Licence

Environmental Protection Act 1986, Part V

Licensee: Eclipse Soils Pty Ltd

Licence: L8974/2016/1

Registered office: The Miramar Building
Level 2, 40 Subiaco Square Road
SUBIACO WA 6008

ACN: 131 802 661

Premises address: Abercrombie Road Resource Recovery Centre
Lot 115 on Plan 48295 (Volume 2602, Folio 976) and Lot 2 on Plan 29392 (Volume 2219, Folio 775) Abercrombie Road
POSTANS WA 6167
As depicted in Schedule 1

Granted: Tuesday, 28 March 2017

Commencement date: Thursday, 30 March 2017

Expiry date: Monday, 27 July 2020

Date of Amendment: 13 May 2019

Prescribed premises category
Schedule 1 of the *Environmental Protection Regulations 1987*

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
61A	Solid waste facility: premises (other than premises within category 67A) on which solid waste produced on other premises is stored, reprocessed, treated, or discharged onto land.	1,000 tonnes or more per year	200,000 tonnes per year
67A	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	1,000 tonnes or more per year	50,000 tonnes per year

Conditions
This Licence is subject to the conditions set out in the attached pages.

[redacted].....
Senior Manager Waste Industries
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Contents

Introduction

This Introduction is not part of the Licence conditions.

DWER's industry licensing role
The Department of Water and Environment Regulation (DWER) is a government department for the state of Western Australia in the portfolio of the Minister for Environment. It was formed on 1 July 2017. Prior to this, the Department was known as the Department of Environment Regulation (DER). DWER's purpose is to advise on and implement strategies for a healthy environment for the benefit of all current and future Western Australians.

DWER has responsibilities under Part V of the *Environmental Protection Act 1986* (the Act) for the licensing of prescribed premises. Through this process DWER regulates to prevent, control and abate pollution and environmental harm to conserve and protect the environment. DWER also monitors and audits compliance with works approvals and licence conditions, takes enforcement action as appropriate and develops and implements licensing and industry regulation policy.

Licence requirements
This Licence is issued under Part V of the Act. Conditions contained within the Licence relate to the prevention, reduction or control of emissions and discharges to the environment and to the monitoring and reporting of them.

Where other statutory instruments impose obligations on the Premises/Licensee the intention is not to replicate them in the licence conditions. You should therefore ensure that you are aware of all your statutory obligations under the Act and any other statutory instrument. Legislation can be accessed through the State Law Publisher website using the following link: http://www.slp.wa.gov.au/legislation/statutes.nsf/default.html

For your Premises relevant statutory instruments include but are not limited to obligations under the:

- *Environmental Protection (Unauthorised Discharges) Regulations 2004* – these Regulations make it an offence to discharge certain materials such as contaminated stormwater into the environment other than in the circumstances set out in the Regulations.

- *Environmental Protection (Controlled Waste) Regulations 2004* - these Regulations place obligations on you if you produce, accept, transport or dispose of controlled waste.

- *Environmental Protection (Noise) Regulations 1997* – these Regulations require noise emissions from the Premises to comply with the assigned noise levels set out in the Regulations.

You must comply with your licence. Non-compliance with your licence is an offence and strict penalties exist for those who do not comply.

Licence holders are also reminded of the requirements of section 53 of the Act which places restrictions on making certain changes to prescribed premises unless the changes are in accordance with a works approval, licence, closure notice or environmental protection notice.

Licence fees
If you have a licence that is issued for more than one year, you are required to pay an annual licence fee prior to the anniversary date of issue of your licence. Non-payment of annual licence fees will result in your licence ceasing to have effect meaning that it will no longer be valid and you will need to apply for a new licence for your Premises.

Ministerial conditions
If your Premises has been assessed under Part IV of the Act you may have had conditions imposed by the Minister for Environment. You are required to comply with any conditions imposed by the Minister.

Premises description and Licence summary
Eclipse Soils Pty Ltd (Eclipse Soils) operates the Abercrombie Road Resource Recovery Centre (ARRRC) located on Lot 115 and Lot 2 Abercrombie Road in Postans. The total premises covers an approximate area of 42 hectares. This premises was previously operated by Eclipse Resources Pty Ltd (Eclipse Resources). The Delegated Officer considered it appropriate to grant a licence for only Part of Lots 2 and 115. The reasons for this are set out in the Decision Document associated with this licence.

Eclipse Resources Pty Ltd previously held licence L7766/2001/5 on the premises for categories 61A, 63 and 67A. That licence expired on 27 April 2015.

This licence is for a prescribed premises category 61A (solid waste facility) and category 67A (compost manufacturing and soil blending facility) and does not authorise the infilling of waste or . Eclipse Soils accept clean fill for soil blending and offsite sales, green waste for processing into composted products, contaminated soils (hydrocarbon, acid sulfate and certain pesticide contaminated soils) for treatment and soil blending. No manures or liquid wastes are proposed to be accepted onsite.

The land is zoned 'Rural B' under the City of Kwinana (City) Town Planning Scheme No. 2 and 'Rural' under the Metropolitan Region Scheme. The premises has been granted planning approval until 27 July 2020. The licence duration is aligned to the planning approval expiry date. The planning approval is for an extractive industry operation however it includes conditions specific to all activities occurring onsite. The approval restricts operational hours to 06:00 to 18:00 Monday to Saturday with trucks not authorised to leave the quarry until 06:30. Clarification was provided by the City to confirm that the premises has valid approval to undertake soil bioremediation, compost manufacturing and soil blending.

An Agricultural Research Station owned and operated by the Department of Agriculture and Food WA is located south of Lot 115 and includes a caretaker's residence. This residence is located approximately 375m from the southern boundary of Lot 115, 600m from the western boundary of Lot 2 and is the closest neighbour to the ARRRC. The closest residential area is that of Orelia, located approximately 750m from the southernmost extent of Eclipse's ARRRC.

The nearest surface water body is an unnamed lake approximately 785m north/northwest and the Spectacles wetland located approximately 1.8km east of site. No surface water bodies or drainage lines exist on site.

As identified through DWER's software system *Perth Groundwater Atlas* (PGA), groundwater on the premises ranges from 11.5 to 20.5 metres below ground level (mbgl) in Lot 115 and from 20.5 to 26.5 mbgl, with these differences attributed to the varying contours of the premises topography. PGA also states that groundwater is considered marginal (total dissolved solids between 500 – 1000 mg/L), has

a low risk of iron staining and has no known risk of Acid Sulfate Soils (ASS). The PGA has identified the surface geology type as Tamala Limestone: predominantly calcarenite.

Water is extracted from an existing high production bore used for dust suppression purposes. The occupier has a groundwater licence to extract 100,000kL per annum. It also assists with stabilisation and compaction and the revegetation activities of the backfilled quarries.

A Threatened Ecological Community (TEC) buffer area exists to the north of the ARRRC. The buffer is in relation to 1.79ha of endangered *Melaleuca huegeli – Melaleuca acerosa* shrublands which is located 190m north of the Premises boundary. A large portion of Lot 115 and part of Lot 2 are located within the buffer area to this TEC. TEC buffers are important to assist in preventing impacts from weeds or dust emissions and can be susceptible to impacts when there are groundwater and surface water discharges that are within the vicinity of the buffer area.

The potential emissions arising from the proposed activities include:

- dust and noise emissions from vehicular movement and machinery use on-site;
- leaching of nutrients and other contaminants to the soil subsurface and underlying groundwater from composting and soil treatment activities; and
- odour emissions from composting and soil treatment activities.

There are no direct (point source) emissions or discharges to air, surface water or groundwater associated with the proposed activities.

The licences issued for the Premises since April 2002 are:

Instrument log			
Instrument	**Granted**	**Licence Holder**	**Description**
L7766/2001/1	17/04/2002	Eclipse Resources Pty Ltd	New application
L7766/2001/2	05/05/2003	Eclipse Resources Pty Ltd	Licence re-issue
L7766/2001/3	28/04/2004	Eclipse Resources Pty Ltd	Licence re-issue
L7766/2001/4	28/04/2005	Eclipse Resources Pty Ltd	Licence re-issue
L7766/2001/5	28/04/2010	Eclipse Resources Pty Ltd	Licence re-issue
L7766/2001/5	07/07/2011	Eclipse Resources Pty Ltd	Amendment
L7766/2001/5	11/08/2011	Eclipse Resources Pty Ltd	Amendment
L8974/2016/1	28/03/2017	Eclipse Soils Pty Ltd	New licence
L8974/2016/1	13/11/2018	Eclipse Soils Pty Ltd	Amendment following Appeal
L8974/2016/1	13/05/2019	Eclipse Soils Pty Ltd	Amendment to increase Cat 61A throughput and include the acceptance of hydrocarbon and pesticide contaminated soils meeting Class IV contaminant criteria, and soil material meeting Class I contaminant criteria.

Severance
It is the intent of these Licence conditions that they shall operate so that, if a condition or a part of a condition is beyond the power of this Licence to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the power of this Licence to impose and are not otherwise *ultra vires* or invalid.

END OF INTRODUCTION

Licence conditions

1 General

1.1 Interpretation

1.1.1 In the Licence, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 For the purposes of this Licence, unless the contrary intention appears:

'Acceptance criteria' has the meaning defined in the Landfill Definitions;

'ACM' means asbestos containing material and has the meaning defined in the *Guidelines for Assessment, Remediation and Management of Asbestos Contaminated Sites, Western Australia,* (DOH, 2009).

'Act' means the *Environmental Protection Act 1986;*

'Acid sulfate soils' includes both sulfidic soil materials as potential acid sulfate soils and sulfuric soil materials as actual acid sulfate soils;

'Actual acid sulfate soils' also known as AASS are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have undergone some oxidation. This results in low pH (i.e. pH < 4) and often a yellow and/or red mottling (jarosite/iron oxide) in the soil profile. AASS commonly also contain residual un-oxidised sulfide minerals (i.e. potential acidity) as well as existing acidity;

'AHD' means the Australian height datum;

'Anniversary Date' means 1 July of each year;

'annual period' means the inclusive period from 1 July in the previous year to 30 June;

'ARI' means Average Recurrence Interval;

'asbestos' means the asbestiform variety of mineral silicates belonging to the serpentine or amphibole groups of rock-forming minerals and includes actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite and any mixture containing 2 or more of those.

'AS 4454' means Australian Standard AS 4454 *Composts, soil conditioners and mulches*;

'AS/NZS 5667.1' means the Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of samples;*

'AS/NZS 5667.11' means the Australian Standard AS/NZS 5667.11 *Water Quality – Sampling – Guidance on sampling of groundwaters;*

'ASS' means acid sulfate soils;

'ASS/PASS Area' means the area labelled ASS/PASS area as depicted in the Premises Map in Schedule 1 of this Licence and within the following GPS Coordinates:

Point	Easting (M)	Northing (M)
21	387687.7189	6435211.9006
22	387686.5842	6435314.2241

23	387833.9854	6435313.1314
24	387824.8536	6435049.8608
25	387522.1758	6435053.6768
26	387521.3379	6435210.9226
27	387550.0854	6435211.1414

'Attachment 1' means Attachment 1 of this Licence unless otherwise stated;

'Attachment 2' means Attachment 2 of this Licence unless otherwise stated;

'Averaging period' means the time over which a limit is measured or a monitoring result is obtained;

'Bioremediation Area' means the area labelled as Bioremediation Area in the Premises Map in Schedule 1 of this Licence and within the following GPS Coordinates:

Point	Easting (M)	Northing (M)
11	387550.5222	6435315.7434
12	387686.5842	6435314.2241
13	387687.7189	6435211.9006
14	387550.0856	6435211.1414

'BGL' means below ground level;

'CEO' means Chief Executive Officer of the Department of Water and Environment Regulation;

'CEO' for the purpose of correspondence means:

Director General
Department Administering the *Environmental Protection Act 1986*
Locked Bag 10
JOONDALUP DC WA 6027
info@dwer.wa.gov.au

'Clean fill' has the meaning defined in Landfill Definitions;

'Compliance Report' means a report in a format approved by the CEO as presented by the Licensee or as specified by the CEO from time to time and published on the Department's website;

'Compost' means an organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process;

'Composting' the process whereby organic materials are microbiologically transformed under controlled aerobic conditions;

'Contaminated soil' has the meaning defined in the Landfill Definitions;

'Damp' means wet enough that dust cannot be visibly generated;

'Department' means the department established under s.35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Division 3 Part V of the *Environmental Protection Act 1986*.

'DER' means the Department of Environment Regulation;

'DWER' means the Department of Water and Environment Regulation;

'DER ASS Treatment Guidelines' means the document titled "Treatment and management of soil and water in acid sulfate soil landscapes", published by the Department of Environment Regulation, as amended from time to time;

'Green waste' means waste that originates from untreated trees or plants;

'Green Waste Area' means the area labelled Green Waste Area in the Premises Map in Schedule 1 of this Licence and within the following GPS Coordinates:

Point	Easting (M)	Northing (M)
1	388103.7793	6434890.0993
2	388269.5289	6434887.2549
3	388264.0988	6434708.3177
4	388157.3053	6434710.1278
5	388157.8225	6434739.3473
6	388101.4163	6434740.7728

'Hardstand' means a surface with a permeability of 10^{-9} metres/second or less;

'Landfill Definitions' means the document titled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer of the Department of Environment as amended from time to time.

'Leachate' means liquid released by or water that has percolated through waste and which contains some of its constituents;

'Licence' means this Licence numbered L8974/2016/1 and issued under the Act;

'Licensee' means the person or organisation named as Licensee on page 1 of the Licence;

'NATA' means the National Association of Testing Authorities, Australia;

'NATA accredited' means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis;

'Natural ground level' means the level of the top of the embankments surrounding the area delineated in yellow as shown on the Natural Ground Level Map in Schedule 1;

'PASS' means potential acid sulfate soils;

'Pasteurisation' means the process whereby organic materials are treated to significantly reduce the numbers of plant and animal pathogens and plant propagules;

'Potential acid sulfate soils' are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have not been oxidised. The field pH of these soils in their undisturbed state is more than pH 4 and is commonly neutral to alkaline (pH 7 to pH 9). These soils or sediments are invariably saturated with water in their natural state. The waterlogged layer may be peat, clay, loam, silt, or sand and is usually dark grey and soft but may also be dark brown, or medium to pale grey to white.

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Licence;

'quarantined storage area or container' means a hardstand storage area or sealed-bottom container that is separate and isolated from authorised waste disposal areas and is capable of

containing all non-conforming waste and its constituents, these areas must be clearly marked and their access restricted to authorised personnel;

'Quarterly' means the 4 inclusive periods from, 1 July to 30 September, 1 October to 31 December and in the following year, 1 January to 31 March, 1 April to 30 June;

'Schedule 1' means Schedule 1 of this Licence unless otherwise stated;

'Schedule 2' means Schedule 2 of this Licence unless otherwise stated;

'Six monthly' means the 2 inclusive periods from 1 January to 30 June and 1 July to 31 December in the same year;

'Spot sample' means a discrete sample representative at the time and place at which the sample is taken;

'Uncontaminated fill' has the meaning defined in the Landfill Definitions; and

'Usual working day' means 0800 – 1700 hours, Monday to Friday excluding public holidays in Western Australia.

1.1.3 Any reference to an Australian or other standard in the Licence means the relevant parts of the standard in force from time to time during the term of this Licence.

1.1.4 Any reference to a guideline or code of practice in the Licence means the version of that guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guideline or code of practice made during the term of this Licence.

1.2 Premises operation

1.2.1 The Licensee shall only accept waste on to the Premises if:
(a) it is of a type listed in Table 1.2.1;
(b) the quantity accepted is below any quantity limit listed in Table 1.2.1; and
(c) it meets any specification listed in Table 1.2.1.

Table 1.2.1: Waste acceptance

Waste type	Quantity limit tonnes/ Annual period	Specification
Clean fill	Combined limit of 200,000 tonnes. The following sub-limits apply within the combined total: • ASS and PASS – 100,000 tonnes. • Class I/II contaminated soils – 20,000 tonnes. • Class III hydrocarbon and pesticide contaminated soils – 50,000 tonnes.	None specified
ASS and PASS		None specified
Class III hydrocarbon and pesticide contaminated soils		Contaminated soil containing hydrocarbons and/or pesticides with contaminant concentrations equal to, or less than, Class III or Class IV landfill acceptance criteria as specified in the Landfill Definitions (and with reference to the quantity limits specified in column 2 of this Table). Pesticide contaminated soil is limited to contamination with the following chemicals: • 2,4-Dichlorophenoxyacetic acid; • 2,4,5-Trichlorophenoxyacetic acid; • Aldrin; • Chlordane; • Dichlorodiphenyltrichloroethane; • Dieldrin; • Lindane; and
Class IV hydrocarbon and pesticide contaminated soils		

Table 1.2.1: Waste acceptance		
Waste type	**Quantity limit tonnes/ Annual period**	**Specification**
	• Class IV hydrocarbon and pesticide ccontaminated soils – 1,000 tonnes.	• Metolachlor. Waste containing visible asbestos or ACM shall not be accepted.
Class I contaminated soils		Must contain contaminant concentrations equal to, or less than, Class I landfill acceptance criteria as specified in the Landfill Definitions. Waste containing visible asbestos or ACM shall not be accepted.
Green waste	50,000 tonnes	Treated timber is not authorised to be accepted.

1.2.2 The Licensee shall ensure that where waste does not meet the waste acceptance criteria set out in condition 1.2.1 it is removed from the Premises by the delivery vehicle or, where that is not possible, stored in a quarantined storage area or container and removed to an appropriately authorised facility within 7 week days.

1.2.3 The Licensee shall ensure that wastes accepted onto the Premises are only subjected to the processes set out in Table 1.2.2 and in accordance with any process limits described in that Table.

Table 1.2.2 Processing of Materials		
Waste type	**Process**	**Process requirements**

Green waste	Receipt, handling, screening, mulching, storage before and after mulching, soil blending and treatment by composting and pasteurisation	• Only to be undertaken in the Green Waste area or ASS/PASS area;
		• Feedstock inputs shall achieve a carbon: nitrogen ratio of 25:1 to 35:1. However, where there are large pieces of ligneous material, such as wood chips or pieces, feedstock inputs shall achieve a carbon: nitrogen ration of at least 40:1;
		• Windrows shall be turned regularly to ensure aerobic conditions are maintained;
		• The core temperature of the composting pile shall be maintained between 55 ºC and 65 ºC for a period of at least three days;
		• Moisture level in the composting piles shall be maintained between 35 to 65 per cent;
		• Only potable water is authorised to be used on composting windrows to provide moisture after pasteurisation has occurred;
		• All mulched green waste shall be stored in windrows no larger than:
		  ○ 3 metres high;
		  ○ 5 metres wide; and
		  ○ have 4 metres of clear ground between windrows;

Table 1.2.2 Processing of Materials		
Waste type	**Process**	**Process requirements**
		• A five metre fire break shall be maintained around all green waste storage areas.
ASS and PASS	Receipt, handling, storage and treatment (neutralisation) prior to soil blending, reuse or offsite disposal	• Only to be undertaken in the ASS/PASS area or Green Waste area; • All ASS and PASS materials must be classified in accordance with Steps 1-6 and Figure 1 of the Landfill Definitions document prior to acceptance at the premises; • The treatment, including validation of treatment, of all ASS and PASS must be undertaken in accordance with the procedures outlined in section 2.5 of the DER ASS Treatment Guidelines, as per Attachment 1; and • All ASS or PASS must be treated on the day of delivery or otherwise stored in accordance with the procedures outlined in section 2.8 of the DER ASS Treatment Guidelines, as per Attachment 2.
Class III Hydrocarbon and pesticide contaminated soils; and Class IV hydrocarbon and pesticide contaminated soils	Receipt, handling, storage and treatment (bioremediation) prior to soil blending, reuse or offsite disposal	• Only to be undertaken in the Bioremediation Area; • All contaminated soils must be classified in accordance with Steps 1-6 and Figure 1 of the Landfill Definitions document prior to acceptance at the premises; and • All treated material is required to be classified in accordance with Steps 1-6 and Figure 1 of the Landfills Definitions document prior to soil blending, reuse or removal offsite.
Clean fill	Receipt, handling and storage	• Stockpiles must be sign-posted so they can be clearly identified for appropriate management on-site.
Class I contaminated soils	Receipt, handling, storage and screening prior to soil blending, and off-site reuse	• Stockpiles of unprocessed and processed material must be sign-posted so they can be cleary identified for appropriate management on-site.

1.2.4 The Licensee shall ensure that waste is stored and processed within infrastructure in accordance with Table 1.2.3 and that the integrity of the containment infrastructure is maintained to the specification in Table 1.2.3.

Table 1.2.3: Containment infrastructure		
Containment area/infrastructure	**Material**	**Infrastructure specification**

Table 1.2.3: Containment infrastructure		
ASS/PASS Area	ASS and PASS	• All ASS and PASS shall be stored and treated on a compacted limestone pad that has a minimum thickness of 300mm; and • The pad must be provided with a bund of at least 300mm in height on all sides except for a truck entry area at the highest point of the pad which must be provided with a bund of at least 150 mm in height.
Green Waste Area	Green waste, mulch, composting green waste	Within 3 months from the date of issue of this Licence: • All green waste must be stored and processed on a compacted limestone pad that has a minimum thickness of 300mm; and • The pad must be provided with a bund of at least 300mm in height on all sides except for a truck entry area at the highest point of the pad which must be provided with a bund of at least 150 mm in height.
Green waste stormwater basin	Contaminated stormwater and leachate from the greenwaste storage, mulching and composting areas	• All runoff and leachate from the green waste storage, mulching and composting areas shall be directed to the stormwater basin that has been constructed from a minimum thickness of 300mm compacted limestone; • A minimum 300mm embankment freeboard must be maintained on the stormwater basin.
Bioremediation Area	Contaminated Soils	• Must be treated on a cell that has a minimum thickness of 200 mm compacted clay with 150mm compacted crushed limestone which has been overlain by 1.00mm high-density polyethylene (HDPE) liner laid to a 1% fall; and • The cell must be provided with a bund of at least 1m in height by 1.5m wide and overlain by 1.0mm HDPE liner.
Stormwater basin within the Bioremediation Area depicted in the Premises Map in Schedule 1	Contaminated stormwater and leachate from the bioremediation area	• All runoff and leachate from the bioremediation area shall be directed to a 1.00mm HDPE lined stormwater basin; and • A minimum 300mm embankment freeboard must be maintained.

1.2.5 The Licensee must ensure that the infrastructure and equipment specified in Table 1.2.4 is maintained and operated in accordance with the requirements specified in Table 1.2.4.

Table 1.2.4: Operational infrastructure (Dust controls)		
Site infrastructure		**Operation details**
1	Abstraction bores with combined 120,000 litres/hour	Must be maintained in good working order to ensure that an adequate water supply for the reticulation main is available at all times
2	Reticulation main along northern, eastern and southern boundaries of Lot 115, extending into Lot 2	Must be maintained in good working order.
3	Reticulated sprinklers and water piping for stockpiles	Reticulated sprinklers must be capable of wetting down the entire surface of all stockpiles on the premises that are subject to dust lift-off simultaneously or within a period of thirty minutes. Spray reach and rate of flow of sprinklers must be sufficient to reach the top of all stockpiles specified above. Spray reach and rate of flow of sprinklers must be maintained in good working order.

1.2.6 The Licensee must undertake the fugitive dust management requirements in Table 1.2.5

Table 1.2.5: Fugitive dust management requirements	
Description	**Operation details**
Water sprays	Operate when visible dust is generated from stockpile surfaces on the premises. Operate proactively subject to weather forecasting over a 24 hour period. Operate during the movement and handling of materials on the Premises to manage dust emissions.
Vehicles	Vehicle speeds limited to less than 25 km/hr on areas of unconsolidated or unsealed road.
Cessation of activities	Cease an activity causing visible dust lift-off where dust emissions are, or are likely to, impact on sensitive receptors.

1.2.7 The Licensee shall ensure that all stockpiles on the Premises are limited to 7m above natural ground level or less.

1.2.8 The Licensee is not authorised to undertake any activities, including excavations, which may disturb the former landfill area of the Premises delineated by the yellow line on the Premises Map in Schedule 1.

2 Monitoring

2.1 General monitoring

2.1.1 The Licensee shall ensure that:
(a) all water samples are collected and preserved in accordance with AS/NZS 5667.1;
(b) all groundwater sampling is conducted in accordance with AS/NZS 5667.11;
(c) all compost samples are collected and preserved in accordance with AS 4454; and
(d) all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured unless indicated otherwise in the relevant table.

2.1.2 The Licensee shall ensure that:
(a) quarterly monitoring is undertaken at least 45 days apart; and
(b) six monthly monitoring is undertaken at least 5 months apart.

2.2 Monitoring and recording of inputs and outputs

2.2.1 The Licensee shall undertake the monitoring and recording in Table 2.2.1 according to the specifications in that table.

Table 2.2.1: Monitoring and recording of inputs and outputs				
Input/Output	**Parameter**	**Units**	**Averaging period**	**Frequency**
Waste Inputs	Green waste, clean fill, ASS and/or PASS materials, hydrocarbon and pesticide contaminated soils; Class III, hydrocarbon and pesticide contaminated soils; Class IV, and Class I contaminated soils	m^3	N/A	Each load arriving at the Premises
Waste Outputs	Waste type as defined in the Landfill Definitions	m^3	N/A	Each load leaving or rejected from the Premises
Other outputs	Treated (neutralised) ASS and/or PASS; treated contaminated soils; blended soils, clean fill, compost, uncontaminated fill, inert waste			Each load leaving the Premises

2.3 Process monitoring and recording

2.3.1 The Licensee shall undertake the monitoring and recording in Table 2.3.1 according to the specifications in that table.

Table 2.3.1: Process monitoring and recording					
Monitoring point reference	**Process description**	**Parameter**	**Units**	**Frequency**	**Method**
Compost windrows	Composting	Temperature	ºC	Weekly	None specified
		Moisture content	%	Weekly	None specified
		Carbon: nitrogen ratio	None specified	Weekly	None specified
		Compost quality	None specified	As required in AS 4454	Sampling and testing in accordance with AS 4454
Blended soils	Soil blending	Blended soil quality	None specified	As required in AS 4419	Sampling and testing in accordance with AS 4419

2.4 Ambient environmental quality monitoring

2.4.1 The Licensee shall undertake the monitoring in Table 2.4.1 according to the specifications in that table.

Table 2.4.1: Monitoring of ambient groundwater quality

Monitoring point reference and location	Parameter	Units	Averaging period	Frequency
ARMB1, ARMB2, ARMB5 and ARMB6A as depicted in the Map of monitoring bore locations in Schedule 1	Standing water level	mAHD and mBGL	Spot sample	Quarterly
	pH	N/A		
	Electrical conductivity	µS/cm		
	Arsenic	mg/L		
	Cadmium			
	Chromium			
	Copper			
	Mercury			
	Ammonium nitrogen			
	Lead			
	Manganese			
	Nickel			
	Zinc			
	Potassium			
	Selenium			
	Chloride			
	Sulphate			
	Total acidity			
	Total alkalinity			
	Total aluminium			
	Total iron			
	Total nitrogen (TN)			
	Total phosphorus (TP)			
	Total Dissolved Solids (TDS)			
	Organochlorines: 2,4-Dichlorophenoxyacetic acid; 2,4,5-Trichlorophenoxyacetic acid; Aldrin; Chlordane; Dichlorodiphenyltrichloroethane; Dieldrin; Lindane; Metolachlor.			
	Organophosphates			
	BTEX (benzene, toluene, ethylbenzene, xylene)			
	Polycyclic aromatic hydrocarbons (PAHs)			
	Polychlorinated biphenyls (PCBs)			
	Total petroleum hydrocarbons			

3 Improvements

3.1 Improvement program

3.1.1 The Licensee shall complete the improvements in Table 3.1.1 by the date of completion in Table 3.1.1.

Table 3.1.1: Improvement program

Improvement reference	Improvement	Date of completion
IC1	The Licensee shall submit to the CEO a report that assesses the permeability of the Green Waste Area limestone pad and green waste stormwater basin. If the Green Waste Area limestone pad or green waste stormwater basin does not achieve a hydraulic conductivity of 1×10^{-8} m/s or less, representative across the respective infrastructure, the Licensee is required to submit to the CEO a report outlining the steps and timeframes involved in meeting that specification.	Before 20 November 2020
IC2	The Licensee shall submit to the CEO a report that assesses the permeability of the ASS/PASS Area limestone pad. If the ASS/PASS Area pad does not achieve a hydraulic conductivity of 1×10^{-8} m/s or less, representative across the respective infrastructure, the Licensee is required to submit to the CEO a report outlining the steps and timeframes involved in meeting that specification.	Before 20 November 2020

4 Information

4.1 Records

4.1.1 All information and records required by the Licence shall:
- (a) be legible;
- (b) if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval;
- (c) except for records listed in 4.1.1(d) be retained for at least 6 years from the date the records were made or until the expiry of the Licence or any subsequent licence; and
- (d) for those following records, be retained until the expiry of the Licence and any subsequent licence:
  - (i) off-site environmental effects; or
  - (ii) matters which affect the condition of the land or waters.

4.1.2 The Licensee shall implement a complaints management system that as a minimum records the number and details of complaints received concerning the environmental impact of the activities undertaken at the Premises and any action taken in response to the complaint.

4.1.3 The Licensee shall maintain a record of the following information for ASS and PASS received at the premises:
- (a) the source of the ASS or PASS;
- (b) analysis results of all ASS or PASS received at the premises;
- (c) the neutralisation status of all ASS or PASS on receipt;
- (d) for ASS or PASS received in an unneutralised state, the quantity of neutralising agent applied; and

(e) all validation and testing results for ASS or PASS treated on the premises.

4.2 Reporting

4.2.1 The Licensee must submit to the CEO within 30 days after the Anniversary Date, a Compliance Report indicating the extent to which the Licensee has complied with the Conditions in this Licence for the Annual Period.

4.2.2 The Licensee shall submit to the CEO within 30 days after the Anniversary Date, an Annual Environmental Report containing the information listed in Table 4.2.1 for the Annual Period.

Table 4.2.1: Annual Environmental Report

Condition or table (if relevant)	Parameter	Format or form[1]
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
-	Summary of any fires at the Premises	None specified
Table 2.2.1	Summary of inputs and outputs	None specified
Table 2.3.1	Monitoring results of ambient groundwater quality including: • An interpretive summary and assessment of ambient groundwater quality monitoring results against relevant assessment levels for water as published in the "assessment and management of contaminated sites" guidelines; and • An interpretive summary and assessment of ambient groundwater quality monitoring results against previous monitoring results. Trend graphs shall be provided in support of this assessment.	• GR1; • a summary of the results should be presented in tabulated form within the body of the report as well as onto site drawings, where appropriate.
4.1.2	Complaints summary	None specified
4.1.3 (f)	Treated ASS and PASS validation and testing results	None specified

Note 1: Forms are in Schedule 2

4.2.3 The Licensee shall submit the information in Table 4.2.2 to the CEO according to the specifications in that table.

Table 4.2.2: Non-annual reporting requirements				
Condition or table (if relevant)	**Parameter**	**Reporting period**	**Reporting date (after end of the reporting period)**	**Format or form**
Table 2.3.1	Records demonstrating compliance with composting process limit requirements for: • C:N ratio; • core temperature; and • moisture level	Not applicable	Within 14 days of the CEOs request	Not specified

4.3 Notification

4.3.1 The Licensee shall ensure that the parameters listed in Table 4.3.1 are notified to the CEO in accordance with the notification requirements of the table.

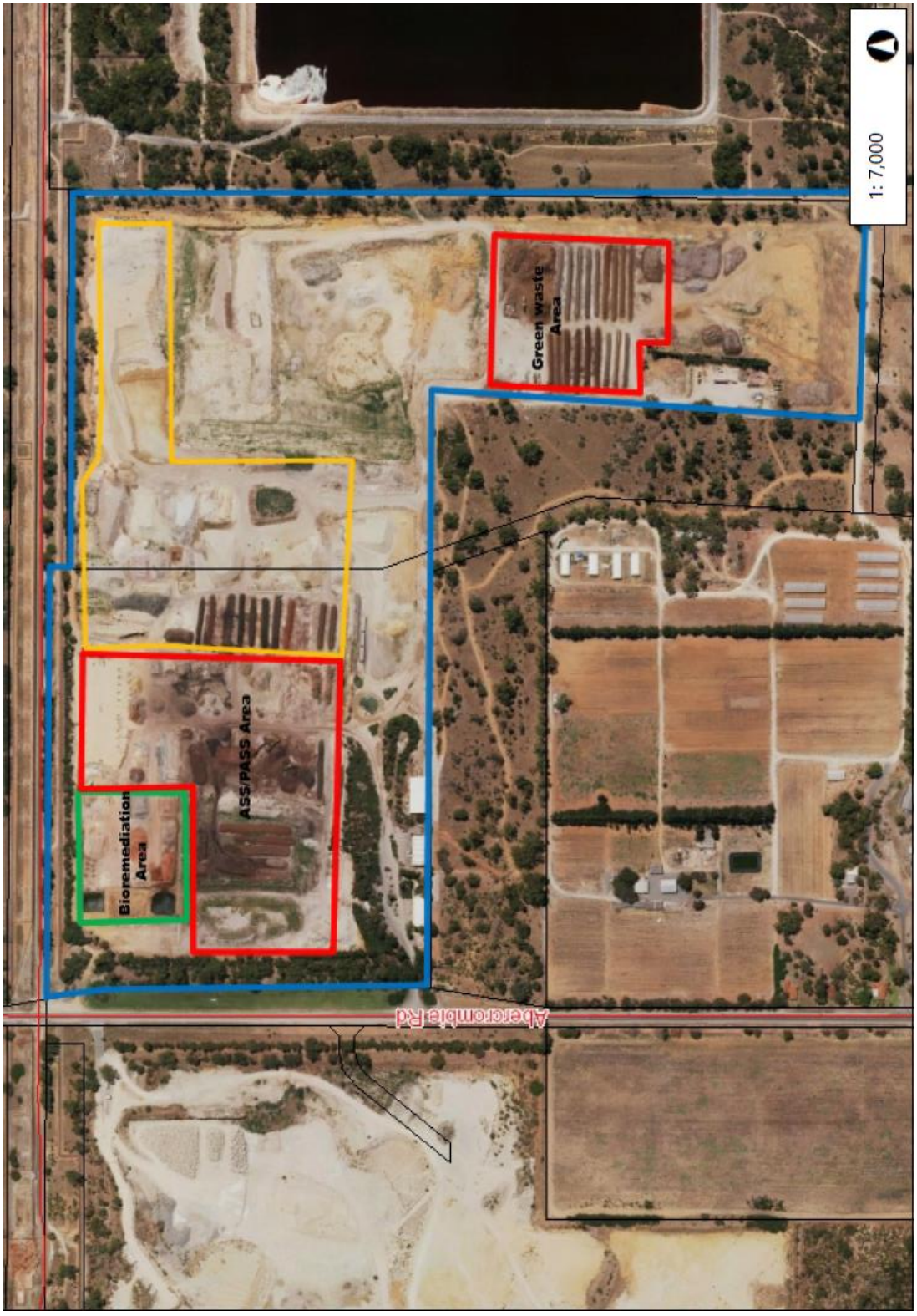
Table 4.3.1: Notification requirements			
Condition or table (if relevant)	**Parameter**	**Notification requirement[1]**	**Format or form[2]**
-	Breach of any limit specified in the licence	Part A: As soon as practicable but no later than 5pm of the next weekday. Part B: As soon as practicable.	N1
-	Fire at premises	As soon as practicable but no later than 5pm of the next weekday.	None specified

Note 1: Notification requirements in the Licence shall not negate the requirement to comply with s72 of the Act
Note 2: Forms are in Schedule 2

Schedule 1: Maps

Premises Map

The Premises is shown in the map below. The blue line depicts the Premises boundary. The red and green lines delineate the storage and processing areas referred to in Tables 1.2.2 and 1.2.3.



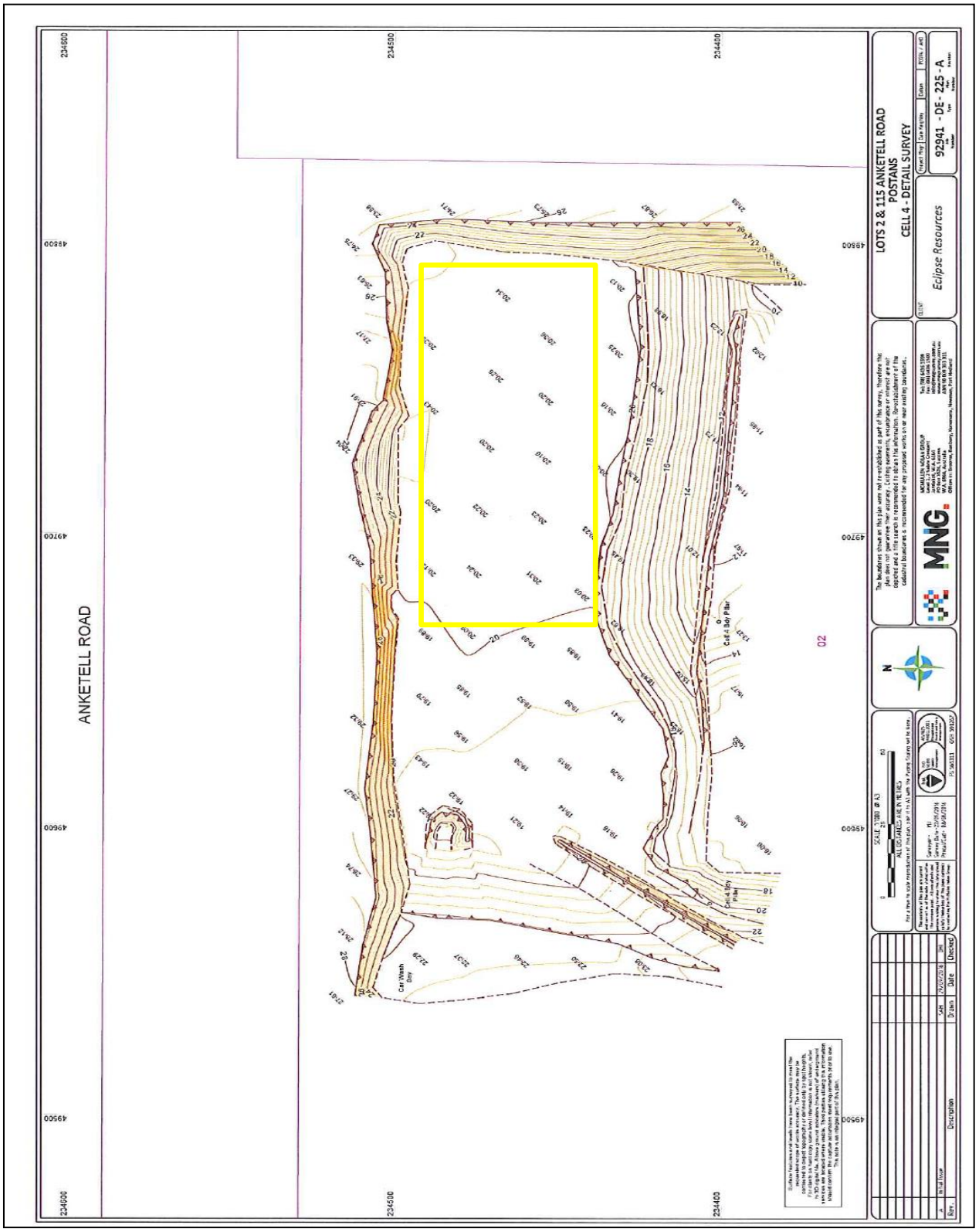
Map of monitoring bore locations

The locations of the monitoring bores defined in Table 2.4.1 are shown below.

Please note that ARMB3 and ARMB4 are extraction bores that were historically sampled. They are not required for monitoring purposes under this licence.

Natural Ground Level Map

The top of the embankments surrounding the area delineated by yellow, are the natural ground levels referred to in this Licence. The area shown in yellow is within the top north-eastern corner of the premises, within part of the area of previous landfilling activities.



Schedule 2: Reporting & notification forms

These forms are provided for the proponent to report monitoring and other data required by the Licence. They can be requested in an electronic format.

Licence: L8974/2016/1 Licensee: Eclipse Soils Pty Ltd
Form: GR1 Period:
Name: Monitoring of point source emissions to groundwater

Form GR1: Monitoring of ambient groundwater					
Emission point	**Parameter**	**Result[1]**	**Averaging period**	**Method**	**Sample date & times**
ARMB1, ARMB2, ARMB5 and ARMB6A	Standing water level	m (AHD) and mBGL	Spot sample		
	pH				
	Electrical conductivity	µS/cm			
	Arsenic	mg/L			
	Cadmium	mg/L			
	Chromium	mg/L			
	Copper	mg/L			
	Mercury	mg/L			
	Ammonium nitrogen	mg/L			
	Lead	mg/L			
	Manganese	mg/L			
	Nickel	mg/L			
	Zinc	mg/L			
	Potassium	mg/L			

ARMB1, ARMB2, ARMB5 and ARMB6A	Selenium		Spot sample		
	Chloride				
	Sulphate				
	Total acidity				
	Total alkalinity				
	Total aluminium				
	Total iron				
	Total nitrogen (TN)				
	Total phosphorus (TP)				
	Total Dissolved Solids (TDS)				
	Organochlorines				
	Organophosphates				
	BTEX				
	PAHs				
	PCBs				
	TPH				

Note 1: All units are referenced to STP dry

Signed on behalf of Eclipse Soils Pty Ltd: …….. Date: …….

Licence: L8974/2016/1 Licensee: Eclipse Soils Pty Ltd
Form: N1 Date of breach:

Notification of detection of the breach of a limit.

These pages outline the information that the operator must provide.
Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

Part A

Licence Number	
Name of operator	
Location of Premises	
Time and date of the detection	

Notification requirements for the breach of a limit	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Part B

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident.	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission.	
The dates of any previous N1 notifications for the Premises in the preceding 24 months.	

Name	
Post	
Signature on behalf of Eclipse Soils Pty Ltd	
Date	

Attachment 1: Section 2.5 of the DER ASS Treatment Guidelines (pages 9 to 16)

2.3.4 Piling and diaphragm walls

'Top down' methods of construction, where underground vertical walls are constructed prior to excavation and construction of basement floors, can significantly reduce the volume and extent of soil and groundwater ASS disturbance. Where dewatering is required, the use of piling or diaphragm wall techniques to construct underground walls can act to eliminate (or limit) the effect of drawdown where dewatering is limited to inside the walls.

2.4 Managing ASS disturbance

Wherever possible, the disturbance of ASS should be avoided. If ASS are to be disturbed, comprehensive management measures will need to be implemented based on the level of risk associated with the disturbance. Factors that may influence the level of risk include the nature, magnitude and duration of the proposed ASS disturbance, the soil characteristics and the sensitivity of the surrounding environment.

Soil management measures are recommended where the volume of ASS to be disturbed is greater than 100m^3. For disturbances of ASS (greater than 100m^3) the management should include:

- staging of disturbance such that the potential effects on any area disturbed at any one time are limited and managed;
- staging of earthworks program to minimise the amount of time that ASS are exposed to the atmosphere (i.e. minimise the time that excavations are left open); and
- neutralisation of ASS materials in accordance with 2.5 Soil neutralisation.

2.4.1 Hydrogen sulfide

Disturbance of some ASS landscapes may release hydrogen sulfide gas. This gas has a characteristic offensive 'rotten egg' odour. However, at high concentrations and/or after prolonged exposure, hydrogen sulfide inhibits the sense of smell. The olfactory nerve loses sensitivity and the potentially hazardous gas is no longer detectable by smell.

Hydrogen sulfide is heavier than air and so tends to settle in depressions and may reach toxic levels within excavations and in confined spaces. Therefore, it is strongly recommended that on-site gas monitoring and occupational health and safety measures are implemented to deal with this contingency during the disturbance of ASS materials, particularly when ASS disturbance is planned to be carried out in urban environments.

More information on hydrogen sulfide can be found in the Government of Western Australia's Department of Health document *Environmental Health Guide, Hydrogen Sulphide and Public Health* (Department of Health, 2009). Guidance on the management of hydrogen sulfide in the work place can be obtained from WorkSafe (a division of the Department of Commerce, the Western Australian State Government agency responsible for the administration of the *Occupational Safety and Health Act 1984*).

2.5 Soil neutralisation

Where the disturbance of ASS is unavoidable, the most common technique used in managing the disturbance is neutralisation of the soils with alkaline materials.

2.5.1 Calculating the quantity of neutralising agent for treatment of ASS

It is important to provide adequate neutralising material to reduce the potential for environmental harm or damage. Sufficient neutralising material should be applied to

counteract the theoretical acid production potential of the soil. The theoretical acid production potential of the soil is determined based on the existing plus the potential acidity of the soil, multiplied by a 'safety factor' of 1.5.

The safety factor is used for the following reasons:

- In most situations the neutralising agent is not fully mixed with the soil regardless of the mixing method used.
- The distribution of sulfides within soil profiles can be highly variable, so there is a risk that investigations may underestimate the theoretical acid production potential of the soil.
- Neutralising agents such as fine aglime (calcium carbonate) have a low solubility and hence a low reactivity and coatings of gypsum, and/or iron and aluminium compounds can form on the grains of neutralising agents during neutralisation, reducing the neutralising efficiency.

In 'high risk' situations larger safety factors may be needed.

The actual amount of neutralising material needed is calculated using the 'net acidity' of the soil as determined during ASS investigations for the project. Note that ASS investigations for this purpose should be undertaken in accordance with *Identification and investigation of acid sulfate soils and acidic landscapes* (DER 2015).

Net acidity should be determined from the suspension peroxide oxidation combined acidity and sulfur (SPOCAS) or chromium reducible sulfur (CRS) methods[6], as detailed in *Acid Sulfate Soils Laboratory Methods Guidelines* (Ahern *et al*., 2004). Soil samples should be analysed to a detection limit of 0.005%S such that net acidity can be calculated, according to an acid-base account (ABA), expressed by the following equation:

- **Net acidity = potential acidity + existing acidity – acid neutralising capacity (ANC)**[7]

For linear disturbances, and for non-linear disturbances less than 1,000m^3, the highest net acidity detected at the site should be used to calculate the amount of neutralising material needed.

When the volume of soil to be disturbed is more than 1,000m^3, the mean net acidity plus the standard deviation may be used to calculate the amount of neutralising material needed, provided a sufficient number of laboratory analyses have been performed to satisfactorily characterise the soil profile and ASS at the site. Detrimental environmental impacts may occur if incorrect liming rates are used.

Calcium carbonate ($CaCO_3$), in the form of finely crushed limestone or 'aglime', is the most commonly used neutralising agent for the treatment of ASS, and is used in the calculations provided below.

Once the net acidity has been determined, the amount of lime needed for soil treatment can be calculated using the following equation:

[6] For highly leached and poorly buffered **Bassendean Sands** in Western Australia, net acidity should be determined to a detection limit of 0.005%S. For further information refer to *Identification and investigation of acid sulfate soils and acidic landscapes* (DER 2015).

[7] Due to the particular characteristics of the sandy soil and groundwater regime in Western Australia, DER does not recognise the validity of ANC values without confirmatory kinetic testing or modified laboratory methods to determine particle size distribution to provide a more accurate estimate of the actual amount of neutralising capacity that would be available under real field conditions. For further information refer to *Identification and investigation of acid sulfate soils and acidic landscapes* (DER 2015).

- **Lime needed (kg $CaCO_3$/tonne soil) = net acidity (kg H_2SO_4/tonne of soil) x 1.02[8] x safety factor[9] x 100/ENV[10]**

As net acidity is most commonly reported in units of percentage sulfur (S%), the equation is rewritten below using S% units:

- **Lime needed (kg $CaCO_3$/tonne soil) = net acidity (S% x 30.59) x 1.02[8] x safety factor[9] x 100/ENV[10]**

The bulk density (BD) of the soil needs to be taken into account when calculating the amount of lime needed to treat a given volume of soil. The liming rate calculation for volumes of soil in cubic metres is shown below.

- **Lime needed (kg $CaCO_3$/m^3 soil) = bulk density soil (tonne/m^3) x net acidity (S% x 30.59) x 1.02[8] x safety factor[9] x 100/ENV[10]**

To access the DER web-based 'Lime rate calculation tool to calculate the amount of lime needed to treat ASS, go to http://www.der.wa.gov.au/your-environment/acid-sulfate-soils/67-lime-rate-calculations-for-neutralising-acid-sulfate-soils.

2.5.2 Selecting neutralising materials

There are many types and sources of neutralising agents. These vary greatly in their ability to change soil pH and the speed at which this happens. This is referred to as their effective neutralising value (ENV).

Calcium carbonate ($CaCO_3$), in the form of finely crushed limestone or 'aglime', is the most commonly used neutralising agent for the treatment of ASS, however, other neutralising agents may also be used. These include magnesite, dolomite, hydrated lime/slaked lime[11], burnt or quicklime, sodium carbonate, sodium bicarbonate, soda ash, etc. Any chemically-amended liming products should be used with caution due to their high alkalinity which has the potential to impact on the receiving environment.

Note on the use of sodium-based compounds in ASS landscapes

Should sodium-based compounds be considered as a neutralising material, precautions should be taken to ensure that the salinity and sodicity of soils are not increased as a result of free sodium ions being introduced into the landscape. Sodium has a dispersive effect in soils and in water and its use should be carefully managed.

The use of sodium-based compounds also increases the salinity of any discharge waters and may contribute to adverse downstream impacts in sensitive waterways.

The use of soda ash (Na_2CO_3) is particularly risky as it has a pH >11 and is highly soluble (one kilogram is soluble in 3.5 litres of water). Its use is not recommended as it releases heat on combination with water and is known to cause sodicity effects on soils. Products such as sodium hydroxide (NaOH) may have little residual alkalinity and buffering capacity over time.

If sodium-based compounds are used, sodium should be added to any water quality

[8] The factor 1.02 is used to stoichiometrically convert units of sulfuric acid (H_2SO_4) to units of calcium carbonate ($CaCO_3$).
[9] A minimum safety factor of 1.5 should be used.

[10] The actual rate of application of neutralising materials required must be corrected for the effective neutralising value (ENV) of the neutralising materials.

[11] Hydrated lime/slaked lime (liquid lime) is the preferred material to be used for neutralisation of water.

monitoring suite and precautions taken with regard to any precipitates/sludge in settlement/retention ponds. This sediment should be analysed and appropriately remediated or disposed of.

The important factors to be considered in selecting neutralising agents are:

- neutralising value (NV) and effective neutralising value (ENV);
- ability to deliver ongoing buffering capacity;
- solubility;
- pH, chemical constituents, moisture content and other impurities/contaminants;
- purity of lime, fineness rating or particle size;
- method of application; and
- occupational safety and health issues.

From an environmental perspective, the most critical factors in managing outcomes are the pH of the neutralising agent, effective neutralising value (ENV) and solubility.

In some circumstances, DER may approve the use of alkaline waste materials as neutralising agents.

However, DER will require assessment of these materials to be carried out to ensure that the concentration of metals (and/or other contaminants) in the neutralised soil will not pose a risk to the environment or human health.

For further information consult DER's policy and guidelines on waste-derived materials http://www.der.wa.gov.au/your-environment/waste/waste-derived-materials.

2.5.3 Calculating effective neutralising value (ENV) of a neutralising material

The effective neutralising value (ENV) of a neutralising material is the ability of a unit mass of neutralising material to change soil pH. The higher the ENV, the more effective the neutralising material will be at increasing pH.

ENV takes into account:

- neutralising value (NV)—i.e. the amount of calcium or magnesium as oxides or carbonates, expressed as a percentage;
- particle size distribution (percentage by weight)—i.e. the fineness of the neutralising material. The finer the product, the greater the surface area for the neutralising chemical reactions to occur; and
- solubility of the neutralising material.

The NV and the solubility of the neutralising material are determined by laboratory analysis. The particle size distribution is determined by mechanical sieving.

The fineness of the neutralising agent will influence the effectiveness and reactivity of the agent. As particle size increases, the amount of soil that portion of neutralising material is able to neutralise decreases. For example, lime particles in the size range 0.30–0.85 millimetres have around 60 per cent effective neutralising value, while lime particles over 0.85 millimetres but below one millimetre have only 10 per cent effective neutralising value. Particle sizes greater than two millimetres are considered ineffective at neutralising acidity.

Generally, DER recommends fine aglime (crushed limestone which passes through a < one

millimetre sieve) as a neutralising agent for acidic or potentially acidic soils because:

- it has a relatively high neutralising value (NV) of 85 per cent to 95 per cent;
- it has a pH in the range pH 8.5 to 9.0, making it safe from an occupational health and safety perspective and reducing the risk of environmental harm from excess alkalinity (i.e. pH 'overshoot'); and
- it has a low solubility in water so it can provide acid buffering capacity over a sustained period of time.

The use of quicklime (burnt lime) and/or slaked lime is generally not recommended because it is highly caustic and presents occupational health and safety challenges. Although most amended liming products have a higher NV (ranging between 150 to 179 per cent) compared to aglime, they are highly alkaline (pH 12.5–13.5) and represent an environmental risk if inappropriately applied to soils. In addition, amended lime products are more soluble in water and generate considerable heat, both of which could impact the receiving environment.

Due to their high dissolution rate, the residual effect of amended lime products may have little residual alkalinity so their ability to neutralise acidity over time may be limited.

Table 2 provides an example, adapted from *New South Wales Acid Sulfate Soil Management Advisory Committee Manual* (Stone *et al.*, 1998), which can assist to clarify the method of calculating ENV values. In this example the crushed limestone product is calculated as having an ENV of 59 per cent. Therefore, 1.7 parts (100/59) of the product is equivalent to one part of pure fine $CaCO_3$, so a correction factor of 1.7 needs to be used for this product. Note that ENV values may need to be further corrected for solubility when the more soluble type of lime products are used (e.g. slaked lime).

Table 2. Calculating ENV values

Materials	Particle size	Proportion (%)	Utilisation factor	ENV
Example: crushed limestone NV 75%	1.00–2.00mm	0	0.01	0.00
	0.85–1.00mm	15	0.10	1.0
	0.300–0.850mm	20	0.60	9.0
	<0.300mm	65	1.00	49.0
	Total	100		59.0%
ENV = % Proportion/100 x Utilisation Factor x NV				

2.5.4 Lime application

Successful treatment of disturbed ASS is based on the effective incorporation of the neutralising material into the soil. It should be noted that over the longer term, iron, aluminium and low solubility gypsum compounds are likely to coat the neutralising agents, reducing their effectiveness. Application methods include, but are not limited to:

- mechanical application and mixing in small windrows using conventional earth working equipment;

- broadscale mechanical application using rotary hoeing and tillage—this method is useful in treating agricultural land and treatment of stockpiled materials for future landscaping use;
- application of a lime slurry to the surface of a soil and further blending;
- injection of an aglime or hydrated lime slurry into an up-hydraulic gradient trench, perpendicular to the direction of groundwater flow;
- injection of an aglime or hydrated lime slurry into dredging pipelines particularly during dredging operations—this method is suitable for sand and silty materials but is not suitable for heavy clay soil; and
- using 'lime buffer' on exposed ASS and covering with clean fill or sandbagging the face and incorporating lime under and in the sandbags—this method is suitable for infrastructure earthworks or rehabilitation of undisturbed ASS landscapes.

***Note**: soils often need to be mixed a minimum of two times and may need to be mixed several more times to ensure sufficient mixing.*

2.5.5 Treatment pad

For treatment of large volumes of material by mechanical application of neutralisation materials, treatment should be carried out on a treatment pad. The treatment pad should consist of a minimum 300-millimetre thickness of compacted crushed limestone, or other appropriate neutralisation material. The treatment pad should be bunded with a minimum 150-millimetre high perimeter of compacted, crushed limestone to contain potential leachate runoff within the treatment pad area and prevent surface water runoff from entering the treatment pad area. The level of compaction used should produce an appropriately low permeability to prevent infiltration of leachate.

In addition, the following management strategies may need to be implemented to manage risk:

- installation of leachate collection and treatment systems; and
- construction of erosion and sediment control structures.

The following issues should also be considered in the treatment pad design.

Earthworks strategy

An earthworks strategy should be formulated to ensure that sufficient space is available to accommodate the volume of soil requiring treatment. Expected rates of throughput in cubic metres, mixing times and validation testing times, along with the capacity of the treatment pads to accept the materials, need to be identified in the strategy.

The earthworks strategy should also ensure that adequate time is available to obtain the results of validation testing before the treated soils need to be reused.

Climate, seasonal conditions and soil texture may affect treatment rates and hence the size of treatment pads needed.

Spatial tracking

The accurate spatial tracking of large volumes of ASS during the neutralisation process (e.g. survey with a hand-held global positioning system (GPS), differential GPS, designated lot numbers or conventional survey, depending on the level of accuracy needed) is essential

to ensure that soil treatment can be properly validated.

Some sites may have difficulty developing an appropriate tracking program, due to spatial constraints. In such situations, alternative management and treatment facilities should be used.

Decommissioning

Once soil treatment has finished the treatment area must be appropriately decommissioned. Decommissioning should include remediation and validation of the ground surface where the treatment pad and associated infrastructure was placed.

Please note that a management plan for an on-site ASS treatment facility is valid only for the duration of the project for which approval was provided. ASS materials from other sites should not be accepted for treatment without considering potential licensing requirements under the *Environmental Protection Act 1986*

2.5.6 Validation of soil treatment

The effectiveness of soil neutralisation activities needs to be validated to confirm that an appropriate amount of neutralising material has been thoroughly mixed with the soil.

Validation sampling should be undertaken using field testing (pH_F and pH_{FOX}) at a sampling intensity reflective of DER's *Landfill Waste Classification and Waste Definitions 1996 (As amended)* (Department of Environment and Conservation, 2009).

The accuracy of the field testing program should be 'calibrated' by sending 25 per cent of samples to a laboratory for confirmatory analysis.

Appropriate laboratory analytical methods for validation purposes include: the SPOCAS suite; pH_{KCl} and pH_{OX} undertaken in a laboratory on an un-ground sample; the CRS with the inclusion of a measurement of total potential acidity (TPA) from the SPOCAS suite.

Additional laboratory analyses are needed to confirm validation if there is poor correlation between laboratory results and field test results.

The following performance criteria should be met to confirm effective neutralisation of soils:

- the neutralising capacity of the treated soil must exceed the existing plus potential acidity of the soil, (e.g. pH_{fox} must be >5);
- the neutralising material has been thoroughly mixed with the soil;
- soil pH must be in the range 6.0 to 8.5; and
- excess neutralising agent must remain within the soil until all acid generation reactions are complete and the soil has no further capacity to generate acidity[12].

Additionally, in order to account for all sources of acidity for poorly buffered sands (e.g. soils of the Bassendean sand formation), measurements of TPA should be less than the limits of reporting.

If soils fail validation, additional neutralisation is needed until results comply with performance criteria.

[12] Choice of appropriate neutralising agent is important to achieve this long-term performance criterion (see 2.5.2 Selecting neutralising materials)

Quality assurance/quality control (QA/QC)

Any sampling program should include measures to ensure the quality and reproducibility of all sampling methods used at the site. Adequate QA/QC is needed to ensure that the samples collected are of the highest quality and integrity, and that analysis is completed with the highest accuracy. Where results are produced with inadequate QA/QC procedures, they cannot be accepted as being accurate or representative of the site conditions.

QA/QC measures are needed regardless of the number of samples taken.

When undertaking validation sampling, standard QA/QC procedures should be followed as outlined below.

Field QA/QC

The minimum field QA/QC procedures that should be performed are:

- collection of field duplicates as quality control samples;
- use of standardised field sampling forms (including Chains of Custody) and methods; and
- documenting calibration and use of field instruments.

Field duplicate samples (also known as blind replicates) are used to identify the variation in analyte concentration between samples collected from the same sampling point and also the repeatability of the laboratory's analysis. Field duplicates should be collected at the rate of one field duplicate for every 20 investigative samples. The field duplicate sample and investigative sample from the same sample location should be submitted to the laboratory as two individual samples without any indication to the laboratory that they have been duplicated.

Laboratory QA/QC

Analysis of samples should be completed by laboratories which hold National Association of Testing Authorities (NATA) accreditation for the particular parameters and methodologies needed. Information on QA/QC methods should be obtained from the designated laboratory before sampling to ensure that they meet acceptable standards.

The laboratory report should be a NATA endorsed report and include the results of the analysis, sample numbers, laboratory numbers, a statement about the condition of the samples when they were received (e.g. on ice, cold, ambient, etc.), date and time of receipt, dates and times of extraction and analysis of samples, quality control results and a report on sampling and extraction holding times.

Data review

Following receipt of field and/or laboratory data, a detailed review of the data should be completed to determine their accuracy and validity, before being used to make any decisions. Analytical data should be reviewed against field data and field observations to identify any spurious results inconsistent with field findings. Where inconsistencies are identified, re-sampling or re-analysis may be needed.

Attachment 2: Section 2.8 of the DER ASS Treatment Guidelines (pages 18 to 22)

2.8 Stockpiling

The risks of stockpiling large volumes of untreated ASS may be very high even over the short term. Stockpiling of untreated ASS should **only** be undertaken as a **short-term** activity. (**Note:** all stockpiled ASS requires treatment)

It is acknowledged that short-term stockpiling may be needed:

- due to weather conditions that may prevent treatment;
- due to delays obtaining laboratory results; or
- where land areas needed for soil neutralising treatment may not be available as quickly as anticipated leading to the creation of small stockpiles before changes can be made to earthworks programs.

Significant quantities of acid can build up, especially in porous sandy stockpiles, if left in an oxidising condition for even short periods of time. Large stockpiles are difficult to neutralise, primarily due to the earthmoving needed.

Stockpiles should be created, where possible, up-gradient of development sites, such that all leachate and run-off water will be directed towards already-disturbed ASS areas.

2.8.1 Management considerations

Stockpiling untreated ASS should be minimised by preparing a detailed earthworks strategy that documents the timing of soil volumes to be moved, treatment locations and capacity of those areas to receive the stockpiled materials.

Stockpiling may mean double-handling and increased earthmoving costs. It is important to account for the risk of wet weather and an increase in material volume upon excavation and plan contingencies to deal effectively with these issues.

Stockpiled ASS should be adequately neutralised and validated prior to re-use or

backfilling regardless of the duration of stockpiling.

2.8.2 Short-term stockpiling

The recommended maximum time period over which soils may be temporarily stockpiled before treatment commences to neutralise acidity is detailed in Table 3.

Table 3. Indicative maximum periods for short-term stockpiling of untreated ASS

Type of material		Maximum duration of stockpiling before the commencement of treatment	
Texture range (AS 1726–1993)	**Approx clay content (%)**	**Days**	**Hours**
Coarse texture **Sands to loamy sands**	≤5	Overnight	18 hours
Medium texture **Sandy loams to light clays**	5–40	2½ days	70 hours
Pyritic peat	NA	2 ½ days	70 hours
Fine texture **Medium to heavy clays and silty clays**	≥40	2½ days	70 hours

Note: *Excavated ASS requires treatment to neutralise acidity regardless of the duration of stockpiling. Table 3 is provided as a guide to the maximum period of time that should elapse before treatment to neutralise acidity commences.*

Note*: These timeframes do not apply to iron monosulfide sediments or gels (formerly known as monosulfidic black oozes). Iron monosulfide gels or sediments should not be stockpiled without a risk assessment and the implementation of strict environmental management protocols.*

At some sites, these figures may be too conservative, and in other circumstances not conservative enough (e.g. during hot weather some sands may begin to oxidise within a matter of hours, whereas complete oxidation of peat may take longer). Appropriate operational delay times should be determined well before the creation of the stockpile.

The use of a guard layer under the short-term stockpiles may be warranted in certain circumstances. Peaty soils containing pyrite should not be stockpiled without the use of a guard layer and adequate bunding.

The total volume of material placed in short-term stockpiles should not exceed 20 per cent of a day's total extraction. When undertaking short-term stockpiling of ASS materials, the stockpile should be monitored for signs of oxidation (e.g. colour changes, decrease in pH of more than half a pH unit). If stockpiled ASS materials are observed to have oxidised they will need to be treated with an appropriate amount of neutralising material before re-burial.

Due diligence is needed when stockpiling sandy soils with no acid buffering capacity (e.g. Bassendean sands), particularly when these soils are extracted from below the watertable. Reburial of untreated and acidifying sandy soils is not recommended.

2.8.3 Medium-term stockpiling

Situations where it is necessary to stockpile untreated ASS for moderate periods of time before treatment commences will need to be justified. Management to reduce the oxidation of sulfides and the collection and treatment of all leachate and run-off water will need to be implemented during the entire stockpiling period. The maximum time period which soils can be temporarily stockpiled in the medium-term before treatment commences is listed in Table 4.

Table 4. Indicative maximum periods for medium-term stockpiling of untreated ASS prior to the commencement of treatment

Type of material		Duration of stockpiling	
Texture range (AS 1726–1993)	**Approx clay content (%)**	**Days**	**Weeks**
Coarse texture **Sands to loamy sands**	≤5	14 days	2 weeks
Medium texture **Sandy loams to light clays**	5–40	21 days	3 weeks
Pyritic peat	NA	21 days	3 weeks
Fine texture **Medium to heavy clays & silty clays**	≥40	28 days	4 weeks

Note: *Excavated ASS requires treatment to neutralise acidity regardless of the duration of stockpiling. Table 4 is provided as a guide to the maximum period of time that should elapse before treatment to neutralise acidity commences.*

Depending on site-specific requirements, a risk assessment should be undertaken if soils are to be stockpiled for longer periods than those listed in Table 4. Neutralisation of the stockpiled materials may be necessary if it cannot be demonstrated that there is minimal risk of acidic leachate being generated by the stockpiles. Stockpiling of untreated ASS in the medium term should be a contingency measure rather than standard practice. Stockpiling of soils is not to be used as an alternative to soil neutralisation, and all soils that are to be replaced in an excavation should be appropriately treated.

The use of a treatment pad or 'guard layer' is needed in all circumstances beneath soil materials that are to be stockpiled in the medium term. Guard layers must be constructed according to specifications provided in 2.5.5 Treatment pad.

In addition, the following management strategies may need to be implemented to manage risk:

- The volume stockpiled should not exceed more than one week's volume of extraction.
- Leachate collection and treatment systems should be installed.
- The surface area of the stockpile should be minimised to reduce exposure to atmospheric oxygen. This may involve shaping the stockpile, and/or capping or lining it with a material that will minimise drying by wind and sun and prevent rainfall entering the stockpile. The cap or liner will need to cover the sides of the stockpile as well as the top.

- Keeping the surface of the material moist using a spray of iron-free water or neutralising solution. The spray should be carefully managed to prevent over-wetting the stockpiled material as this may produce leachate or runoff, and the spray should be a fine-mist to prevent desegregation of the soil from the stockpile surface.
- Erosion and sediment control structures should be constructed.

2.8.4 Long-term stockpiling

Long-term stockpiling prior to treatment is not recommended. Any stockpiling exceeding the time frames provided in Table 4 is considered long-term stockpiling and an appropriate management strategy is needed. The proposed management strategy for long-term stockpiling should be provided to DER for review and comment before the commencement of stockpiling.

The management strategy must document the alternatives considered and include a risk assessment and an environmental management plan. The environmental management plan should include, as a minimum, those management strategies outlined for medium-term stockpiles. The installation of a groundwater monitoring bore directly down hydraulic gradient of the stockpile may also be necessary. Failure to manage environmental risks posed by long term stockpiling may result in DER taking action under the *Environmental Protection Act 1986* and/or the *Contaminated Sites Act 2003*.

2.8.5 Stockpiling of topsoil

It is routine practice to scrape the topsoil before excavation and store it until it is needed for top-dressing. Some of the management options listed under medium-term stockpiles may be appropriate for managing topsoil stockpiles, especially if they contain low levels of sulfides. Low levels of sulfides may be intrinsic in topsoils or may occur as a result of 'over-stripping' during collection. It should be noted that:

- it is recognised that topsoil (A1 and A2 horizons) pH is generally less than pH 7 across Western Australia. A large proportion of topsoils (40 per cent) are in the range of pH 5.1–6.0. Bassendean sand type soils are typically in the range pH 5.1 to 5.7; and
- generally topsoils do not require treatment. However, if pH is less than 4.0, topsoils should be treated to revised validation criteria of pH 5. This level of treatment is considered appropriate as long as the validation testing demonstrates effective mixing and that, after stripping, the soil structure remains stable and non-acid forming.

2.9 Off-site ASS treatment and disposal

2.9.1 Off-site treatment at a licensed soil treatment facility

There are a number of licensed soil treatment facilities in the Perth Metropolitan area and in the south-west region which specialise in the treatment (neutralisation and validation) of ASS. The process undertaken in these facilities generally involves neutralising the ASS materials and then blending them with other materials to create compost or other soil amendment materials to be used for landscaping purposes.

Untreated ASS should only be taken to facilities which are licensed under the *Environmental Protection Act 1984* (approved) and have a DER approved ASS management plan.

ASS treatment facilities should be provided with full details of the materials they are being requested to accept so that they are able to appropriately manage the materials.

If off-site treatment of ASS is proposed, the proponent will need to provide receipts or other acceptance records from the relevant facility including details of the total amount of soil taken to the chosen facility within the initial closure report.

2.9.2 Off-site disposal at a licensed landfill facility

Anyone wishing to dispose of ASS to a licensed landfill facility should consult the *Landfill Waste Classifications Definitions 1996* (*as amended, Dec* 2009) to assist in the selection of an appropriate facility. The acceptance of materials for disposal to licensed landfill facilities must be in accordance with this document.

If disposal of ASS at a licensed landfill is proposed, the proponent will need to provide receipts or other acceptance records from relevant facility including details of the total amount of soil taken to the chosen facility within the an initial closure report.

2.9.3 Off-site re-use of treated ASS

DER's preferred position is that treated (suitable neutralised and validated) ASS are managed for re-use. These materials should be considered a resource, not a waste. Consequently, disposal to a landfill facility should be considered as a last resort only.

Guidance for the re-use of treated ASS is contained within DER's series of guidelines on waste-derived materials.

Note: Treated ASS may possess geotechnical characteristics or chemical properties that limit their suitability for re-use on some sites.

If off-site re-use of treated ASS is proposed, the proponent should provide receipts or other acceptance records from the receiving site including details of the total amount of soil taken to the chosen site within the an initial closure report.