



# **Upper Lachlan Shire Council**

## Crookwell Landfill

### Surface Water Management Plan

September 2016



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# 1. Introduction

## 1.1 Overview

Upper Lachlan Shire Council (Council) owns Crookwell Landfill (the site) located on Grabben Gullen Road in Crookwell, NSW.

During April 2015, Council engaged GHD Pty Ltd (GHD) to assess the potential for, and the feasibility of, upgrading the site to achieve the relevant recommendations contained within the NSW Environment Protection Authority's *Environmental Guidelines: Solid Waste Landfills, Second Edition* (2016).

The assessment identified three potential options for the site:

1. Close the landfill as soon as possible
2. Continue filling of the site with conservative extension
3. Continue filling at the site with maximised footprint area

The assessment concluded that should Council wish to continue landfilling operations at the site, additional works were required to manage the ongoing environmental performance of the site.

GHD received advice from Council during October 2015 that Council wished to continue landfilling operations at the site in accordance with the option three scenario above. As such, Council retained GHD during December 2015 to undertake the following works for the site:

- Develop preliminary staging plans
- Develop a surface water management plan (this 'SMP')
- Develop a leachate management plan
- Develop a landfill gas risk assessment

## 1.2 Purpose of this plan

The purpose of this SMP is to:

- Document relevant information associated with surface water management at the site, including relevant regulatory requirements
- Estimate sediment laden water flows and management requirements at the site
- Identify proposed surface water management measures for the medium to long-term future of the site and present associated conceptual plans

## 1.3 Reliance

A number of documents were obtained, reviewed and relied upon for the purposes of preparing this report. These key documents included:

- CMPS&F Pty Ltd (1998) *Landfill Environmental Management Plan for Crookwell Waste Depot*
- Egis Consulting Australia (1999) *Report on Hydrological Investigation of the Crookwell Landfill*
- GHD (2015a) *Feasibility Study Crookwell Landfill*
- GHD (2015b) *Surface water Management & Conceptual Drainage Design*

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- GHD (2016) *Crookwell Landfill – Staging Plans*
- NSW Environment Protection Authority (2015) *Environmental Protection Licence 6054 (EPL)*
- Upper Lachlan Shire Council (2016a) *Hand marked up copy of GHD Existing Surface Water Flow Plan*
- Upper Lachlan Shire Council (2016b) *RE: Crookwell - Final Staging Plans and Preliminary Quantities*

The following guidelines and standards were considered:

- NSW Environment Protection Authority (2016) *Environmental Guidelines: Solid Waste Landfills Second Edition, 2016* (henceforth referred to as ‘the NSW Landfill Guidelines’)
- Landcom (2004) *Manual Managing Urban Stormwater: Soils and Construction – Volume 1” (4<sup>th</sup> Edition)* (henceforth referred to as ‘the Blue Book’)
- Landcom (2008) *Manual Managing Urban Stormwater: Soils and Construction – Volume 2B, Waste Landfills*

## 1.4 Limitations

*This report: has been prepared by GHD for the Upper Lachlan Shire Council and may only be used and relied on by the Upper Lachlan Shire Council for the purpose agreed between GHD and the Upper Lachlan Shire Council as set out in section 0 of this report.*

*GHD otherwise disclaims responsibility to any person other than the Upper Lachlan Shire Council 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 (refer section 0 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

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*The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.*

*Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.*

*Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.*

## 2. Existing environment

*This section provides an overview of the site and the local conditions.*

### 2.1 Site location and lots

The site is located on Grabben Gullen Road, Crookwell NSW and is formally identified as Lot No. 1 DP 332252.

The site has a total area of approximately 7.7 hectares (77,000 m<sup>2</sup>) and is bordered by:

- Bushland and Grabben Gullen Road to the north with farmland and isolated rural residential properties beyond
- Farmland/bushland to the east
- Farmland/bushland to the south
- Grabben Gullen Road to the west with farmland/bushland beyond

Further details on the location, approximate boundary and environmental setting of the site are provided on Sketch SK010 contained in Appendix A.

### 2.2 Approvals, licenses and notices

#### 2.2.1 Development consent

Due to the length of time that the site has been operational (since 1962), GHD understand that formal development consent for the site does not exist and that the site operates under pre-existing use rights.

#### 2.2.2 Environment Protection Licence (EPL)

Waste disposal operations at the site are licensed under Environment Protection Licence (EPL) No. 6054 as issued by the NSW Environment Protection Authority (NSW EPA).

This EPL contains a range of management, monitoring and reporting conditions designed to ensure that waste disposal operations cause minimal impact on the local environment and community.

The EPL outlines the surface water monitoring and management requirements for the site. Further details are provided in Section 3.

### 2.3 Topography

It is understood that the site is situated on the western flank of the Crookwell River valley, approximately 2 km upstream of Crookwell, and 2.5 km west of the river. The current elevation of the site ranges between approximately 990 mAHD and 1000 mAHD as shown on the drawings contained in Appendix A.

Waste disposal operations have disturbed the original natural topography, which is believed to have comprised gently sloping land falling towards the middle of the site and eastwards towards the Crookwell River.

The surface created by the waste disposal operations varies in shape and slope. A slope analysis previously undertaken by GHD (GHD, 2015a) identified that large parts of the eastern and western batters were over steepened and exceeded slopes of 1(V):3(H). It is understood that Council is currently undertaking works to reduce the steepness of these slopes to 1(V): 4(V) to provide batters that are stable in the long term and capable of supporting a landfill cap.

It is noted that GHD has recently developed staging plans for the reshaping and future filling of the site (GHD, 2015b). These are contained in Appendix A.

## 2.4 Soils and geology

The site is understood to be located within the Taralga soil landscape, which consists of plateaux or valleys of gently undulating to undulating rises. The Taralga soil landscape is understood to be associated with weathering of basalt plateaux. Typically, soils in this landscape consist of Kraznozems and Xanthozems on crests, Chocolate soils on sideslopes and Prarie soils on footslopes.

GHD understands that the site is underlain by sediments of an undifferentiated sequence of Ordovician age. The sediments are of an intermediate-deep marine origin, which have undergone low-grade metamorphism. These rocks consist of black and grey slate and phyllite with greyish to olive, muddy, fine to medium quartzose sandstone. The sandstone frequently exhibits graded bedding and may be classed as a subgreywacke. The sequence is of an unknown thickness.

Furthermore, it is understood that:

- The Crookwell area is characterised by the presence of basalt and dolerite extrusive igneous rocks that are also found in the central Lachlan valley
- That the area around the site is a zone of intense deformation comprised of isoclinally folded and cleaved material, frequently turned over with small scale folds

Available site specific information suggests that the soils at the site are variable in composition and consist of a mixture of clay, gravel, silt, sand and peat (location dependent). Furthermore, this information suggests that these soils are variable in thickness (from 0 metres to approximately 1 m thick) and are underlain by weathered slate/phyllite bedrock (which become more competent/stronger with depth).

## 2.5 Hydrogeology

### 2.5.1 Groundwater

Standing water level data obtained from groundwater monitoring bores at or within the site boundary by GHD on 8 August 2016 are summarised in Table 1 below. The location of these groundwater monitoring bores are shown on Sketch SK010 contained in Appendix A.

**Table 1 Summary of groundwater level monitoring data (from 08/08/2016)**

Well	Casing upstand above ground level (m)	Depth to water (mbtoc) <sup>(1)</sup>	Base of well (mbtoc)	Depth to water below ground level (mbgl) <sup>(2)</sup>
MW1	0.7	0.03	9.80	Above ground level
MW2	0.56	1.80	11.20	1.24
MW4S	0.68	0.37	7.40	Above ground level
MW4D	0.62	0.80	1.50	0.18

The data in Table 1 indicates that the groundwater table at or within the site boundary varies between being above the prevailing ground levels to up to 1.24 m below the prevailing ground levels at the groundwater monitoring bores. It is noted that these groundwater levels may not

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<sup>1</sup> metres below top of casing

<sup>2</sup> metres below ground level

indicate typical long term groundwater levels around the site and may be more indicative of recent heavy and persistent rainfall during 2016.

GHD further understands that:

- A previous investigation undertaken at the site (CPMS&F, 1998) identified two water bearing zones underneath the site as follows:
  - The first water bearing zone was a shallow, impermanent zone located in the soil profile. At that time, this system was only present in permeable soils (approximately 2 to 3 m thick) and was regarded as a type of perched aquifer. The groundwater encountered during this investigation was located between 0.3 and 1.8 metres below the prevailing ground level and was considered to possibly be perched on ironstone bands located within the soil horizon
  - The second and more significant water bearing zone was thought to be located in a fractured rock aquifer representing the bedrock beneath the soil profile at a much greater depth than the first water bearing zone. At that time, it was thought that this groundwater was transported through the rock mass via interconnected fractures and joints towards the east of the site in the direction of the Crookwell River (in accordance with the prevailing local topography)
- There are two groundwater wells within 600 m of the site <sup>(3)</sup>. These wells (GW703578 and GW703579) are located to the site's north. These wells showed several water bearing zones at the time of monitoring, all in excess of 36 metres depth below the prevailing ground levels
- The *1:2,000,000 Groundwater in New South Wales, Assessment of Pollution Risk Map* (1987) indicates that the investigation area is likely to be underlain by fractured rocks/all pre-Permian rocks, mainly igneous and metamorphic rocks, which transmit water through an inter-connected network of joints and partings. It was classified as having moderate potential for groundwater movement and a low salinity rendering it suitable for stock, domestic and some irrigation purposes (i.e. 0 - 1000 mg/L)

### **2.5.2 Leachate**

There is no recent data available on the composition of leachate at the site or its relative levels within the landfill itself.

## **2.6 Hydrology**

Further details on existing stormwater management at the site is provided in Section 4.

## **2.7 Local climate**

The climate at the site is summarised in Table 2 below, which contains weather data available from the Crookwell Post Office Bureau of Meteorology (BOM) weather monitoring station (No. 070025) and Goulburn TAFE Bureau of Meteorology (BOM) weather monitoring station (No. 070263). The Crookwell post office and Goulburn TAFE BOM stations are approximately 3.5 km northeast and 40 km southeast of the site respectively.

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**Table 2 Summary of average monthly climatic conditions for Crookwell <sup>(4)</sup>**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)	26.5	25.9	23.6	18.4	13.9	10.3	9.5	11.0	14.7	18.3	21.4	25.0	18.2
Mean minimum temperature (°C)	10.7	10.7	8.8	5.0	2.3	0.6	-0.4	0.3	2.1	4.6	6.7	9.0	5.0
Mean monthly rainfall (mm)	69.6	54.3	58	58.5	65.9	89	84.6	89.5	74.7	76.4	65.3	66.3	858.6
Mean daily evaporation <sup>(5)</sup> (mm)	6.3	5.2	4.0	2.5	1.6	1.1	1.2	1.9	2.8	3.9	5.0	6.1	3.5
Mean monthly evaporation <sup>(6)</sup> (mm)	195.3	146.9	124	75	49.6	33	37.2	58.9	84	120.9	150	189.1	1263.9

From the data in Table 2, it can be seen that:

- Mean monthly rainfall is variable throughout the year, with rainfall being highest during June to August and lowest during February to April
- Mean monthly evaporation is lowest during the months of May to August and highest during the months of November to February
- The annual mean monthly evaporation (1263.9 mm) far exceeds the annual mean rainfall (858.6 mm)
- Mean monthly evaporation exceeds mean monthly rainfall between September and April
- Mean monthly rainfall exceeds mean monthly evaporation between May and August
- Mean maximum temperature is highest during the months of November to March (between 21.4°C and 26.5°C)
- Mean minimum temperature is lowest during the months of June to August (between -0.4°C and 0.6°C)

## 2.8 Waste types, footprint and quantities received

Only relatively limited information is available in relation to the types of waste landfilled at the site. This information suggests that a variety of materials may have been landfilled at the site including:

- Earthen fill materials (for example soil and rocks)
- Municipal solid waste (MSW)
- Commercial and industrial waste (C&I)
- Construction and demolition waste (C&D)
- Agricultural waste
- Special waste including animal carcasses, stabilised biosolids and asbestos

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<sup>4</sup> Data for mean maximum temperature, mean minimum temperatures and mean monthly rainfall obtained from Crookwell Post Office BOM station, accessed 27 February 2016 (1916 to 1975 data for mean maximum and minimum temperatures, 1883 to 2016 data for mean monthly rainfall).

<sup>5</sup> 1968 to 2016 data for evaporation obtained from Goulburn TAFE BOM station, accessed 27 February 2016. This data was used as the Crookwell Post Office BOM station does not record evaporation data.

<sup>6</sup> Mean daily evaporation multiplied by days in month

The available information suggests that the majority of waste landfilled at the site to date is municipal solid waste.

The current waste footprint at the site as estimated by GHD is shown on Sketch SK004 in Appendix A. This waste footprint is approximately 3.5 ha in area (350,000 m<sup>2</sup>). It is noted that this footprint is indicative only and requires further confirmation.

It is noted that a minor area of waste deposition had previously occurred outside the northern boundary of the site in the adjacent road reserve. GHD understands that this material was removed and placed on-site during early 2016.

Detailed records of the waste types and quantities landfilled at the site are not available for all years of operation. However, data is available for 5 recent financial years <sup>(7)</sup>. This data is summarised in Table 3.

**Table 3 Annual waste quantities (2010/11 to 2014/15)**

Financial Year Ending (FYE)	Waste quantities (tonnes)			Total received (tonnes)	Materials transported offsite for recovery (tonnes)	Total waste landfilled (tonnes)
	MSW	C&I	C&D			
2010/11	2,649	26	285	2,960	77	2,882
2011/12	2,375	27	362	3,116	68	3,048
2012/13	2,621	27	325	2,972	242	2,730
2013/14	2,725	28	283	3,036	233	2,803
2014/15	2,975	28	94	3,097	217	2,880
<b>Average</b>	<b>2,669</b>	<b>27</b>	<b>270</b>	<b>3,036</b>	<b>167</b>	<b>2,869</b>

Table 3 identifies that:

- The majority of waste deposited at the site (at least in recent years) has been MSW, with only relatively minor quantities of C&I and C&D wastes deposited
- The quantities of deposited waste have been relatively stable (as least in recent years) at around 3,000 tonnes per annum

GHD previously estimated that a total quantity of approximately 135,000 m<sup>3</sup> of waste was present at the site (GHD, 2015). This estimate excluded the animal carcass trench and asbestos pit areas and assumed that no excavation had been undertaken at the site beneath the existing bulk waste mass.

## 2.9 Waste placement, compaction and covering

GHD understands that all waste landfilled at the site has been placed in layers and compacted using typical landfilling equipment, including a landfill compactor and/or dozer.

It is understood that the area method of landfilling has been employed at the site to date, with minimal trenching and subsequent filling occurring. Where trenching and subsequent filling has occurred, it has been in limited locations and for special wastes only.

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The site's current EPL requires Council to achieve an average compaction rate of not less than 650 kg/m<sup>3</sup> for all waste disposed of at the site.

It is understood that there have been (and continue to be) no formal requirements in relation to cover material application at the site. It is noted that the availability of suitable cover material at the site has been (and continues to be) limited. Council is currently undertaking additional on-site investigations in relation to sourcing potentially suitable cover material.

Subject to its availability, Council has (and continues to) covered waste with a layer of clean fill or similar material when filling activities have concluded for the day. It is understood that the material type, applied thickness and timing of covering works have been (and continues to be) variable.

## **2.10 Containment system and leachate management**

No engineered basal or side wall containment system is known to be present at the site.

No engineered leachate collection system is known to be present at the site. Leachate is not actively collected and managed at the site at this time.

## **2.11 Final cover layer**

It is understood that no part of the site has ever been formally rehabilitated and that no formally engineered final cover layer is present at the site.

The thickness and specification of the existing cover layer present across parts of the site is unknown to GHD.

It is noted that GHD (2015) describes potential landfill capping options for the site.

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## 3. Regulatory requirements

*This section details the relevant regulatory requirements with regards to surface water management at the site.*

### 3.1 Environment Protection Licence

The primary document that regulates surface water management at the site is EPL No. 6054 (refer Appendix B). This SMP has been developed with consideration of these requirements. However, it is noted that proposed amendments to the site (decommissioning of some infrastructure, commissioning of new infrastructure) outlined in this document will require the existing site EPL to be revised (refer Section 7).

Specifically, this EPL contains the following conditions that are relevant to surface water management and the preparation of this SMP:

#### Condition M2.2

*Water and/or Land Monitoring Requirements (refer Appendix B for more details).*

#### Condition O6.3

*Surface drainage must be diverted away from any area where waste is being or has been landfilled.*

### 3.2 NSW Landfill Guidelines

The NSW Landfill Guidelines provides guidance and outlines the minimum standards for the environmental management, which includes surface water management, of landfills in NSW. These include a mix of design and construction techniques, effective site operations, monitoring and reporting protocols, and post-closure management.

The guidelines specify the following required outcomes in relation to surface water management:

- *Controls must be implemented to minimise erosion and reduce the sediment load (suspended solids) of surface water discharged from the site*

### 3.3 Blue Book

The Blue Book provides guidelines on mitigating the impacts of land disturbance activities on soils, landform and receiving waters by focussing on erosion and sediment control. Volume 2B of the series provides guidelines, principles and recommended minimum design standards for good management practice in erosion and sediment control for waste landfills.

## 4. Existing surface water management measures

*This section details the existing surface water management measures implemented at the site.*

### 4.1 Surface water flow paths and infrastructure

#### 4.1.1 Off-site run-on

There is a large bund along the north-western boundary of the site, parallel to Grabben Gullen Road. The bund is vegetated with grass and large trees. There is also a grassed channel in the crest of the bund, which collects surface water from Grabben Gullen Road and conveys it to the informal leachate/stormwater depression located on the site's eastern boundary.

The precise size of the grassed channel located at the crest of the bund is unknown.

#### 4.1.2 On-site flows

No formalised stormwater infrastructure is currently in place to collect and direct stormwater generated on-site. As such, stormwater generated on the site's eastern part currently flows in accordance with the prevailing topography (i.e. eastwards) towards the informal leachate/stormwater depression located on the site's eastern boundary. From here, this stormwater subsequently flows off-site via an intermittent watercourse towards the Crookwell River.

Stormwater generated on the site's western part currently flows in accordance with the prevailing topography (i.e. south easterly) towards the site's south-eastern boundary. From here, this stormwater subsequently flows off-site into an off-site dam.

Stormwater from the low spot present in the central part of the landfill area currently flows eastwards via a concrete pipe installed through the waste mass to the informal leachate/stormwater depression located adjacent to the eastern boundary. The composition of this stormwater is currently unknown but it may be contaminated by landfill leachate due to its passage through the concrete pipe (which is installed through waste).

Ponding was identified in the following locations during a previous site inspection by GHD:

- In the ditches adjacent to the site access road
- Near the north-western boundary of the site between the embankment and the landfill
- At the central part of the landfill area

### 4.2 Erosion and sediment control

Currently the informal leachate/surface water pond is used as a quasi-sedimentation pond by Council.

A diversion bund/embankment is located along the western part of the site's south-western boundary. This acts to help direct surface water towards the leachate/surface water pond located on the site's eastern boundary.

No information is available in relation to the capacities of the informal leachate/surface water pond. As such, GHD has estimated the capacity of this water body using distance information obtained from recent aerial photographs and best guesses based on a previous site inspection during 2015. This information was then input into the dam volume calculator located at

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<http://www.aqua-calc.com/calculate/volume-dam> to produce its estimated total capacity. This is provided in Table 4 below.

**Table 4 Estimated maximum capacities of existing dam**

Dam name	Average length (m)	Average width (m)	Estimated maximum depth (m)	Approximate maximum capacity (m <sup>3</sup> )
Leachate/ surface water depression	44	26	0.5	550

### 4.3 Environmental monitoring and reporting

Current environmental monitoring and reporting requirements are described in Section 3 above.

Water monitoring data from Dam 1 (to the south of the site) and groundwater wells is available for March 2016 (refer Appendix C). This data suggests that the groundwater downstream of the site may be impacted in a minor way by landfill leachate but that there are no apparent impacts upon the surface water in Dam 1.

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## 5. Surface water management basis

*This section details the basis for the surface water management strategy developed in Section 6.*

### 5.1 Current performance and capacity

Current surface water management at the site appears functional but has a few issues including:

- The existing surface water management system is informal and the overall capacity cannot be confirmed as no design information is available for it
- Stormwater run-on from Grabben Gullen Road is currently being conveyed into the informal leachate/stormwater depression, mixing with sediment laden water collected on the site
- Leachate may be potentially being generated via directing stormwater through a concrete pipe installed in waste
- Potential mixing of leachate and stormwater may be occurring particularly at the informal leachate/stormwater depression
- The site is currently making informal use of off-site ponds (not owned by Council) as sedimentation dams
- Ponding is occurring in a number of locations on site due to poor grading

Whether the existing surface water management system is of an adequate capacity is unknown as no design information is available for it.

### 5.2 Constraints and opportunities

#### 5.2.1 Constraints

- Currently no final capping has been constructed at the site
- The concrete pipe installed through the waste mass that currently conveys surface water to the east will need to be removed during future landfilling stages
- The majority of the site's internal roads are not sealed
- The groundwater is understood to be relatively shallow on site
- Alterations to surface water management at the site may impact water access for neighbouring agricultural properties
- Excavation work on waste batters located along the eastern portions of the site is required to provide stable batters (which are less susceptible to erosion than current)

#### 5.2.2 Opportunities

- Significant parts of the historical landfill areas can be rehabilitated and revegetated to reduce erosion. This water could then be treated as 'clean' water and likely able to be directly discharged off-site
- Off-site surface water run on can be more effectively diverted to minimise mixing of off-site and on-site waters

- Management of sediment laden water can be formalised and occur wholly on-site rather than using off-site dams. The unused space in the south-eastern corner of the site may be used for a formal sedimentation dam
- Required excavation work on eastern waste batters may allow for the construction of contour drain on the landfill cap

### **5.3 Ongoing site development**

#### **5.3.1 Final landform**

The site is expected to continue progressive landfilling to reach the proposed final landform as described in the staging plans (refer Appendix A).

Rehabilitation works will be undertaken in a progressive manner to reduce sediment laden surface water generation as the landfill reaches its final landform.

#### **5.3.2 Pond development**

Surface water drainage across the site will be formalised and directed to a newly constructed on-site sedimentation dam located in the site's south-eastern corner.

The existing informal leachate/surface water pond will be de-commissioned and a lined leachate collection pond constructed in its place as per the site Leachate Management Plan (GHD, 2016).

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## 6. Surface water management strategy

*This section details the proposed surface water management strategy for the ongoing operation, closure and rehabilitation of the site.*

### 6.1 Surface water management objective

According to the Blue Book, the goal for surface water management is:

*'to ensure that there is no pollution of surface or ground waters. Current best-practice erosion and sediment control techniques are, however, unlikely to achieve this goal, due to the limited effectiveness of most of these techniques. An appropriate management objective is therefore to take all reasonable measures (i.e. implement best-practice) to minimise water-quality impacts from erosion and sedimentation.*

*Given the limited effectiveness of techniques for retaining eroded sediment, a strong emphasis should be placed on pollution prevention through erosion control, rather than relying on treatment techniques to capture these sediments.'*

Therefore, with the primary objective of not polluting surface waters, GHD has developed a set of guiding principles (refer Section 6.2). The focus of these principles and the following strategy is to minimise the discharge of sediment laden waters off site.

### 6.2 Soil and water management guiding principles

The over-arching goal for surface water management at the site is to minimise erosion and sediment generation at the source, and, where this is not possible, to capture and treat any sediment generated before discharge off site.

The following guiding principles have been developed to provide a framework for the development and assessment of site-specific options to achieve this:

- Minimising the volume of surface water running onto the site
- Minimising the extent of disturbed areas within the site
- Minimising surface water from running onto disturbed areas of the site by staging operations and, where necessary, utilising surface water diversion drains and bunds for disposal and processing areas
- Ensuring all surface water runoff from disturbed areas of the site is managed prior to reuse or discharge offsite
- Ensuring all erosion and sediment controls are properly maintained by implementing an inspection and monitoring schedule
- Separating 'clean' and 'dirty' water, where possible
- Providing staff education and adopting strategies for early identification of potential surface water issues
- Monitor water quality in receiving waters and within water bodies onsite to ensure that the relevant water-quality limits are being met

### 6.3 Design parameters

For the purposes of implementing erosion and sediment control at the site, the following design parameters have been developed (refer Table 5).

**Table 5 Erosion and sediment control design parameters**

Characteristics	Data source	Value/rating
Mean annual rainfall	Bureau of Meteorology	858.6 mm
Mean annual open water evaporation	Bureau of Meteorology	1263.9 mm
Rainfall zone	Figure 4.9, vol. 1	7
Rainfall erosivity	Appendix A, vol. 1	1250 (R-factor)
Soil hydrologic class	Assumed <sup>(8)</sup>	Sediment Basins: Type D Interim Basins: Type D
Disturbed land gradient	Site survey	Varies
Potential erosion hazard (existing)	Figure 4.6, vol. 1	High
Proposed landfill batter gradient	Landfill design	25%
Proposed landfill platform gradient	Landfill design	5%
Detention basins volume requirement	Table 6.3, vol. 1	90th percentile 20-day rainfall <sup>(9)</sup> – 75.6 mm
Non-erosive hydraulic capacity of temporary drainage (erosion) controls <sup>(10)</sup>	Table 6.1, vol. 2	20 years ARI of design storm event
Structural requirements of temporary sediment control measures <sup>(11)</sup>	Table 6.1, vol. 2	Withstand 20 years ARI of design storm event
Structural requirements of sediment retention basin embankment and spillway	Table 6.1, vol. 2	Withstand 50 years ARI of design storm event
Total catchment area/Total Site area/total disturbed area	Site survey/walkover	4.9 ha/7.7 ha/4.9 ha
Required sediment settling zone capacity	Calculated	2 741 m <sup>3</sup>
Required sediment storage zone capacity	Calculated (50% of settling zone)	1 371 m <sup>3</sup>
Total sediment basin volume	Calculated	4 000 m <sup>3</sup> (Rounded up to nearest 1000)

## 6.4 Strategy – short term site development (Stage 1)

The following strategies are proposed for the Stage 1 works (refer Sketch SK012 in Appendix A) for the different areas on site.

### 6.4.1 Off-site run-on

- Formalise the existing drain along the north-western embankment and redirect it off-site to divert off-site water away from the site

### 6.4.2 On-site flows

- Construct a sediment pond in the south-eastern corner of the site. The overflow for the new dam would flow into the adjacent property, pending approval from the property owner
- Provide a perimeter drain at the toe of the landfill footprint on the north-western boundary
- Provide a perimeter drain at the toe of the landfill footprint on the eastern boundary. This drain will discharge directly off-site. As such, localised sediment and erosion control measures will be required such as sediment fencing and rock check dams within this drain

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<sup>9</sup> Parameters adapted for Goulburn

<sup>10</sup> e.g. diversion banks, perimeter banks, catch drains, level spreaders, check dams, batter drains and chutes.

<sup>11</sup> e.g. sediment fences, stacked rock sediment traps etc.

- Decommission existing surface water pipe located in the centre of the landfill
- Trim and cover existing eastern waste batters as required
- Install leachate interception trench and formal leachate collection pond
- Locally grade existing surface between landfill and north-western embankment to promote surface water flow to the south of the site

#### **6.4.3 Additional works**

- Where vegetation is not present, bare ground will be vegetated to minimise erosion potential
- Source control will be used for temporary construction works (i.e. constructing ponds and drains)
- Sediment control features are to be incorporated into proposed drains
- Any areas of localised ponding shall be re-graded as necessary

### **6.5 Strategy – medium to long –term development (Stages 2 to 7)**

In addition to the short term management strategies identified in Section 6.3 above, the following strategies should be adopted during different stages of the site (refer sketches contained in Appendix A).

#### **6.5.1 Stages 2 to 6 (medium to long term operational phases)**

- Progressively final cap and revegetate the filled areas
- Construct and progressively extend contour drain on the final landfill cap once constructed to maximise the amount of surface water that is conveyed to the proposed surface water pond in the site's south-eastern corner
- Locally grade existing surface to promote surface water flow as required
- Realign/extend surface water drains as required for filling purposes

#### **6.5.2 Stage 7 (post closure phase)**

Filling and capping and revegetation works are expected to occur progressively as outlined on the sketches contained in Appendix A. Once areas are revegetated, the associated section of perimeter drain can be realigned to flow off-site.

# 7. Infrastructure requirements

*This section details the infrastructure required for the proposed surface water management strategy.*

## 7.1 Drainage infrastructure

The development of drainage works considers long term requirements to minimise the number of temporary drainage works required to be constructed.

Flow requirements for the drains are described in Table 6. Locations and dimensions are shown in Drawing SK010 (Appendix A).

**Table 6 Drain sizes and flow requirements**

Drain	Flow requirement (m <sup>3</sup> /s)	Lining material
Drain 1	1.06	Grass lined
Drain 1 + 2	1.38	Grass lined
Drain 3	0.5	Grass lined
Drain 4	0.19	Grass lined

Flow and drain size calculations are contained in Appendix D. The above drains meet the design requirements as stipulated by the Blue Book.

A minimum 1.5% fall is required along the drains to facilitate effective water drainage.

It is noted that Drain 4 will outlet directly off-site prior without being directed through the sediment pond due to limitations with the site topography. The Blue Book states that if the annual predicted sediment generation for a site is less than 150 m<sup>3</sup> then a sediment basin may not be required and alternative measures could be installed. Calculations prepared using the Revised Universal Soil Loss Equation (RUSLE) from the Blue Book and for the proposed catchment area shows that the drain will meet this requirement (and Drain 4 would not need to flow into a sediment pond) if the following conditions are met:

- The disturbed catchment area directed to the drain is maintained below 1.2 ha
- The slope vs slope length ration is maintained in the acceptable ranges, which could be achieved through installation of contour banks across the relevant landfill batter
- Provide rock check dams along the drain in accordance with the Blue Book
- Provide a small sump at the outlet to catch any very coarse sediment, with regular cleaning out of the sump

These conditions will be met via implementing the proposed staging plans in Appendix A.

## 7.2 Sediment pond

According to the Blue Book (Volume 2B), sites expected to be in operation for more than three years, and with non-sensitive downstream receptors, are required to achieve retention in a 90<sup>th</sup> percentile 20-day rainfall event.

Based on the 90<sup>th</sup> percentile 20-day rainfall event of 75.6 mm for Goulburn (Managing Urban Stormwater, Soils and Construction, Volume 1, Landcom, 2004) and a catchment area of 4.9 ha (inlet from Drain 2 and Drain 3), a stormwater pond of 4,000 m<sup>3</sup> capacity is required.

Table 7 outlines the design for the sediment pond. The pond will be relatively shallow to mitigate potential issues caused by the shallow groundwater table. Final levels will be confirmed during detailed design.

**Table 7 Sediment pond design**

Component	Settling zone volume (m <sup>3</sup> )	Storage zone volume (m <sup>3</sup> )	Total volume (m <sup>3</sup> )
Sediment pond	2,556	1,278	4,000

Runoff from areas that are likely to generate sediment will be directed into the designated sedimentation ponds as per the drawings (Appendix A).

The sedimentation pond will provide surface water for onsite uses including dust suppression, compaction of capping and irrigation of vegetation for establishment purposes.

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## 8. General surface water management

*This section details the general surface water management and erosion and sediment control measures to be implemented at the site.*

### 8.1 General instruction

Site operators and any contractors will ensure that all surface water management works are undertaken as instructed in this plan and constructed following the relevant guidelines set out in the Blue Book.

Works should be scheduled for a forecast dry weather period. Once commenced, works must be completed without delay in order to minimise the risk of significant rainfall during construction. All subcontractors will be informed of their responsibilities in reducing the potential for soil erosion and pollution to down-slope areas.

### 8.2 Land disturbance

All proposed erosion and sediment control measures will be implemented before disturbing any new areas, including the installation of sediment fencing or alternative controls down-slope of any areas that do not drain toward the proposed sedimentation dam. Sediment fencing will be installed in accordance with standard drawing 6-8 (refer Appendix E).

Prior to clearing, the limits of disturbance will be clearly and visibly marked. All operations will be planned to ensure that there is minimal land disturbance outside the limits to be cleared.

Land disturbance will be minimised by clearing the smallest practical area of land ahead of earthworks and leaving this disturbed for the shortest possible time.

### 8.3 Site access roads

Roads will be constructed to ensure surface drainage is optimised and stabilised, thereby reducing roadside erosion and sedimentation. Cross-fall drainage structures and mitre drainage will be implemented for the entire length of the roads. Crowning will generally be implemented on any steeper sections of the roads. Out-fall drainage will be constructed where the road traverses small-fill batter areas, and in-fall drainage will occur where the road traverses larger-fill batter areas. Road runoff will be intercepted at regular intervals to reduce runoff velocity in each mitre drain. Drain spacing will not exceed 50 m.

All main access roads will be sealed. Rock check dams will be constructed as necessary.

### 8.4 Vehicle access

Vehicles will only travel on designated access roads and tracks to prohibit unnecessary site disturbance.

Additional site access roads to work areas will be temporary and be laid out by Council.

Temporary barrier fencing will be installed at the discretion of Council to ensure traffic control and prohibit unnecessary site disturbance.

### 8.5 Dust control

Unsealed, trafficable surfaces, material stockpiles and other disturbed areas not subject to revegetation will be kept damp as required to control dust using surface water from the sediment control pond(s), or by using a water tanker.

## 8.6 Soil and stockpile management

During the operational phase, the emphasis will be on maximising the direct transfer of materials and minimising the need for stockpiling. However, there will still be a need for an active stockpiling area for storage of various materials.

Stockpiles will be placed so as to avoid impediment of drainage lines. Stockpiles will be managed in accordance with standard drawing 4-1 (refer Appendix E).

Specific requirements for soil stockpile management are set out below:

- A diversion bank will be constructed up-slope of stockpiles to divert overland flow around the stockpiles
- Stockpiles must be appropriately protected from concentrated surface flow and excessive up-slope surface water surface flows
- Loss of soil material from the stockpiles is to be minimised by means of sediment fences constructed in accordance with standard drawing 6-8 (refer Appendix E)
- Stockpiles must be located at least 2 m from any hazardous area, retained vegetation, or concentrated drainage line and will not impede natural or constructed surface drainage lines
- The stockpile surfaces should have a generally even surface that is as 'rough' as possible, to assist in runoff control and seed retention and germination (where stockpile is planted)
- Due to the nature of the soils, runoff from the stockpile areas may be directed to a dedicated stockpile sedimentation pond before overflowing to other site sedimentation ponds for further treatment, preventing untreated runoff from leaving the site
- A suitable flow diversion system must be established immediately up-slope of a stockpile of erodible material that has the potential to cause environmental harm if displaced, if the up-slope catchment area draining to the stockpile exceeds 1500 m<sup>2</sup>

## 8.7 Water diversion and conveyance

### 8.7.1 Clean water (run-on)

Run-on from off site (Grabben Gullen Road) is considered to be 'clean' run-on. At present, this water is collected by a grassed channel located in the crest of the bund running along the site's northern boundary. This water is conveyed around the south-western boundary of the site ultimately to Dam 1. This drain is to be formalised and stabilised using grasses sown promptly at the completion of earthworks, and re-directed away from the landfill area. Additional sediment control measures will be implemented prior to the establishment of stabilising vegetation to prevent erosion and sediment issues resulting.

### 8.7.2 Disturbed water (run-off)

Runoff from disturbed areas of the site will be directed into the sedimentation pond as far as is possible.

All disturbed water diversion and conveyance structures will be constructed according to the design parameters in described in Section 7 and Drawing SK020 in Appendix A.

### 8.7.3 Rock check dams

Rock check dams will be constructed inline in high flow drain paths and at the entrance points to drainage channels from disturbed areas as per standard drawings 5-4 (refer Appendix E). Figure 1 illustrates a typical inline rock check dam.



**Figure 1 Typical in-line rock check dam**

### 8.8 Sedimentation pond management

Sedimentation ponds should be managed in accordance with the following measures:

- Sedimentation ponds should be drained as soon as possible following rainfall and sediment regularly removed to maintain overall site capacity
- Pond capacity should be reviewed monthly and after any large rainfall event with removal of silt to occur when sediment storage zone reaches capacity
- Installation of depth indicating markers within all stilling structures and sedimentation pond to indicate maximum sediment storage zone and capacity remaining in pond
- Outflow drainage channels from all ponds are to be inspected to ensure adequate capacity and identify and correct any erosion
- Runoff from areas that are likely to generate high sediment loads (i.e. stockpiles) will be directed into the designated sedimentation pond
- When using a petrol pump to drain the ponds, the pump will be placed within a “bunded platform” to capture any spills from both operation and refuelling activities.

Council will review the pond design in 3 years in light of a potentially reduced catchment area at the site.

### 8.9 Establishment of final landform

During placement of material, temporary machinery work on batters will be carried out so as to minimise susceptibility to erosion, using techniques such as ‘track walking’ a machine up and down the slope (refer Figure 2).

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**Figure 2 Track-walked slope (Figure 4.3a from Managing Urban Surface water: Soils and Construction)**

The final landform will have the following features:

- The final landform will be as per Sketch SK018 (refer Appendix A)
- The landform will be free draining, with flows directed towards the sedimentation pond and diverted to natural drainage channels after areas are fully rehabilitated (with ground cover of at least 70 per cent). This is with the exception of the drain located on the site's north eastern boundary which will discharge directly off-site
- Stable drainage will be constructed to drain water from the landform areas including grass-lined channels and reinforced channel lining on steeper channel sections.

The final landform will be revegetated as soon as practicable after final capping and placement of topsoil.

## **8.10 Surface preparation for final rehabilitation**

Before final soil preparation, the surface is to be ripped to a depth of approximately 200 mm to allow better root penetration by the plants to ensure rapid establishment and growth of vegetation. Where possible, the surface will be covered with topsoil using a suitable machine to minimise compaction. Topsoil/mulch mix will be spread along the contour of completed batters to minimise erosion by dumping at the top of slopes and grading downwards and across the contour. Once the topsoil is spread, vehicle traffic will be prevented from entering the area.

Gypsum and/or lime may be applied to the final surface using broadcasting machinery immediately prior to sowing. The ameliorants will be incorporated to a nominal depth of 200 mm.

Topsoil that has been stored separately from subsoil material will be re-spread on the surface of the batters and upper surface of the landfill so that the organic layer, containing any seed or vegetation, is returned to the surface.

Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish. A sterile cover crop will be applied to assist with initial soil stabilisation.

All disturbed areas should be stabilised as soon as possible following completion of works on that area.

## 8.11 Vegetation establishment

Revegetation of disturbed areas is an integral component of the site surface water management and, as such, progressive revegetation of disturbed areas will be undertaken as soon as possible after disturbance. The condition of revegetation works will be visually monitored and if any of the sections of planting show evidence of poor health professional advice should be sought. Any revegetation that fails should be replanted.

Sowing time for re-vegetation activities will generally be undertaken in spring and autumn, although opportunistic re-vegetation will be practiced if areas become available for sowing in summer and winter.

After surface soil amelioration and tillage is completed for any given area, re-vegetation will commence as soon as practicable. The proposed method of sowing will be via conventional spreading using agricultural broadcasting equipment.

Slope stabilising techniques such as hydroseeding and straw mulching, will be undertaken on slopes exceeding 1 in 4 for enhancement of pasture germination.

Fertiliser application will be undertaken simultaneously with seeding. Maintenance fertilising will be conducted as required. Fertiliser type and application rates will be determined by prior soil analysis, if required. Care should be taken in fertiliser application, so as not to introduce unacceptable nutrient loads to the sediment pond or off-site surface water discharges.

Signage should be installed near the revegetation works to advise all construction equipment and materials are not allowed to enter the site.

## 8.12 Surface water management control plan

A surface water control plan will be produced of all soil and water management devices and surface water travel paths to allow better tracking of maintenance and identification of the location of issues found on site. The surface water control plan will identify:

- Run-off directions
- Current/proposed treatment controls including:
  - In-line rock check dams
  - Silt fences
  - Culverts
  - Sediment ponds
  - Diversion bunds
  - Stockpiles
  - Drains
- Disturbed areas
- Active tipping area
- Identified surface water management issues including
  - Silt build-up
  - Erosion observed
  - Ponding observed

A typical surface water management control plan is contained in Appendix F.

The surface water control plan should be prepared and updated by Council on a regular basis and as site conditions change.

### **8.13 Site induction**

Environmental matters will be highlighted in the site induction for all personnel including subcontractors. The site induction will include issues relating to erosion minimisation, sediment control and water quality. Staff will be made aware of their responsibilities under relevant environmental legislation.

### **8.14 Staff training**

Site staff and managers should be trained to consider surface water pollution in everyday landfilling operations and planning. This could include ensuring landfill operators understand:

- The requirements of the relevant legislation (e.g. the Protection of the Environment Operations Act 1997) and the EPL
- The role of site practices and measures implemented, including waste cover practices (including daily, intermediate and final cover), infiltration and leachate generation
- The factors that affect surface water and erosion, including large disturbed areas, poor site grading and vegetation
- Construction and maintenance of erosion and sediment control measures
- Their obligations in accordance with the site Pollution Incident Response Management Plan (PIRMP) (refer Appendix G)

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# 9. Inspection, maintenance and monitoring

## 9.1 Inspection

Council or their representative will undertake a visual inspection of the installed erosion and sediment control measures inclusive of the drains and ponds as follows:

- At least fortnightly
- Immediately following any rainfall event that produces significant runoff

Furthermore, sedimentation ponds will be inspected after any significant rainfall event (more than 75.6 mm over a 20-day period) in order to assess the effectiveness of sedimentation ponds for sediment retention.

Council will retain checklists, procedures and all inspection records onsite for future reference.

## 9.2 Maintenance

Generally, maintenance activities will be undertaken as required with consideration of the inspection reports and the guidance contained within the Blue Book.

Sedimentation ponds will be emptied and cleaned of sediment build-up annually, to restore surface water holding capacities. The frequency of clean-out will be reviewed, as required.

Council will retain checklists, procedures and all maintenance records onsite for future reference.

## 9.3 Monitoring

Monitoring will be undertaken in accordance with the requirements of the site's EPL. It is noted that the proposed construction of new infrastructure (sedimentation pond, new drains etc.) will make some of the monitoring requirements in the existing EPL redundant (by removing certain of the current monitoring locations and adding new ones). As such, ultimately Council will need to apply to vary the site's existing EPL to address this issue.

## 9.4 Reporting

For each surface water monitoring event, water quality results will be compared against assessment criteria defined in the EPL (or as otherwise selected by Council). Any exceedance of criteria will trigger an investigation to determine the cause of the exceedance and preparation of a corrective action report to re-establish appropriate controls, if required.

The reporting of all monitoring and measurement will be undertaken in accordance with the EPL and PIRMP, including notification of monitoring and investigation results to external organisations, if required.

Results, including any actual or potential significant off site impacts on people or the biophysical environment will also be reported to EPA as soon as practicable after any incident and in accordance with Part 5.7 of the POEO Act.

Staff will use the site EPL and PIRMP as a basis for responding to, and managing, any actual or potential pollution incident.

## 9.5 Reviews

The following reviews should be undertaken at the site in relation to erosion and sediment control:

- Review and update of this erosion and sediment control plan every 3 years
- Review of the sediment pond design in 3 years in light of a potentially reduced catchment area at the site (as the landfill footprint is progressively rehabilitated in accordance with the site staging plans)

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## Appendices

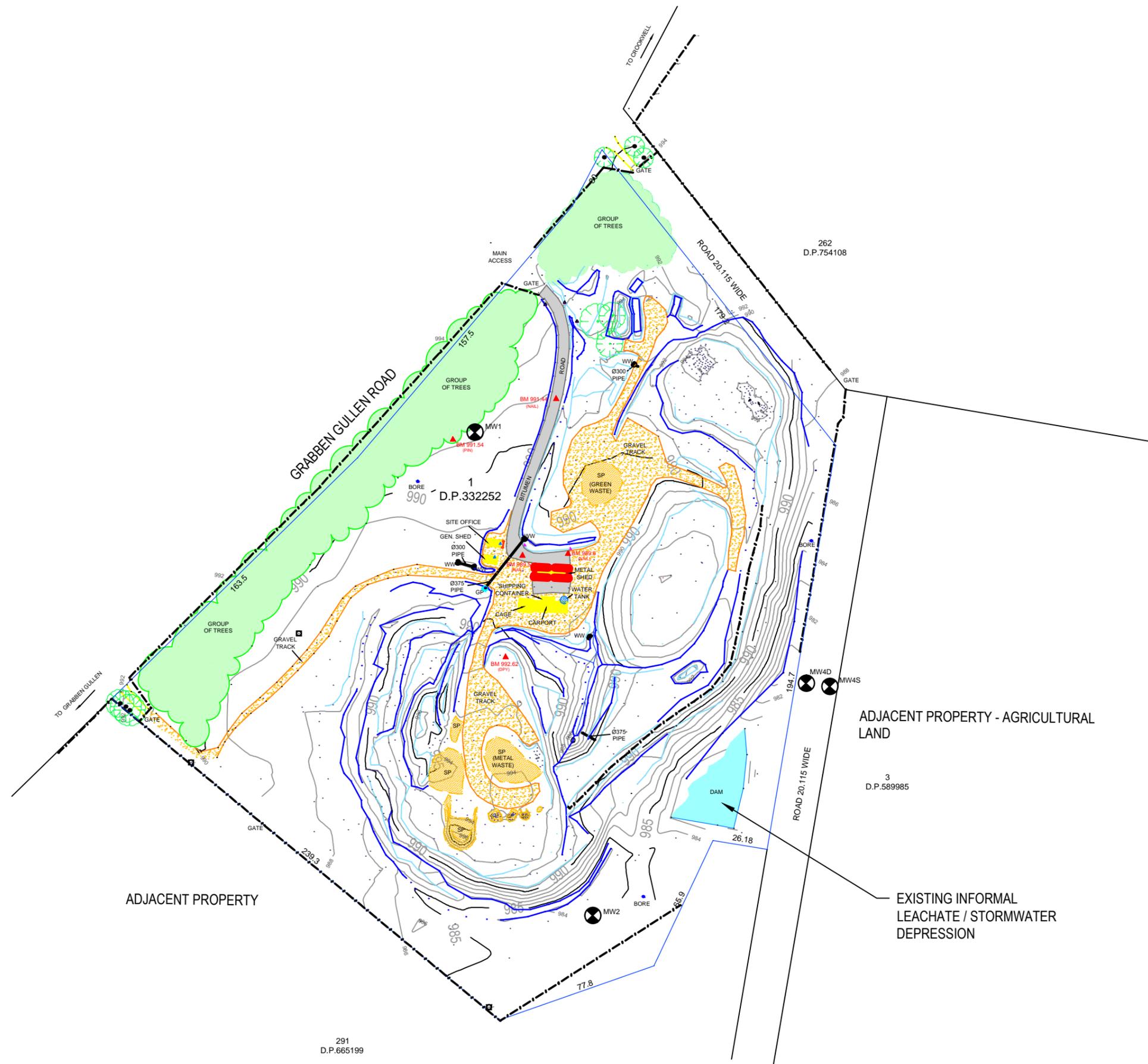
## **Appendix A** – Drawings, plans and sketches

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**LEGEND**

-  BOUNDARY
-  EXISTING FENCELINE (VARIOUS MATERIALS)
-  TOP OF BANK
-  TOE OF BANK
-  BENCH MARK
-  SIGN
- GP GRATED PIT
- WW WING WALL
- SP STOCKPILES (VARIOUS MATERIALS)
-  GROUNDWATER BORE LOCATION (INDICATIVE)



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
A	INITIAL ISSUE	MW	13.07.16
rev	description	app'd	date

UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
EXISTING ARRANGEMENT



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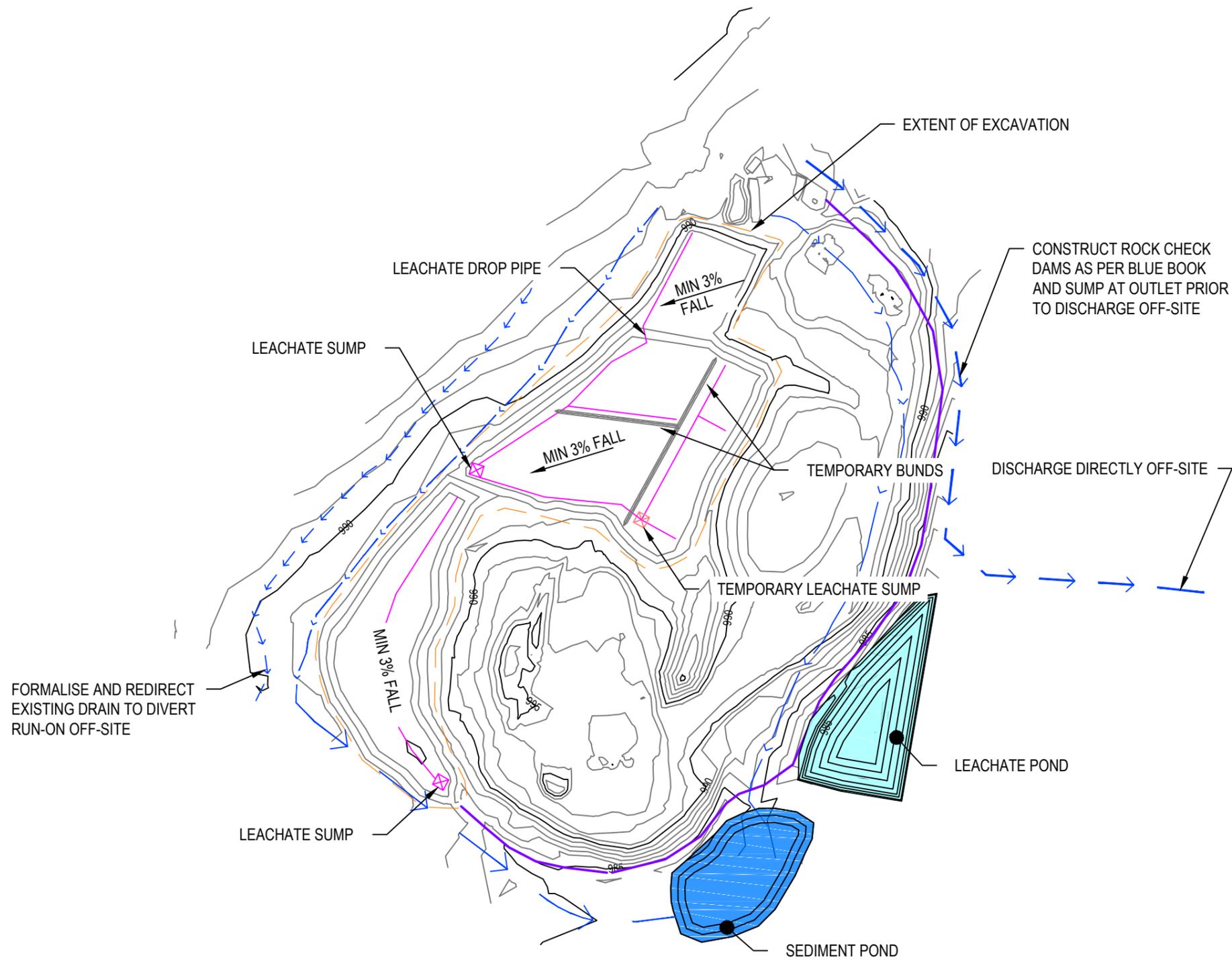
approved (PD) . . . . . **SK010**

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**LEGEND**

- ===== DESIGN SUBGRADE
- EXCAVATION BOUNDARY
- LEACHATE COLLECTION PIPE
- ⊠ LEACHATE SUMP
- LEACHATE INTERCEPTION TRENCH
- → → → EXISTING SURFACE WATER DRAIN
- → → → SURFACE WATER DRAIN 1
- → → → SURFACE WATER DRAIN 2
- → → → SURFACE WATER DRAIN 3
- → → → SURFACE WATER DRAIN 4



**PRELIMINARY**

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rev	description	app'd	date

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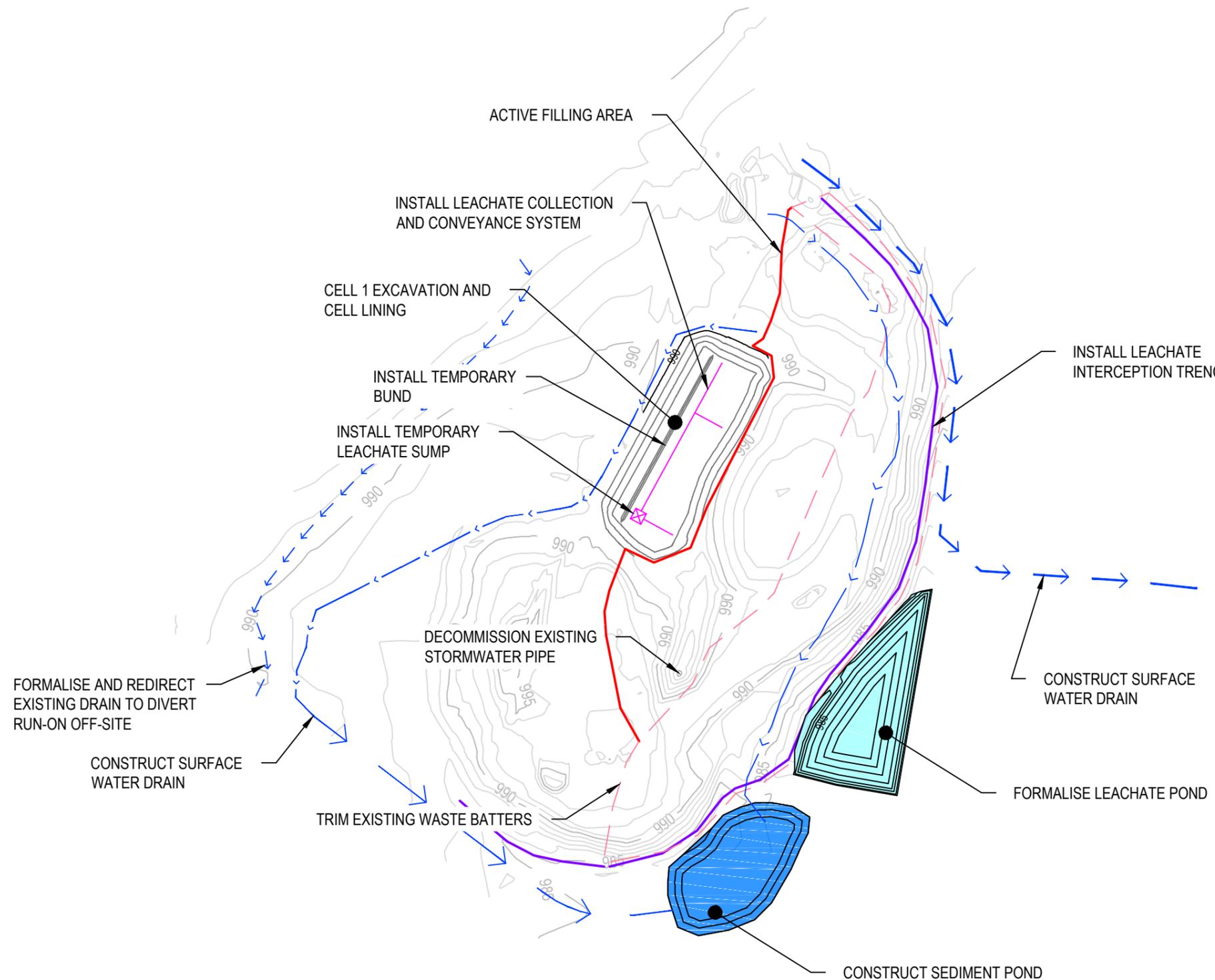
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**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

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rev	description	app'd	date

UPPER LACHLAN SHIRE COUNCIL  
 CROOKWELL LANDFILL  
 STAGING PLANS  
 STAGE 1



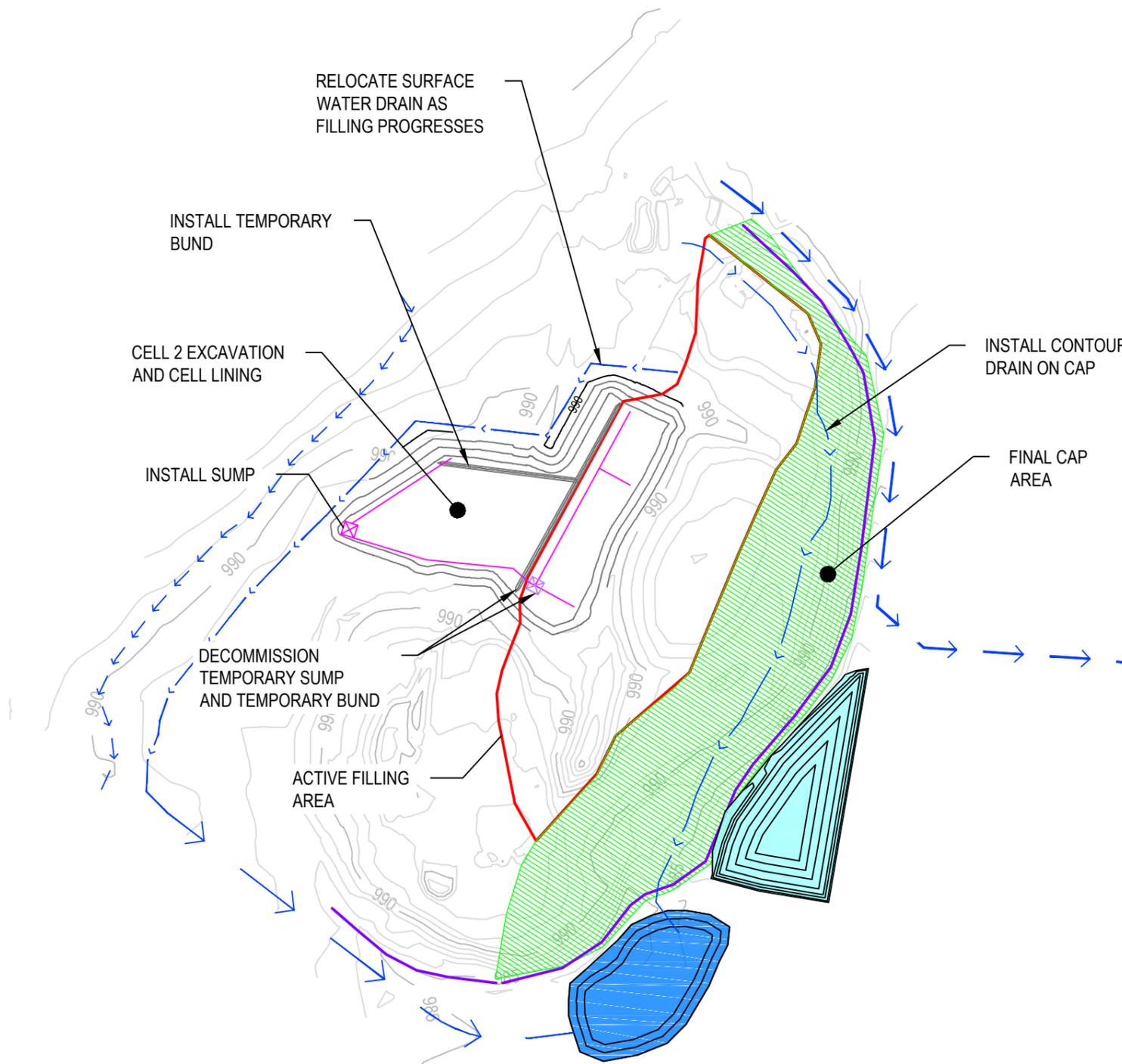
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**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
A	INITIAL ISSUE	MW	13.07.16
rev	description	app'd	date

UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
STAGING PLANS  
STAGE 2



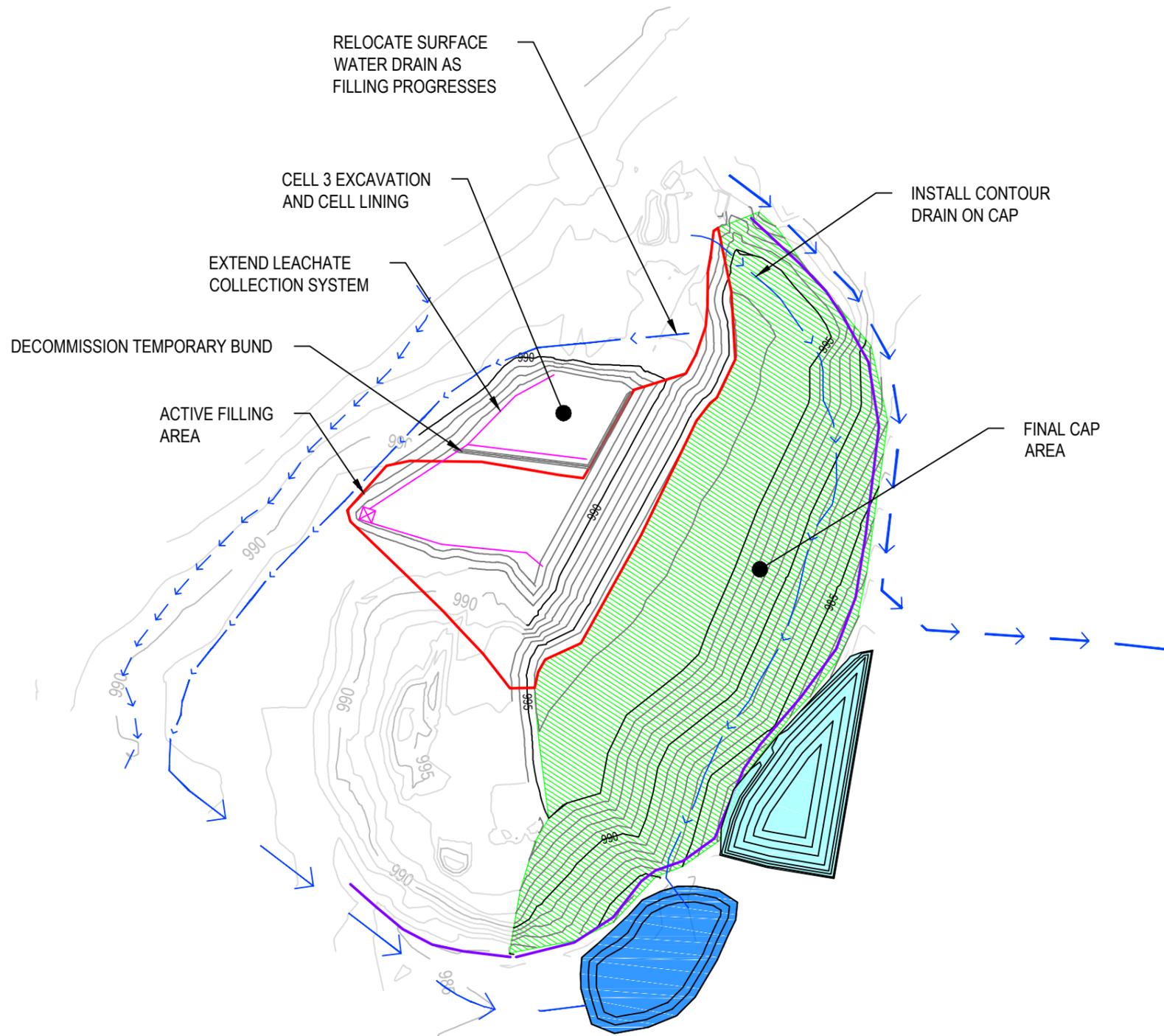
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approved (PD) . . . . . **SK013**

SURVEY PROVIDED BY LANDTEAM AUSTRALIA PTY LTD AND DATED 10 FEBRUARY 2015



**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
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rev	description	app'd	date

UPPER LACHLAN SHIRE COUNCIL  
 CROOKWELL LANDFILL  
 STAGING PLANS  
 STAGE 3



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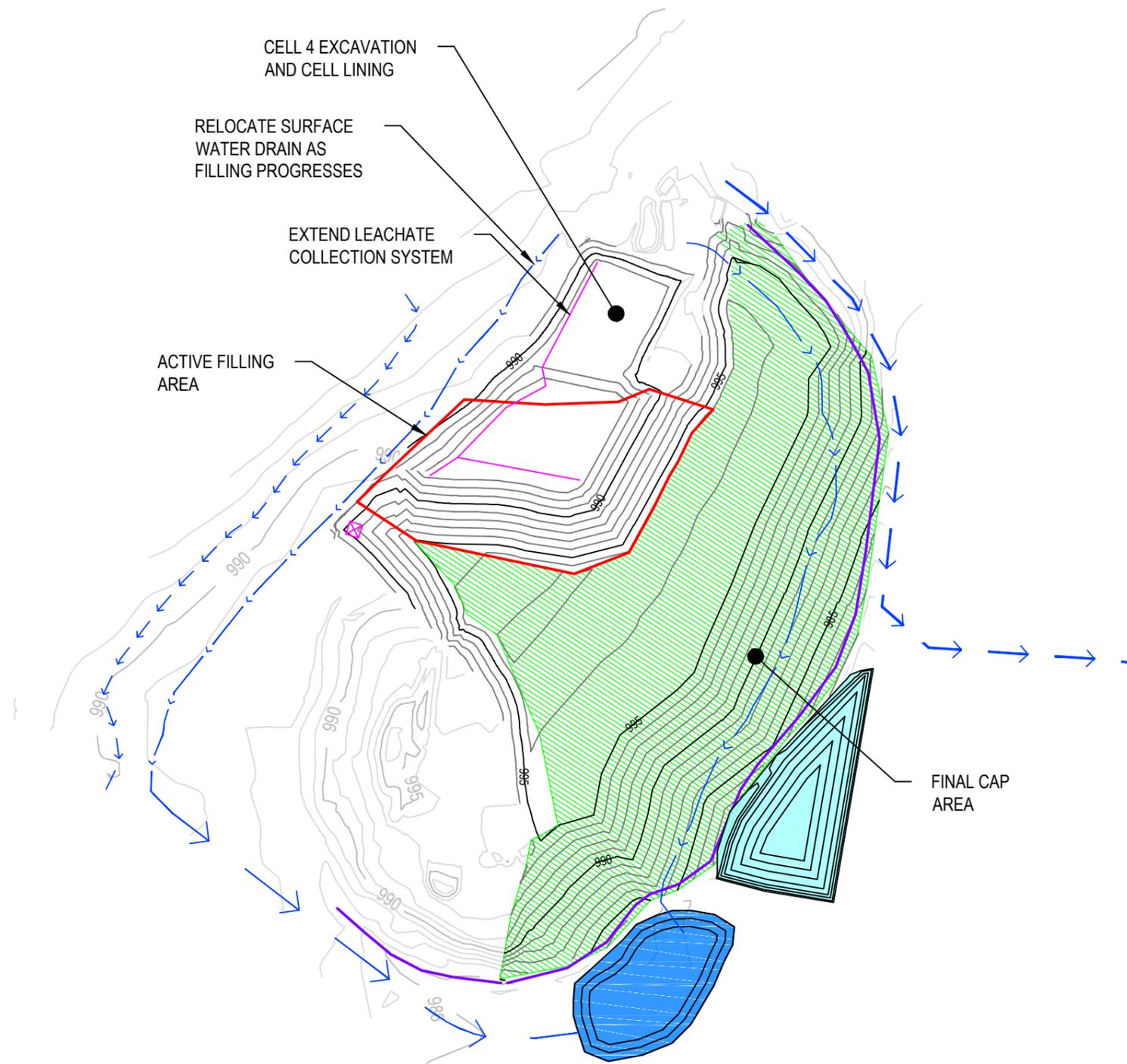
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**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
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rev	description	app'd	date

**UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
STAGING PLANS  
STAGE 4**



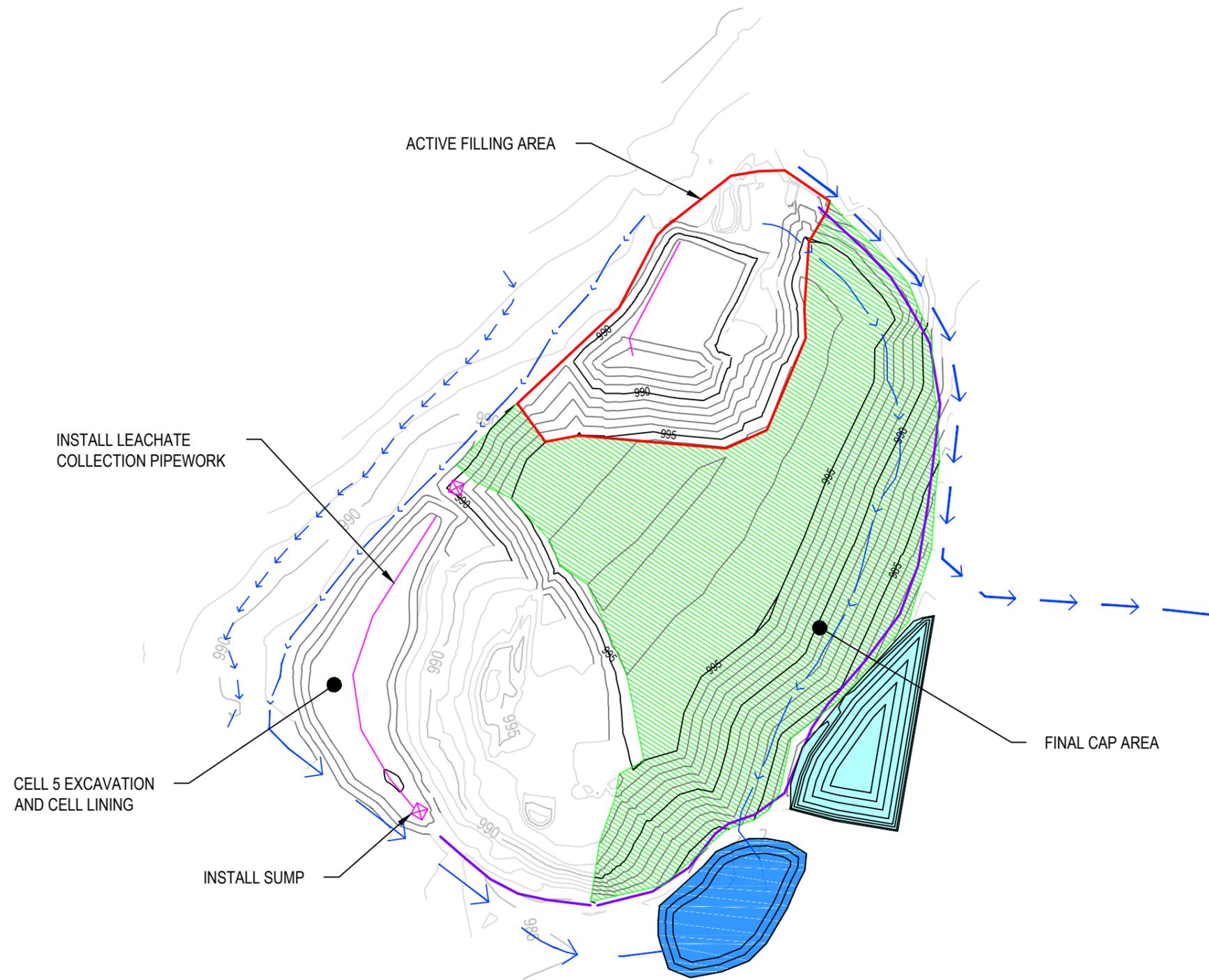
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approved (PD) . . . . . **SK015**

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**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
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rev	description	app'd	date

**UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
STAGING PLANS  
STAGE 5**



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approved (PD) . . . . . **SK016**

SURVEY PROVIDED BY LANDTEAM AUSTRALIA PTY LTD AND DATED 10 FEBRUARY 2015



**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

rev	description	app'd	date
B	FOR APPROVAL		16.09.16
A	INITIAL ISSUE	MW	13.07.16

UPPER LACHLAN SHIRE COUNCIL  
 CROOKWELL LANDFILL  
 STAGING PLANS  
 STAGE 6



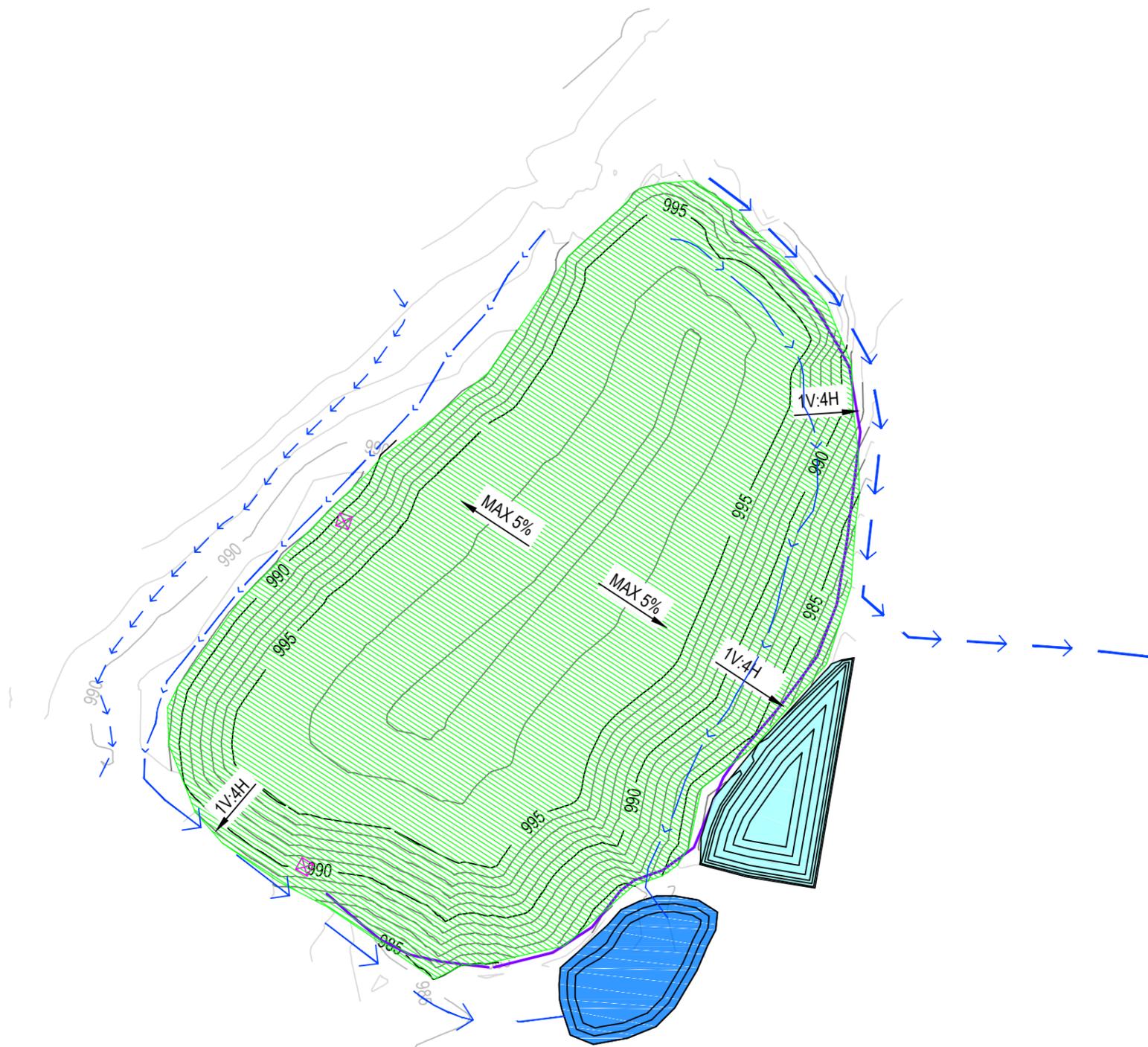
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**LEGEND**

- EXISTING SURFACE
- DESIGN SUBGRADE
- ACTIVE FILLING AREA
- FINAL CAP AREA
- SURFACE WATER MANAGEMENT
- LEACHATE INTERCEPTION TRENCH
- LEACHATE COLLECTION PIPE
- LEACHATE SUMP
- AREA OF WASTE TRIMMING
- EXISTING SURFACE WATER DRAIN
- SURFACE WATER DRAIN 1
- SURFACE WATER DRAIN 2
- SURFACE WATER DRAIN 3
- SURFACE WATER DRAIN 4



**PRELIMINARY**

B	FOR APPROVAL		16.09.16
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rev	description	app'd	date

UPPER LACHLAN SHIRE COUNCIL  
 CROOKWELL LANDFILL  
 STAGING PLANS  
 FINAL LANDFORM



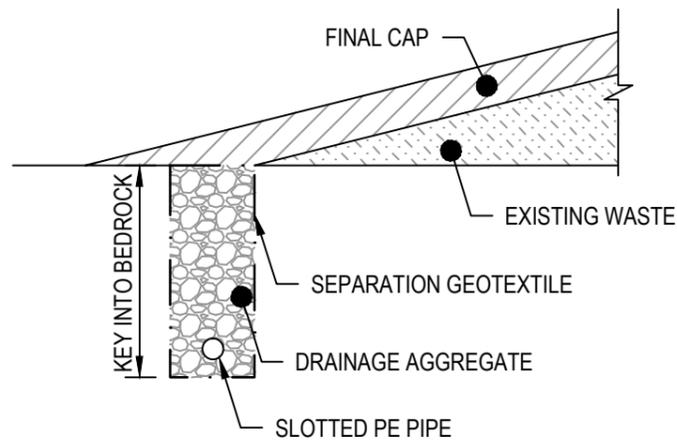
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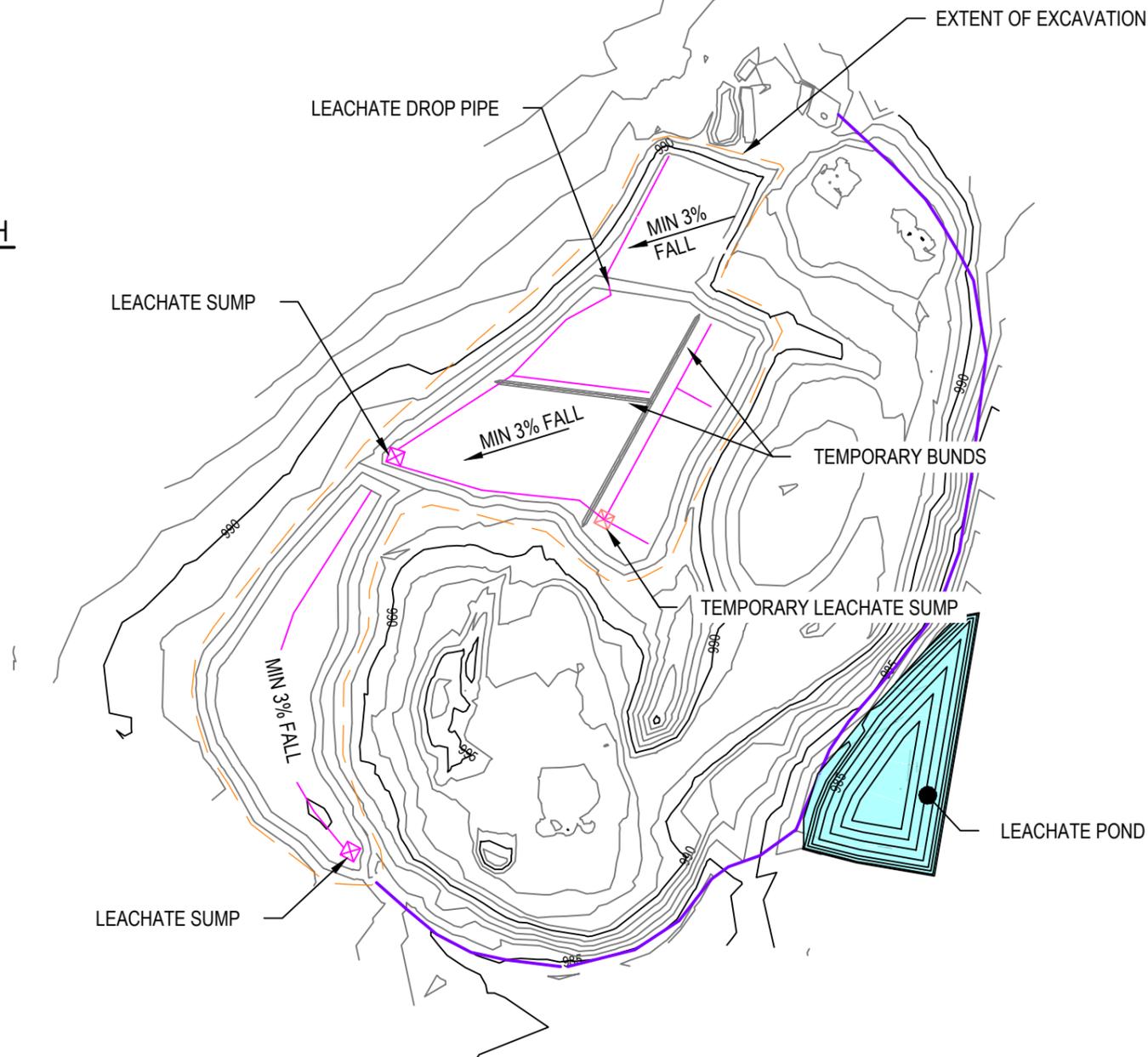
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1 DETAIL  
SCALE 1 : 50

**LEACHATE INTERCEPTION TRENCH  
TYPICAL DETAIL**



**PRELIMINARY**

rev	description	app'd	date
A	FOR APPROVAL		16.09.16

UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
**LEACHATE MANAGEMENT  
CONCEPT LAYOUT**



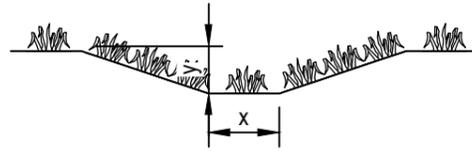
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approved (PD) . . . . . **SK019**

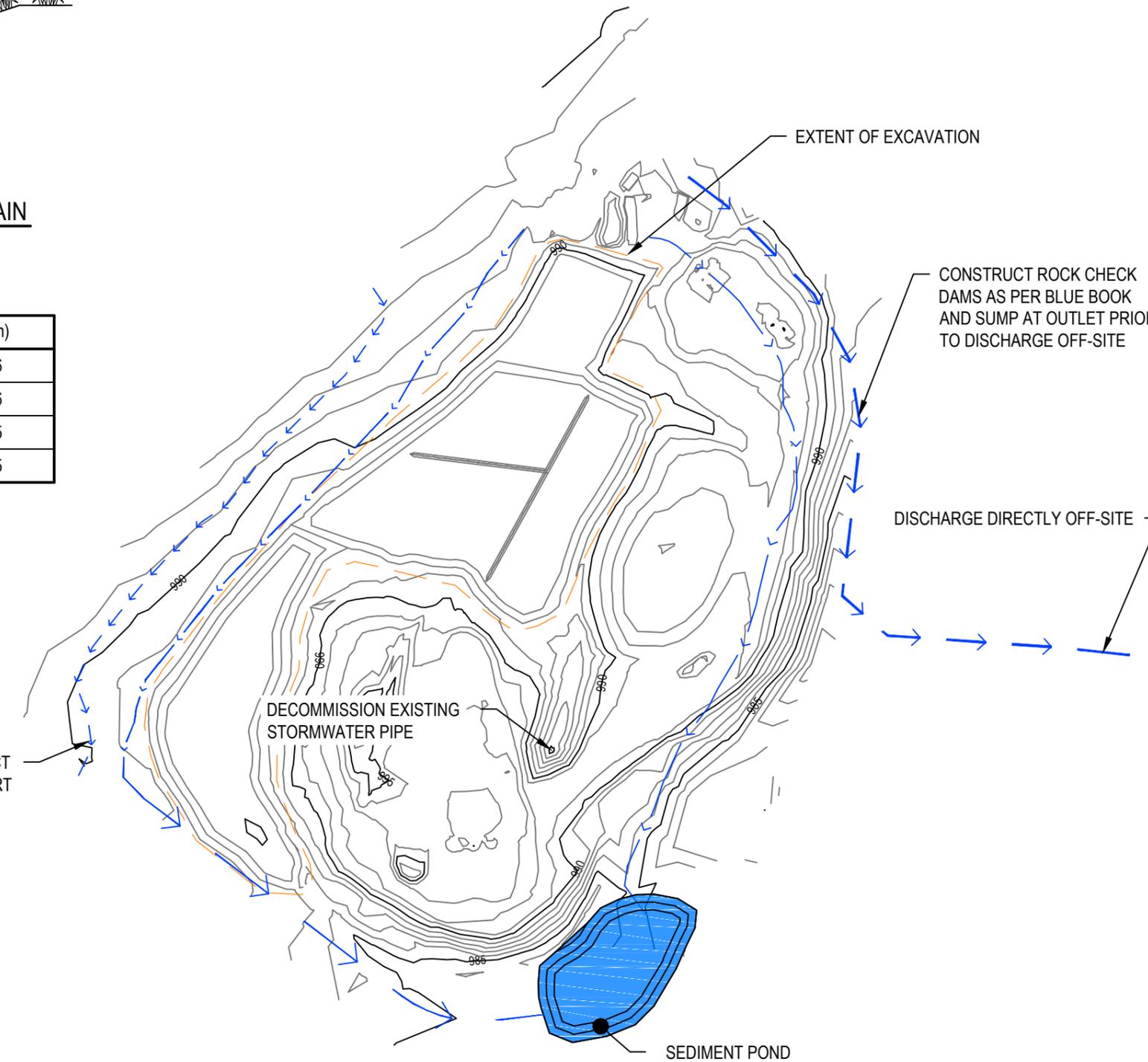
SURVEY PROVIDED BY LANDTEAM AUSTRALIA PTY LTD AND DATED 10 FEBRUARY 2015



**SURFACE WATER DRAIN  
TYPICAL DETAIL**

SURFACE WATER DRAIN	x (m)	y (m)
1	1.5	0.6
2	1.75	0.6
3	0.9	0.5
4	0.5	0.5

FORMALISE AND REDIRECT  
EXISTING DRAIN TO DIVERT  
RUN-ON OFF-SITE



**LEGEND**

- ===== DESIGN SUBGRADE
- - - - - EXCAVATION BOUNDARY
- → → EXISTING SURFACE WATER DRAIN
- > — SURFACE WATER DRAIN 1
- > — SURFACE WATER DRAIN 2
- > — SURFACE WATER DRAIN 3
- > — SURFACE WATER DRAIN 4



**PRELIMINARY**

rev	description	app'd	date
A	FOR APPROVAL	MW	16.09.16

**UPPER LACHLAN SHIRE COUNCIL  
CROOKWELL LANDFILL  
SURFACE WATER MANAGEMENT  
CONCEPT LAYOUT**



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approved (PD) . . . . . **SK020**

# Appendix B – EPL 6054

DRAFT

# Environment Protection Licence



Licence - 6054

## Licence Details

Number:	6054
Anniversary Date:	20-June

## Licensee

UPPER LACHLAN SHIRE COUNCIL

PO BOX 42

GUNNING NSW 2581

## Premises

CROOKWELL LANDFILL FACILITY

GRABEN GULLEN ROAD

CROOKWELL NSW 2583

## Scheduled Activity

Waste Disposal (application to land)

## Fee Based Activity

## Scale

Waste disposal by application to land

Any annual capacity

## Region

South East - Queanbeyan

11 Farrer Place

QUEANBEYAN NSW 2620

Phone: (02) 6229 7002

Fax: (02) 6229 7006

PO Box 622 QUEANBEYAN

NSW 2620

# Environment Protection Licence

Licence - 6054



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# Environment Protection Licence



Licence - 6054

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# Environment Protection Licence

---

Licence - 6054



## Information about this licence

### Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

### Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

### Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

### Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

### Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

### Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

# Environment Protection Licence



Licence - 6054

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

## Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

## Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

## This licence is issued to:

<b>UPPER LACHLAN SHIRE COUNCIL</b>
<b>PO BOX 42</b>
<b>GUNNING NSW 2581</b>

subject to the conditions which follow.

# Environment Protection Licence

Licence - 6054



## 1 Administrative Conditions

### A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Waste Disposal (application to land)	Waste disposal by application to land	Any annual capacity

### A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
CROOKWELL LANDFILL FACILITY
GRABBEN GULLEN ROAD
CROOKWELL
NSW 2583
LOT 1 DP 332252

### A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and

b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

A3.2 The report titled "Crookwell Shire Council Landfill Environmental Management Plan for Crookwell Waste Depot, prepared by CMPS & F Pty Ltd, March 1998" is not to be taken as part of the documentation in A4.1, other than those parts specifically referenced in this licence.

# Environment Protection Licence

Licence - 6054



## 2 Discharges to Air and Water and Applications to Land

### P1 Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

#### *Water and land*

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Leachate quality monitoring		Leachate Dam on site
2	Surface water quality monitoring		Sedimentation Dam on site
3	Surface water quality monitoring		Sedimentation Pond on Eastern Property
4	Groundwater quality monitoring		Groundwater bore labelled "MW1" on drawing titled "Crookwell Landfill Depot" of "Report on Hydrological Investigation of the Crookwell Landfill" dated July 1999 (QU/REP305).
5	Groundwater quality monitoring		Groundwater bore labelled "MW2" on drawing titled "Crookwell Landfill Depot" of "Report on Hydrological Investigation of the Crookwell Landfill" dated July 1999 (QU/REP305).
6	Groundwater quality monitoring		Groundwater bore labelled "MW3" on drawing titled "Crookwell Landfill Depot" of "Report on Hydrological Investigation of the Crookwell Landfill" dated July 1999 (QU/REP305).
7	Groundwater quality monitoring		Groundwater bore labelled "MW4S" on drawing titled "Crookwell Landfill Depot" of "Report on Hydrological Investigation of the Crookwell Landfill" dated July 1999 (QU/REP305).
8	Groundwater quality monitoring		Groundwater bore labelled "MW4D" on drawing titled "Crookwell Landfill Depot" of "Report on Hydrological Investigation of the Crookwell Landfill" dated July 1999 (QU/REP305).

# Environment Protection Licence

Licence - 6054



## 3 Limit Conditions

### L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

### L2 Waste

L2.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General solid waste (non-putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time.	Waste disposal (application to land)	The total tonnage of general solid waste (non-putrescible), general solid waste (putrescible), asbestos waste and waste tyres disposed of at the premises must not exceed 7,000 tonnes per annum.
NA	General solid waste (putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time.	Waste disposal (application to land)	The total tonnage of general solid waste (non-putrescible), general solid waste (putrescible), asbestos waste and waste tyres disposed of at the premises must not exceed 7,000 tonnes per annum.
NA	Asbestos waste	As defined in Schedule 1 of the POEO Act, in	Waste disposal (application to land)	The total tonnage of general solid

# Environment Protection Licence

Licence - 6054



		force from time to time.		waste (non-putrescible), general solid waste (putrescible), asbestos waste and waste tyres disposed of at the premises must not exceed 7,000 tonnes per annum.
NA	Waste tyres	As defined in Schedule 1 of the POEO Act, in force from time to time.	Waste disposal (application to land)	The total tonnage of general solid waste (non-putrescible), general solid waste (putrescible), asbestos waste and waste tyres disposed of at the premises must not exceed 7,000 tonnes per annum.
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

- L2.2 Tyres from the Sydney Metropolitan Area must not be received at the premises unless:
- a) they have been shredded into pieces measuring no more than 250mm in any direction; or
  - b) they have had their walls removed; or
  - c) the facility has the capacity, at the time of receiving the tyres, to recycle or reprocess the tyres into a saleable product (including retreading the tyres); or
  - d) the facility has the capacity, at the time of receiving the tyres, to shred the tyres or remove the walls from the tyres; or
  - e) the tyres are from a domestic load containing no more than 5 tyres having a diameter of less than 1.2 metres.

Note: Disposal of asbestos must be in accordance with Clause 42 of the Protection of the Environment Operations (Waste) Regulation 2005.

### L3 Noise limits

- L3.1 The level of continuous noise LA10, T emanating from the operation of the premises must not exceed the background level LA90, T by more than 5dB(A) when measured over a minimum period of 15 minutes at any point within six metres of the nearest affected residence or other noise sensitive areas in the vicinity

# Environment Protection Licence

Licence - 6054



of the premises, using the "Fast" response on the sound meter.

- L3.2 In the case of any noise which is tonal or impulsive in character, the level of continuous noise LA10, T from the premises at any point within six metres of any residence or other noise sensitive area in the vicinity of the premises, is obtained by adding 5d(B)A to the measured level.

## **L4 Hours of operation**

- L4.1 All work at the premises must be conducted between the following hours:  
8:00am - 6:00pm

## **L5 Potentially offensive odour**

- L5.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

## **4 Operating Conditions**

### **O1 Activities must be carried out in a competent manner**

- O1.1 Licensed activities must be carried out in a competent manner.  
This includes:  
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and  
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

### **O2 Maintenance of plant and equipment**

- O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:  
a) must be maintained in a proper and efficient condition; and  
b) must be operated in a proper and efficient manner.

### **O3 Dust**

- O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

# Environment Protection Licence

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Licence - 6054



## **O4 Emergency response**

- O4.1 The licensee must have in place and implement a site- specific fire management plan and train all staff in relevant procedures to minimise the risk of fire at the premises.
- O4.2 The licensee must extinguish fires at the premises as soon as possible.
- O4.3 The licensee must implement fire prevention measures at the premises in accordance with Section 6.5.4 of the report titled "Crookwell Shire Council Landfill Environment Management Plan for Crookwell Waste Depot, prepared by CMPS & F Pty Ltd, March 1998".

## **O5 Processes and management**

- O5.1 The licensee must take all practicable steps to control entry to the premises.
- O5.2 The licensee must implement the litter management program specified in Section 6.5.2. in the Landfill Environmental Management Plan for the Crookwell Waste Depot, CMPS & F Pty Ltd, 31st March 1998.
- O5.3 The licensee must control pests, vermin and weeds at the premises.
- O5.4 The licensee must ensure that adequately trained staff are available at the premises in order to administer the requirements of this licence.
- O5.5 The licensee must train staff in accordance with Section 6.5.5 of the report titled "Crookwell Shire Council Landfill Environmental Management Plan for Crookwell Landfill Depot, prepared by CMPS & F Pty Ltd, March 1998".

## **O6 Waste management**

- O6.1 The last licensee must prepare and submit to the EPA within three months of the completion of a landfill's waste receipt operations, a closure plan in accordance with section 76 of the Protection of the Environment Operations Act 1997.
- O6.2 The leachate barrier system and leachate collection system must be installed on each surface within the premises to be used for the disposal of waste. This condition does not apply to any surface used for the emplacement of waste before the 1 July 2000.
- O6.3 Surface drainage must be diverted away from any area where waste is being or has been landfilled.
- O6.4 The licensee must ensure that the amount of landfill space used is minimised.
- O6.5 An average compaction rate of not less than 650 kg per cubic metre must be achieved for all waste disposed of at the premises.
- O6.6 The licensee must ensure that the landfill cells are capped progressively when the level of waste reaches

# Environment Protection Licence

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final heights.

- O6.7 The total quantity of used, rejected or unwanted tyres (including shredded tyres and tyre pieces) stockpiled at the premises must not exceed 50 tonnes.
- O6.8 The licensee must ensure that stockpiles of used, rejected or unwanted tyres (including shredded tyres and tyre pieces) are located in a clearly defined area.
- O6.9 The licensee must ensure that stockpiles of used, rejected or unwanted tyres (including shredded tyres and tyre pieces) are managed so as not to cause or to be likely to cause the spread of disease by vermin.
- O6.10 The licensee must ensure that measures are taken to prevent stockpiles of used, rejected or unwanted tyres (including shredded tyres and tyre pieces) from catching on fire.

## **O7 Other operating conditions**

### **Burning of garden waste**

- O7.1 Stockpiles of clean timber, cardboard and vegetation measuring no greater than 10 metres across the diameter of the base at any location and free of tyres, plastics, metals, wet grass clippings, soil and building or putrescible wastes may be burnt subject to:
  - (a) The stockpile being dried for a period of not less than 3 months;
  - (b) The prevailing and predicted weather pattern is not toward any nearby residences and places of business not associated with the waste facility;
  - (c) A buffer zone of 15 metres being maintained between timber stockpiles;
  - (d) A buffer zone of 30 metres being maintained between the timber stockpile area and the working face of the putrescible garbage cell and any stockpiles of tyres, car bodies or like materials retained for recycling purposes;
  - (e) Smoke from the burning stockpiles of timber will not impact on any residential, recreational or institutional premises.

### **Controlled burning**

- O7.2 The licensee must extinguish all fires other than the wastes being burnt in accordance with the conditions of the licence.

## **5 Monitoring and Recording Conditions**

### **M1 Monitoring records**

- M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.
- M1.2 All records required to be kept by this licence must be:
  - a) in a legible form, or in a form that can readily be reduced to a legible form;
  - b) kept for at least 4 years after the monitoring or event to which they relate took place; and

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c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

## M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

### POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Total suspended solids	milligrams per litre	Quarterly	Grab sample

### POINT 1,2,3,4,5,6,7,8

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	micrograms per litre	Quarterly	Grab sample
Ammonia	micrograms per litre	Quarterly	Grab sample
Conductivity	microsiemens per centimetre	Quarterly	Grab sample
Nitrate	micrograms per litre	Quarterly	Grab sample
pH	pH	Quarterly	Grab sample

### POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample
Total suspended solids	milligrams per litre	Quarterly	Grab sample

### POINT 3

Pollutant	Units of measure	Frequency	Sampling Method
-----------	------------------	-----------	-----------------

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Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample
Total suspended solids	milligrams per litre	Quarterly	Grab sample

## POINT 4

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample

## POINT 5

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample

## POINT 6

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample

## POINT 7

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Quarterly	Grab sample

## POINT 8

Pollutant	Units of measure	Frequency	Sampling Method
Biochemical oxygen demand	milligrams per litre	Bi-Monthly	Grab sample

## M3 Testing methods - concentration limits

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

## M4 Recording of pollution complaints

M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent

# Environment Protection Licence

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of the licensee in relation to pollution arising from any activity to which this licence applies.

M4.2 The record must include details of the following:

- a) the date and time of the complaint;
- b) the method by which the complaint was made;
- c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- d) the nature of the complaint;
- e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
- f) if no action was taken by the licensee, the reasons why no action was taken.

M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

## M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

## M6 Requirement to monitor volume or mass

M6.1 For each discharge point or utilisation area specified below, the licensee must monitor:

- a) the volume of liquids discharged to water or applied to the area;
  - b) the mass of solids applied to the area;
  - c) the mass of pollutants emitted to the air;
- at the frequency and using the method and units of measure, specified below.

### POINT 1

Frequency	Unit of Measure	Sampling Method
Quarterly	kilolitres	Estimate

## 6 Reporting Conditions

### R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

# Environment Protection Licence

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- a) a Statement of Compliance; and
- b) a Monitoring and Complaints Summary.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

- R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.
- R1.3 Where this licence is transferred from the licensee to a new licensee:
- a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
  - b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.
- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
  - b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.
- R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
  - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

## **R2 Notification of environmental harm**

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

# Environment Protection Licence

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## R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
- where this licence applies to premises, an event has occurred at the premises; or
  - where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.
- R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.
- R3.3 The request may require a report which includes any or all of the following information:
- the cause, time and duration of the event;
  - the type, volume and concentration of every pollutant discharged as a result of the event;
  - the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
  - the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
  - action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
  - details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
  - any other relevant matters.
- R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

## R4 Other reporting conditions

- R4.1 The licensee must record the following data in relation to fires occurring at the premises:
- Time and date when the fire started.
  - Whether the fire was authorised by the licensee, and, if not, the circumstances which ignited the fire.
  - The time and date that the fire burnt out or was extinguished.
  - The location of fire (eg. clean timber stockpile, putrescible garbage cell, etc).
  - Prevailing weather conditions at the time of the fire.
  - Observations made in regard to smoke direction and dispersion.
  - The amount of waste that was combusted by the fire.
  - Action taken to extinguish the fire;
  - Action taken to prevent a reoccurrence.

The data must be recorded on each day that the fire is burning.

- R4.2 The licensee or its employees or agents must notify the occurrence of all fires on the premises in accordance with conditions R2.1 and R2.2 as soon as practical after becoming aware of the fire.

# Environment Protection Licence

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## 7 General Conditions

### G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

### G2 Contact number for incidents and responsible employees

G2.1 The licensee must operate 24-hour telephone contact lines for the purpose of enabling the EPA to directly contact one or more representatives of the licensee who can:

- a) respond at all times to incidents relating to the premises; and
- b) contact the licensee's senior employees or agents authorised at all times to:
  - i) speak on behalf of the licensee; and
  - ii) provide any information or document required under this licence.

G2.2 The licensee is to inform the EPA of the representative or representatives and their telephone number within 3 months of the date of the issue of this licence. The EPA must be notified of the telephone number on commencement of its operation.

G2.3 The licensee is to inform the EPA in writing of the appointment of any subsequent contact persons, or changes to the person's contact details as soon as practicable and in any event within fourteen days of the appointment or change.

# Environment Protection Licence



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## Dictionary

### General Dictionary

<b>3DGM [in relation to a concentration limit]</b>	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
<b>Act</b>	Means the Protection of the Environment Operations Act 1997
<b>activity</b>	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
<b>actual load</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>AM</b>	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
<b>AMG</b>	Australian Map Grid
<b>anniversary date</b>	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
<b>annual return</b>	Is defined in R1.1
<b>Approved Methods Publication</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>assessable pollutants</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>BOD</b>	Means biochemical oxygen demand
<b>CEM</b>	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
<b>COD</b>	Means chemical oxygen demand
<b>composite sample</b>	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
<b>cond.</b>	Means conductivity
<b>environment</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>environment protection legislation</b>	Has the same meaning as in the Protection of the Environment Administration Act 1991
<b>EPA</b>	Means Environment Protection Authority of New South Wales.
<b>fee-based activity classification</b>	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
<b>general solid waste (non-putrescible)</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

# Environment Protection Licence



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<b>flow weighted composite sample</b>	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
<b>general solid waste (putrescible)</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>grab sample</b>	Means a single sample taken at a point at a single time
<b>hazardous waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>licensee</b>	Means the licence holder described at the front of this licence
<b>load calculation protocol</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>local authority</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>material harm</b>	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
<b>MBAS</b>	Means methylene blue active substances
<b>Minister</b>	Means the Minister administering the Protection of the Environment Operations Act 1997
<b>mobile plant</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>motor vehicle</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>O&amp;G</b>	Means oil and grease
<b>percentile [in relation to a concentration limit of a sample]</b>	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
<b>plant</b>	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
<b>pollution of waters [or water pollution]</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>premises</b>	Means the premises described in condition A2.1
<b>public authority</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>regional office</b>	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
<b>reporting period</b>	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
<b>restricted solid waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>scheduled activity</b>	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
<b>special waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>TM</b>	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

# Environment Protection Licence



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<b>TSP</b>	Means total suspended particles
<b>TSS</b>	Means total suspended solids
<b>Type 1 substance</b>	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
<b>Type 2 substance</b>	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
<b>utilisation area</b>	Means any area shown as a utilisation area on a map submitted with the application for this licence
<b>waste</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>waste type</b>	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Nigel Sargent

Environment Protection Authority

(By Delegation)

Date of this edition: 17-January-2001

# Environment Protection Licence

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## End Notes

- 1 Licence varied by notice 1009263, issued on 06-Jul-2001, which came into effect on 31-Jul-2001.
- 2 Licence varied by notice 1031433, issued on 21-Nov-2003, which came into effect on 16-Dec-2003.
- 3 Licence transferred through application 143383, approved on 12-Apr-2005, which came into effect on 11-Feb-2004.
- 4 Licence fee period changed by notice 1061234 on 02-Jun-2006.
- 5 Licence fee period changed by notice 1061232 on 02-Jun-2006.
- 6 Licence varied by change to DEC file number, issued on 15-Mar-2007, which came into effect on 15-Mar-2007.
- 7 Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
- 8 Licence varied by notice 1098724, issued on 27-Mar-2009, which came into effect on 27-Mar-2009.
- 9 Licence varied by notice 1516479 issued on 23-Aug-2013
- 10 Licence varied by notice 1525059 issued on 03-Nov-2014
- 11 Licence varied by notice 1529838 issued on 10-Apr-2015
- 12 Licence varied by notice 1532825 issued on 12-Aug-2015

## **Appendix C – Monitoring results (March 2016)**

DRAFT

## CERTIFICATE OF ANALYSIS

<b>Work Order</b> : <b>CA1601780</b> <b>Client</b> : <b>Upper Lachlan Shire Council</b> <b>Contact</b> : Mr David Scott <b>Address</b> : Accounts Payable PO Box 42 GUNNING NSW 2581  <b>Telephone</b> : 02 4832 1942 <b>Project</b> : Crookwell Landfill Monitoring <b>Order number</b> : 6896 <b>C-O-C number</b> : ---- <b>Sampler</b> : ---- <b>Site</b> : ---- <b>Quote number</b> : ---- <b>No. of samples received</b> : 4 <b>No. of samples analysed</b> : 4	<b>Page</b> : 1 of 2  <b>Laboratory</b> : ALS Water Resources Group <b>Contact</b> : Client Services <b>Address</b> : 16B Lithgow Street Fyshwick ACT Australia 2609  <b>Telephone</b> : +61 2 6202 5404 <b>Date Samples Received</b> : 23-Mar-2016 09:00 <b>Date Analysis Commenced</b> : 24-Mar-2016 <b>Issue Date</b> : 31-Mar-2016 15:14
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NATA Accredited Laboratory 992  
 Accredited for compliance with  
 ISO/IEC 17025.

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Geetha Ramasundara	Teamleader Wet Chem	Inorganics, Fyshwick, ACT
Terry OBrien	Teamleader Nutrients	Inorganics, Fyshwick, ACT



## General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.  
 LOR = Limit of reporting  
 ^ = This result is computed from individual analyte detections at or above the level of reporting  
 ø = ALS is not NATA accredited for these tests.

## Analytical Results

Sub-Matrix: **WATER**  
 (Matrix: **WATER**)

Client sample ID

				CRW110 BORE MW1	CRW120 Bore MW2	CRW140 BORE MW4	CRW180 D/s Dam	----
Client sampling date / time				[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	[22-Mar-2016]	----
Compound	CAS Number	LOR	Unit	CA1601780-001	CA1601780-002	CA1601780-003	CA1601780-004	-----
				Result	Result	Result	Result	Result
<b>EA005: pH</b>								
pH	----	0.01	pH Unit	6.17	5.55	4.76	8.25	----
<b>EA010: Conductivity</b>								
Electrical Conductivity @ 25°C	----	2	µS/cm	98	202	386	1060	----
<b>EA025: Suspended Solids</b>								
Suspended Solids (SS)	----	2	mg/L	10	7	527	<2	----
<b>ED037: Alkalinity</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----
Carbonate Alkalinity as CaCO3	3812-32-6	0.1	mg/L	<0.1	<0.1	<0.1	21.2	----
Bicarbonate Alkalinity as CaCO3	71-52-3	0.1	mg/L	14.6	8.1	5.0	316	----
Total Alkalinity as CaCO3	----	1	mg/L	15	8	5	337	----
<b>EK055: Ammonia as N</b>								
Ammonia as N	7664-41-7	0.1	mg/L	<0.1	<0.1	0.2	<0.1	----
<b>EK057: Nitrite as N</b>								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
<b>EK058: Nitrate as N</b>								
Nitrate as N	14797-55-8	0.01	mg/L	0.56	6.70	12.7	<0.05	----
<b>EK059: Nitrite plus Nitrate as N (NOx)</b>								
Nitrite + Nitrate as N	----	0.05	mg/L	0.56	6.70	12.7	<0.05	----
<b>EP030: Biochemical Oxygen Demand (BOD)</b>								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	<2	<2	----

## **Appendix D** – Stormwater Management & Conceptual Drainage Design (GHD, 2015b)

DRAFT



18 September 2015

Luke Moloney  
Upper Lachlan Shire Council  
PO Box 10  
Crookwell NSW 2583

Our ref: 21/24277  
211051  
Your ref:

Dear Luke

## **Crookwell Landfill Stormwater Management & Conceptual Drainage Design**

### **1 Background**

GHD has been engaged to assist Upper Lachlan Shire Council to develop a stormwater management plan for Crookwell Landfill (the site) located on Grabben Gullen Road in Crookwell, NSW.

This advice is provided to Upper Lachlan Shire Council when considering the stormwater management works required for the Crookwell Landfill.

### **2 Purpose**

The purpose of this letter is to provide a conceptual stormwater management and drainage design plan for the site.

### **3 Scope of Works**

The following works have been completed by GHD:

- Site visit
- Development of concept surface water plan and
- Conceptual sizing of surface water catchment drains.

### **4 Reliance**

The following documents were referred to when preparing the drainage designs:

- Managing Urban Stormwater, Soils and Construction, Volume 2B Landfills (DECC, 2008)
- Australian Rainfall and Runoff, A Guide to Flood Estimation, Volume 1 (IEA, 2001)

### **5 Site visit observations**

On 28 August 2015, Andrew Quinn of GHD visited Crookwell Landfill.

The following key observations were made (Refer to Figure 1 for an aerial view of the site):

- The site has trees along the northern and north-western boundaries. The land to the south and east of the site is agricultural. A large farm dam (Dam 1) is located to the south-west of the site. A smaller farm dam (Dam 2) is located to the south and a third farm dam (Dam 3) to the east.
- The site generally falls to the south-east, with surface water currently being discharged from the south-eastern boundary into Dam 1 on the neighbouring property.
- There is a sealed entry road. Surface water was observed to be ponding in the ditches on either side of the sealed site access road.
- A gravelled area located in the centre of the site currently serves as a recycling and transfer station.
- There is a large bund along the north-western boundary of the site, parallel to Grabben Gullen Road. The bund is vegetated with grass and large trees. There is also a grassed channel in the crest of the bund, which collects surface water from Grabben Gullen Road and conveys it to the south-western boundary of the site. From here, it flows in a culvert under an embankment and into Dam 1.
- An additional embankment has been constructed along the western portion of the south-western boundary.
- A second culvert is located near the south-western boundary, conveying additional surface water from the northern parts of the site into Dam 1.
- Near the north-western boundary of the site between the embankment and the landfill, there are areas where water ponding was observed.
- Previous filling has created a gully within the landfill footprint into which surface water flows and ponds.
- There is an existing depression at the eastern boundary of the site, where water was observed to pond. This overflows into Dam 3.



**Figure 1 - Crookwell Landfill**

## **6 Future site arrangement**

As part of previous works, GHD provided Council with a number of options for the future of the site.

GHD assumes that the waste footprint will be extended to the north-west. The works will also require trimming of the waste batters along the eastern portions of the site in order to provide stable batters (maximum 1 in 4) which are offset from the site boundary.

## **7 Concept surface water management arrangement**

### **7.1 Key considerations**

A surface water management system should consider:

- Diversion of clean water around the site
- Separation of clean and sediment-affected water

- Collection of sediment laden water and
- The future development of the site and staging.

## 7.2 Constraints and opportunities

Upon evaluation of stormwater drainage for the Crookwell landfill site, the following constraints and opportunities were identified:

### Constraints:

- The proposed stormwater management system may impact water access for neighbouring agricultural properties
- Excavation work on waste batters on the eastern portions of the site in order to provide stable batters (maximum 1 in 4) which are offset from the site boundary.

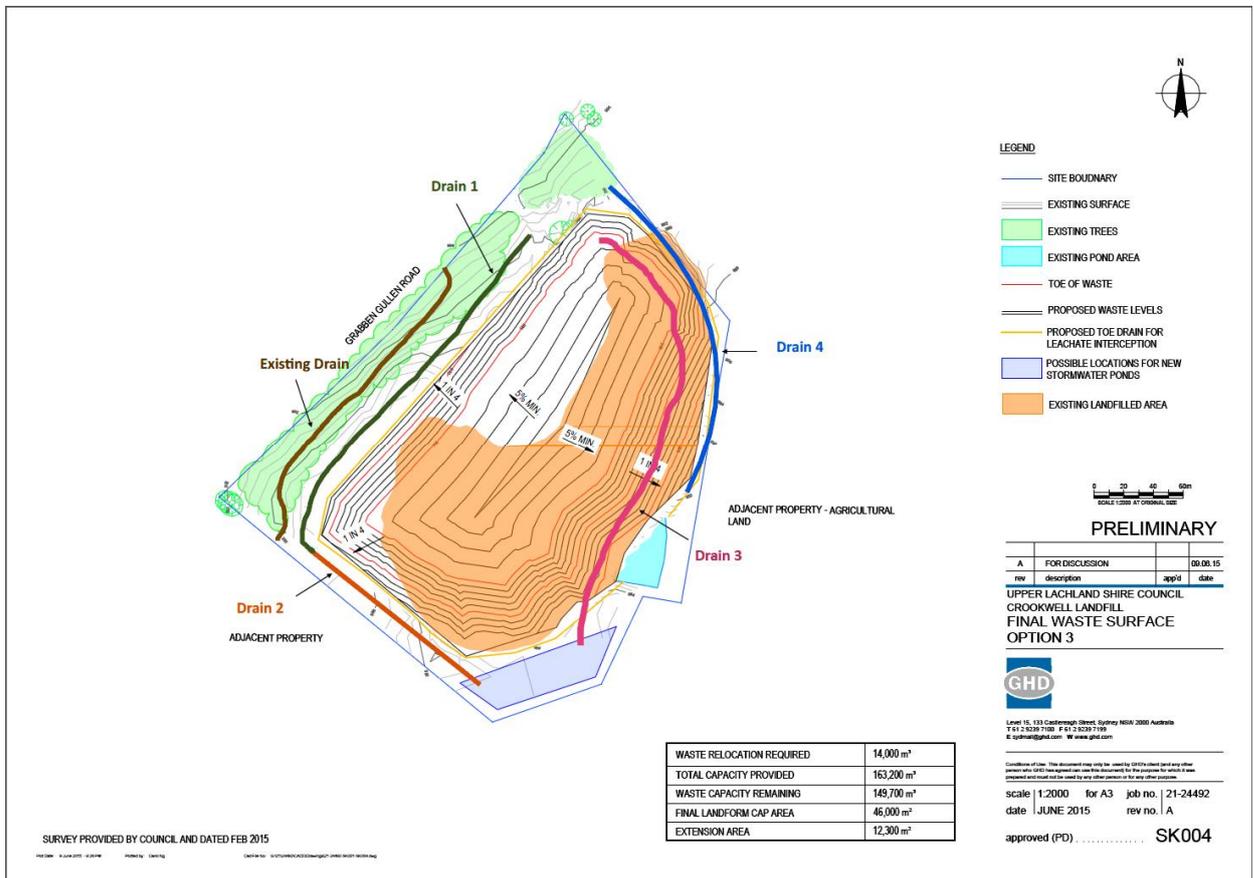
### Opportunities:

- The unused space on the southern corner of the site may be used for a sediment pond which would overflow into Dam 3 on the adjacent property
- Use of existing drain to direct additional stormwater from catchment A.
- Required excavation work on waste batters may allow for the construction of contour drain on the landfill cap.

## 7.3 Proposed system

GHD has proposed the following surface water management system, which is shown in Figure 2:

- Formalise the existing drain in the north-western embankment which parallels the road and diverts offsite water into Dam 1.
- Construct a sediment pond in the southern corner of the site. The overflow for the new dam would flow into the adjacent property, pending approval from the property owner.
- Provide a perimeter drain at the toe of the proposed landfill footprint on the north-western (Drain 1) and south-western (Drain 2) boundaries.
- Provide a perimeter drain at the toe of the proposed landfill footprint on the north side of the landfill (Drain 4). This will require the landfill reshaping works to be undertaken first to provide sufficient offset between the site boundary and the toe of the waste. As Drain 4 will not be able to be discharged to the new pond:
  - Localised erosion and sediment controls, materials such as sediment fencing and rock check dams, will be required within Drain 4 to allow direct discharge offsite.
  - An additional contour drain (Drain 3) should be constructed on the capped waste to maximise the amount of water which is conveyed to the proposed stormwater pond on the south-eastern corner of the site.



**Figure 2 Concept stormwater management system design**

## 7.4 Discussion

The following additional works are required to confirm this conceptual arrangement is suitable:

- Detailed design of the drains and ponds which should consider how the development of the remaining landfill area is going to be staged. Additional drains may be required in the interim stages.
- GHD notes that the proposed stormwater management system may impact water access for neighbouring agricultural properties. GHD recommends that the following be undertaken:
  - Confirm arrangement with western neighbour regarding acceptance of water which is diverted around the landfill
  - Confirm that the proposed pond will have minimal impact on the farm dams located to the south east of the site, particularly Dam 2.

## 8 Concept sizing of drains

GHD has prepared conceptual design of the proposed drains to determine if the proposed arrangement would be feasible based on the site arrangement. The conceptual dimensions for the drains are shown in Table 1.

In preparing these concept designs, the following assumptions were made:

- The channels would be trapezoid shaped with side slopes of 1 in 3
- A freeboard of 0.3 m will be required
- The drain will be grassed
- Water run-on from outside the site boundary was not considered
- Average recurrence interval = 20 years
- Time of concentration = 5 minutes
- Coefficient of discharge = 1.

**Table 1 Concept drain sizing**

Drain ID	Assumed catchment area (ha)	Assumed average grade	Drain dimensions (m)		
			Bed width	Average Depth	Top width
1	2.8	1 in 66	1.5	0.6	5.1
2	3.6	1 in 47	1.75	0.6	5.35
3	1.3	1 in 21	0.9	0.5	3.9
4	0.5	1 in 21	0.5	0.4	3.5

Refer to Appendix C for the design calculations and drainage cross-section.

These dimensions are indicative only and should be confirmed through detailed design.

## 9 Concept sizing of pond

The capacity of a sediment pond is determined by selecting a design storm event which needs to be contained before overflow of sediment laden water is allowed.

The capacity can be considered in two parts:

- The sediment storage zone
- The settling zone

In order to work as intended, both the sediment storage zone and the settling zone need to be empty when a rain event commences.

The final volume of the pond then needs to consider:

- How quickly the water in the pond can be treated and emptied from the settling zone, and
- How often the pond will be maintained and cleared of the build-up of sediment to restore the sediment storage zone.

For the same design storm event, a larger pond can be emptied and cleaned less regularly.

In order to provide a reduced maintenance period, a large pond should be considered.

Two pond sizes have been considered, based on containment of a 90<sup>th</sup> percentile rainfall event and water removal within either five days or 20 days.

### **9.1 90<sup>th</sup> percentile five day rainfall event**

According to Managing Urban Stormwater, Soils and Construction, Volume 2B Landfills (DECC, 2008) sites expected to be in operation for more than three years, and with non-sensitive downstream receptors, are required to achieve retention in a 90<sup>th</sup> percentile five day rainfall event.

Based on the 90<sup>th</sup> percentile five day rainfall event of 28.6 mm for Goulburn (Managing Urban Stormwater, Soils and Construction, Volume 1, Landcom, 2004) and a catchment area of 4.9 ha (inlet from Drain 2 and Drain 3), a stormwater pond of 1,400 m<sup>3</sup> capacity is likely to be required.

Conceptually, a pond with 1(V) in 3(H) internal slopes, approximate dimensions of 23 m x 59 m and a total depth of 2.5 m (includes 0.5 m freeboard) would provide the required capacity.

### **9.2 90<sup>th</sup> percentile 20-day rainfall event**

Further calculations for the same catchment area of 4.9 ha were made based on a 90<sup>th</sup> percentile 20-day rainfall event with a rainfall depth of 75.6 mm for Goulburn and it was found that a stormwater pond of 4,000 m<sup>3</sup> capacity is likely to be required.

To meet a 4,000 m<sup>3</sup> capacity, a pond with 1(V) in 3(H) internal slopes, approximate dimensions of 38 m x 78 m and a total depth of 2.5 m (includes 0.5 m freeboard) would be required.

## **10 Conclusion**

Based on the above design calculations and site evaluation, the management of the stormwater runoff affecting the landfill site is feasible for a 90<sup>th</sup> percentile five day rainfall event. However, as for a 90<sup>th</sup> percentile 20-day event, further survey of the site will be required to confirm the eligibility of the construction of the proposed stormwater pond.

GHD recommends Upper Lachlan Shire Council engage a consultant to undertake additional works on the site for a more detailed drainage design, such as consideration of staging of the future works, 3D modelling and development, CAD drawings, construction drawing sets, technical specifications and project management.

**Regards,**

**Adrian Roberts**

Principal Engineer  
02 9239 7307

Appendix A  
**Design Rainfall Intensity Table**

From BOM

## Intensity-Frequency-Duration Table

Location: 34.625S 149.450E Issued: 14/9/2015

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

### Average Recurrence Interval

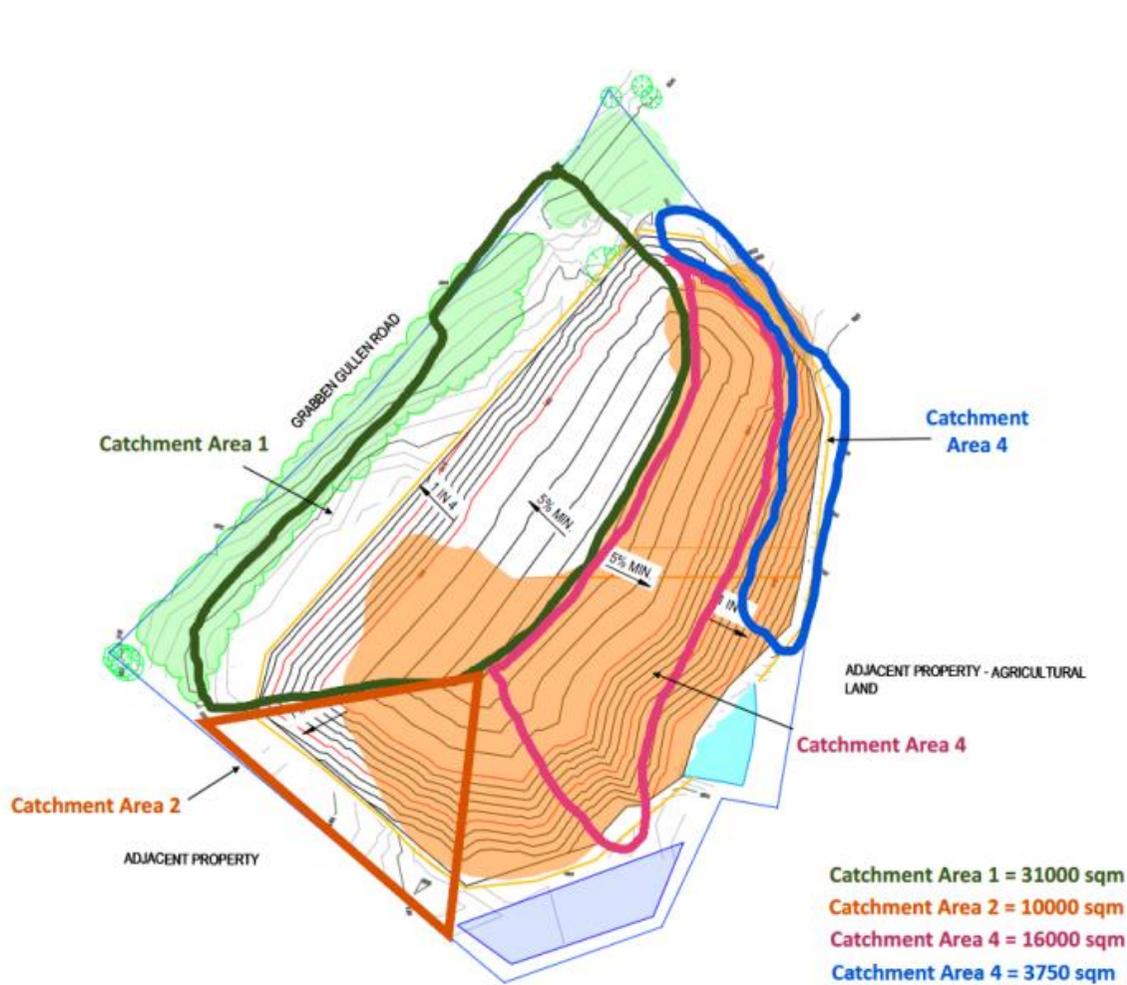
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	55.8	73.5	99.0	115	137	167	191
6Mins	52.1	68.6	92.2	107	127	155	177
10Mins	42.5	55.8	74.5	86.4	102	124	141
20Mins	30.9	40.4	53.2	61.2	71.9	86.5	98.1
30Mins	25.0	32.6	42.6	48.8	57.1	68.5	77.4
1Hr	16.8	21.8	28.1	32.0	37.3	44.4	50.0
2Hrs	10.9	14.1	18.0	20.4	23.6	28.0	31.4
3Hrs	8.46	10.9	13.8	15.6	18.0	21.2	23.8
6Hrs	5.41	6.95	8.74	9.80	11.3	13.2	14.7
12Hrs	3.44	4.40	5.49	6.14	7.03	8.22	9.13
24Hrs	2.15	2.74	3.40	3.79	4.33	5.05	5.61
48Hrs	1.29	1.64	2.03	2.26	2.58	3.00	3.33
72Hrs	.922	1.18	1.46	1.62	1.85	2.15	2.38

(Raw data: 22.13, 4.48, 1.19, 42.74, 7.96, 2.08, skew=0.19, F2=4.29, F50=15.61)

© Australian Government, Bureau of Meteorology

Appendix B

## Indicative Catchment Areas



Catchment Area 1 = 31000 sqm  
 Catchment Area 2 = 10000 sqm  
 Catchment Area 4 = 16000 sqm  
 Catchment Area 4 = 3750 sqm

WASTE RELOCATION REQUIRED	14,000 m <sup>3</sup>
TOTAL CAPACITY PROVIDED	163,200 m <sup>3</sup>
WASTE CAPACITY REMAINING	149,700 m <sup>3</sup>
FINAL LANDFORM CAP AREA	46,000 m <sup>2</sup>
EXTENSION AREA	12,300 m <sup>2</sup>



**LEGEND**

- SITE BOUNDARY
- EXISTING SURFACE
- EXISTING TREES
- EXISTING POND AREA
- TOE OF WASTE
- PROPOSED WASTE LEVELS
- PROPOSED TOE DRAIN FOR LEACHATE INTERCEPTION
- POSSIBLE LOCATIONS FOR NEW STORMWATER PONDS
- EXISTING LANDFILLED AREA



**PRELIMINARY**

A	FOR DISCUSSION		09.08.15
rev	description	app'd	date

UPPER LACHLAND SHIRE COUNCIL  
 CROOKWELL LANDFILL  
 FINAL WASTE SURFACE  
 OPTION 3



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 date | JUNE 2015 rev no. | A

approved (PD) ..... SK004

Appendix C

## Drainage design calculations

Crookwell Landfill: Conceptual Drainage Designs

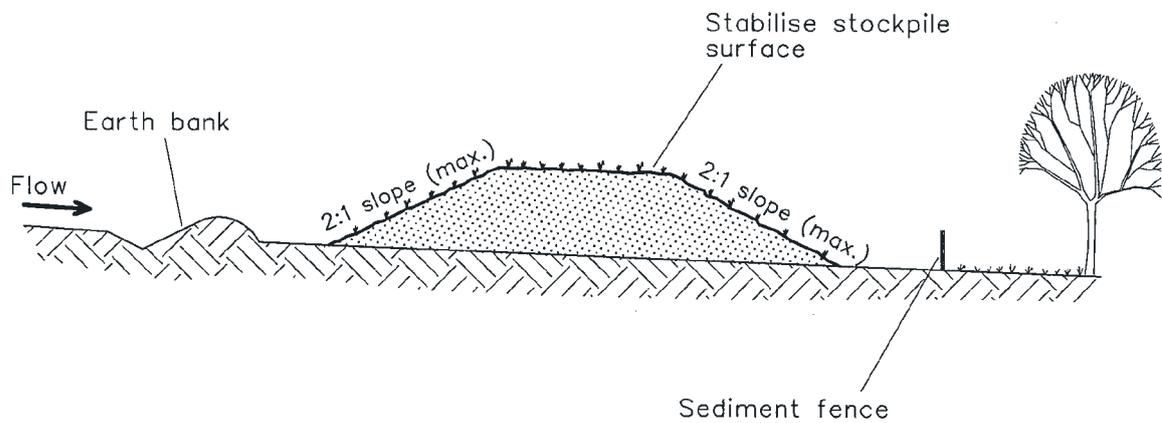
	Drain 1	Drain 2	Drain 3	Drain 4
Catchment Area	A1	A1 + A2	A3	A4
Area (m <sup>2</sup> )	27,900	36,200	13,200	5,000
Area, A (ha)	2.79	3.62	1.32	0.5
Time of concentration (mins)	5	5	5	5
ARI	20	20	20	20
Intensity, I (mm/hr)	137	137	137	137
Coefficient of Discharge, C	1	1	1	1
Q (m <sup>3</sup> /s) = CIA/360	1.06	1.38	0.50	0.19
Manning's coefficient "n"	0.03	0.03	0.03	0.03
Bed slope 1 in..	66	47.3	20.6	21
Left bank slope (Sl)1 in..	3	3	3	3
Bed width (m)	1.5	1.75	0.9	0.5
Right bank slope(Sr)1 in..	3	3	3	3
Channel depth (m)	0.6	0.6	0.5	0.5
Drain top width (m)	5.1	5.35	3.9	3.5
Maximum Water Level	0.3	0.3	0.2	0.2
Max. Channel Capacity (m <sup>3</sup> /s)	4.22	4.57	3.91	3.06

\* includes 0.3m freeboard

## **Appendix E** – Soil and water management standard drawings

- SD 4-1 Stockpiles
- SD 5-1 Temporary Water Crossing
- SD 5-4 Rock Check Dams
- SD 5-5 Earth Bank (Low Flows)
- SD 5-6 Earth Bank (High Flows)
- SD 5-7 Concentrated Flow
- SD 5-8 Energy Dissipater
- SD 6-8 Sediment Fence

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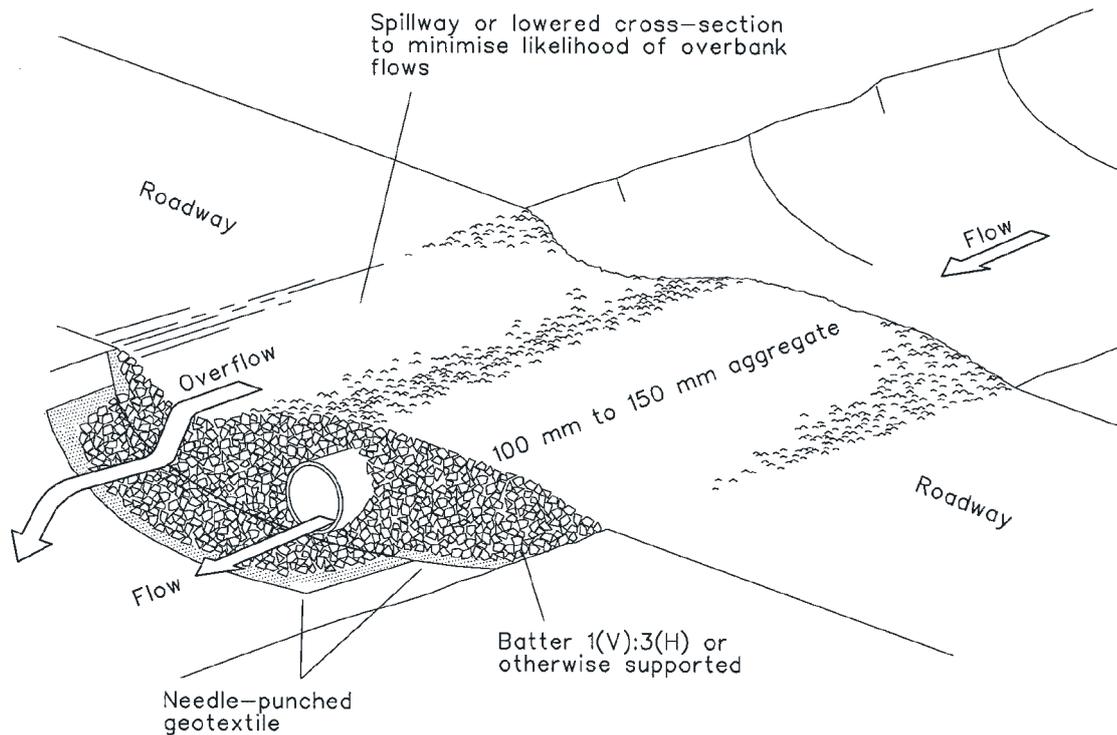


## Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

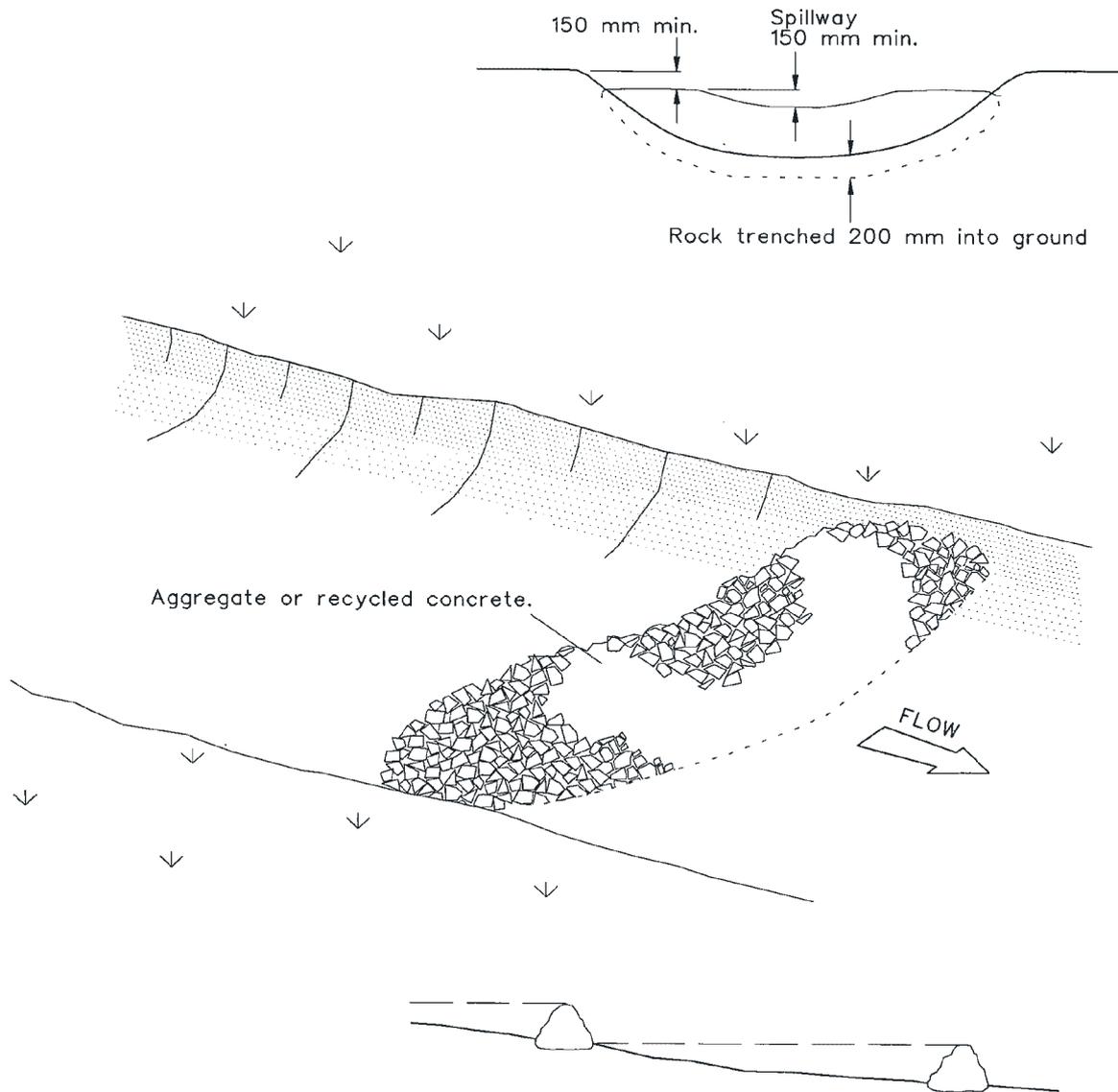
**STOCKPILES**

**SD 4-1**



## Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than design storm events.
6. Ensure that culvert outlets extend beyond the toe of fill embankments.



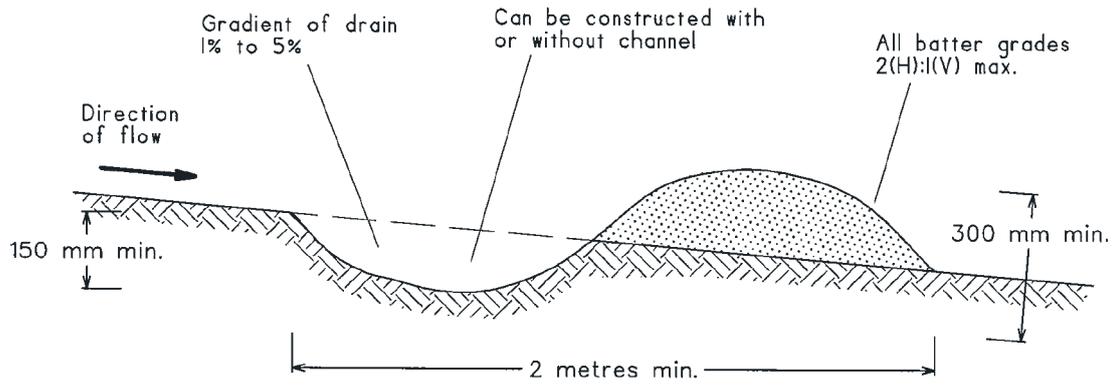
Spacing of check dams along centreline and scour protection below each check dam to be specified on SWMP/ESCP

## Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

## ROCK CHECK DAM

SD 5-4



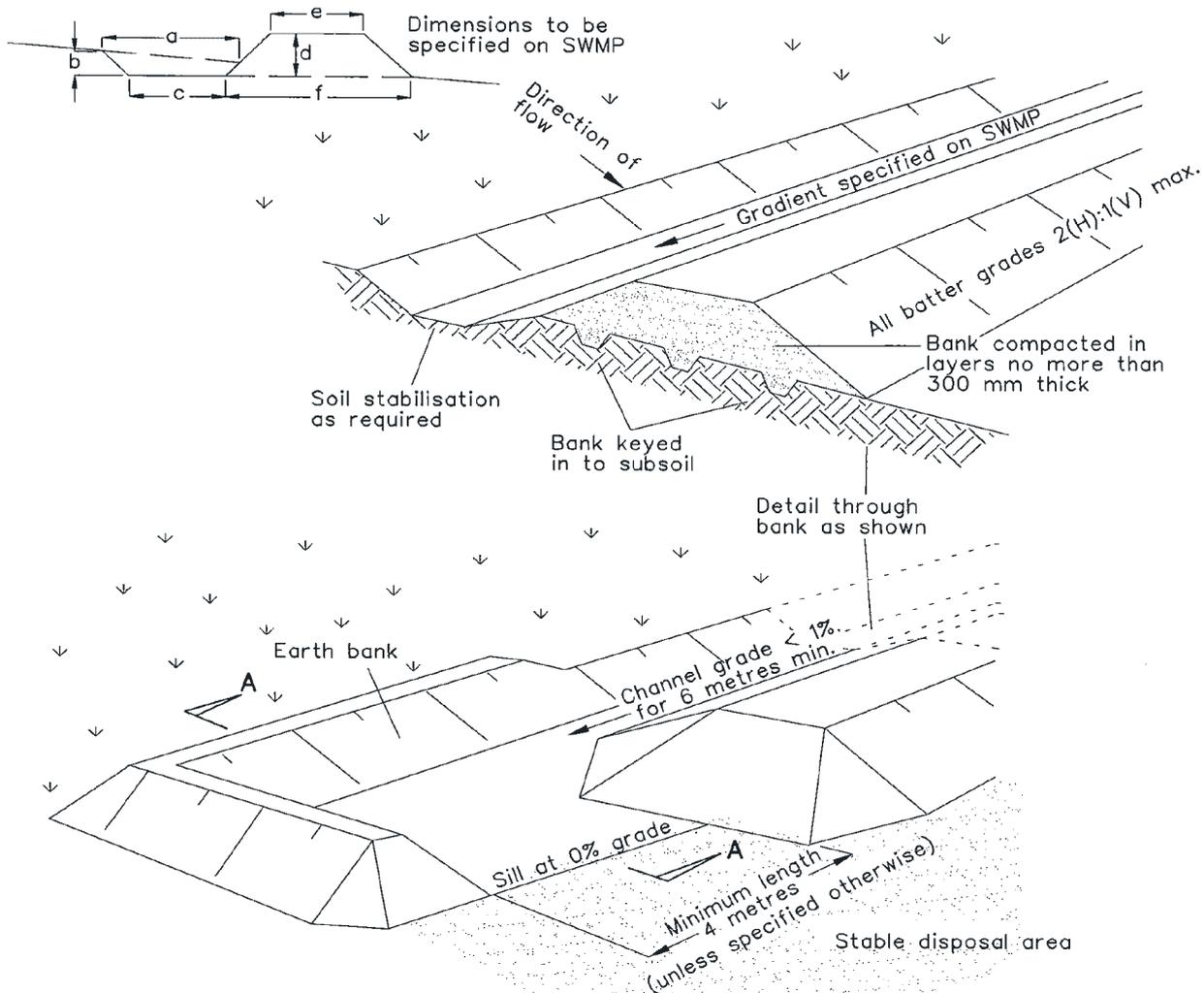
NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

## Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

**EARTH BANK (LOW FLOW)**

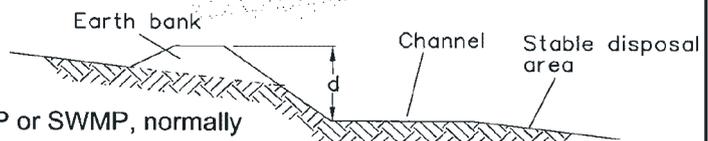
**SD 5-5**



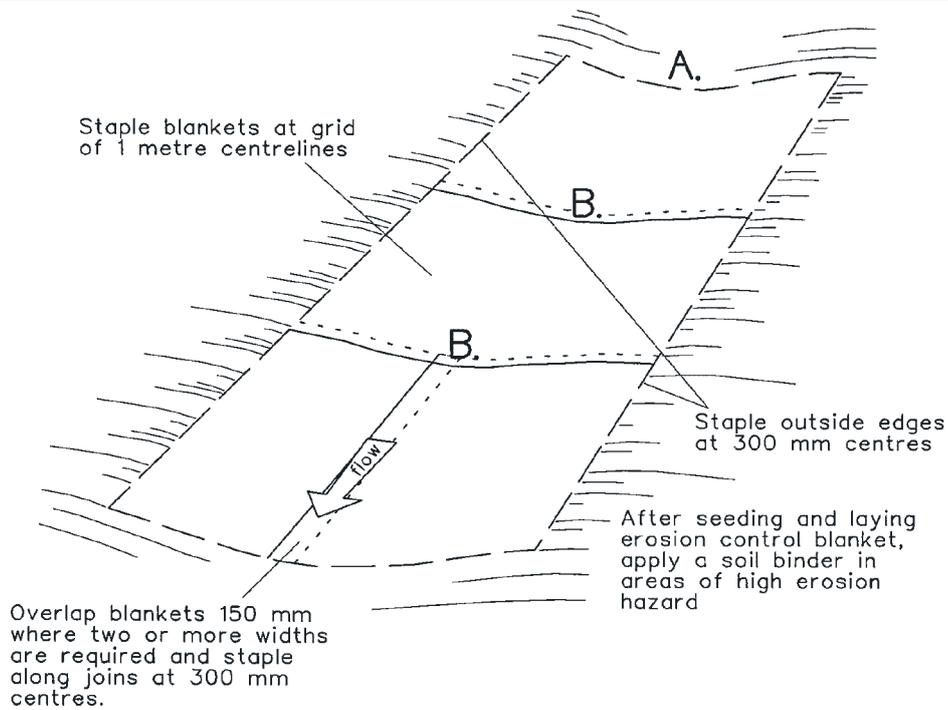
### Level Spreader (or Sill)

### Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.



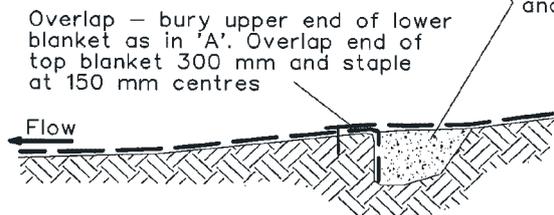
Section AA



Bury the top of the blanket in a trench 300 mm or more in depth and staple at 150 mm centres. Tamp soil over blanket



Centreline section at point "A".

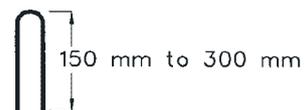


Centreline section at points "B".

Overlap – bury upper end of lower blanket as in 'A'. Overlap end of top blanket 300 mm and staple at 150 mm centres

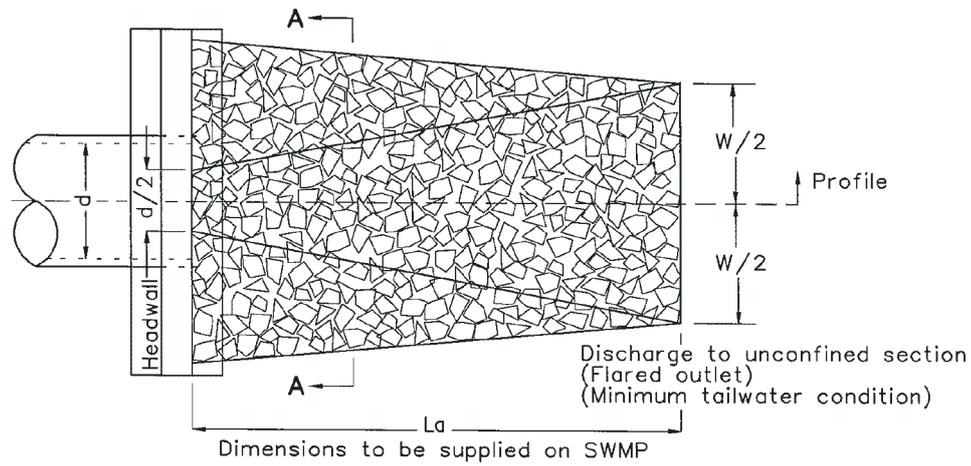
Fill the trench with soil and compact

Staples: 8 gauge (4mm) wire

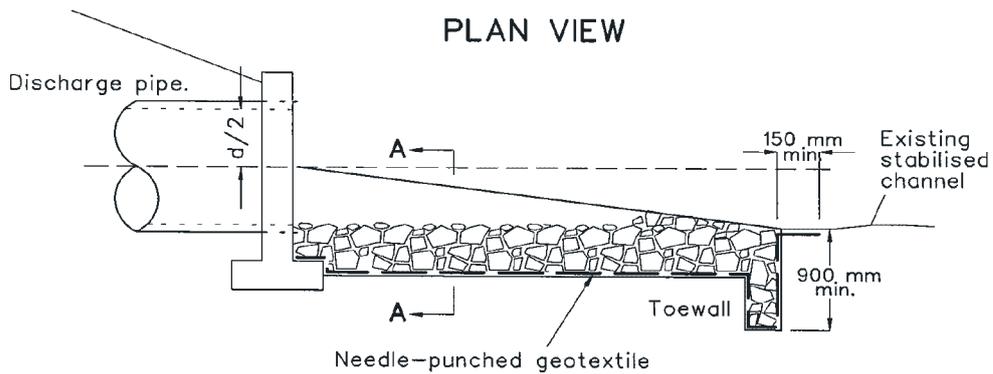


## Construction Notes

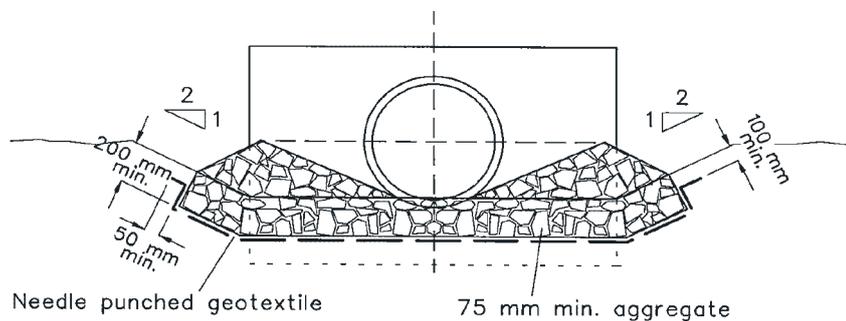
1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end (Standard Drawing 5-7b).
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.



PLAN VIEW



PLAN VIEW



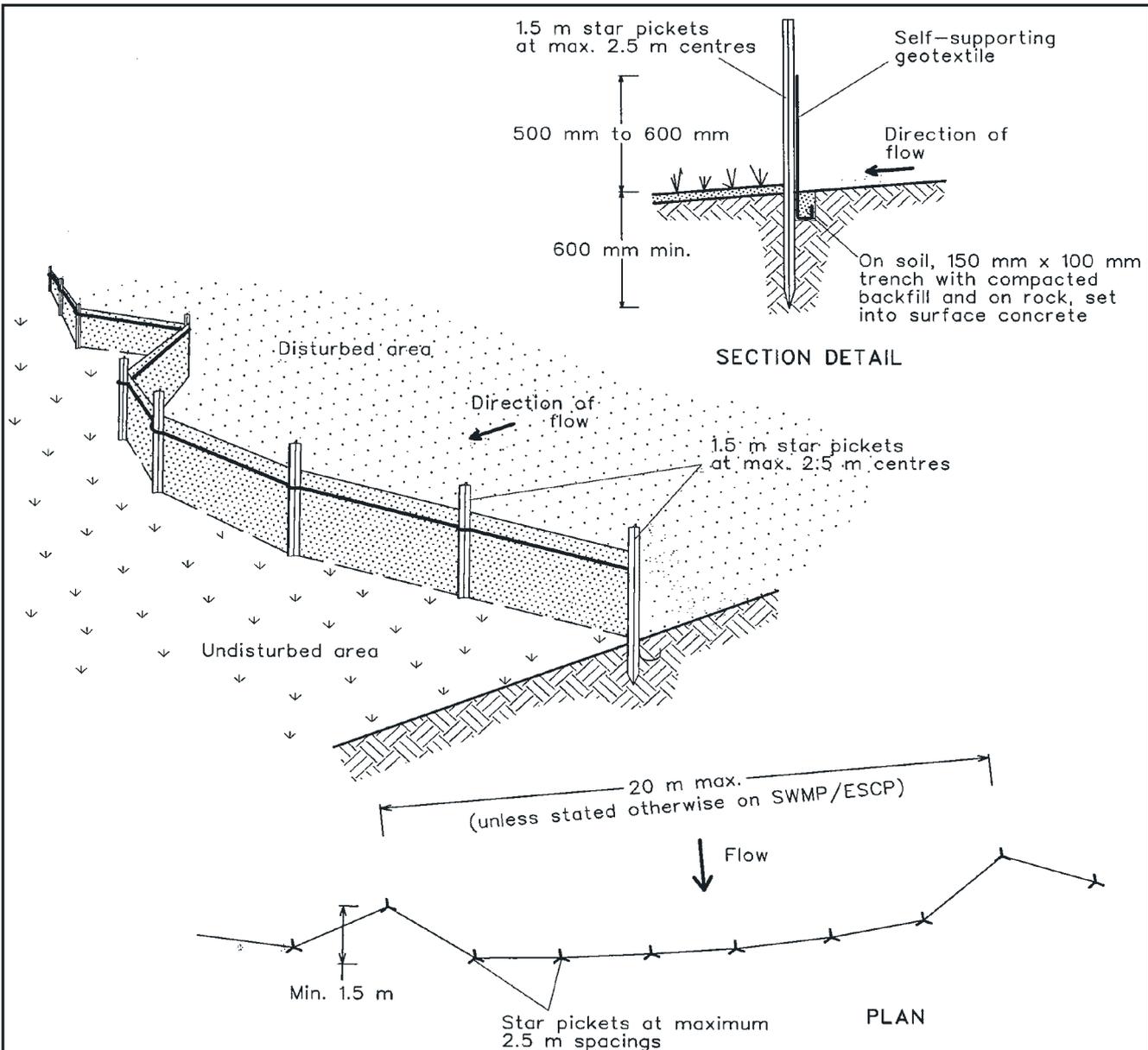
CROSS SECTION AA

### Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

**ENERGY DISSIPATER**

**SD 5-8**



## Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

**SEDIMENT FENCE**

**SD 6-8**

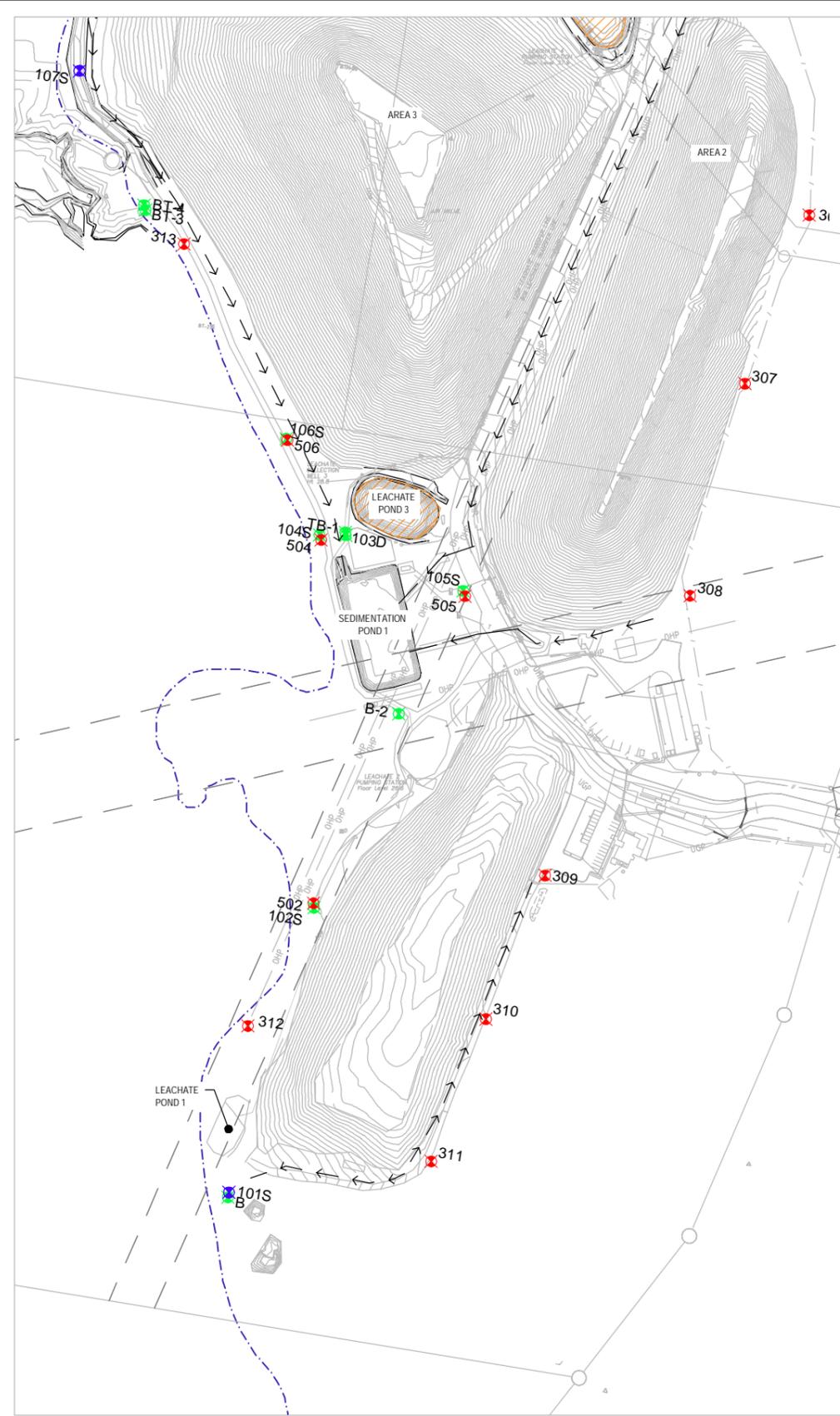
# Appendix F – Surface Water Management Control Plan

This plan is to be regularly updated as per Section 8.12

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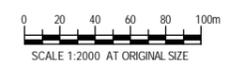
PLAN - NORTHERN AREA  
SCALE 1:2000



PLAN - SOUTHERN AREA  
SCALE 1:2000

- LEGEND:**
- EXISTING SURFACE
  - EXISTING SEDIMENTATION POND
  - GAS MONITORING WELL
  - GROUNDWATER & GAS WELL
  - GROUNDWATER MONITORING WELL
  - SURFACE WATER DRAINAGE
- GENERAL NOTES:**
- ALL SITE WORKS ARE SUBJECT TO CONDITIONS PROVIDED IN SITE EPL

INSPECTOR	SIGNATURE	DATE



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Client **TYPICAL CLIENT**  
Project **TYPICAL SITE**  
Title **SURFACE WATER MANAGEMENT CONTROL PLAN EXAMPLE**

# **Appendix G** – Pollution Incident Response Management Plan

DRAFT



# Pollution Incident Response Management Plan

## EPL 6054: Waste Disposal by Application to Land - Crookwell Landfill Facility

**Licensee:** Upper Lachlan Shire Council  
**Address:** PO Box 42, Gunning NSW 2581  
**Telephone:** (02) 4830 1000  
**Fax:** (02) 4832 2066  
**Email:** [council@upperlachlan.nsw.gov.au](mailto:council@upperlachlan.nsw.gov.au)

## Version Control

List of relevant dates and amendments:

Version	Date	Description of Amendment	Effective From
1	October 2013	Draft	October 2013

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## 1.0 Introduction

The POELA Act 2011 introduces several changes to improve the way pollution incidents are reported, managed and communicated to the general community. The Act includes a new requirement under Part 5.7A of the *Protection of the Environment Operations Act 1997* (POEO Act) to prepare, keep, test and implement a pollution incident response management plan.

The objectives of these plans are to:

- ensure comprehensive and timely communication about a pollution incident to staff at the premises, the Environment Protection Authority (EPA), other relevant authorities specified in the Act (such as Local Councils, NSW Ministry of Health, WorkCover NSW, and Fire and Rescue NSW) and people outside the facility who may be affected by the impacts of the pollution incident
- minimise and control the risk of a pollution incident at the facility by requiring identification of risks and the development of planned actions to minimise and manage those risks
- ensure that the plan is properly implemented by trained staff, identifying persons responsible for implementing it, and ensuring that the plan is regularly tested for accuracy, currency and suitability

## 2.0 Purpose

The purpose of the plan is to:

- Outline how the risk of a pollution incident will be minimised and controlled through the identification of risks and the development of planned actions to minimise and manage those risks.
- Document the notification protocol to ensure comprehensive and timely communication about a pollution incident is provided to all relevant stakeholders.
- Ensure the risks associated with the activity are mitigated, to ensure the protection of workers, community and the environment.
- Ensure compliance with all legislative requirements.

## 3.0 Scope

The plan applies to the operation of the Crookwell Waste Management Centre, located at Grabben Gullen Road, Crookwell NSW 2583. The EPA Licence for this facility is 6054. Figure 3.1 visually identifies the location of this facility.



Figure 3.1 – Crookwell Waste Management Centre

## 4.0 Incident Reporting

### 4.1 Legal Duty to Notify

It is the responsibility of all employees and contractors of the Upper Lachlan Shire Council, who are engaged in any work activity at the Crookwell Waste Management Centre, to notify management personnel of all environmental incidents and hazards which may result in an environmental incident, regardless of the nature or scale.

Notification responsibilities are detailed under the POEO Act (Section 148), which encompasses all site personnel, including contractors and subcontractors. These can be categorised as follows (extracts taken from section 148 of POEO act):

- *Duty of employee engaged in carrying on activity to notify A person engaged as an employee in carrying on an activity must, immediately after the person becomes aware of the incident, notify the employer of the incident and all relevant information about it. If the employer cannot be contacted, the person is required to notify each relevant authority.*
- *Duty of employer to notify Without limiting subsection (2), an employer who is notified of an incident under subsection (3) or who otherwise becomes aware of a pollution incident which is related to an activity of the employer, must immediately after being notified or otherwise becoming aware of the incident, notify each relevant authority of the incident and all relevant information about it.*

## 4.2 Incident Definition

The definition of a pollution incident, as taken from the POEO Act is:

*“an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of substance, as a result of which pollution has occurred, is occurring or is likely to occur. It includes an incident or set of circumstances in which a substance has been placed or disposed of on premises, but it does not include an incident or set of circumstances involving only the emission of any noise.”*

A pollution incident is required to be notified if there is a risk of ‘material harm to the environment’, which is defined in section 147 of the POEO Act as:

*(a) harm to the environment is material if:*

- (i) It involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or*
- (ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (or such other amount as is prescribed by the regulations), and*

*(b) loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.*

## 4.3 Incident Reporting

An incident that causes or threatens material harm to the environment shall be communicated to OEH as soon as practicable after first becoming aware of the incident. Initial contact will be via the 24 hour **OEH Pollution Hotline (133 555)**. Written notice shall follow within 7 days. Examples of incidences which require reporting may include but are not limited to:

- Identification of non-domestic quantities (200ml or g) of hazardous waste mixed amongst solid waste;
- Fires at the landfill;
- Mixing of leachate and stormwater or waste and stormwater;
- Identification of any failure of an environmental protection system;
- Detection of subsurface gas migration in perimeter gas well at greater than 5% (v/v) methane;
- Any other incident or observation that could potentially pose an immediate environmental hazard outside normal operating conditions.

The occurrence of any such incident shall also be recorded in the operators daily log book.

## POLLUTION INCIDENT CLASSIFICATION, RISK ASSESSMENT AND CONTRIBUTING FACTORS

Description of Pollution Incident	Likelihood	Impact	Contributing Factors
Identifying non-domestic quantities of hazardous substances among waste	Medium	Low	Human errors made during waste screening
Surface or subsurface fires at active landfill, public receiving areas & recycling facility	Medium	Medium	High winds, dry weather, prolonged high temperatures and low humidity. Human errors made during waste screening, poor maintenance of plant and equipment, spontaneous combustion, hot embers in waste deliveries.
Surface or subsurface fires at inactive areas	Low	High	High winds, dry weather, prolonged high temperatures, low humidity and spontaneous combustion.
Mixing of leachate and stormwater or waste and stormwater	Low	Medium	Prolonged periods of heavy rain and lack of surface water pond and site maintenance.
Identification of any failure of an environmental protection system	Low	Low	Prolonged periods of heavy rain and/or a mechanical failure of the leachate return system.
Identification of a significant difference in groundwater indicator parameters	Low	Low	Prolonged periods of heavy rain.
Acts of vandalism	Low	Medium	Increased risk during hours of closure.

## 5.0 Incident Reporting

### 5.1 Fire Control

Council shall comply with all requirements of the POEO Act.

In the event of a fire occurring at the site Council shall take prompt action to extinguish the fire. The local Fire Brigade shall be immediately notified of all fires irrespective of the extent of the fire and whether or not it has been controlled.

In addition, the OEHL must immediately be notified by phone on 131 555 and in writing within 7 days of the date on which the fire occurred.

The following details must be recorded for all fire events and for each day that the fire is burning.

- The time and date when the fire started;
- Whether the fire was authorised and if not, the circumstances which ignited the fire;
- The time and date that the fire burnt out or was extinguished;
- The location of the fire (e.g. clean timber stockpile, putrescibles cell, etc.);
- Observations made in regard to smoke direction and dispersion;
- The amount of waste that was combusted by the fire;
- Action taken to extinguish the fire; and
- Action taken to prevent a reoccurrence.

In the event of a surface fire occurring at the site, water and/or earth shall be used as appropriate to extinguish the fire. Underground fires shall be treated on a case by case basis, but it will normally be necessary to excavate and spread the smouldering material and then smother it with earth or water.

A water tanker capable of being used for fire fighting, as well as dust suppression, shall be provided on site at all times and maintained in a proper working order.

## 6.0 Communicating with the Community

The following mechanisms appropriate to the circumstances may be adopted to notify and update the surrounding community of an incident, and would be undertaken following consultation with the relevant agencies and specialist advice:

- Telephone calls or doorknocking (where appropriate)
- Local media sources
- Upper Lachlan Shire Council Website [www.upperlachlan.local-e.nsw.gov.au](http://www.upperlachlan.local-e.nsw.gov.au)

## 7.0 Contact Information

If you suspect an incident has occurred as a result of Council activity, please contact Council immediately on (02) 4830 1000.

### 7.1 Contact Details

RELEVANT AUTHORITY	PHONE NUMBER
Upper Lachlan Shire Council	02 4830 1000 (office hours) 0429 786 659 (after hours)
EPA – Pollution Line	131 555 (24 hours)
WorkCover NSW	131 050 (24 hours)
Ministry of Health - Public Health Unit Goulburn	02 4824 1840 (office hours) 02 6080 8900 (after hours)
Fire & Rescue	000
Rural Fire Service	000

Where adequate resources are available for concurrent notification and immediate response and immediate response to an environmental incident, notification to the relevant Authorities must be given immediately. The following information should be given when notifying relevant authorities:

- The time, date, nature, duration and location of the incident;
- The location of the place where the pollution is occurring or likely to occur;
- The nature, estimated quantity or volume and the concentration of any pollutants involved;
- The circumstances of which the incident occurred;
- The action(s) taken or proposed to deal with the incident and any resulting pollution or threatened pollution; and
- Any other information requested by the Authority.

## 8.0 Terms and Definitions

Term	Description
<b>EPA</b>	Environmental Protection Authority
<b>EPL</b>	Environmental Protection Licence
<b>PIRMP</b>	Pollution Incident Response Management Plan
<b>POEO Act</b>	Protection of the Environment Operations Act 1997
<b>Pollution Incident</b>	Pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of substance, as a result of which pollution has occurred, is occurring or likely to occur.
<b>Notifiable Incident</b>	A pollution causing incident causing or threatening material harm (actual or potential harm to the safety of human beings or the ecosystems that is not trivial, or results in actual or potential loss or property damage of an amount, exceeding \$10,000.00).
<b>Relevant Authority</b>	Environment Protection Authority, NSW Health (Public Health Unit), WorkCover, Upper Lachlan Shire Council, Fire Rescue NSW
<b>OEH</b>	Office of Environment and Heritage



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