.31
SOIL WATER AT START OF YEAR	2184.773	21847.727	
SOIL WATER AT END OF YEAR	2188.914	21889.137	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0003	-0.003	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	0.14	252.82	0.00	11.13	0.00	54.65
	1.32	0.00	1.87	0.00	0.00	9.66
EVAPOTRANSPIRATION	64.62	69.71	58.44	57.66	42.68	46.10
	47.99	52.54	58.24	34.39	22.41	74.66
PERCOLATION/LEAKAGE THROUGH	5.225	5.765	5.320	5.733	5.672	5.970
LAYER 4	5.561	5.349	5.252	4.533	4.322	5.477
PERCOLATION/LEAKAGE THROUGH	5.636	4.982	5.801	6.768	5.318	5.948
LAYER 6	4.436	6.419	4.634	6.616	2.994	4.985

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	57.046	78.059	59.180	72.699	67.056	78.195
TOP OF LAYER 4	64.585	59.838	61.587	41.537	40.047	62.701
STD. DEVIATION OF DAILY	12.179	6.648	10.205	8.995	7.921	9.437
HEAD ON TOP OF LAYER 4	7.261	9.990	11.521	8.608	5.431	9.584

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	331.614	3316.144	32.67
EVAPOTRANSPIRATION	629.454	6294.541	62.02
PERC./LEAKAGE THROUGH LAYER 4	64.179527	641.795	6.32
AVG. HEAD ON TOP OF LAYER 4	618.7767		
PERC./LEAKAGE THROUGH LAYER 6	64.534828	645.348	6.36
CHANGE IN WATER STORAGE	-10.603	-106.034	-1.04
SOIL WATER AT START OF YEAR	2167.499	21674.992	
SOIL WATER AT END OF YEAR	2156.896	21568.959	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.002	0.00

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    \LH2RAIN.D4
TEMPERATURE DATA FILE:      O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE:  O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA:    O:\LHFIN2.D11
SOIL AND DESIGN DATA FILE:  O:\LHFINS.D10
OUTPUT DATA FILE:           O:\LHFINS.OUT


TIME:  17:38     DATE:   9/14/2015


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     TITLE:  LUCAS HEIGHTS NEW CAP ON SLOPES

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
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                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  54
           THICKNESS                   =    10.00   CM
           POROSITY                    =     0.6500 VOL/VOL
           FIELD CAPACITY              =     0.4300 VOL/VOL
           WILTING POINT               =     0.2100 VOL/VOL
           INITIAL SOIL WATER CONTENT  =     0.2351 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.499999989000E-02 CM/SEC


                                  LAYER  2
                                  --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  59
           THICKNESS                   =    25.00   CM
           POROSITY                    =     0.4270 VOL/VOL
           FIELD CAPACITY              =     0.4100 VOL/VOL
           WILTING POINT               =     0.3600 VOL/VOL
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INITIAL SOIL WATER CONTENT = 0.3919 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 57

THICKNESS = 50.00 CM
POROSITY = 0.4270 VOL/VOL
FIELD CAPACITY = 0.4100 VOL/VOL
WILTING POINT = 0.3600 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS = 60.00 CM
POROSITY = 0.4270 VOL/VOL
FIELD CAPACITY = 0.4180 VOL/VOL
WILTING POINT = 0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000001000E-06 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS = 30.00 CM
POROSITY = 0.4000 VOL/VOL
FIELD CAPACITY = 0.3660 VOL/VOL
WILTING POINT = 0.2880 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3660 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.499999987000E-05 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS = 500.00 CM
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #22 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 17.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	87.90	
FRACTION OF AREA ALLOWING RUNOFF	=	95.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	35.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	12.148	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	17.175	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	11.100	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	216.076	CM
TOTAL INITIAL WATER	=	216.076	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 3.50	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 35.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6

	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	4.47	3.59	0.00	285.24	68.22	3.93
	88.13	0.00	31.12	0.00	44.49	28.98
EVAPOTRANSPIRATION	87.87	73.12	48.73	59.32	53.95	47.52
	57.90	23.00	56.10	43.38	41.56	92.54
PERCOLATION/LEAKAGE THROUGH	5.765	5.164	4.679	5.878	6.090	6.042
LAYER 4	6.016	4.887	5.420	5.066	4.969	6.249
PERCOLATION/LEAKAGE THROUGH	3.930	5.083	4.557	6.122	6.519	5.584
LAYER 6	5.744	5.008	6.927	4.357	4.813	5.606

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	69.148	63.664	44.827	76.058	76.419	79.869
TOP OF LAYER 4	74.762	49.484	65.462	53.498	55.031	79.991
STD. DEVIATION OF DAILY	6.405	13.771	7.479	16.369	7.097	2.357
HEAD ON TOP OF LAYER 4	7.747	4.968	15.520	12.335	26.742	2.879

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	558.163	5581.625	42.44
EVAPOTRANSPIRATION	684.972	6849.717	52.09
PERC./LEAKAGE THROUGH LAYER 4	66.225853	662.258	5.04
AVG. HEAD ON TOP OF LAYER 4	656.8456		
PERC./LEAKAGE THROUGH LAYER 6	64.249680	642.497	4.89
CHANGE IN WATER STORAGE	7.716	77.164	0.59
SOIL WATER AT START OF YEAR	2180.650	21806.498	
SOIL WATER AT END OF YEAR	2188.366	21883.662	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0007	-0.007	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	0.22	253.18	0.00	10.81	0.00	55.23
	1.57	0.00	2.22	0.00	0.00	10.82
EVAPOTRANSPIRATION	64.00	69.71	58.44	57.66	42.68	46.04
	46.89	53.48	56.95	34.55	22.43	74.67
PERCOLATION/LEAKAGE THROUGH LAYER 4	5.227	5.761	5.323	5.793	5.665	5.961
	5.521	5.354	5.257	4.553	4.336	5.444
PERCOLATION/LEAKAGE THROUGH LAYER 6	5.865	4.948	7.268	3.849	5.109	5.943
	6.357	6.142	4.855	5.398	3.622	5.100

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	57.092	77.953	59.251	74.111	66.908	77.983
	63.679	59.940	61.683	42.004	40.365	61.953
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	12.097	6.621	9.984	7.196	7.904	9.368
	7.001	10.073	11.683	8.485	5.398	9.838

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ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	334.045	3340.447	32.91
EVAPOTRANSPIRATION	627.511	6275.115	61.82
PERC./LEAKAGE THROUGH LAYER 4	64.194885	641.949	6.32
AVG. HEAD ON TOP OF LAYER 4	619.1011		
PERC./LEAKAGE THROUGH LAYER 6	64.455643	644.556	6.35
CHANGE IN WATER STORAGE	-11.012	-110.115	-1.08
SOIL WATER AT START OF YEAR	2166.537	21665.367	
SOIL WATER AT END OF YEAR	2155.525	21555.252	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.001	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHCLOSE.D11
SOIL AND DESIGN DATA FILE: O:\LHCLOSEF.D10
OUTPUT DATA FILE: O:\LHCLOSEF.OUT

TIME: 17:44 DATE: 9/14/2015

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TITLE: LUCAS HEIGHTS NEW CAP ON PLATFORM POST CLOSURE

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 54

THICKNESS	=	10.00	CM
POROSITY	=	0.6500	VOL/VOL
FIELD CAPACITY	=	0.4300	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2630	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999989000E-02	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 59

THICKNESS	=	40.00	CM
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4100	VOL/VOL
WILTING POINT	=	0.3600	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.3755 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 57

THICKNESS	=	50.00 CM
POROSITY	=	0.4270 VOL/VOL
FIELD CAPACITY	=	0.4100 VOL/VOL
WILTING POINT	=	0.3600 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4260 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999997000E-06 CM/SEC

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	60.00 CM
POROSITY	=	0.4270 VOL/VOL
FIELD CAPACITY	=	0.4180 VOL/VOL
WILTING POINT	=	0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS	=	30.00 CM
POROSITY	=	0.4000 VOL/VOL
FIELD CAPACITY	=	0.3660 VOL/VOL
WILTING POINT	=	0.2880 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3660 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-05 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS	=	500.00 CM
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #22 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	90.70	
FRACTION OF AREA ALLOWING RUNOFF	=	90.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	100.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	38.951	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	44.930	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	34.500	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	221.539	CM
TOTAL INITIAL WATER	=	221.539	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 5.00	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 100.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6

	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	9.07	7.43	0.00	268.09	75.83	8.92
	79.87	0.02	36.83	0.00	40.54	29.71
EVAPOTRANSPIRATION	87.68	69.14	52.04	56.68	51.83	45.94
	56.49	23.18	55.63	43.01	48.11	92.54
PERCOLATION/LEAKAGE THROUGH	5.447	4.797	3.939	6.250	6.600	6.287
LAYER 4	6.341	4.935	5.948	5.006	5.019	6.545
PERCOLATION/LEAKAGE THROUGH	6.065	3.793	5.444	5.360	6.794	5.549
LAYER 6	6.540	5.118	5.842	4.743	5.783	5.928

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	62.020	54.872	28.241	84.669	87.859	85.540
TOP OF LAYER 4	82.048	50.563	77.696	52.135	56.181	86.618
STD. DEVIATION OF DAILY	7.040	15.372	9.926	28.679	10.399	7.727
HEAD ON TOP OF LAYER 4	14.353	4.335	14.551	14.227	32.590	7.161

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	556.311	5563.110	42.30
EVAPOTRANSPIRATION	682.266	6822.662	51.88
PERC./LEAKAGE THROUGH LAYER 4	67.114578	671.146	5.10
AVG. HEAD ON TOP OF LAYER 4	673.7019		
PERC./LEAKAGE THROUGH LAYER 6	66.958214	669.582	5.09
CHANGE IN WATER STORAGE	9.565	95.645	0.73
SOIL WATER AT START OF YEAR	2233.888	22338.881	
SOIL WATER AT END OF YEAR	2243.453	22434.525	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.004	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	1.86	243.71	1.34	12.50	0.00	50.54
	7.04	0.51	6.88	0.00	0.34	17.12
EVAPOTRANSPIRATION	64.91	69.71	58.94	55.40	45.09	45.39
	45.06	47.64	52.54	39.87	38.79	67.07
PERCOLATION/LEAKAGE THROUGH LAYER 4	5.003	6.042	5.647	5.923	5.857	6.446
	5.913	5.608	5.275	4.531	4.049	4.044
PERCOLATION/LEAKAGE THROUGH LAYER 6	5.522	6.154	7.039	4.166	5.996	6.152
	7.689	4.253	5.753	7.200	2.287	3.063

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
AVERAGE DAILY HEAD ON TOP OF LAYER 4	52.069	84.682	66.499	77.117	71.207	89.218
	72.467	65.618	62.098	41.492	33.733	30.587
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	15.169	15.945	13.200	13.926	10.063	13.135
	7.399	9.924	13.219	7.118	8.403	13.206

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	341.834	3418.341	33.68
EVAPOTRANSPIRATION	630.418	6304.182	62.11
PERC./LEAKAGE THROUGH LAYER 4	64.336777	643.368	6.34
AVG. HEAD ON TOP OF LAYER 4	622.3222		
PERC./LEAKAGE THROUGH LAYER 6	65.272888	652.729	6.43
CHANGE IN WATER STORAGE	-22.525	-225.248	-2.22
SOIL WATER AT START OF YEAR	2221.259	22212.590	
SOIL WATER AT END OF YEAR	2198.734	21987.342	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0002	-0.002	0.00

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
** DEVELOPED BY ENVIRONMENTAL LABORATORY
** USAE WATERWAYS EXPERIMENT STATION
** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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PRECIPITATION DATA FILE: \LH2RAIN.D4
TEMPERATURE DATA FILE: O:\LH2TEMP.D7
SOLAR RADIATION DATA FILE: O:\LH2EVAP.D13
EVAPOTRANSPIRATION DATA: O:\LHCLOSE.D11
SOIL AND DESIGN DATA FILE: O:\LHCLOSES.D10
OUTPUT DATA FILE: O:\LHCLOSES.OUT

TIME: 17:44 DATE: 9/14/2015

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TITLE: LUCAS HEIGHTS NEW CAP ON SLOPES POST CLOSURE

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 54

THICKNESS	=	10.00	CM
POROSITY	=	0.6500	VOL/VOL
FIELD CAPACITY	=	0.4300	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2620	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999989000E-02	CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 59

THICKNESS	=	40.00	CM
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4100	VOL/VOL
WILTING POINT	=	0.3600	VOL/VOL

INITIAL SOIL WATER CONTENT = 0.3662 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 57

THICKNESS = 50.00 CM
POROSITY = 0.4270 VOL/VOL
FIELD CAPACITY = 0.4100 VOL/VOL
WILTING POINT = 0.3600 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4249 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS = 60.00 CM
POROSITY = 0.4270 VOL/VOL
FIELD CAPACITY = 0.4180 VOL/VOL
WILTING POINT = 0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000001000E-06 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 58

THICKNESS = 30.00 CM
POROSITY = 0.4000 VOL/VOL
FIELD CAPACITY = 0.3660 VOL/VOL
WILTING POINT = 0.2880 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3660 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.499999987000E-05 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 18

THICKNESS = 500.00 CM
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2919 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #22 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 17.% AND A SLOPE LENGTH OF 50. METERS.

SCS RUNOFF CURVE NUMBER	=	91.00	
FRACTION OF AREA ALLOWING RUNOFF	=	95.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.0000	HECTARES
EVAPORATIVE ZONE DEPTH	=	100.0	CM
INITIAL WATER IN EVAPORATIVE ZONE	=	38.512	CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	44.930	CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	34.500	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	221.059	CM
TOTAL INITIAL WATER	=	221.059	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM Lucas Heights(ANSTO) NSW

STATION LATITUDE	= -34.05	DEGREES
MAXIMUM LEAF AREA INDEX	= 5.00	
START OF GROWING SEASON (JULIAN DATE)	= 275	
END OF GROWING SEASON (JULIAN DATE)	= 91	
EVAPORATIVE ZONE DEPTH	= 100.0	CM
AVERAGE ANNUAL WIND SPEED	= 10.40	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 67.80	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 65.30	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 58.50	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 61.30	%

NOTE: PRECIPITATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA FOR Lucas Heights (ANSTO) NSW WAS ENTERED BY THE USER.

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MONTHLY TOTALS (MM) FOR YEAR 1988

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	83.7	83.3	47.4	397.6	114.4	44.6

	135.8	27.3	121.6	0.0	146.5	112.9
RUNOFF	9.90	8.18	0.00	268.73	76.73	9.06
	80.44	0.03	37.05	0.00	41.42	30.12
EVAPOTRANSPIRATION	87.93	67.63	50.22	56.56	51.78	46.02
	56.39	23.17	55.65	43.02	46.78	92.54
PERCOLATION/LEAKAGE THROUGH	5.135	4.644	4.008	6.232	6.577	6.221
LAYER 4	6.253	4.852	5.859	4.962	4.979	6.484
PERCOLATION/LEAKAGE THROUGH	4.729	3.692	4.913	5.458	6.948	6.768
LAYER 6	6.007	5.267	5.037	5.513	4.383	6.374

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	55.027	51.209	29.783	84.271	87.345	84.007
TOP OF LAYER 4	80.082	48.702	75.617	51.164	55.262	85.246
STD. DEVIATION OF DAILY	9.034	16.914	10.138	28.046	10.536	8.278
HEAD ON TOP OF LAYER 4	14.908	3.444	15.587	13.746	32.077	7.142

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ANNUAL TOTALS FOR YEAR 1988

	MM	CU. METERS	PERCENT
PRECIPITATION	1315.10	13150.995	100.00
RUNOFF	561.662	5616.620	42.71
EVAPOTRANSPIRATION	677.681	6776.807	51.53
PERC./LEAKAGE THROUGH LAYER 4	66.206947	662.070	5.03
AVG. HEAD ON TOP OF LAYER 4	656.4289		
PERC./LEAKAGE THROUGH LAYER 6	65.087883	650.879	4.95
CHANGE IN WATER STORAGE	10.670	106.695	0.81
SOIL WATER AT START OF YEAR	2231.001	22310.008	
SOIL WATER AT END OF YEAR	2241.670	22416.703	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0005	-0.005	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.0	355.0	55.5	92.3	13.1	128.9
	60.8	29.0	51.9	45.7	49.0	67.8
RUNOFF	2.16	242.23	1.50	12.51	0.00	50.95
	6.64	0.58	6.97	0.01	0.44	18.62
EVAPOTRANSPIRATION	64.72	69.71	58.97	55.46	45.02	45.42
	46.27	48.00	52.28	39.87	37.12	64.65
PERCOLATION/LEAKAGE THROUGH	4.875	5.985	5.590	5.852	5.828	6.407
LAYER 4	5.774	5.578	5.251	4.349	3.991	4.038
PERCOLATION/LEAKAGE THROUGH	5.249	5.740	5.635	5.581	6.202	6.532
LAYER 6	5.243	5.535	5.365	6.244	1.810	4.821

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	49.200	83.316	65.219	75.468	70.559	88.320
TOP OF LAYER 4	69.355	64.960	61.557	37.425	32.375	30.465
STD. DEVIATION OF DAILY	15.099	16.768	13.817	14.776	9.710	12.936
HEAD ON TOP OF LAYER 4	8.769	13.578	12.137	7.320	8.175	13.718

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	1015.00	10150.001	100.00
RUNOFF	342.627	3426.270	33.76
EVAPOTRANSPIRATION	627.486	6274.863	61.82
PERC./LEAKAGE THROUGH LAYER 4	63.518391	635.184	6.26
AVG. HEAD ON TOP OF LAYER 4	606.8513		
PERC./LEAKAGE THROUGH LAYER 6	63.957226	639.572	6.30
CHANGE IN WATER STORAGE	-19.071	-190.705	-1.88
SOIL WATER AT START OF YEAR	2218.823	22188.225	
SOIL WATER AT END OF YEAR	2199.752	21997.520	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.002	0.00

Appendix D – Water balance model

Lucas Heights WMF - 50% AEP year

50% AEP year (2008) for existing cover scenario

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	-	m2
Intermediate cover 5%	431,602	m2
Intermediate cover slopes	90,379	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	270	m3/day
Harringtons quarry	15	m3/day
Groundwater collection system	10	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	570	kL/d
Assumed leachate disposal rate (kL/day	800	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8	1015		100%
Rainfall Days		13	21	10	17	5	16	13	8	11	13	11	9			
Pan Evaporation																
Evaporation (from BOM)	(mm)	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6	1319		130%
Pan evaporation	(mm)	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7	1083		107%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0	255	2547	25%
Existing cap 2%		6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4	242	100636	24%
Existing cap 10%		8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6	301	10884	30%
Stripped cap		20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9	392	0	39%
Intermediate cover 5%		25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5	495	213777	49%
Intermediate cover slopes		26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8	526	47494	52%
New final cap 5%		0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7	332	0	33%
New final cap slopes		0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8	334	0	33%
Post closure cap 5%		1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1	342	0	34%
Post closure cap slopes		2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6	343	0	34%
Total Runoff	(m3/month)	**16,427**	**206,267**	**7,736**	**19,938**	**67**	**55,908**	**12,603**	**2,404**	**15,201**	**3,985**	**7,623**	**27,180**		**375,338**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6	525	1312	52%
Daily cover		28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4	364	3635	36%
Existing cap 2%		52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2	604	251723	60%
Existing cap 10%		52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9	602	21746	59%
Stripped cap		39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0	471	0	46%
Intermediate cover 5%		35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6	446	192525	44%
Intermediate cover slopes		41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4	447	40381	44%
New final cap 5%		64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7	629	0	62%
New final cap slopes		64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7	628	0	62%
Post closure cap 5%		64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1	630	0	62%
Post closure cap slopes		64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7	627	0	62%
Total Evapotranspiration	(m3/month)	**43,237**	**62,679**	**40,794**	**57,579**	**31,336**	**45,362**	**33,200**	**37,329**	**45,615**	**31,557**	**23,735**	**58,901**		**511,322**	
Leachate - Calculated using HELP (mm)																
Tip face		10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7	487	1217	48%
Daily cover		9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5	396	3961	39%
Existing cap 2%		6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9	177	73640	17%
Existing cap 10%		2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2	118	4261	12%
Stripped cap		6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0	151	0	15%
Intermediate cover 5%		1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9	73	31702	7%
Intermediate cover slopes		0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3	46	4190	5%
New final cap 5%		5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0	65	0	6%
New final cap slopes		5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1	64	0	6%
Post closure cap 5%		5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1	65	0	6%
Post closure cap slopes		5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8	64	0	6%
Total Leachate Collected	(m3/month)	**3,928**	**28,101**	**41,732**	**5,839**	**11,470**	**14,559**	**3,775**	**225**	**3,894**	**109**	**82**	**5,258**		**118,971**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370		98,550	
Harringtons quarry		465	420	465	450	465	450	465	465	450	465	450	465		5,475	
Leachate containment pond																
Rainfall into Pond	(m3)	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937		14,027	
Evaporation From Pond	(m3)	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173		8,666	
Net Leachate Generation	(m3)	**12,617**	**40,213**	**50,469**	**15,123**	**20,110**	**24,589**	**13,075**	**8,967**	**12,389**	**8,641**	**8,309**	**13,857**		**228,358**	
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**		**208,050**	
Required containment		**1,947**	**26,200**	**58,999**	**57,022**	**59,462**	**66,951**	**62,356**	**53,653**	**48,941**	**39,912**	**31,121**	**27,308**			
Operational containment volume	(m3)	**1,947**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**			
Operational containment volume	(%)	**11%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Emergency containment volume	(m3)	**0**	**8,700**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**			
Emergency containment volume	(%)	**0%**	**94%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Remaining leachate	(m3)	**0**	**0**	**32,269**	**30,292**	**32,732**	**40,221**	**35,626**	**26,923**	**22,211**	**13,182**	**4,391**	**578**			
Leachate level fluctuation	m	**-**	**-**	**3.25**	**3.25**	**3.25**	**3.75**	**3.50**	**3.00**	**2.75**	**2.25**	**1.25**	**0.50**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	4,498	26,570	3,840	6,773	833	9,670	4,473	2,015	3,607	3,067	3,289	4,579			
Groundwater collection system	(m3)	310	280	310	300	310	300	310	310	300	310	300	310			
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**		**292,000**	
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**20,130**	**16,840**	**16,713**	**10,416**	**13,186**	**10,530**	**5,415**	**2,122**	**0**	**0**	**0**			

Lucas Heights WMF - 10% AEP year

10% AEP year (1988) for existing cover scenario

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	-	m2
Intermediate cover 5%	431,602	m2
Intermediate cover slopes	90,379	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	570	kL/d
Assumed leachate disposal rate (kL/day	800	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	1315		100%
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17			
Pan Evaporation																
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	1469		112%
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	1202		91%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	363	3634	28%
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	359	149600	27%
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	436	15751	33%
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	564	0	43%
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	713	307931	54%
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	761	68735	58%
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	555	0	42%
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	558	0	42%
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	556	0	42%
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	562	0	43%
Total Runoff	(m3/month)	**17,177**	**25,450**	**2,163**	**228,539**	**60,840**	**5,617**	**75,408**	**1,774**	**46,277**	**0**	**55,653**	**26,752**		**545,651**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	603	1507	46%
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	434	4344	33%
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	652	271553	50%
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	651	23539	50%
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	548	0	42%
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	499	215352	38%
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	484	43772	37%
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	689	0	52%
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	685	0	52%
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	682	0	52%
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	678	0	52%
Total Evapotranspiration	(m3/month)	**74,952**	**57,221**	**31,163**	**59,917**	**47,169**	**47,503**	**45,809**	**9,716**	**48,257**	**19,132**	**34,350**	**84,880**		**560,068**	
Leachate - Calculated using HELP (mm)																
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	697	1743	53%
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	523	5235	40%
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	295	122761	22%
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	224	8081	17%
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	227	0	17%
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	119	51555	9%
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	85	7691	6%
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	67	0	5%
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	64	0	5%
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	67	0	5%
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	65	0	5%
Total Leachate Collected	(m3/month)	**2,815**	**5,167**	**5,814**	**21,665**	**43,670**	**41,599**	**13,738**	**9,299**	**9,540**	**13,130**	**7,453**	**23,175**		**197,066**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286		121,105	
Harringtons quarry		620	560	620	600	620	600	620	620	600	620	600	620		7,300	
Leachate containment pond																
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560		18,175	
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014		9,651	
Net Leachate Generation	(m3)	**13,679**	**15,186**	**16,504**	**37,216**	**55,752**	**52,373**	**26,095**	**19,967**	**20,974**	**22,620**	**19,002**	**34,627**		**333,994**	
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**		**208,050**	
Required containment		**3,009**	**2,235**	**1,069**	**21,186**	**59,267**	**94,540**	**102,965**	**105,262**	**109,136**	**114,085**	**115,988**	**132,944**			
Operational containment volume	(m3)	**3,009**	**2,235**	**1,069**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**			
Operational containment volume	(%)	**17%**	**13%**	**6%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**3,686**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**40%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**32,537**	**67,810**	**76,235**	**78,532**	**82,406**	**87,355**	**89,258**	**106,214**			
Leachate level fluctuation	m	**-**	**-**	**-**	**-**	**3.25**	**5.25**	**5.75**	**6.00**	**6.00**	**6.25**	**6.50**	**7.25**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079			
Groundwater collection system	(m3)	930	840	930	900	930	900	930	930	900	930	900	930			
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**		**292,000**	
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**23,064**	**24,443**	**20,779**	**23,796**	**18,506**	**20,492**	**13,362**	**17,139**	**18,087**			

Lucas Heights WMF - 50% AEP year

50% AEP year (2008) for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	270	m3/day
Harringtons quarry	15	m3/day
Groundwater collection system	10	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	570	kL/d
Assumed leachate disposal rate (kL/day	800	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8	1015		100%
Rainfall Days		13	21	10	17	5	16	13	8	11	13	11	9			
Pan Evaporation																
Evaporation (from BOM)	(mm)	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6	1319		130%
Pan evaporation	(mm)	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7	1083		107%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0	255	2547	25%
Existing cap 2%		6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4	242	100636	24%
Existing cap 10%		8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6	301	10884	30%
Stripped cap		20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9	392	7848	39%
Intermediate cover 5%		25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5	495	168578	49%
Intermediate cover slopes		26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8	526	84938	52%
New final cap 5%		0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7	332	0	33%
New final cap slopes		0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8	334	0	33%
Post closure cap 5%		1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1	342	0	34%
Post closure cap slopes		2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6	343	0	34%
Total Runoff	(m3/month)	**16,363**	**206,381**	**7,708**	**19,912**	**68**	**55,953**	**12,642**	**2,412**	**15,115**	**4,054**	**7,628**	**27,196**		**375,431**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6	525	1312	52%
Daily cover		28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4	364	3635	36%
Existing cap 2%		52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2	604	251723	60%
Existing cap 10%		52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9	602	21746	59%
Stripped cap		39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0	471	9425	46%
Intermediate cover 5%		35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6	446	151819	44%
Intermediate cover slopes		41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4	447	72218	44%
New final cap 5%		64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7	629	0	62%
New final cap slopes		64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7	628	0	62%
Post closure cap 5%		64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1	630	0	62%
Post closure cap slopes		64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7	627	0	62%
Total Evapotranspiration	(m3/month)	**43,754**	**62,580**	**40,974**	**57,580**	**31,357**	**45,265**	**33,164**	**37,288**	**45,751**	**31,300**	**23,944**	**58,921**		**511,878**	
Leachate - Calculated using HELP (mm)																
Tip face		10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7	487	1217	48%
Daily cover		9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5	396	3961	39%
Existing cap 2%		6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9	177	73640	17%
Existing cap 10%		2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2	118	4261	12%
Stripped cap		6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0	151	3022	15%
Intermediate cover 5%		1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9	73	24999	7%
Intermediate cover slopes		0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3	46	7493	5%
New final cap 5%		5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0	65	0	6%
New final cap slopes		5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1	64	0	6%
Post closure cap 5%		5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1	65	0	6%
Post closure cap slopes		5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8	64	0	6%
Total Leachate Collected	(m3/month)	**3,894**	**27,279**	**42,378**	**5,758**	**11,399**	**14,627**	**3,799**	**246**	**3,856**	**109**	**82**	**5,169**		**118,593**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370		98,550	
Harringtons quarry		465	420	465	450	465	450	465	465	450	465	450	465		5,475	
Leachate containment pond																
Rainfall into Pond	(m3)	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937		14,027	
Evaporation From Pond	(m3)	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173		8,666	
Net Leachate Generation	(m3)	**12,583**	**39,391**	**51,114**	**15,042**	**20,039**	**24,657**	**13,098**	**8,988**	**12,351**	**8,641**	**8,309**	**13,767**		**227,980**	
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**		**208,050**	
Required containment		**1,913**	**25,344**	**58,788**	**56,730**	**59,099**	**66,656**	**62,085**	**53,402**	**48,653**	**39,624**	**30,833**	**26,930**			
Operational containment volume	(m3)	**1,913**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**			
Operational containment volume	(%)	**11%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Emergency containment volume	(m3)	**0**	**7,844**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**			
Emergency containment volume	(%)	**0%**	**85%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Remaining leachate	(m3)	**0**	**0**	**32,058**	**30,000**	**32,369**	**39,926**	**35,355**	**26,672**	**21,923**	**12,894**	**4,103**	**200**			
Leachate level fluctuation	m	**-**	**-**	**3.25**	**3.25**	**3.25**	**3.75**	**3.50**	**3.00**	**2.75**	**2.25**	**1.25**	**0.50**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	4,498	26,570	3,840	6,773	833	9,670	4,473	2,015	3,607	3,067	3,289	4,579			
Groundwater collection system	(m3)	310	280	310	300	310	300	310	310	300	310	300	310			
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**		**292,000**	
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**20,130**	**16,840**	**16,713**	**10,416**	**13,186**	**10,530**	**5,415**	**2,122**	**0**	**0**	**0**			

Lucas Heights WMF - 10% AEP year

10% AEP year (1988) for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	570	kL/d
Assumed leachate disposal rate (kL/day	800	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	1315		100%
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17			
Pan Evaporation																
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	1469		112%
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	1202		91%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	363	3634	28%
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	359	149600	27%
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	436	15751	33%
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	564	11287	43%
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	713	242825	54%
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	761	122925	58%
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	555	0	42%
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	558	0	42%
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	556	0	42%
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	562	0	43%
Total Runoff	(m3/month)	**17,184**	**25,442**	**2,174**	**228,513**	**60,892**	**5,602**	**75,484**	**1,780**	**46,361**	**0**	**55,728**	**26,863**		**546,022**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	603	1507	46%
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	434	4344	33%
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	652	271553	50%
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	651	23539	50%
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	548	10951	42%
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	499	169820	38%
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	484	78282	37%
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	689	0	52%
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	685	0	52%
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	682	0	52%
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	678	0	52%
Total Evapotranspiration	(m3/month)	**75,189**	**57,194**	**31,190**	**59,911**	**47,176**	**47,411**	**45,848**	**9,711**	**48,361**	**19,129**	**34,545**	**84,332**		**559,996**	
Leachate - Calculated using HELP (mm)																
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	697	1743	53%
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	523	5235	40%
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	295	122761	22%
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	224	8081	17%
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	227	4547	17%
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	119	40655	9%
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	85	13755	6%
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	67	0	5%
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	64	0	5%
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	67	0	5%
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	65	0	5%
Total Leachate Collected	(m3/month)	**2,740**	**4,999**	**5,826**	**21,642**	**43,577**	**41,865**	**13,588**	**9,299**	**9,567**	**12,922**	**7,668**	**23,085**		**196,776**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286		121,105	
Harringtons quarry		620	560	620	600	620	600	620	620	600	620	600	620		7,300	
Leachate containment pond																
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560		18,175	
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014		9,651	
Net Leachate Generation	(m3)	**13,604**	**15,018**	**16,517**	**37,192**	**55,659**	**52,638**	**25,944**	**19,967**	**21,001**	**22,412**	**19,217**	**34,537**		**333,704**	
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**		**208,050**	
Required containment		**2,934**	**1,991**	**838**	**20,930**	**58,919**	**94,457**	**102,731**	**105,028**	**108,929**	**113,670**	**115,788**	**132,654**			
Operational containment volume	(m3)	**2,934**	**1,991**	**838**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**			
Operational containment volume	(%)	**17%**	**11%**	**5%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**3,430**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**37%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**32,189**	**67,727**	**76,001**	**78,298**	**82,199**	**86,940**	**89,058**	**105,924**			
Leachate level fluctuation	m	**-**	**-**	**-**	**-**	**3.25**	**5.25**	**5.75**	**6.00**	**6.00**	**6.25**	**6.50**	**7.25**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079			
Groundwater collection system	(m3)	930	840	930	900	930	900	930	930	900	930	900	930			
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**		**292,000**	
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**23,064**	**24,443**	**20,779**	**23,796**	**18,506**	**20,492**	**13,362**	**17,139**	**18,087**			

Lucas Heights WMF - 10% AEP year + 50% AEP year

10% AEP year followed by 50% AEP year for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	

DISPOSAL	First year	Second year	
Assumed leachate treatment rate (kL/day)	570	870	kL/d
Assumed leachate disposal rate (kL/day)	800	1200	kL/d

		10% AEP year (1988)												50% AEP year (1988)											
Parameter		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
		31	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**
Precipitation (mm)																									
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17	13	21	10	17	5	16	13	8	11	13	11	9
Pan Evaporation																									
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7
Runoff - Calculated using HELP (mm)																									
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6
Total Runoff	(m3/month)	**17,184**	**25,442**	**2,174**	**228,513**	**60,892**	**5,602**	**75,484**	**1,780**	**46,361**	**0**	**55,728**	**26,863**	**16,363**	**206,381**	**7,708**	**19,912**	**68**	**55,953**	**12,642**	**2,412**	**15,115**	**4,054**	**7,628**	**27,196**
Evapotranspiration - Calculated using HELP (mm)																									
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7
Total Evapotranspiration	(m3/month)	**75,189**	**57,194**	**31,190**	**59,911**	**47,176**	**47,411**	**45,848**	**9,711**	**48,361**	**19,129**	**34,545**	**84,332**	**43,754**	**62,580**	**40,974**	**57,580**	**31,357**	**45,265**	**33,164**	**37,288**	**45,751**	**31,300**	**23,944**	**58,921**
Leachate - Calculated using HELP (mm)																									
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8
Total Leachate Collected	(m3/month)	**2,740**	**4,999**	**5,826**	**21,642**	**43,577**	**41,865**	**13,588**	**9,299**	**9,567**	**12,922**	**7,668**	**23,085**	**3,894**	**27,279**	**42,378**	**5,758**	**11,399**	**14,627**	**3,799**	**246**	**3,856**	**109**	**82**	**5,169**
Other leachate sources	(m3/month)																								
Harringtons quarry		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286	8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370
Groundwater collection system		620	560	620	600	620	600	620	620	600	620	600	620	465	420	465	450	465	450	465	465	450	465	450	465
Leachate containment pond																									
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173
Net Leachate Generation	(m3)	**13,604**	**15,018**	**16,517**	**37,192**	**55,659**	**52,638**	**25,944**	**19,967**	**21,001**	**22,412**	**19,217**	**34,537**	**12,583**	**39,391**	**51,114**	**15,042**	**20,039**	**24,657**	**13,098**	**8,988**	**12,351**	**8,641**	**8,309**	**13,767**
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**
Required containment		**2,934**	**1,991**	**838**	**20,930**	**58,919**	**94,457**	**102,731**	**105,028**	**108,929**	**113,670**	**115,788**	**132,654**	**118,267**	**133,298**	**157,442**	**146,384**	**139,453**	**138,011**	**124,139**	**106,157**	**92,407**	**74,078**	**56,287**	**43,084**
Operational containment volume	(m3)	**2,934**	**1,991**	**838**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**
Operational containment volume	(%)	**17%**	**11%**	**5%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Emergency containment volume	(m3)	**0**	**0**	**0**	**3,430**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**37%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**32,189**	**67,727**	**76,001**	**78,298**	**82,199**	**86,940**	**89,058**	**105,924**	**91,537**	**106,568**	**130,712**	**119,654**	**112,723**	**111,281**	**97,409**	**79,427**	**65,677**	**47,348**	**29,557**	**16,354**
Leachate level fluctuation	m	-	-	-	-	**3.25**	**5.25**	**5.75**	**6.00**	**6.00**	**6.25**	**6.50**	**7.25**	**6.50**	**7.25**	**8.50**	**8.00**	**7.75**	**7.50**	**7.00**	**6.00**	**5.25**	**4.25**	**3.25**	**2.50**
Sources of water to sewer																									
Cell 5.3 excavation catchment generation	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079	4,498	26,570	3,840	6,773	833	9,670	4,473	2,015	3,607	3,067	3,289	4,579
Cell 5.3 excavation catchment area	(m3)	930	840	930	900	930	900	930	930	900	930	900	930	310	280	310	300	310	300	310	310	300	310	300	310
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**10,230**	**9,240**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**23,064**	**24,443**	**20,779**	**23,796**	**18,506**	**20,492**	**13,362**	**17,139**	**18,087**	**12,355**	**29,685**	**23,296**	**20,169**	**10,771**	**10,542**	**4,785**	**0**	**0**	**0**	**0**	**0**

Lucas Heights WMF - 10% AEP year + 10% AEP year

10% AEP year followed by 10% AEP year for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	

DISPOSAL	First year	Second year	
Assumed leachate treatment rate (kL/day)	570	870	kL/d
Assumed leachate disposal rate (kL/day)	800	1200	kL/d

		10% AEP year (1988)												10% AEP year (1988)											
Parameter		**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
		31	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**
Precipitation (mm)																									
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17	10	11	15	22	12	9	8	11	10	0	15	17
Pan Evaporation																									
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0
Runoff - Calculated using HELP (mm)																									
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1
Total Runoff	(m3/month)	**17,184**	**25,442**	**2,174**	**228,513**	**60,892**	**5,602**	**75,484**	**1,780**	**46,361**	**0**	**55,728**	**26,863**	**17,184**	**25,442**	**2,174**	**228,513**	**60,892**	**5,602**	**75,484**	**1,780**	**46,361**	**0**	**55,728**	**26,863**
Evapotranspiration - Calculated using HELP (mm)																									
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5
Total Evapotranspiration	(m3/month)	**75,189**	**57,194**	**31,190**	**59,911**	**47,176**	**47,411**	**45,848**	**9,711**	**48,361**	**19,129**	**34,545**	**84,332**	**75,189**	**57,194**	**31,190**	**59,911**	**47,176**	**47,411**	**45,848**	**9,711**	**48,361**	**19,129**	**34,545**	**84,332**
Leachate - Calculated using HELP (mm)																									
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4
Total Leachate Collected	(m3/month)	**2,740**	**4,999**	**5,826**	**21,642**	**43,577**	**41,865**	**13,588**	**9,299**	**9,567**	**12,922**	**7,668**	**23,085**	**2,740**	**4,999**	**5,826**	**21,642**	**43,577**	**41,865**	**13,588**	**9,299**	**9,567**	**12,922**	**7,668**	**23,085**
Other leachate sources	(m3/month)																								
Harringtons quarry		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286	10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286
Groundwater collection system		620	560	620	600	620	600	620	620	600	620	600	620	620	560	620	600	620	600	620	620	600	620	600	620
Leachate containment pond																									
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014
Net Leachate Generation	(m3)	**13,604**	**15,018**	**16,517**	**37,192**	**55,659**	**52,638**	**25,944**	**19,967**	**21,001**	**22,412**	**19,217**	**34,537**	**13,604**	**15,018**	**16,517**	**37,192**	**55,659**	**52,638**	**25,944**	**19,967**	**21,001**	**22,412**	**19,217**	**34,537**
Leachate treatment capacity	(m3/month)	**17,670**	**15,960**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**17,670**	**17,100**	**17,670**	**17,100**	**17,670**	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**
Required containment		**2,934**	**1,991**	**838**	**20,930**	**58,919**	**94,457**	**102,731**	**105,028**	**108,929**	**113,670**	**115,788**	**132,654**	**119,288**	**109,945**	**99,492**	**110,584**	**139,273**	**165,811**	**164,785**	**157,782**	**152,683**	**148,125**	**141,242**	**148,809**
Operational containment volume	(m3)	**2,934**	**1,991**	**838**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**
Operational containment volume	(%)	**17%**	**11%**	**5%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Emergency containment volume	(m3)	**0**	**0**	**0**	**3,430**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**37%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**32,189**	**67,727**	**76,001**	**78,298**	**82,199**	**86,940**	**89,058**	**105,924**	**92,558**	**83,215**	**72,762**	**83,854**	**112,543**	**139,081**	**138,055**	**131,052**	**125,953**	**121,395**	**114,512**	**122,079**
Leachate level fluctuation	m	-	-	-	-	**3.25**	**5.25**	**5.75**	**6.00**	**6.00**	**6.25**	**6.50**	**7.25**	**6.75**	**6.25**	**5.50**	**6.25**	**7.75**	**9.00**	**9.00**	**8.50**	**8.25**	**8.00**	**7.75**	**8.25**
Sources of water to sewer																									
Cell 5.3 excavation catchment generation	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079
Cell 5.3 excavation catchment area	(m3)	930	840	930	900	930	900	930	930	900	930	900	930	930	840	930	900	930	900	930	930	900	930	900	930
Sewer disposal capacity	(m3/month)	**24,800**	**22,400**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**24,800**	**24,000**	**24,800**	**24,000**	**24,800**	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**
Remaining capacity for disposal to sewer	(m3/month)	**7,130**	**6,440**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**7,130**	**6,900**	**7,130**	**6,900**	**7,130**	**10,230**	**9,240**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**23,064**	**24,443**	**20,779**	**23,796**	**18,506**	**20,492**	**13,362**	**17,139**	**18,087**	**0**	**0**	**0**	**20,064**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**777**	**0**

Lucas Heights WMF - 50% AEP year

50% AEP year (2008) for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	270	m3/day
Harringtons quarry	15	m3/day
Groundwater collection system	10	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8	1015		100%
Rainfall Days		13	21	10	17	5	16	13	8	11	13	11	9			
Pan Evaporation																
Evaporation (from BOM)	(mm)	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6	1319		130%
Pan evaporation	(mm)	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7	1083		107%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0	255	2547	25%
Existing cap 2%		6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4	242	100636	24%
Existing cap 10%		8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6	301	10884	30%
Stripped cap		20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9	392	7848	39%
Intermediate cover 5%		25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5	495	168578	49%
Intermediate cover slopes		26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8	526	84938	52%
New final cap 5%		0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7	332	0	33%
New final cap slopes		0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8	334	0	33%
Post closure cap 5%		1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1	342	0	34%
Post closure cap slopes		2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6	343	0	34%
Total Runoff	(m3/month)	**16,363**	**206,381**	**7,708**	**19,912**	**68**	**55,953**	**12,642**	**2,412**	**15,115**	**4,054**	**7,628**	**27,196**		**375,431**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6	525	1312	52%
Daily cover		28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4	364	3635	36%
Existing cap 2%		52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2	604	251723	60%
Existing cap 10%		52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9	602	21746	59%
Stripped cap		39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0	471	9425	46%
Intermediate cover 5%		35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6	446	151819	44%
Intermediate cover slopes		41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4	447	72218	44%
New final cap 5%		64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7	629	0	62%
New final cap slopes		64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7	628	0	62%
Post closure cap 5%		64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1	630	0	62%
Post closure cap slopes		64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7	627	0	62%
Total Evapotranspiration	(m3/month)	**43,754**	**62,580**	**40,974**	**57,580**	**31,357**	**45,265**	**33,164**	**37,288**	**45,751**	**31,300**	**23,944**	**58,921**		**511,878**	
Leachate - Calculated using HELP (mm)																
Tip face		10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7	487	1217	48%
Daily cover		9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5	396	3961	39%
Existing cap 2%		6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9	177	73640	17%
Existing cap 10%		2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2	118	4261	12%
Stripped cap		6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0	151	3022	15%
Intermediate cover 5%		1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9	73	24999	7%
Intermediate cover slopes		0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3	46	7493	5%
New final cap 5%		5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0	65	0	6%
New final cap slopes		5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1	64	0	6%
Post closure cap 5%		5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1	65	0	6%
Post closure cap slopes		5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8	64	0	6%
Total Leachate Collected	(m3/month)	**3,894**	**27,279**	**42,378**	**5,758**	**11,399**	**14,627**	**3,799**	**246**	**3,856**	**109**	**82**	**5,169**		**118,593**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370		98,550	
Harringtons quarry		465	420	465	450	465	450	465	465	450	465	450	465		5,475	
Leachate containment pond																
Rainfall into Pond	(m3)	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937		14,027	
Evaporation From Pond	(m3)	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173		8,666	
Net Leachate Generation	(m3)	**12,583**	**39,391**	**51,114**	**15,042**	**20,039**	**24,657**	**13,098**	**8,988**	**12,351**	**8,641**	**8,309**	**13,767**		**227,980**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**15,031**	**39,175**	**28,117**	**21,186**	**19,743**	**5,872**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(m3)	**0**	**15,031**	**17,500**	**17,500**	**17,500**	**17,500**	**5,872**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(%)	**0%**	**86%**	**100%**	**100%**	**100%**	**100%**	**34%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Emergency containment volume	(m3)	**0**	**0**	**9,230**	**9,230**	**3,686**	**2,243**	**0**	**0**	**0**	**0**	**0**	**0**			
Emergency containment volume	(%)	**0%**	**0%**	**100%**	**100%**	**40%**	**24%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Remaining leachate	(m3)	**0**	**0**	**12,445**	**1,387**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Leachate level fluctuation	m	**-**	**-**	**2.00**	**0.75**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	4,498	26,570	3,840	6,773	833	9,670	4,473	2,015	3,607	3,067	3,289	4,579			
Groundwater collection system	(m3)	310	280	310	300	310	300	310	310	300	310	300	310			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**17,617**	**9,240**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**	**22,341**	**23,649**	**28,559**	**27,691**	**23,433**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**17,330**	**10,940**	**7,813**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			

Lucas Heights WMF - 10% AEP year

10% AEPyear (1988) for Phase 1

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	416,608	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	340,348	m2
Intermediate cover slopes	161,633	m2
New final cap 5%	-	m2
New final cap slopes	-	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	1315		100%
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17			
Pan Evaporation																
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	1469		112%
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	1202		91%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	363	3634	28%
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	359	149600	27%
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	436	15751	33%
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	564	11287	43%
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	713	242825	54%
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	761	122925	58%
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	555	0	42%
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	558	0	42%
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	556	0	42%
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	562	0	43%
Total Runoff	(m3/month)	**17,184**	**25,442**	**2,174**	**228,513**	**60,892**	**5,602**	**75,484**	**1,780**	**46,361**	**0**	**55,728**	**26,863**		**546,022**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	603	1507	46%
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	434	4344	33%
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	652	271553	50%
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	651	23539	50%
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	548	10951	42%
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	499	169820	38%
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	484	78282	37%
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	689	0	52%
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	685	0	52%
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	682	0	52%
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	678	0	52%
Total Evapotranspiration	(m3/month)	**75,189**	**57,194**	**31,190**	**59,911**	**47,176**	**47,411**	**45,848**	**9,711**	**48,361**	**19,129**	**34,545**	**84,332**		**559,996**	
Leachate - Calculated using HELP (mm)																
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	697	1743	53%
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	523	5235	40%
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	295	122761	22%
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	224	8081	17%
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	227	4547	17%
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	119	40655	9%
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	85	13755	6%
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	67	0	5%
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	64	0	5%
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	67	0	5%
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	65	0	5%
Total Leachate Collected	(m3/month)	**2,740**	**4,999**	**5,826**	**21,642**	**43,577**	**41,865**	**13,588**	**9,299**	**9,567**	**12,922**	**7,668**	**23,085**		**196,776**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286		121,105	
Harringtons quarry		620	560	620	600	620	600	620	620	600	620	600	620		7,300	
Leachate containment pond																
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560		18,175	
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014		9,651	
Net Leachate Generation	(m3)	**13,604**	**15,018**	**16,517**	**37,192**	**55,659**	**52,638**	**25,944**	**19,967**	**21,001**	**22,412**	**19,217**	**34,537**		**333,704**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**0**	**0**	**11,092**	**39,781**	**66,319**	**65,293**	**58,290**	**53,191**	**48,633**	**41,750**	**49,317**			
Operational containment volume	(m3)	**0**	**0**	**0**	**11,092**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**	**17,500**			
Operational containment volume	(%)	**0%**	**0%**	**0%**	**63%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**0**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**	**9,230**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**13,051**	**39,589**	**38,563**	**31,560**	**26,461**	**21,903**	**15,020**	**22,587**			
Leachate level fluctuation	m	**-**	**-**	**-**	**-**	**2.25**	**3.75**	**3.75**	**3.25**	**3.00**	**2.75**	**2.25**	**2.75**			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079			
Groundwater collection system	(m3)	930	840	930	900	930	900	930	930	900	930	900	930			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**16,596**	**18,582**	**20,683**	**9,900**	**10,230**	**9,900**	**10,230**	**10,230**	**9,900**	**10,230**	**9,900**	**10,230**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**20,064**	**18,343**	**11,679**	**11,596**	**3,206**	**2,192**	**0**	**777**	**0**			

Lucas Heights WMF - 50% AEP year

50% AEP year (2008) for Phase 5

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	165,296	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	272,611	m2
Intermediate cover slopes	244,923	m2
New final cap 5%	255,890	m2
New final cap slopes	49,916	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	270	m3/day
Harringtons quarry	15	m3/day
Groundwater collection system	10	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8	1015		100%
Rainfall Days		13	21	10	17	5	16	13	8	11	13	11	9			
Pan Evaporation																
Evaporation (from BOM)	(mm)	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6	1319		130%
Pan evaporation	(mm)	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7	1083		107%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0	255	2547	25%
Existing cap 2%		6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4	242	39929	24%
Existing cap 10%		8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6	301	10884	30%
Stripped cap		20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9	392	7848	39%
Intermediate cover 5%		25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5	495	135027	49%
Intermediate cover slopes		26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8	526	128707	52%
New final cap 5%		0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7	332	84851	33%
New final cap slopes		0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8	334	16674	33%
Post closure cap 5%		1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1	342	0	34%
Post closure cap slopes		2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6	343	0	34%
Total Runoff	(m3/month)	**15,281**	**247,559**	**7,782**	**21,691**	**73**	**64,724**	**12,563**	**2,522**	**14,911**	**4,252**	**7,723**	**27,387**		**426,467**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6	525	1312	52%
Daily cover		28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4	364	3635	36%
Existing cap 2%		52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2	604	99875	60%
Existing cap 10%		52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9	602	21746	59%
Stripped cap		39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0	471	9425	46%
Intermediate cover 5%		35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6	446	121604	44%
Intermediate cover slopes		41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4	447	109432	44%
New final cap 5%		64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7	629	161067	62%
New final cap slopes		64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7	628	31322	62%
Post closure cap 5%		64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1	630	0	62%
Post closure cap slopes		64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7	627	0	62%
Total Evapotranspiration	(m3/month)	**51,265**	**67,221**	**46,930**	**61,298**	**34,509**	**48,359**	**37,262**	**40,904**	**50,104**	**33,729**	**23,726**	**64,111**		**559,418**	
Leachate - Calculated using HELP (mm)																
Tip face		10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7	487	1217	48%
Daily cover		9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5	396	3961	39%
Existing cap 2%		6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9	177	29218	17%
Existing cap 10%		2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2	118	4261	12%
Stripped cap		6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0	151	3022	15%
Intermediate cover 5%		1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9	73	20024	7%
Intermediate cover slopes		0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3	46	11354	5%
New final cap 5%		5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0	65	16514	6%
New final cap slopes		5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1	64	3217	6%
Post closure cap 5%		5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1	65	0	6%
Post closure cap slopes		5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8	64	0	6%
Total Leachate Collected	(m3/month)	**3,756**	**23,832**	**21,565**	**6,918**	**7,193**	**11,435**	**3,180**	**2,195**	**4,608**	**2,071**	**1,028**	**5,008**		**92,788**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370		98,550	
Harringtons quarry		465	420	465	450	465	450	465	465	450	465	450	465		5,475	
Leachate containment pond																
Rainfall into Pond	(m3)	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937		14,027	
Evaporation From Pond	(m3)	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173		8,666	
Net Leachate Generation	(m3)	**12,446**	**35,944**	**30,301**	**16,202**	**15,833**	**21,465**	**12,479**	**10,937**	**13,103**	**10,603**	**9,256**	**13,607**		**202,175**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**11,584**	**14,915**	**5,017**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(m3)	**0**	**11,584**	**14,915**	**5,017**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(%)	**0%**	**66%**	**85%**	**29%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Leachate level fluctuation	m	-	-	-	-	-	-	-	-	-	-	-	-			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	4,498	26,570	3,840	6,773	833	9,670	4,473	2,015	3,607	3,067	3,289	4,579			
Groundwater collection system	(m3)	310	280	310	300	310	300	310	310	300	310	300	310			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**17,754**	**9,240**	**10,230**	**9,900**	**16,350**	**14,535**	**24,721**	**26,263**	**22,897**	**26,597**	**26,744**	**23,593**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**17,330**	**10,940**	**7,813**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			

Lucas Heights WMF - 10% AEP year

10% AEP year (1988) for Phase 5

LANDFILL GENERATION		
Tip face	2,500	m2
Daily cover	10,000	m2
Existing cap 2%	165,296	m2
Existing cap 10%	36,147	m2
Stripped cap	20,000	m2
Intermediate cover 5%	272,611	m2
Intermediate cover slopes	244,923	m2
New final cap 5%	255,890	m2
New final cap slopes	49,916	m2
Post closure cap 5%	-	m2
Post closure cap slopes	-	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	75,900	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area	3,530	m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	1315		100%
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17			
Pan Evaporation																
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	1469		112%
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	1202		91%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	363	3634	28%
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	359	59356	27%
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	436	15751	33%
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	564	11287	43%
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	713	194497	54%
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	761	186269	58%
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	555	142045	42%
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	558	27862	42%
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	556	0	42%
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	562	0	43%
Total Runoff	(m3/month)	**17,562**	**24,827**	**2,285**	**276,807**	**71,738**	**6,795**	**89,977**	**1,864**	**50,827**	**0**	**63,385**	**34,634**		**640,701**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	603	1507	46%
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	434	4344	33%
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	652	107743	50%
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	651	23539	50%
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	548	10951	42%
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	499	136022	38%
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	484	118621	37%
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	689	176398	52%
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	685	34192	52%
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	682	0	52%
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	678	0	52%
Total Evapotranspiration	(m3/month)	**81,533**	**61,929**	**37,377**	**63,708**	**50,475**	**50,242**	**49,365**	**14,256**	**52,260**	**24,872**	**37,344**	**89,956**		**613,317**	
Leachate - Calculated using HELP (mm)																
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	697	1743	53%
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	523	5235	40%
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	295	48707	22%
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	224	8081	17%
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	227	4547	17%
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	119	32563	9%
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	85	20843	6%
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	67	17024	5%
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	64	3207	5%
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	67	0	5%
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	65	0	5%
Total Leachate Collected	(m3/month)	**3,980**	**5,854**	**4,043**	**21,147**	**28,852**	**20,760**	**9,525**	**5,621**	**10,029**	**8,423**	**8,595**	**15,121**		**141,951**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286		121,105	
Harringtons quarry		620	560	620	600	620	600	620	620	600	620	600	620		7,300	
Leachate containment pond																
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560		18,175	
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014		9,651	
Net Leachate Generation	(m3)	**14,844**	**15,873**	**14,734**	**36,698**	**40,934**	**31,534**	**21,882**	**16,289**	**21,463**	**17,912**	**20,145**	**26,573**		**278,879**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**0**	**0**	**10,598**	**24,562**	**29,996**	**24,907**	**14,227**	**9,589**	**532**	**0**	**0**			
Operational containment volume	(m3)	**0**	**0**	**0**	**10,598**	**17,500**	**17,500**	**17,500**	**14,227**	**9,589**	**532**	**0**	**0**			
Operational containment volume	(%)	**0%**	**0%**	**0%**	**61%**	**100%**	**100%**	**100%**	**81%**	**55%**	**3%**	**0%**	**0%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**0**	**7,062**	**9,230**	**7,407**	**0**	**0**	**0**	**0**	**0**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**77%**	**100%**	**80%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**0**	**3,266**	**0**	**0**	**0**	**0**	**0**	**0**			
Leachate level fluctuation	m	-	-	-	-	-	**1.25**	-	-	-	-	-	-			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	5,773	5,847	3,224	29,964	8,509	3,236	10,147	1,841	8,885	0	10,677	8,079			
Groundwater collection system	(m3)	930	840	930	900	930	900	930	930	900	930	900	930			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**15,356**	**17,727**	**22,466**	**9,900**	**10,230**	**9,900**	**10,230**	**10,230**	**9,900**	**10,230**	**15,324**	**10,627**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**20,064**	**18,343**	**11,679**	**11,596**	**3,206**	**2,192**	**0**	**0**	**0**			

Lucas Heights WMF - 50% AEP year

50% AEP year (2008) for final cover scenario

LANDFILL GENERATION		
Tip face	-	m2
Daily cover	-	m2
Existing cap 2%	138,000	m2
Existing cap 10%	-	m2
Stripped cap	-	m2
Intermediate cover 5%	-	m2
Intermediate cover slopes	-	m2
New final cap 5%	396,842	m2
New final cap slopes	357,044	m2
Post closure cap 5%	99,658	m2
Post closure cap slopes	139,026	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	270	m3/day
Harringtons quarry	15	m3/day
Groundwater collection system	10	m3/day
Cell 5.3 excavation catchment area	-	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area		m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	66.0	355.0	55.5	92.3	13.1	128.9	60.8	29.0	51.9	45.7	49.0	67.8	1015		100%
Rainfall Days		13	21	10	17	5	16	13	8	11	13	11	9			
Pan Evaporation																
Evaporation (from BOM)	(mm)	161.0	117.8	131.8	82.4	57.2	45.8	57.2	75.2	117.6	142.2	152.2	178.6	1319		130%
Pan evaporation	(mm)	144.9	106.0	105.4	65.9	45.8	32.1	40.0	52.6	94.1	113.8	121.8	160.7	1083		107%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.0	128.6	5.9	14.2	0.1	37.8	10.5	2.6	9.8	3.7	6.6	22.0	255	0	25%
Existing cap 2%		6.3	163.8	0.8	8.7	0.0	37.7	3.9	0.0	5.1	0.1	0.9	14.4	242	33335	24%
Existing cap 10%		8.3	200.3	1.3	11.5	0.0	46.9	5.2	0.0	7.4	0.3	1.3	18.6	301	0	30%
Stripped cap		20.3	200.5	9.4	23.4	0.0	58.9	15.3	3.1	15.6	5.7	9.5	30.9	392	0	39%
Intermediate cover 5%		25.5	245.6	13.8	29.9	0.1	72.3	20.2	4.5	24.2	7.2	13.5	38.5	495	0	49%
Intermediate cover slopes		26.1	259.9	14.7	31.4	0.2	76.7	22.1	5.0	25.4	8.6	14.7	40.8	526	0	52%
New final cap 5%		0.1	252.8	0.0	11.1	0.0	54.7	1.3	0.0	1.9	0.0	0.0	9.7	332	131589	33%
New final cap slopes		0.2	253.2	0.0	10.8	0.0	55.2	1.6	0.0	2.2	0.0	0.0	10.8	334	119271	33%
Post closure cap 5%		1.9	243.7	1.3	12.5	0.0	50.5	7.0	0.5	6.9	0.0	0.3	17.1	342	34067	34%
Post closure cap slopes		2.2	242.2	1.5	12.5	0.0	51.0	6.6	0.6	7.0	0.0	0.4	18.6	343	47632	34%
Total Runoff	(m3/month)	**1,485**	**271,293**	**458**	**12,468**	**0**	**58,723**	**3,240**	**131**	**3,888**	**18**	**212**	**13,977**		**365,893**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		43.4	62.6	43.9	59.7	29.0	46.1	28.8	42.5	44.4	33.8	25.0	65.6	525	0	52%
Daily cover		28.1	47.6	37.2	55.4	12.5	38.9	22.8	17.2	33.6	26.6	15.3	28.4	364	0	36%
Existing cap 2%		52.9	69.6	49.8	58.9	41.0	46.2	43.2	51.0	55.6	33.1	29.8	73.2	604	83382	60%
Existing cap 10%		52.6	69.6	49.4	58.8	41.0	46.2	43.2	49.8	53.7	34.7	29.9	72.9	602	0	59%
Stripped cap		39.0	58.5	39.5	58.6	24.5	45.9	26.9	28.9	46.0	29.8	23.8	50.0	471	0	46%
Intermediate cover 5%		35.2	58.8	33.9	57.9	24.1	46.1	25.7	27.0	38.5	31.5	18.9	48.6	446	0	44%
Intermediate cover slopes		41.4	57.5	34.8	57.7	24.3	44.8	24.9	25.9	38.3	28.4	20.5	48.4	447	0	44%
New final cap 5%		64.6	69.7	58.4	57.7	42.7	46.1	48.0	52.5	58.2	34.4	22.4	74.7	629	249788	62%
New final cap slopes		64.0	69.7	58.4	57.7	42.7	46.0	46.9	53.5	57.0	34.6	22.4	74.7	628	224045	62%
Post closure cap 5%		64.9	69.7	58.9	55.4	45.1	45.4	45.1	47.6	52.5	39.9	38.8	67.1	630	62825	62%
Post closure cap slopes		64.7	69.7	59.0	55.5	45.0	45.4	46.3	48.0	52.3	39.9	37.1	64.7	627	87237	62%
Total Evapotranspiration	(m3/month)	**71,255**	**78,791**	**65,006**	**64,827**	**48,579**	**51,945**	**52,670**	**58,408**	**63,624**	**40,072**	**30,045**	**82,057**		**707,279**	
Leachate - Calculated using HELP (mm)																
Tip face		10.1	132.8	129.8	38.9	31.0	50.3	29.8	14.2	18.5	0.6	0.0	30.7	487	0	48%
Daily cover		9.4	85.5	92.4	27.3	20.4	49.5	10.7	18.9	22.7	10.7	8.2	40.5	396	0	39%
Existing cap 2%		6.9	18.0	89.8	3.2	22.5	19.7	8.2	0.0	2.6	0.0	0.0	5.9	177	24393	17%
Existing cap 10%		2.9	12.6	59.6	0.6	19.5	14.5	4.4	0.0	0.6	0.0	0.0	3.2	118	0	12%
Stripped cap		6.8	42.2	39.1	7.6	8.4	23.9	1.2	1.0	7.8	0.0	0.0	13.0	151	0	15%
Intermediate cover 5%		1.9	38.5	2.0	8.1	2.6	10.5	0.0	0.0	5.1	0.0	0.0	4.9	73	0	7%
Intermediate cover slopes		0.0	25.9	0.6	7.0	0.0	7.7	0.0	0.0	3.8	0.0	0.0	1.3	46	0	5%
New final cap 5%		5.6	5.0	5.8	6.8	5.3	5.9	4.4	6.4	4.6	6.6	3.0	5.0	65	25611	6%
New final cap slopes		5.9	4.9	7.3	3.8	5.1	5.9	6.4	6.1	4.9	5.4	3.6	5.1	64	23014	6%
Post closure cap 5%		5.5	6.2	7.0	4.2	6.0	6.2	7.7	4.3	5.8	7.2	2.3	3.1	65	6505	6%
Post closure cap slopes		5.2	5.7	5.6	5.6	6.2	6.5	5.2	5.5	5.4	6.2	1.8	4.8	64	8892	6%
Total Leachate Collected	(m3/month)	**6,569**	**7,637**	**18,780**	**5,693**	**8,494**	**8,716**	**6,663**	**5,934**	**5,247**	**6,138**	**2,961**	**5,582**		**88,415**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		8,370	7,560	8,370	8,100	8,370	8,100	8,370	8,370	8,100	8,370	8,100	8,370		98,550	
Harringtons quarry		465	420	465	450	465	450	465	465	450	465	450	465		5,475	
Leachate containment pond																
Rainfall into Pond	(m3)	912	4,906	767	1,276	181	1,781	840	401	717	632	677	937		14,027	
Evaporation From Pond	(m3)	1,058	774	866	541	376	301	376	494	773	934	1,000	1,173		8,666	
Net Leachate Generation	(m3)	**15,259**	**19,749**	**27,516**	**14,978**	**17,135**	**18,746**	**15,962**	**14,675**	**13,741**	**14,671**	**11,188**	**14,181**		**197,801**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**0**	**546**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(m3)	**0**	**0**	**546**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(%)	**0%**	**0%**	**3%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Leachate level fluctuation	m	-	-	-	-	-	-	-	-	-	-	-	-			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	0	0	0	0	0	0	0	0	0	0	0	0			
Groundwater collection system	(m3)	310	280	310	300	310	300	310	310	300	310	300	310			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**14,941**	**13,851**	**10,230**	**20,477**	**20,065**	**17,254**	**21,238**	**22,525**	**22,259**	**22,529**	**24,812**	**23,019**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			

Lucas Heights WMF - 10% AEP year

10% AEP year (1988) for final cover scenario

LANDFILL GENERATION		
Tip face	-	m2
Daily cover	-	m2
Existing cap 2%	138,000	m2
Existing cap 10%	-	m2
Stripped cap	-	m2
Intermediate cover 5%	-	m2
Intermediate cover slopes	-	m2
New final cap 5%	396,842	m2
New final cap slopes	357,044	m2
Post closure cap 5%	99,658	m2
Post closure cap slopes	139,026	m2
OTHER GENERATION		
Lucas Heights 1 landfill (average)	332	m3/day
Harringtons quarry	20	m3/day
Groundwater collection system	30	m3/day
Cell 5.3 excavation catchment area	-	m2
CONTAINMENT		
Operational containment capacity	17,500	m3
Emergency containment dam capacity	9,230	m3
Operational containment surface area	11,500	m2
Operational containment basal area	4,500	m2
Operational containment catchment area	13,820	m2
Initial Pond Volume	0.4	vol/vol
Cell 5.3 excavation containment area		m2
Pan Evaporation Percentage - winter	70%	
Pan Evaporation Percentage - autumn, spring	80%	
Pan Evaporation Percentage - summer	90%	
DISPOSAL		
Assumed leachate treatment rate (kL/day)	870	kL/d
Assumed leachate disposal rate (kL/day	1200	kL/d

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total mm	Annual Total m3	Percent
		31	28	31	30	31	30	31	31	30	31	30	31			
Precipitation (mm)																
Rainfall (2008)	(mm)	83.7	83.3	47.4	397.6	114.4	44.6	135.8	27.3	121.6	0.0	146.5	112.9	1315		100%
Rainfall Days		10	11	15	22	12	9	8	11	10	0	15	17			
Pan Evaporation																
Evaporation (from BOM)	(mm)	182.4	149.6	132.4	75.8	61.6	60.4	64.8	93.6	121.8	215.6	156.6	154.4	1469		112%
Pan evaporation	(mm)	164.2	134.6	105.9	60.6	49.3	42.3	45.4	65.5	97.4	172.5	125.3	139.0	1202		91%
Runoff - Calculated using HELP (mm)																
Tip face		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0%
Daily cover		13.4	19.0	1.7	139.6	40.3	5.6	51.5	2.0	31.4	0.0	36.9	22.0	363	0	28%
Existing cap 2%		5.8	9.6	0.0	176.0	45.6	0.8	56.8	0.0	25.4	0.0	30.6	8.6	359	49554	27%
Existing cap 10%		6.5	12.0	0.0	208.9	55.0	0.9	69.2	0.0	32.7	0.0	39.0	11.6	436	0	33%
Stripped cap		20.4	30.6	2.5	223.6	60.8	7.5	76.0	2.2	48.0	0.0	60.6	32.3	564	0	43%
Intermediate cover 5%		27.2	39.5	4.0	277.7	74.8	9.9	92.4	3.3	64.5	0.0	77.8	42.4	713	0	54%
Intermediate cover slopes		29.2	41.9	4.6	292.5	79.5	10.3	98.1	3.7	70.3	0.0	83.6	46.8	761	0	58%
New final cap 5%		4.0	3.1	0.0	284.2	67.8	3.9	87.7	0.0	30.6	0.0	44.7	29.1	555	220287	42%
New final cap slopes		4.5	3.6	0.0	285.2	68.2	3.9	88.1	0.0	31.1	0.0	44.5	29.0	558	199291	42%
Post closure cap 5%		9.1	7.4	0.0	268.1	75.8	8.9	79.9	0.0	36.8	0.0	40.5	29.7	556	55441	42%
Post closure cap slopes		9.9	8.2	0.0	268.7	76.7	9.1	80.4	0.0	37.1	0.0	41.4	30.1	562	78085	43%
Total Runoff	(m3/month)	**6,276**	**5,713**	**0**	**302,986**	**75,770**	**5,216**	**93,257**	**6**	**35,565**	**0**	**47,640**	**30,229**		**602,659**	
Evapotranspiration - Calculated using HELP (mm)																
Tip face		86.3	65.1	29.0	62.1	45.0	49.5	47.8	10.6	56.4	19.0	41.0	91.0	603	0	46%
Daily cover		59.8	31.1	32.0	53.7	28.5	37.3	25.2	10.4	44.9	3.7	41.9	65.8	434	0	33%
Existing cap 2%		85.9	74.5	37.4	61.0	55.2	49.0	58.7	11.8	54.9	30.0	41.2	92.3	652	89951	50%
Existing cap 10%		85.9	73.6	39.0	59.4	55.3	49.0	58.8	11.7	54.9	30.3	41.2	92.3	651	0	50%
Stripped cap		79.1	46.5	27.6	62.1	41.9	49.2	37.9	9.1	56.3	11.1	39.4	87.4	548	0	42%
Intermediate cover 5%		67.6	44.3	26.4	60.7	41.7	47.8	36.1	8.2	44.1	10.5	29.1	82.4	499	0	38%
Intermediate cover slopes		67.6	43.3	26.5	60.3	41.8	46.2	36.1	7.9	42.1	10.3	29.0	73.3	484	0	37%
New final cap 5%		87.8	75.1	49.7	59.7	54.0	47.6	57.9	24.5	56.2	42.9	41.5	92.5	689	273563	52%
New final cap slopes		87.9	73.1	48.7	59.3	54.0	47.5	57.9	23.0	56.1	43.4	41.6	92.5	685	244572	52%
Post closure cap 5%		87.7	69.1	52.0	56.7	51.8	45.9	56.5	23.2	55.6	43.0	48.1	92.5	682	67994	52%
Post closure cap slopes		87.9	67.6	50.2	56.6	51.8	46.0	56.4	23.2	55.7	43.0	46.8	92.5	678	94217	52%
Total Evapotranspiration	(m3/month)	**99,038**	**82,465**	**54,456**	**66,783**	**60,680**	**53,580**	**65,237**	**25,077**	**63,171**	**46,912**	**48,303**	**104,593**		**770,296**	
Leachate - Calculated using HELP (mm)																
Tip face		22.9	13.2	16.9	77.1	194.1	107.5	86.6	40.5	11.9	50.9	8.4	67.3	697	0	53%
Daily cover		35.1	18.2	20.9	52.1	115.0	89.4	55.1	11.6	18.3	33.4	10.2	64.2	523	0	40%
Existing cap 2%		1.1	3.0	12.5	10.6	63.3	91.3	21.1	21.2	5.6	23.2	4.2	37.5	295	40664	22%
Existing cap 10%		1.2	3.4	10.2	10.7	48.1	66.4	19.7	7.5	2.8	19.0	1.0	33.6	224	0	17%
Stripped cap		9.3	10.3	0.6	34.7	80.1	13.3	22.1	0.0	11.5	11.3	9.4	24.8	227	0	17%
Intermediate cover 5%		4.1	7.4	0.0	31.2	29.4	0.0	7.7	0.0	13.0	5.2	10.0	11.5	119	0	9%
Intermediate cover slopes		1.5	4.2	0.0	29.8	13.8	0.0	1.5	0.0	13.9	0.6	13.2	6.5	85	0	6%
New final cap 5%		5.8	5.9	4.4	5.8	6.6	6.1	5.3	5.4	4.9	5.5	5.2	5.5	67	26402	5%
New final cap slopes		3.9	5.1	4.6	6.1	6.5	5.6	5.7	5.0	6.9	4.4	4.8	5.6	64	22940	5%
Post closure cap 5%		6.1	3.8	5.4	5.4	6.8	5.5	6.5	5.1	5.8	4.7	5.8	5.9	67	6673	5%
Post closure cap slopes		4.7	3.7	4.9	5.5	6.9	6.8	6.0	5.3	5.0	5.5	4.4	6.4	65	9049	5%
Total Leachate Collected	(m3/month)	**5,107**	**5,472**	**6,313**	**7,262**	**15,328**	**18,507**	**8,564**	**8,101**	**6,485**	**8,192**	**5,547**	**10,849**		**105,728**	
Other leachate sources	(m3/month)															
Lucas Heights 1 landfill (average)		10,286	9,290	10,286	9,954	10,286	9,954	10,286	10,286	9,954	10,286	9,954	10,286		121,105	
Harringtons quarry		620	560	620	600	620	600	620	620	600	620	600	620		7,300	
Leachate containment pond																
Rainfall into Pond	(m3)	1,157	1,151	655	5,495	1,581	616	1,877	377	1,681	0	2,025	1,560		18,175	
Evaporation From Pond	(m3)	1,198	983	870	498	405	397	426	615	800	1,416	1,029	1,014		9,651	
Net Leachate Generation	(m3)	**15,971**	**15,490**	**17,004**	**22,813**	**27,410**	**29,281**	**20,921**	**18,769**	**17,919**	**17,681**	**17,097**	**22,300**		**242,656**	
Leachate treatment capacity	(m3/month)	**26,970**	**24,360**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**	**26,970**	**26,100**	**26,970**	**26,100**	**26,970**		**317,550**	
Required containment		**0**	**0**	**0**	**0**	**440**	**3,621**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(m3)	**0**	**0**	**0**	**0**	**440**	**3,621**	**0**	**0**	**0**	**0**	**0**	**0**			
Operational containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**3%**	**21%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Emergency containment volume	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Emergency containment volume	(%)	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**			
Remaining leachate	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			
Leachate level fluctuation	m	-	-	-	-	-	-	-	-	-	-	-	-			
Sources of water to sewer																
Cell 5.3 excavation catchment generatior	(m3)	0	0	0	0	0	0	0	0	0	0	0	0			
Groundwater collection system	(m3)	930	840	930	900	930	900	930	930	900	930	900	930			
Sewer disposal capacity	(m3/month)	**37,200**	**33,600**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**	**37,200**	**36,000**	**37,200**	**36,000**	**37,200**		**438,000**	
Remaining capacity for disposal to sewer	(m3/month)	**14,229**	**18,110**	**20,196**	**13,187**	**10,230**	**9,900**	**12,659**	**18,431**	**18,081**	**19,519**	**18,903**	**14,900**			
Containment in excavation (assume empty at start of year)	(m3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			

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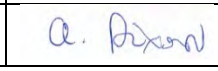
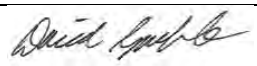
7	A Horlyck	A Dixon		D Gamble		15.09.15

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