SITA Australia

Lucas Heights Resource Recovery Park Project

Environmental Impact Statement

VOLUME 7 : Appendix R – Parkland, Future Use and Post Closure Management

October 2015

SITA Australia is changing brand to SUEZ

Executive summary

This report has been prepared by GHD Pty Ltd and SITA to provide details of parkland, landscaping, final land use and post closure management of the Lucas Heights Resource Recovery Park (LHRRP), following the cessation of waste related activities.

The expansion of the LHRRP which is outlined in the prepared Environmental Impact Statement would permit the construction of the proposed parkland and enable future use of the land for recreational purposes.

Objectives

The objectives post-closure of the site is to:

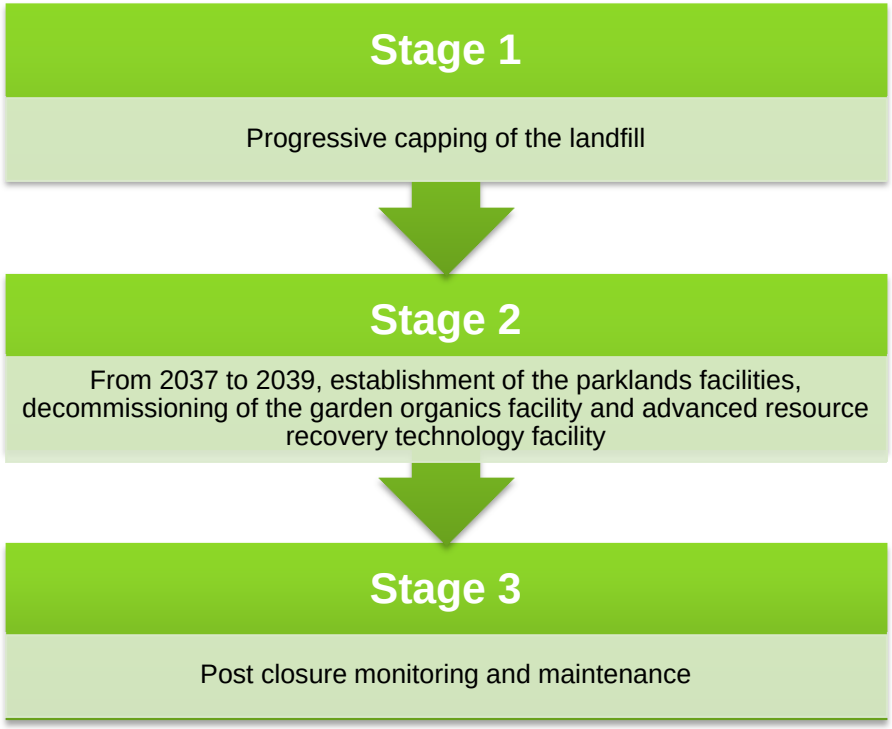
- Establish a parkland suitable for community use
- Define post closure commitments

Site rehabilitation

The progressive filling of the site will achieve the final landform which was developed to provide more suitable grades adequate for draining stormwater off the landfilled areas and meeting the Environmental Guidelines: Solid Waste Landfills prepared by the New South Wales Environment Protection Authority (NSW EPA). Capping works will be undertaken progressively as the landfill reaches final levels. The cap will provide for containment of the waste and reduce the volume of rainfall infiltration into the waste, reducing leachate generation. A detailed site closure plan would be developed and submitted to the NSW EPA within twelve months prior to the last load of waste being landfilled.

Staging of rehabilitation

Following closure of the site, the rehabilitation of the landform to a community area would be undertaken in the following three stages.



The future uses of the parklands would be determined by Sutherland Shire Council based on community needs at the time. This would be undertaken in 2035 in accordance with the Voluntary Planning Agreement and in consultation with the community and the Australian Nuclear Science and Technology Organisation as appropriate.

Identified potential future uses include viewing areas, general open space, recreational trails, water bodies and vehicular access. The parkland has been designed to be compatible with existing adjacent facilities.

Responsibilities

While Sutherland Shire Council would be responsible for maintaining the parkland, SITA will continue to have responsibility for the environmental management of the disposed waste for a minimum 30 year period after site closure and in accordance with the closure requirements administered by the NSW EPA. SITA commits to maintaining various assets post closure, as outlined in the Voluntary Planning Agreement.

A Post Closure Environmental Management Plan has been developed and provides detailed guidance on the ongoing environmental management of the LHRRP.

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Glossary

Term	Definition
ANSTO	Australian Nuclear Science and Technology Organisation
ARI	Average Recurrence Interval
ARRT facility	Advanced Resource Recovery Technology facility
DA	Development application
Disturbed Runoff	Runoff from unsealed areas where mobilisation of sediment is likely
EIS	Environmental Impact Statement
EMP	Environmental management plan
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
NSW EPA	New South Wales Environment Protection Authority and any successor body
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) 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 and SITA to provide details of the final landform parkland design, landscaping and uses for the site, following the cessation of waste related activities. 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 (EIS) 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).

This report provides a description of the final landform, parkland design, landscaping, the potential future use of the site and the post closure management arrangements.

1.2 Objectives

The objectives post-closure of the site is to:

- Establish a parkland suitable for community use
- Define post closure commitments

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:

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.

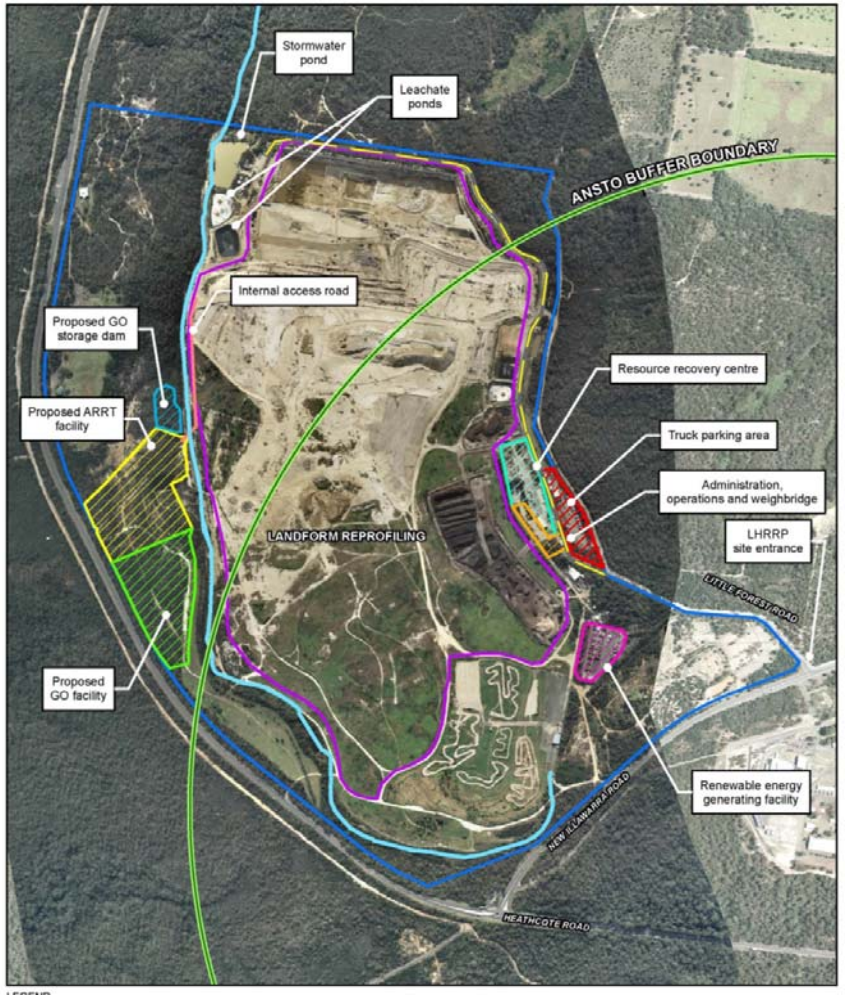
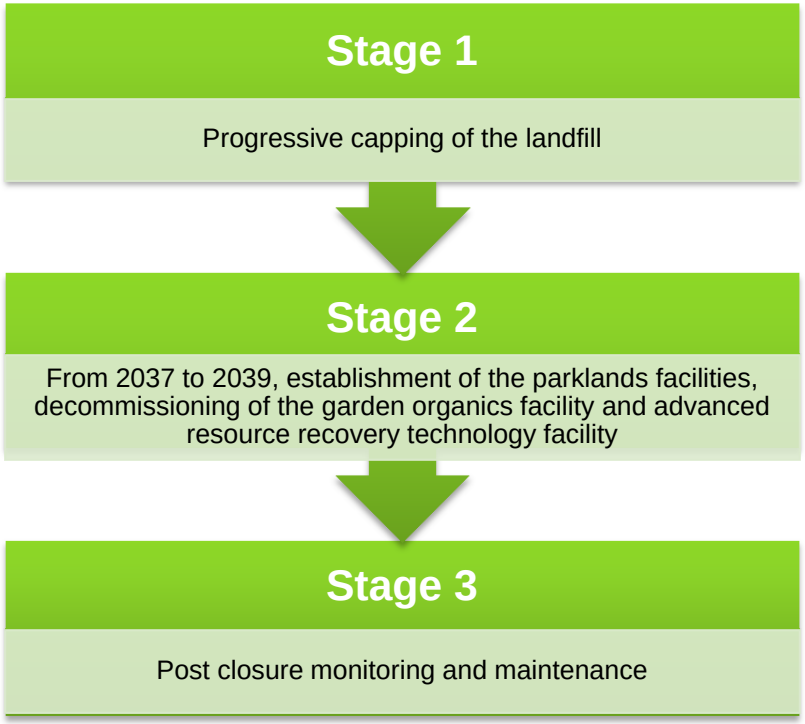


Figure 1.1 The proposal site

1.3.2 Rehabilitation overview

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.

The rehabilitation of the landform to a community area would be undertaken in the following three stages:



While Sutherland Shire Council (SSC) would be responsible for maintaining the parkland, SITA would continue to have responsibility for the environmental management of the disposed waste for a minimum 30 year period after site closure and in accordance with the closure requirements administered by the New South Wales Environment Protection Authority (NSW EPA). As part of the proposal SITA has committed to entering into an agreement with SSC in the form of a Voluntary Planning Agreement (VPA). The process of transfer of land, access rights and other important details is described in the VPA. Additional post closure commitments to SSC in the VPA are described in this report.

In addition, an environmental management plan (EMP) has been prepared for the post closure activities of the LHRRP to measure and manage potential environmental impacts, reflect regulatory requirements and provide guidance for site operators to undertake activities in an environmentally sound manner.

1.4 Scope and structure of the report

1.4.1 Scope of report

This report describes the parkland design and landscaping features and identifies a range of future uses for post-closure of the LHRRP based on community consultation and review of the existing consent.

This report also outlines the post closure management arrangements, including a summary of the contents of the Voluntary Planning Agreement.

1.4.2 Structure of report

- **Chapter 1 – Introduction** – This chapter introduces the the project and the basis for closure and rehabilitation of the site
- **Chapter 2 – Final landform** – This chapter provides an outline of SITA's vision for the final landform and how it would be achieved through progressive capping of the waste
- **Chapter 3 – Parkland design and landscaping** – This chapter outlines the improvements provided by the 2015 Master Plan and provides a description of the proposed parkland area and the physical features
- **Chapter 4 – Future use** – This chapter outlines the options for recreational uses and confirms the compatibility of the final landform with recreational use options
- **Chapter 5 – Post closure arrangements** – This chapter outlines the commitments made by SITA under the Voluntary Planning Agreement to undertaking post construction maintenance
- **Chapter 6 – References** – This chapter provides a reference list

2. Final landform

SITA will provide a final shape which will allow for improved environmental management at the site

2.1 Final landform and grades

The final landform is the shape that the landfill will achieve after completion of landfill operations, including reprofiling and capping works. Due to the decomposition of the waste and compression of the waste from the weight above, the landform will settle over time, where it eventually establishes a final shape. Figure 2.1 provides an illustration of the final landform contours after settlement.

2.1.1 Improvements to the 1999 final landform

The final landform was developed after a review of the original landform developed in 1999. Through the review, it was established that there were insufficient grades to provide appropriate drainage of stormwater off the landfilled areas. This has a range of undesirable consequences such as allowing water to pond on the landfill surface which results in excess leachate generation. A revised landform was developed in order to meet the NSW EPA's Environmental Guidelines: Solid Waste Landfills which provides guidance on final landform design, specifically in Benchmark Technique 28 (site capping and revegetation) where, it states:

"The final settlement of the seal bearing surface should leave a gradient of greater than 5% to defined drainage points"

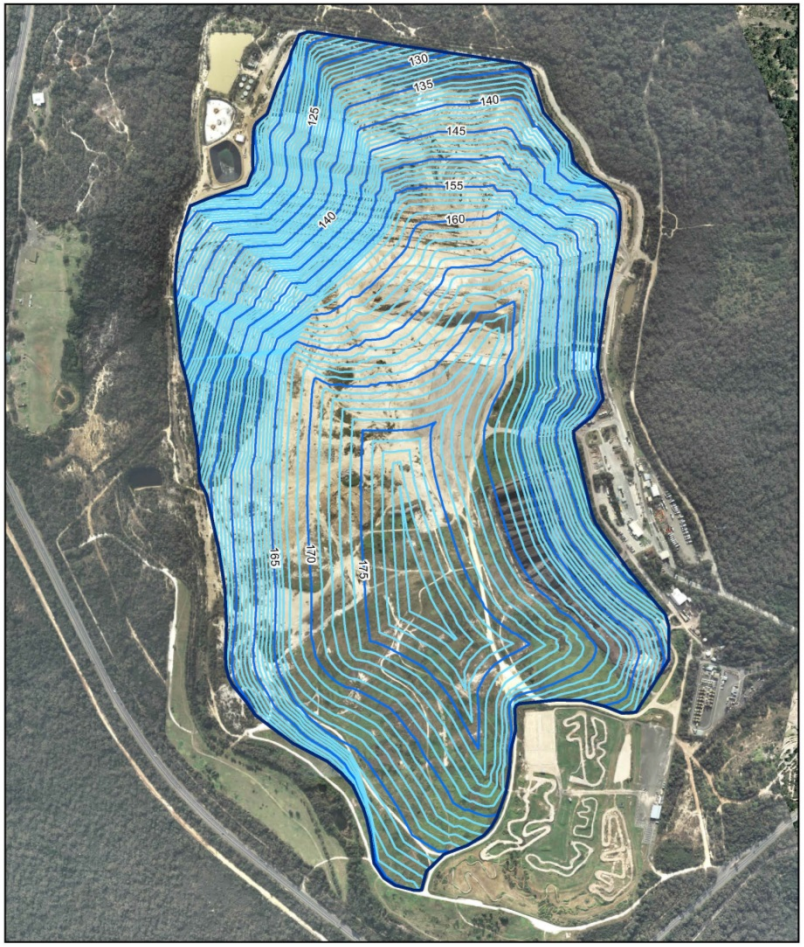
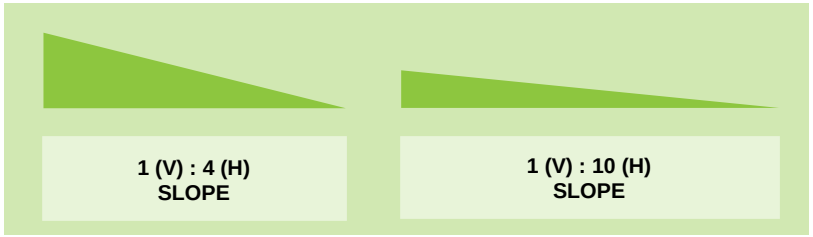


Figure 2.1 Final landform after settlement

A slope analysis for the proposed final landform demonstrates that the post-settlement final landform achieves the minimum 5% design criteria as outlined above. The results of the slope analysis are depicted in Figure 2.2.

A maximum grade of 1V:4H is established to allow maintenance of vegetation on the final landform. Most parts of the site would be constructed with slopes between 5% and 10% (1V:10H). These slopes allow for a range of future use activities as described in Chapter 4.



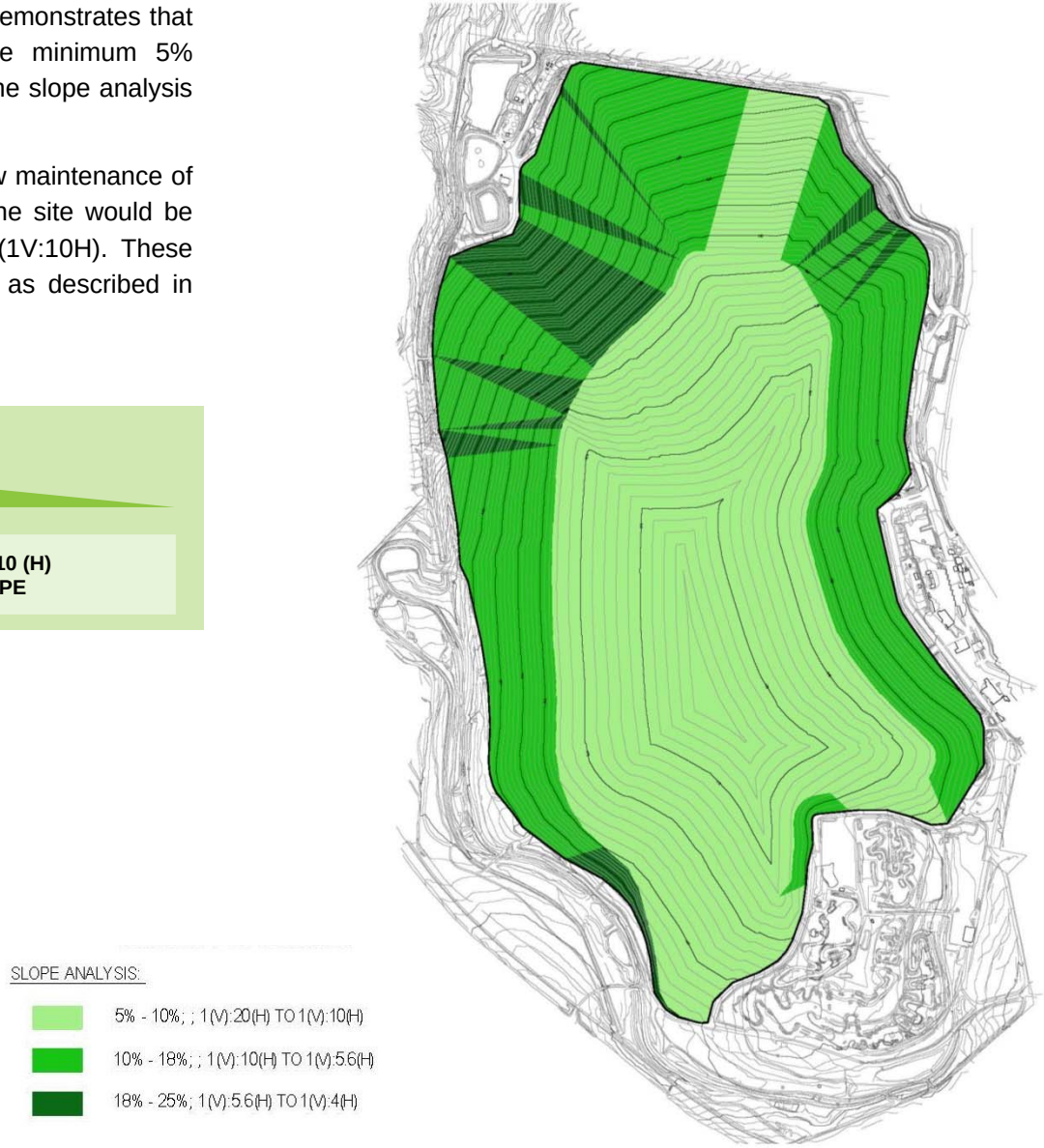


Figure 2.2 Slope analysis of final landform

2.1.2 Comparison with existing heights

The waste would be placed to a level which will result in a landform with maximum height of RL 179.9 m AHD after settlement (includes waste and final cap). This is approximately 8 m above the level which is currently approved.

The maximum height of the constructed surface at the highest point of the reprofiled landfill would not exceed RL 184.9 m AHD (includes waste and final cap). This means that the highest point of the reprofiled landform, located near the centre of the site, would be approximately 2 m above the height of the existing stockpile (2015) which is located towards the northern end of the site. This is shown conceptually in Figure 2.3. A cross section prepared to scale further demonstrates this concept in Figure 2.4.

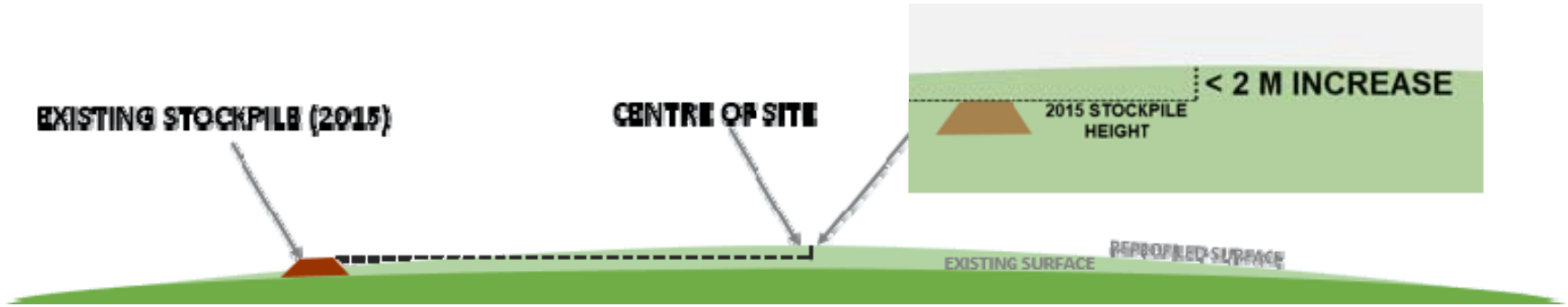


Figure 2.3 Conceptual representation of height increase

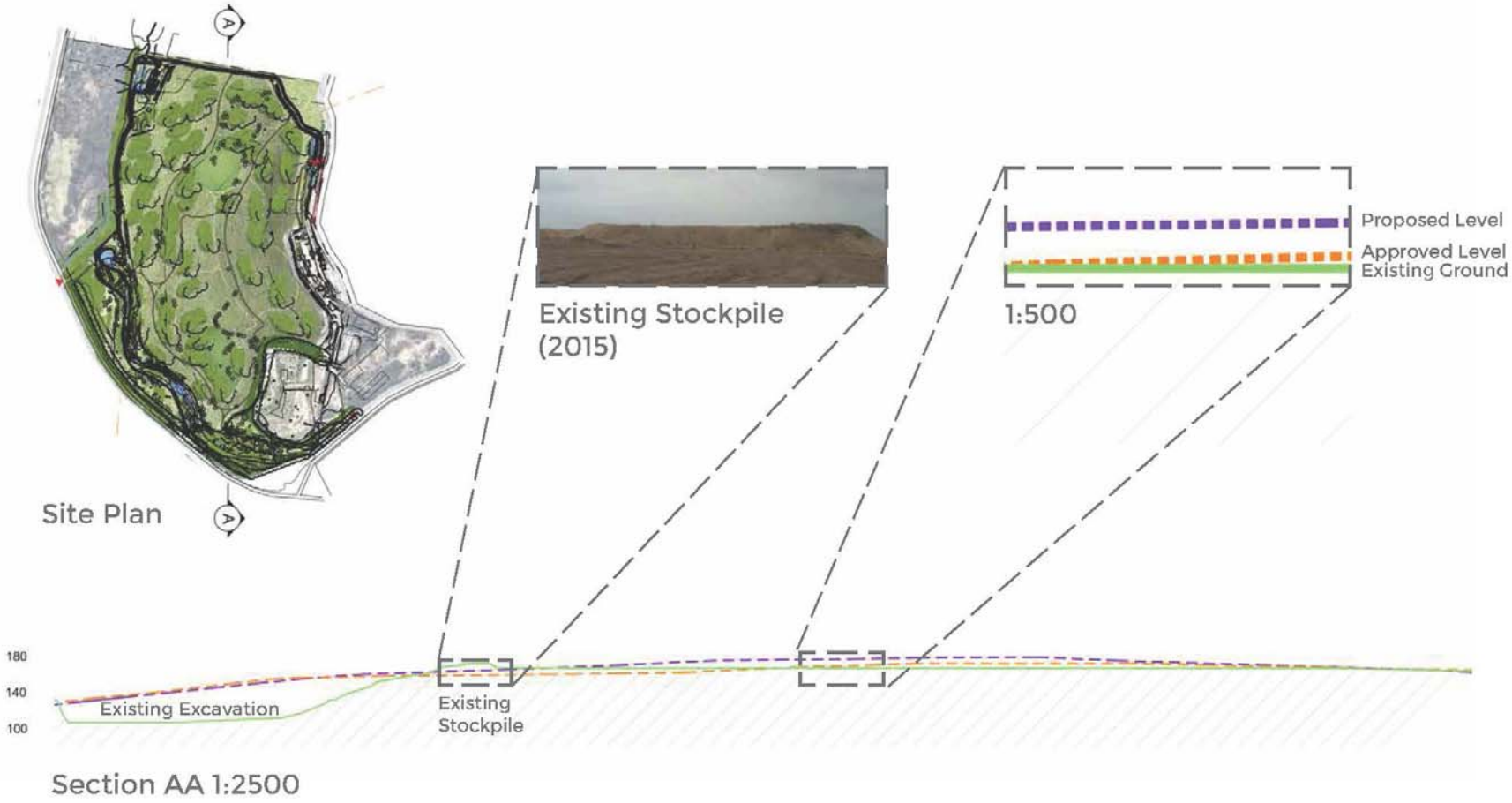


Figure 2.4 Final landform comparison

2.2 Progressive capping

Capping works will be undertaken progressively as the landfill reaches final levels. The cap will provide for containment of the waste and reduce the volume of rainwater infiltration into the waste, reducing leachate generation. Figure 2.5 shows the final cap profile.

This final cap profile may be subject to review and revised in the future, but only if an alternative equivalent profile is approved.

The cap would be progressively seeded with grass until 2037, when final landscaping of the site would take place.

The gas collection and extraction system would continue to be progressively installed in the reprofiled areas as per current practice, with consideration (in terms of locating gas headers and other surface infrastructure) given to the future use of the site as parkland.

2.3 Site closure plan

A detailed site closure plan would be developed and submitted to the EPA within twelve months prior to the last load of waste being landfilled, as required by the site EPL.

The closure plan would be developed in accordance with section 76 of the Protection of the Environment Operations Act 1997.

Figure 2.5 Final cap profile

3. Parkland design and landscaping

SITA has developed a revised landscape master plan for the site which provides a substantial community parkland with a range of physical features

3.1 Parkland development methodology

3.1.1 Review of 1998 Landscape Master Plan

SITA has commissioned Taylor Brammer Landscape Architects to review the Landscape Master Plan developed for the Waste Management Centre at Lucas Heights, prepared in 1998 by Hassell.

The master plan prepared by Hassell proposed a broad scale parkland primarily for passive recreational use with substantial undulating open spaces with areas catering for a variety of activities. The plan took advantage of existing features of the site including ponds, a creek and with the modulation of the fill the created high points for long and middle distance views. It proposed a landscape character which was low key, 'quasi rural' with large grassed open space areas connected by a system of link roads and paths. Tree planting was generally in swathes across the site with accent areas of individual tree planting in turfed areas.

The master plan prepared by Hassell was accepted by SSC as a template for the development of the site as an important recreational facility for the Shire and region. Sixteen years has passed since the master plan was prepared. Ownership of the facility has changed, recreational expectations have evolved and the final landform design for the site has been revised to reflect current projected fill levels.

The review undertaken by Taylor Brammer identified aspects of the master plan which may no longer be appropriate or relevant to recommend amendments to the plan without major changes to the overall vision for the park. Key risks were also identified and appropriately mitigated through the update.

A summary of key improvements are provided in Table 3.1. A detailed review is provided in Appendix A.

Table 3.1 Key improvements in 2015 Master Plan

1998 Master Plan	2015 Master Plan
Risk: Safety and drainage	
A continuous canopy of trees over 100 meters across the landscape raises issues associated with drainage and safety The widths of planting raises the important issue of sight lines across the site. These planted areas do not conform with Crime Prevention Through Environmental Design (CPTED) principals as the distances will allow for obstructions to occur across the site, thus reducing the safety and security of the site for all users.	Tree groves are proposed to be 50 metres in width with an informal grass layer below the trees so to ensure that clear sight lines and drainage pathways are maintained through the groves and under the canopies of the proposed tree vegetation. This provides an appropriate design in respect to the accepted CPTED guidelines for the use of public open space. While there is a reduction of tree numbers of site for the above reasons, there is a better outcome in relation to the overall park design and to usability for contemporary recreation needs.
Risk: Accessibility	
The Master Plan was designed 16 years ago and reflects accessibility concurrence of the date of the plan, which is now outdated	Proposed Master Plan design complies with current accessibility requirements as per AS1428 - Design for access and mobility
Risk: Suitability of layout for revised final landform	
The general principle of a ring road through the site with supplementary car parking areas has been approved by Council. Car parking is located in nominated spaces adjacent to the roads.	The original layout was reviewed and adjusted to suit the current post settlement landform. The replacement of the road to the south of Mill Creek with a pedestrian path provides greater ecological and pedestrian opportunities for this area of the site.
Risk: Suitability of facilities for revised final landform	
Toilets were allocated at strategic locations through the park. The Master Plan was silent on the services provided to the toilets.	It was confirmed that the proposed toilets are adequate and the 2015 Master Plan maintains the same number of toilets provided on the parkland. Solar lighting and rainwater tanks would be provided to service the toilets.

3.1.1 Parkland vision

The revised landscape design provided as part of this proposal maintains the overall vision for the park developed as part of the 1998 Landscape Master Plan. It also incorporates the improvements identified through a detailed review of the plan.

The landscape design of the parkland is aimed to provide broad open grassed and treed areas with integrated cycling paths and vehicular access through the site. The landscape design incorporates Crime Prevention Through Environmental Design (CPTED) guidelines that leads to safe and inviting public open spaces that incorporate clear sight lines across the site with informal tree groupings under-planted with low native grasses.

The design of the parkland incorporates a contemporary open space design approach where flexibility for evolving recreation patterns for the future are accommodated across the site with broad grassed open areas, shade planting using sustainable design principles and a carefully crafted landscape identity.

Figure 3.1 Artist's impression of the future use at the LHRRP

3.2 Parkland area

The proposed parkland will have a total area of 149 ha. A comparison to Sydney's Centennial Parklands is illustrated in Figure 3.2. The parklands will include the reprofiling area and an additional 55.4 ha of natural land located to the west of the landfill where the GO and ARRT facilities will be located. The existing resource recovery centre, administration area, truck parking area and PCYC minibike area are not included in the parkland area.

Figure 3.2 Parklands scale comparison

3.3 Parkland features

Once landfilling has ceased, the site will be converted to parkland, in accordance with the Landscaping Plan contained in Appendix C. The parkland features are described below.

3.3.1 Viewing points

The proposed landform reprofiling would create a new broad ridgeline with a maximum height of RL184.9 mAHD and lateral valleys that drain towards channels including Mill Creek to the west. The high point would be close to the central north-south axis of the site, slightly towards the eastern side.

The site's highest point and ridgeline would provide prominent views including the Sydney City and North Shore skyline. The ridgeline is consistent with the surrounding landform and will blend with adjacent vegetated hilltops and ridgelines.

Figure 3.3 Existing view from LHRRP

3.3.2 Water bodies

Water bodies add to the aesthetics of the proposed recreation and open space development. The water bodies on the site will make use of existing surface water management dams. New water features are also proposed.

The present course of Mill Creek includes a chain of ponds which have been shaped to suit available runoff recharge capacity and to meet functional needs. As part of the construction of the ARRT facility a part of the creek would be realigned. During creation of the parkland, Mill Creek would be retained with the addition of Mill Pond and Duck Pond (discussed below). Mill Pond and Duck Pond are two major ponds proposed for the parkland. A variety of edge treatments are proposed to maximise landscape amenity and provide areas of public accessibility to the water edge. Gentle sloping grassed edges will allow public access to the waters edge at both water bodies.

Simple rural style culverts are proposed across the dam to provide pedestrian and vehicular access. These will be a visual feature of the pond environments.

Wier and spillway structures will be constructed to control water levels. Detailed engineering detailing of the dam structures will be provided prior to the construction of the water features.

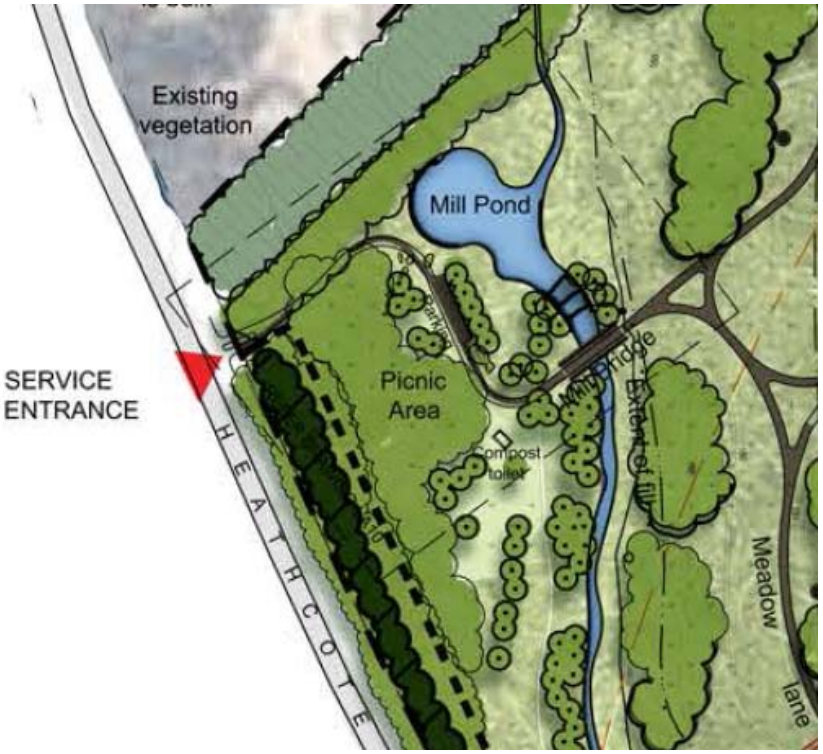


Figure 3.4 New ponds will become major features of the new park

Mill Pond

As part of creation of the parkland, Mill Pond would be constructed and shaped to create a visual landscape feature and amenity. A weir and spillway structure would be constructed to control the water level.

A bridge (Mill Bridge) would be constructed over a weir and would provide a strong visual element within the site. It would be constructed as a piped culvert with stone masonry walls. The bridge would provide pedestrian access to the picnic area on the western side of the site.

Mill Pond would be maintained as a ‘clear water’ pond with densely grassed margins. Self-composting toilets will be located in the area near Mill Pond.

Duck Pond

A new water feature, termed Duck Pond, would be constructed in the south eastern part of the site. Duck Pond would be established with macrophyte planting to remove any nutrients and sediment from the water. Runoff from Heathcote Road would enter Mill Creek above this pond and the pond could be used to provide initial treatment for this runoff. Islands would be formed within the pond to serve as fauna protection habitats, especially for waterfowl.

A pedestrian bridge (Paddock Bridge) would be constructed over the southern part of the pond and would provide a point of focus for the area. Paddock Bridge would be a piped culvert crossing with stone masonry walls.

Wetland

The existing water body next to the proposed North Entrance to the site would be retained. The pond would be used as a visual element and wildlife refuge as part of the final open space development.

Leachate lagoon

The existing leachate dam, in the north western corner of the site, would remain in its present location. Leachate management including collection and treatment will be ongoing following cessation of waste related activities. The dams and related infrastructure would be fenced and public access would be prohibited. A service road would be maintained for access to this area from Little Forest Road.

This portion of the site would be situated on steeply sloping land under an open tree canopy. Development of dense woodland plantings is proposed through the area westwards from the Woodlands drive. This would provide a screen for the leachate dam and ponds and other facilities remaining in the area. It would also create a visual and ecological extension of the Lucas Heights Conservation Area.

Figure 3.5 Water and drainage will become key landscape features of the new parkland

3.3.3 Access

Three vehicular access points are proposed into the parkland. The main entry point would be the North Entrance, from Little Forest Road. Two other entrances (service only) are proposed including to the south (from New Illawarra Road) and to the west (from Heathcote Road). The Heathcote Road entry would be used for emergency/egress only. The New Illawarra Road entry would be primarily used as a service access point.

Two distinct circulation systems are proposed for the parkland. These are:

- Provision for light-duty vehicular (and occasional service vehicles) movement
- Provision for pedestrian, bicycle and other non-motorised movement.

Vehicular traffic

The vehicular tracks would circulate between the three access points. This system would be criss-crossed by many smaller trail links and would involve loop roads and parking areas which would allow movement completely within the park. The major vehicular links would be known as:

- Mill Run, linking New Illawarra Road and Heathcote Road through the site
- Woodlands Drive, connecting the western areas of the site to the northern parts of the site
- Meadow Lane, The Cutting, and The Ridgeway providing vehicular connections to the highest point of the site and along the eastern boundary of the parkland.
- A service road, connecting the leachate dam and Little Forest Road

Roads would be 6 m wide and constructed using cement stabilised crushed sandstone with a two coat seal finish.

Pedestrian/cycle traffic

A shared pedestrian and cyclist path would be provided on the site which will link various parkland facilities. It would be 2.5 m wide and constructed of compacted, crushed sandstone and could be finished with two coat spray seal. The path network offers in excess of 6 km of exclusive pedestrian and cycle use.

Figure 3.6 Over 6km of pedestrian and cycle paths will be provided throughout the park

3.4 Rehabilitation of landfill area

The flow chart below shows the key stages to rehabilitation of the landfill. The stages are described in detail in sections below.

1. Decommissioning and removal of the GO and ARRT facilities

2. Establishment of Mill Pond and water features

3. Development of surface water management infrastructure on the landfill

4. Thickening of revegetation layer over parts of the reprofiled area to support larger plants

4. Tree and shrub planting

5. Development of access tracks and pathways

6. Construction of amenities such as car parking, composting toilets, picnic shelters

3.4.1 GO and ARRT facilities

The GO and ARRT facilities will be decommissioned. This will include the removal of any buildings, hardstand, services and ponds. The area will be returned to its natural topography.

The vehicular access to the GO and ARRT facilities will be included as part of the parkland road network wherever possible.

3.4.2 Mill Pond & Duck Pond

Mill Pond will be established. This will include establishment of the Mill Creek connection to the pond and the indigenous plant life to provide additional habitat opportunities.

Duck Pond, located in the south west corner of the site, will be constructed as previously committed (1999 EIS).

These are illustrated in Figure 3.7 and on the landscape drawings included in Appendix C.

3.4.3 Surface water management

The following description of the parkland surface water requirements is based on the Lucas Heights Resource Recovery Park Project, Surface Water Assessment (GHD, 2015).

Water management dams

The main sediment and water reuse dams would remain, functioning as water management dams. These would be cleared of sediment and landscaped before the parkland's availability.

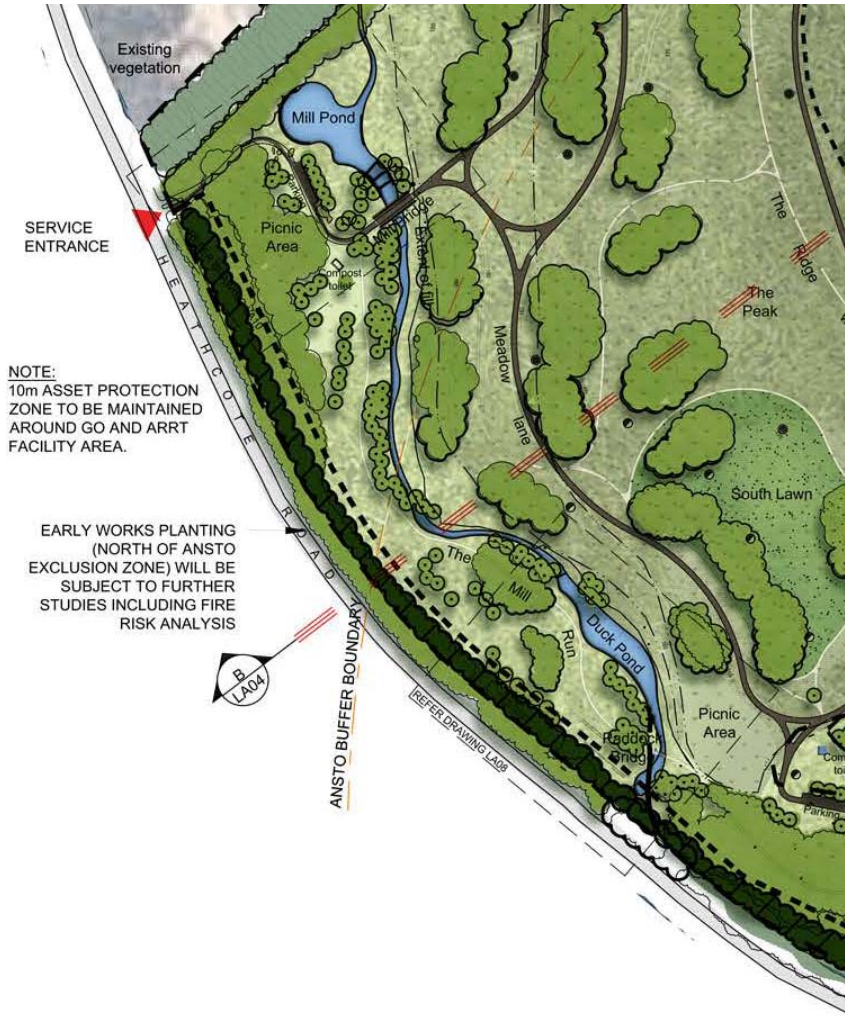


Figure 3.7 Mill Pond and Duck Pond

Drainage channels

Drainage channels as shown in Sketch 21-23396-SK016 (Appendix B) would collect surface water runoff. The channel locations have been proposed such that the areas draining to the main sediment and reuse basin is approximately equal to the maximum catchment draining to the dam during the operational phase of the project.

This would provide the maximum volume of water available for re-use (if needed) over the parkland site, whilst not significantly decreasing environmental flows to Mill Creek compared to during the operational phase of the project. Detailed design of the drainage channels would be required prior to construction of the channels before the commencement of each landfill stage in consideration of potential for scour, including rock protection, energy dissipation or stepping where required.

Indicative channel sizing

An indicative design has been undertaken and the design methodology, basis and results are contained in the Surface Water Assessment (GHD, 2015). This indicative design takes into account the post-closure surface water drainage requirements.

Indicative channel sizes are shown on Sketch 21-23482-SK016 contained in Appendix B.

The capacity of the perimeter drainage (Mill Creek and drainage around the east and north of the site) was also reviewed and confirms the peak 100-year Average Recurrence Interval (ARI) event could be conveyed in the drainage lines and outer perimeter drains.

The existing dimensions are therefore considered to be adequate and are therefore proposed to be retained post-closure of the LHRRP.

Channel lining

The selection of lining type should consider the velocities likely to be experienced in the channels during a 20 year ARI design storm event in order to prevent excessive soil erosion.

Different lining types provide protection for flows within certain velocity range. Lining materials would include rock, mesh reinforced turf, grass, jute or coin mesh.

Suggested channel lining treatments based on the expected channel velocities are shown on Sketch 21-23482-SK022 contained in Appendix B. The most suitable channel lining type would be determined during detail design with consideration of critical flows velocities and final drain locations.

3.4.4 Revegetation

The revegetation/landscaping of the final landform would be in accordance with the landscape drawings prepared by Taylor Brammer (2015), as included in Appendix C.

An extensive planting program would be undertaken using a range of trees and shrubs to create a pleasant setting for passive recreational uses. Thickening of revegetation layer would be required over parts of the reprofiled area to support larger plants. This will be applied to almost a quarter of the reprofiled area where the layer will be thickened from 250 mm to 1000 mm and the topsoil re-established. In addition, pedestrian, cycle pathways and water features, combined with lawn areas and toilet facilities are proposed. The landscape plans have been developed utilising the proposed final landform surface discussed in Section 2.

3.4.5 Roads and cycle paths

A light-duty vehicular road system would be constructed throughout the proposed park allowing movements of vehicles within the entire park environment. These are illustrated on the landscape drawings prepared by Taylor Brammer (2015), as included in Appendix C.

Figure 3.8 High quality topsoil is proposed for planted and grassed areas

Figure 3.9 Key species proposed for the revegetation of the site

3.4.6 Composting toilets

Above ground composting toilet facilities will be established to support the use of public space. These are illustrated on the landscape drawings as included in Appendix C. Toilets connected to sewer are not appropriate for areas containing landfilled waste.

The design of the toilets will need to include ventilation to prevent potential gas build-up, consider the impacts of settlement and allow for disabled access. Solar lights (if required) and rainwater tanks would be provided to service the toilets.

3.4.7 Retained existing infrastructure

The leachate and surface water management infrastructure located in the north west corner of the site and the landfill gas power generation facility in the south east of the site will be retained for ongoing environmental management. The existing resource recovery facility, administration buildings, PCYC minibike club and SICTA area do not form part of the parkland area.

Figure 3.10 Existing surface water dam

4. Future use

The final landform will be compatible with a range of recreational uses

4.1 Parkland recreation uses

The final uses for the parkland have not been determined, however uses may include viewing areas, general open space, recreational trails, water bodies and vehicular access. The parkland has been designed to be compatible with the existing adjacent facilities.

The final uses of the parkland would be determined by SSC based on community needs at the time. This would be undertaken in 2035 in accordance with the Voluntary Planning Agreement and in consultation with the community and ANSTO as appropriate.

ANSTO will have no financial or other responsibility for maintenance of recreational areas.

Aspects which will be considered are outlined in this section. These aspects consider those previously covered in:

- National Environmental Consulting Services (NECS, 1999) Environmental Impact Statement, Lucas Heights 1, Lucas Heights Waste Management Centre, Lucas Heights Conservation Area
- Office of Environmental Mediation and Inquiry (1996) Proposal for Future Use of Lands at Lucas Heights

Figure 4.1 Artist's impression of the future use at the LHRRP

4.1.1 General open space areas for passive recreational use

The site would contain extensive areas of open space. The parkland would provide primarily for passive recreational uses. The detailed design of the parkland would not fully emerge until completion of the final stage of reprofiling in 2037.

Grading and landscaping of all site areas has been developed to provide maximum flexibility to accommodate the possible needs of future generations. Large, gently undulating and sloping spaces edged with trees and pathways would be able to cater for a range of different activities.

Future uses of the open space areas could include (but are not limited to):

- A model aeroplane flying area
- Dog training and dog walking
- Picnic areas
- Walking and cycling tracks
- Kite flying
- Equestrian uses / stables
- Archery
- Tai-chi
- Informal ball-games
- Grass skiing
- Family recreation areas

A model aeroplane flying area will be located in a section on the northern boundary of the site in accordance with a Council resolution on the matter.

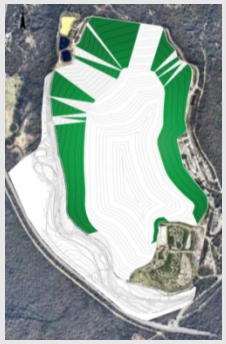
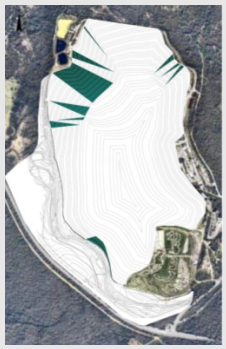
These suggestions are indicative only. The final selection and location of all uses will be subject to community response, compatibility, detailed design and will require ANSTO and SSC approval.

4.2 Final landform and final uses

Typical sections through the final landscapes landform are included in Appendix C.

The final landform provides grades which are appropriate for the proposed passive recreation uses. A discussion of the grades and examples of equivalent slopes in existing parklands is provided in Table 4.1. The full slope analysis is depicted in sketch 21-23482-SK020 (Appendix B).

Table 4.1 Reprofiling area slope analysis

Grade range	Park area	Portion of park area		Example of equivalent slope	
5 – 10%	52.4 hectares	35%			Barden Ridge Sporting Complex
10 – 18%	35.6 hectares	24%			Bicentennial Park
18 – 25%	4.6 hectares	3%			Cronulla Park

5. Post closure arrangements

SITA will enter into a Voluntary Planning Agreement (VPA) in which SITA will commit to undertaking post construction maintenance

5.1 Voluntary Planning Agreement

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 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.

The VPA commits SITA to providing significant financial resources to SSC and the community to enable it to develop additional community facilities throughout the Sutherland Shire like the Ridges Sporting Complex and golf course. Under the VPA, SITA is committing to meet a number of environmental obligations in terms of actions it will take based on the site's environmental performance.

The post closure environmental management plan (EMP) forms part of the VPA.

Within the VPA, SITA has made commitments to maintaining site infrastructure as per Table 5.1.

Table 5.1 SITA Post Closure Care Period

Asset	Period of care (from 1 January 2040)
Landscaping	2 years
Stormwater infrastructure	5 years
Roads and cycle paths	5 years
Facilities (composting toilets)	15 years
Landfill cap	Minimum 30 years

5.1.1 Landscaping

Once the GO facility and ARRT facility have been decommissioned and the parklands facilities established by 2039 (as described in Section 3.4), SITA will maintain the landscaping of the landfill area for two years (2040 and 2041) prior to the transferal of maintenance responsibilities to SSC.

SITA will maintain the rehabilitation of the landfill area in accordance with the landscape drawings, as included in Appendix C. An artist impression of the landscaping is shown on Figure 5.1.

Figure 5.1 Artist impression of landscaping

5.1.2 Stormwater infrastructure & re-establishing Mill Pond

The post closure EMP (SITA, 2015) has been prepared and outlines the environmental and operational activities associated with the management of various aspects at the LHRRP site following the cessation of waste related activities. This includes the management of stormwater.

A stormwater monitoring and maintenance program will be developed to detail requirements such as inspection locations, inspection frequencies and any corrective actions.

Erosion and sediment control measures will be maintained until the site is stabilised. 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 (GHD, 2015 – EIS Chapter 13 Section 13.5).

SITA will maintain the stormwater infrastructure for five years (2040-2044) prior to the transferal of maintenance responsibilities to SSC.

Management Strategy

- Sediment dams and sediment traps will be designed and operated so that sedimentation can occur
- Activate the stormwater treatment plant if required
- Periodic removal of accumulated sediment
- Surface water dams will be de-silted as required
- Maintain vegetation in drains to ensure adequate flow
- Repairing any erosion or scoured vegetation as required
- Clearing obstructions as required
- Repair of structure and associated facilities as required
- Removal of sediment from storage ponds after 5 years (prior to handover) if required

The post closure management plan outlines corrective actions which should be considered if ponding or erosion is identified.

5.1.3 Road and cycle paths

Following construction of the vehicular road system and the pedestrian/cycle paths detailed in Section3.3.3; SITA will maintain these roads and pathways for five years (2040-2044) prior to the transferal of maintenance responsibilities to SSC.

5.1.4 Facilities

SITA will maintain facilities for 15 years as outlined in Table 5.1 prior to the transferal of maintenance responsibilities to SSC.

5.1.5 Landfill cap

Site capping and revegetation will ensure that the final surface provides a barrier to the migration of water into the waste, controls emissions to surface water and atmosphere, promotes sound land management and conservation, and prevents hazards and protects amenity.

Following closure of the LHRRP, the landfill cap will be maintained by SITA for a minimum of 30 years, prior to the transferal of maintenance responsibilities to SSC. This will include rectification of any identified problem areas.

Management Strategy

The soil cover will be inspected regularly for the following:

- Rills - cracks or small channels measuring up to 15 cm wide by 10 cm deep
- Gullies - cracks or small channels measuring greater than 15 cm wide by 10 cm deep
- Increased exposure of erosion control monuments
- Intrusion by humans or animals
- Trails showing human or animal activity
- Damage from vehicular traffic such as ruts and tire marks

Vegetation will be inspected for the following:

- Burned areas
- Overall vigour
- Excessive grazing
- Disease or pests
- Weed infestations

Should the above problems be observed, corrective actions would be undertaken to rectify the issue.

The post closure management plan outlines corrective actions which should be considered if settlement or changes in the cap are identified, or if there is erosion or absence of vegetation.

5.1.6 Landfill environmental management infrastructure

The leachate and landfill gas management systems would continue to operate for many years after site closure. Landfill gas, groundwater quality and leachate would all be monitored to ensure that they comply with the post closure EMP.

SITA would monitor and manage the site and these systems in accordance with the closure requirements administered by the NSW EPA.

6. Conclusions

SITA is committed to better environmental outcomes by the application of best practice prevention, mitigation and rectification measures for all aspects of the Lucas Heights Resource Recovery Park proposal, including the landfill facility, GO facility and ARRT facility.

The Environmental Impact Statement prepared in consultation with a range of stakeholders concluded that there would be no significant impacts to the environment or the community.

SITA recognises the importance of this project within the community and have worked closely with Sutherland Shire Council and other stakeholders to ensure appropriate controls would be in place for the proposal. This proposal would deliver:

- Significant social and financial benefits to the community within the Sutherland Shire
- Improved environmental outcomes during operations and following the cessation of waste related activities
- Increased local employment opportunities
- Following rehabilitation, an extensive and improved parkland compatible with a range of recreational uses

7. 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 – Detailed review of 1998 Master Plan

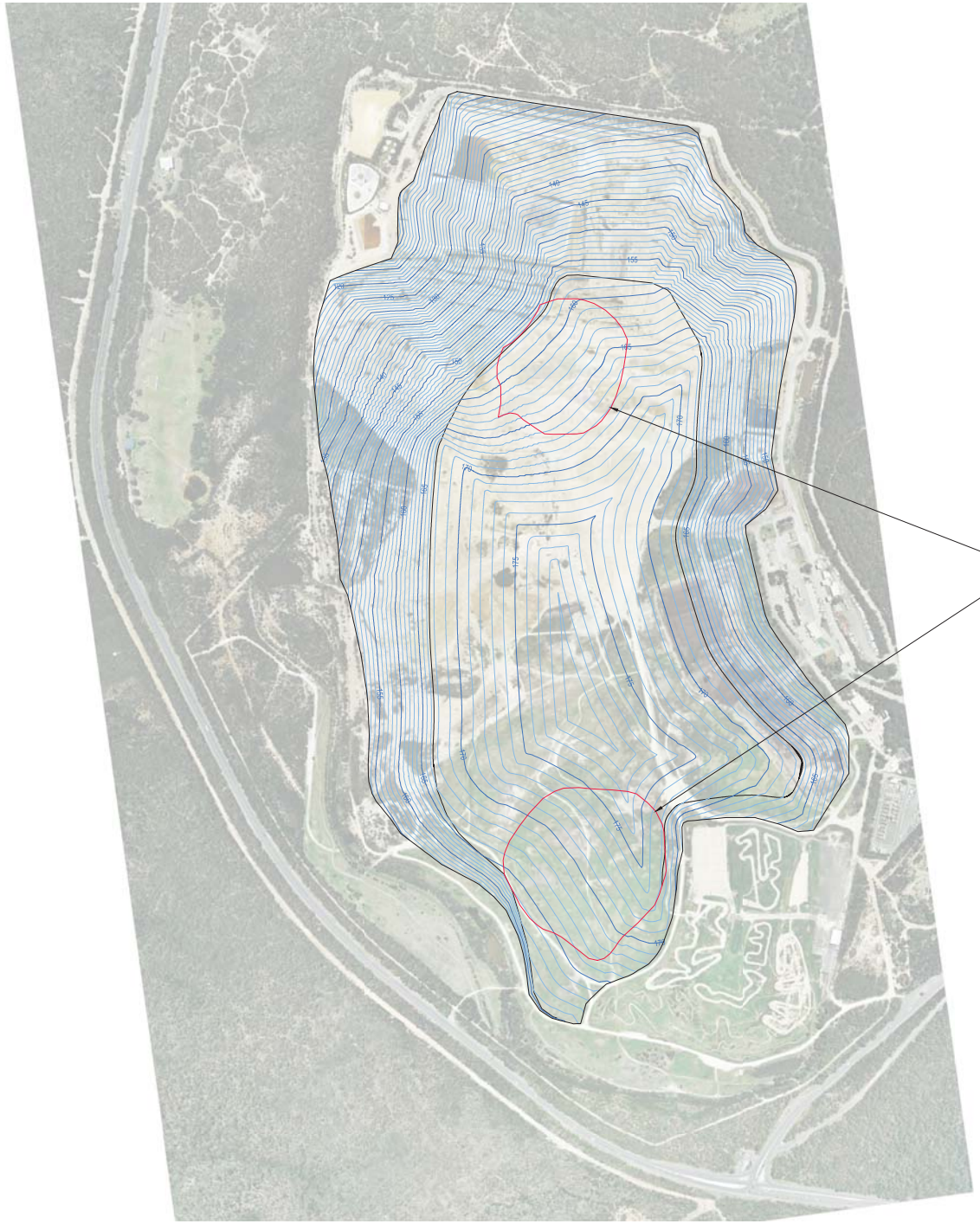
Item	1998 Master Plan	2015 Master Plan
Ground modelling	**Risk: There is limited acknowledgement in the original Master Plan of the constraints relating to placing a parkland on a landfill site.** Details such as individual tree planting in turf were not explained in relation to founding on a fill site and the growing medium over a capping layer was identified to be inadequate. Advice by Taylor Brammer's engineers suggested that the original soil depth allowance made are not adequate for the sustainability of the capping layer over the fill (this needs to be kept moist). It is also inadequate for the proposed vegetation layer to thrive. A consistent fill level of 750mm as proposed in the original Master Plan for tree plantings further inhibits overland flow routes through the landscape creating scouring, pooling of water and results in an underutilised space creating CPTED (Crime Prevention Through Environmental Design) issues.	**Key outcomes:** • Allowance of 0.75 m - 1 m depth of fill for tree growth • Allowance of 0.30 m – 0.35 m depth of soil for turf • Drainage across the site was accommodated through careful design to eliminate pooling of water The above allowances ensures adequate soil depth for sustainable planting and allows the clay liner as part of the landfill cap is retained in a hydrated state
Extent of trees on site	**Risk: The depth of the tree massing at an average of 100 metres across raises issues of site safety and drainage across the site.** The widths of planting raises the important issue of sight lines across the site. These planted areas do not conform with CPTED (Crime Prevention Through Environmental Design) as the distances will allow for obstructions to occur across the site, thus reducing the safety and security of the site for all users.	**Key outcomes:** • Tree groves are proposed to be 50 metres in width with an informal grass layer below the trees so to ensure that clear sight lines are maintained through the groves and under the canopies of the proposed tree vegetation. • This provides an appropriate design in respect to the accepted CPTED guidelines for the use of public open space • While there is a reduction of tree numbers of site for the above reasons, there is

Item	1998 Master Plan	2015 Master Plan
		a better outcome in relation to the overall park design in relation to usability for contemporary recreation needs
Road layout / car parking / pedestrian Paths	General principle of a ring road through the site with supplementary car parking areas identified has been approved by Council. Car parking is located in nominated spaces adjacent to the roads. General principle of the layout of pedestrian paths was confirmed.	**Key outcomes:** • Original layout was accepted in principle and adjusted to suit current post settlement landform • The replacement of the road to the south of Mills Creek with a pedestrian path provides greater ecological and pedestrian opportunities for this area of the site • Further opportunities exist for linear car parking along road network with roll over kerb
Facilities	Toilets were allocated at strategic locations through the park. The Master Plan was silent on the services provided to the toilets.	**Key outcomes:** • It was confirmed that the proposed toilets are adequate • Maintained the same amount of toilets on the

Item	1998 Master Plan	2015 Master Plan
		parkland • Solar lighting and rainwater tanks would be provided to service the toilets
Other infrastructure - bridges	Two vehicular bridges proposed, vehicular barriers associated with car parking	**Key outcomes:** • Removal of one vehicular bridge with removal of road adjacent to Mill Creek • Allocation of two pedestrian bridges to facilitate access to the southern side of Mill Creek
Accessibility	**Risk: The Master Plan was designed 16 years ago and reflects accessibility concurrence of the date of the plan, which is now outdated**	**Key outcomes:** Proposed Master Plan design complies with current accessibility requirements as per AS1428 - Design for access and mobility
Views internal / external	Acknowledgement of views from the site with a grassed ridgeline through the site	**Key outcomes:** Existing plan retained in principle, views gained from ridge line, potential of more dramatic views being gained from potential viewing points

Item	1998 Master Plan	2015 Master Plan
		with revised post settlement landform design.
Vegetation types	**Risk: There are range of trees, shrubs and groundcovers proposed, many of which are indigenous to the area.** Note is made of some substantial trees such as Forest Red Gum, Eucalyptus tereticornis, and Sydney Bark Apple Angophora costata as significantly large trees that will have a potential for their roots to break the clay liner to the fill. No sequential planting strategy.	**Key outcomes:** Revised vegetation list takes into consideration the restrictions of planting over a clay liner with restricted soil depth over and amalgamates indigenous plant species of the area. Plan for sequential planting that will provide shelter for the longer term planting for the site.

Appendix B – Sketches



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SCALE 1:4000 AT ORIGINAL SIZE

PRELIMINARY

rev	description	app'd	date
A	INITIAL ISSUE	AD	29.5.14

SITA AUSTRALIA
LUCAS HEIGHTS RRP

PROPOSED FINAL LANDFORM (POST-SETTLEMENT)

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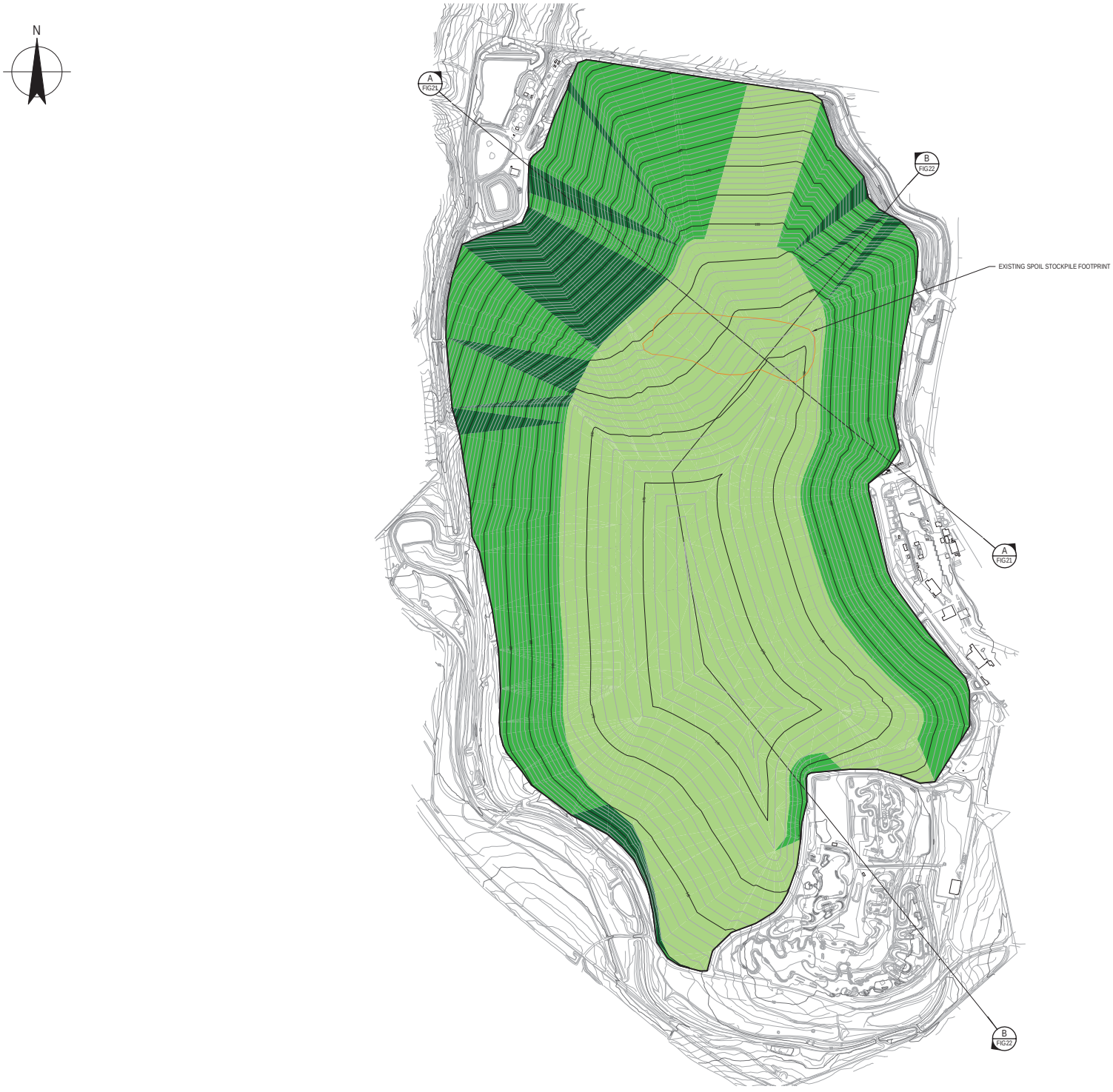
scale	1:4000 for A1	job no.	21-23396
date	MAY 2014	rev no.	A

approved (PD) SK002

Plot Date: 29 May 2014 - 11:25 AM Plotted by: Chris Nivison-Smith Cad File No: \\ghdnetghd\AU\Sydney\Projects\21\23396\CADD\Drawings\21-23396-SK001-002.dwg



LEGEND:

PROPOSED LANDFORM CONTOURS - POST SETTLEMENT

SLOPE ANALYSIS:

- 5% - 10%; ; 1(V):20(H) TO 1(V):10(H)
- 10% - 18%; ; 1(V):10(H) TO 1(V):5.6(H)
- 18% - 25%; 1(V):5.6(H) TO 1(V):4(H)

NOTE
THE FINAL LANDFORM HAS BEEN MODELLED TO A CONCEPTUAL LEVEL ONLY.

PRELIMINARY

rev	description	app'd	date
C	REVISED	AD	08.05.15
B	REVISED	AD	01.05.15

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PROPOSED FINAL LANDFORM SLOPE ANALYSIS

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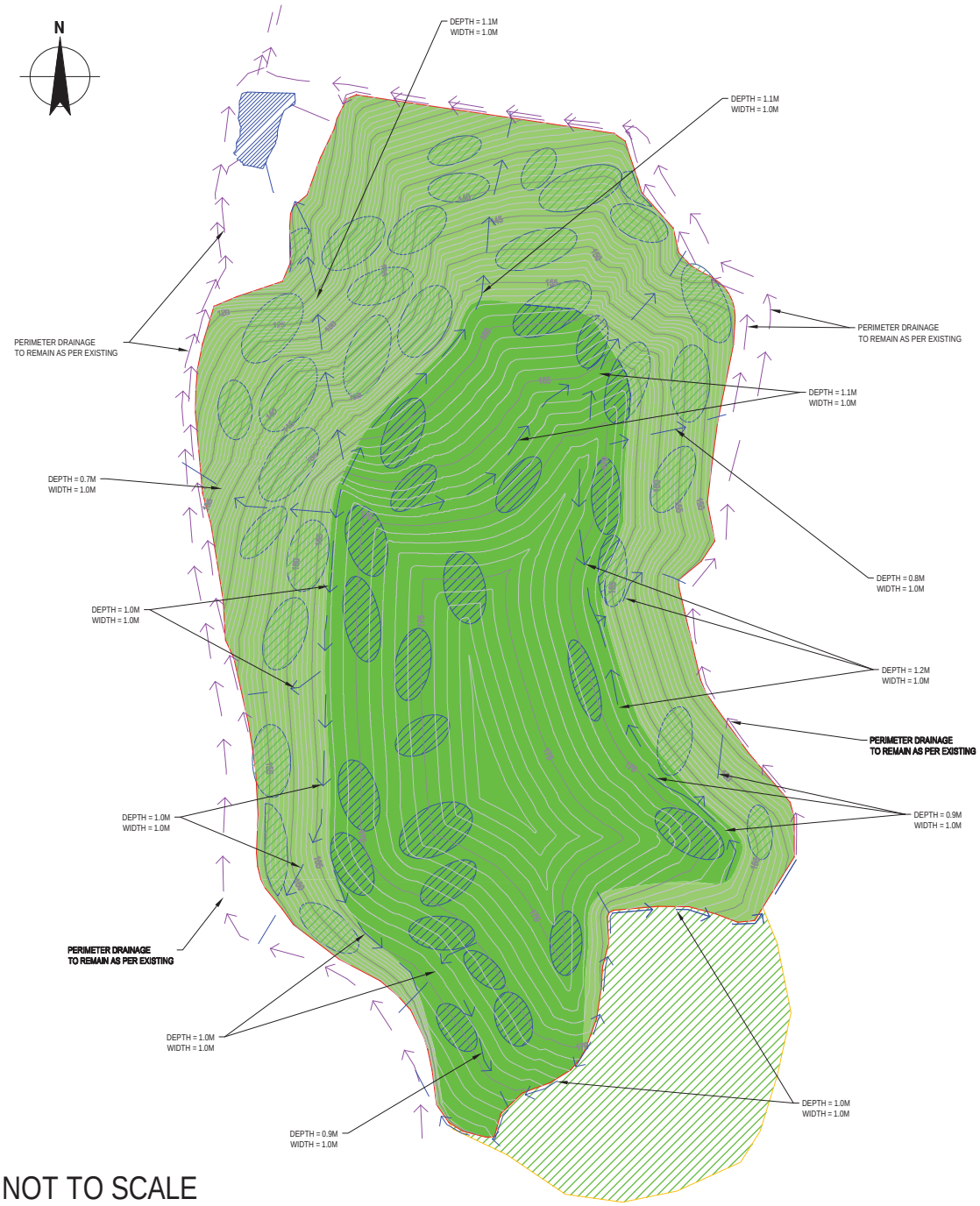
scale	1:3500 for A1	job no.	21-23482
date	MAY 2015	rev no.	C

approved (PD) SK020

Plot Date: 8 May 2015 - 1:50 PM Plotted by: Allison Horlyck Cad File No: G:\21\23482\CADD\Drawings\21-23482-SK020.dwg

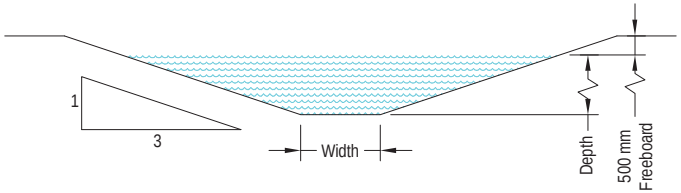


NOT TO SCALE

LEGEND:

- PROPOSED RE-PROFILING BOUNDARY
- PROPOSED FINAL CAP - PLATFORM
- PROPOSED FINAL CAP - SLOPES
- PROPOSED POST-CLOSURE CAP - PLATFORM (MOUNDED AREAS FOR TREES)
- PROPOSED POST-CLOSURE CAP - SLOPES (MOUNDED AREAS FOR TREES)
- PERIMETER DRAIN (TO REMAIN AS PER EXISTING)
- INDICATIVE SURFACE WATER DIVERSION DRAIN

NOTES:
ALL DRAINAGE CHANNELS ARE TRAPEZOIDAL



NOTES:

1. REHABILITATION DESIGN TO INCLUDE GRADING AROUND MOUNDED AREAS AND INTO DRAINAGE LINES
2. CONCENTRATED FLOWS TO BE AVOIDED ADJACENT TO DRAINAGE LINES
3. DETAILED DESIGN TO TAKE INTO ACCOUNT THE EXISTING AND FINAL CONTOURS OF LANDFILL LANDFORM
4. PERIMETER DRAINAGE CHANNELS TO REMAIN AS PER EXISTING
5. CHANNEL LINING AND LOCATIONS ARE INDICATIVE ONLY. TO BE CONFIRMED DURING DETAILED DESIGN WITH CONSIDERATION OF PEAK FLOW RATES AND EXPECTED FLOW VELOCITIES
6. INDICATIVE LINING MATERIALS SELECTED BASED ON "MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION" (LANDCOM 2004) TABLE 5.2: MAXIMUM DESIGN FLOW VELOCITIES IN WATERWAYS
7. ALL DRAINAGE CHANNELS LOCATED ON LANDFORM ARE TRAPEZOIDAL WITH 1V:3H SLOPES
8. DRAINAGE CHANNELS TO BE CONSTRUCTED PROGRESSIVELY WITH LANDFILLING AND CAPPING WORKS

rev	description	app'd	date
E	REVISED	AD	19.08.15

SITA AUSTRALIA
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PROPOSED REPROFILING DEVELOPMENT PLAN

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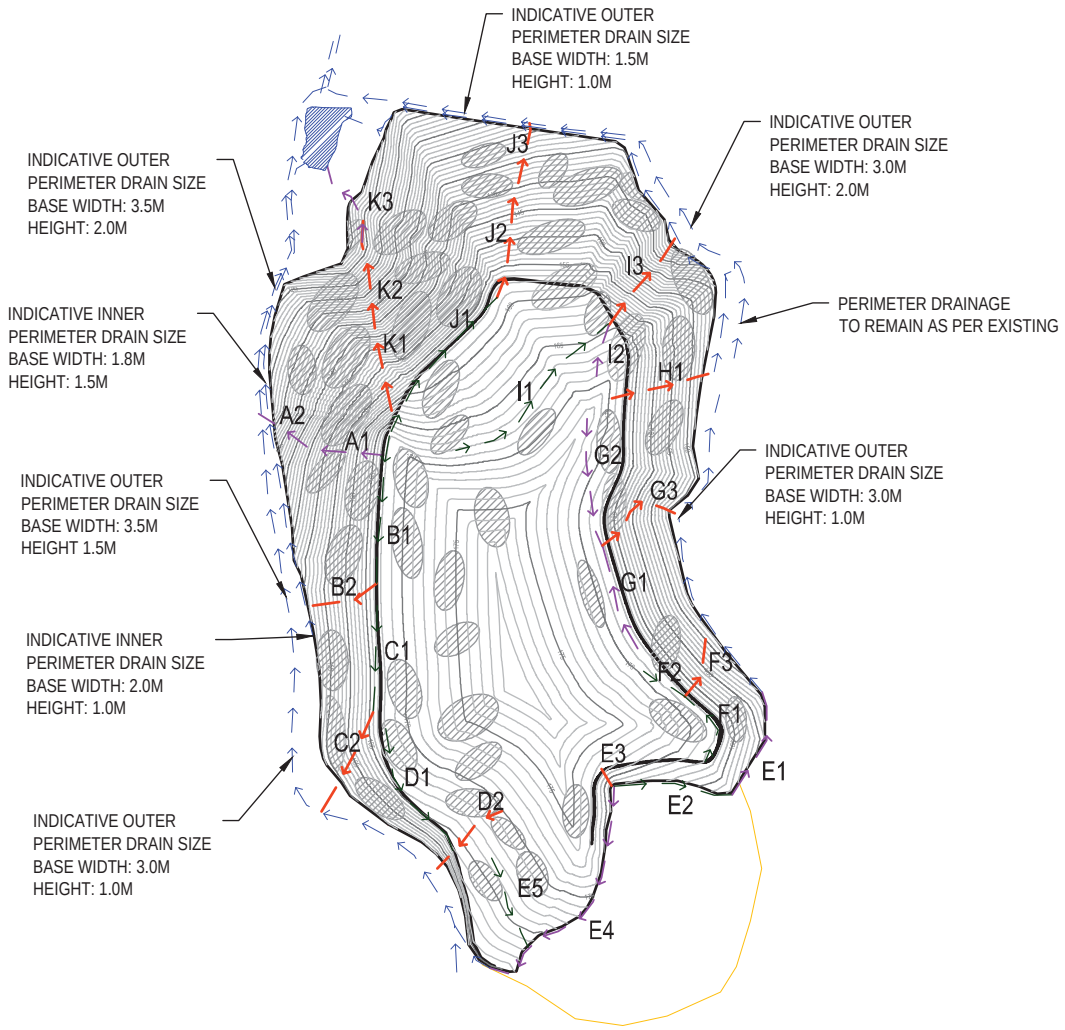
scale	NTS for A3	job no.	21-23482
date	AUG 2015	rev no.	E

approved (PD) SK016

Plot Date: 27 August 2015 - 4:30 PM Plotted by: Alison Horlyck Cad File No: G:\21\23482\CADD\Drawings\209708 Attachment for ANSTO\21-23386-SK016_landscape.dwg

INDICATIVE PROPOSED DRAINAGE LINING MATERIALS		
CHANNEL ID	APPROX. SLOPE (% FALL)	INDICATIVE LINING MATERIAL
A1	20.0%	ROCK
A2	20.0%	ROCK
B1	1.5%	GRASS
B2	15.0%	ROCK
C1	1.5%	GRASS
C2	15.0%	ROCK
D1	1.5%	GRASS
D2	9.0%	ROCK
E1	4.0%	TRM
E2	2.0%	GRASS
E3	13.0%	ROCK
E4	4.0%	TRM
E5	2.0%	GRASS
F1	1.0%	GRASS
F2	1.5%	GRASS
F3	12.0%	ROCK
G1	2.0%	TRM
G2	2.0%	TRM
G3	12.0%	ROCK
H1	15.0%	ROCK
I1	1.0%	GRASS
I2	3.0%	TRM
I3	20.0%	ROCK
J1	3.0%	TRM
J2	10.0%	ROCK
J3	25.0%	ROCK
K1	13.0%	ROCK
K2	20.0%	ROCK
K3	5.0%	TRM



LEGEND:

- PROPOSED RE-PROFILING BOUNDARY
- PERIMETER DRAINAGE
- GRASS LINED STORMWATER DRAIN
- TURF REINFORCEMENT MAT LINED STORMWATER DRAIN
- ROCK LINED STORMWATER DRAIN
- FINAL POST SETTLED LANDFORM CONTOURS

NOTES:

1. DETAILED DESIGN TO TAKE INTO ACCOUNT THE EXISTING AND FINAL CONTOURS OF LANDFILL LANDFORM
2. PERIMETER DRAINAGE CHANNELS TO REMAIN AS PER EXISTING
3. CONCENTRATED FLOWS TO BE AVOIDED ADJACENT TO DRAINAGE LINES
4. CHANNEL LINING AND LOCATIONS ARE INDICATIVE ONLY. TO BE CONFIRMED DURING DETAILED DESIGN WITH CONSIDERATION OF PEAK FLOW RATES AND EXPECTED FLOW VELOCITIES
5. INDICATIVE LINING MATERIALS SELECTED BASED ON TABLE 5.2: MAXIMUM DESIGN FLOW VELOCITIES IN WATERWAYS MANAGING URBAN STORMWATER
6. ALL DRAINAGE CHANNELS LOCATED ON LANDFORM ARE TRAPEZOIDAL WITH 1V:3H SLOPES

PRELIMINARY

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A	INITIAL ISSUE	AD	03/07/15

SITA AUSTRALIA
LUCAS HEIGHTS RRP

INDICATIVE DRAINAGE FINAL LANDFORM

GHD

0 50 100 150m
SCALE 1:5000 AT ORIGINAL SIZE

N

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scale 1:1000. for A3 | job no. 21-2482
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approved (PD) SK022

Plot Date: 3 July 2015 - 1:49 PM Plotted by: Carol Ng Cad File No: G:\21\23482\CADD\Drawings\21-23482-SK022.dwg

Appendix C – Landscaping Plans

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A Horlyck	D Gamble		D Gamble		18.09.15

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