Government of Western Australia
Department of Environment Regulation

Decision Document

Environmental Protection Act 1986, Part V

Proponent: Shire of Esperance

Licence: L6882/1997/13

Registered office: Shire of Esperance
Windich Street
ESPERANCE WA 6450

Premises address: Wylie Bay Sanitary Landfill Site
BANDY CREEK WA 6450
being Lot 5 on Plan 61342, Wylie Bay Road as depicted in Schedule 1.

Issue date: Thursday, 4 August 2011

Commencement date: Wednesday, 10 August 2011

Expiry date: Friday, 9 August 2019

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue an amended licence. DER considers that in reaching this decision, it has taken into account all relevant considerations and that the Licence and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by: Clarrie Green
Licensing Officer

Decision Document authorised by: Steve Checker
Manager Licensing

Contents

1 Purpose of this document

This Decision Document explains how DER has assessed and determined the application for a works approval or licence, and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

Works approval and licence conditions
DER has three types of conditions that may be imposed on works approvals and licences. They are as follows;

Standard conditions

DER has standard conditions that are imposed on all works approvals and licences regardless of the activities undertaken on the Premises and the information provided in the application. These are included as the following conditions on works approvals and licences:

Works approval conditions: 1.1.1-1.1.4, 1.2.1, 1.2.2, 5.1.1 and 5.1.2.

Licence conditions: 1.1.1-1.1.4, 1.2.1-1.2.4, 5.1.1-5.1.4 and 5.2.1.

For such conditions, justification within the Decision Document is not provided.

Optional standard conditions

In the interests of regulatory consistency DER has a set of optional standard conditions that can be imposed on works approvals and licences. DER will include optional standard conditions as necessary and are likely to constitute the majority of conditions in any licence. The inclusion of any optional standard conditions is justified in section 4 of this document.

Non standard conditions

Where the proposed activities require conditions outside the standard conditions suite DER will impose one or more non-standard conditions. These include both premises and sector specific conditions and are likely to occur within few licences. Where used, justification for the application of these conditions will be included in section 4.

2 Administrative summary

Administrative details		
Application type	Works Approval ☐ New Licence ☐ Licence amendment ☒ Works Approval amendment ☐	
Activities that cause the premises to become prescribed premises	**Category number(s)**	**Assessed design capacity**
	13	10,000 tonnes per year
	57	No more than 250 tyres
	62	5,000 tonnes per year
	64	50,000 tonnes per year
Application verified Application fee paid	Date: N/A Date: N/A	
Works Approval has been complied with Compliance Certificate received	Yes☐ No☐ N/A☒ Yes☐ No☐ N/A☒	
Commercial-in-confidence claim	Yes☐ No☒	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes☐ No☒	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*?	Yes☐ No☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Is the proposal subject to Ministerial Conditions?	Yes☐ No☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☐ No☒ Department of Water consulted Yes ☐ No ☒	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes☐ No☒ If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes☐ No☒ If Yes, include details here, eg Site is subject to SO_2 requirements of Kwinana EPP.		

3 Executive summary of proposal

The Shire of Esperance operate the Wylie Bay Sanitary Landfill Site (the landfill), a Class II Landfill (Category 64, Schedule 1 of the *Environmental Protection Regulations 1987*), under licence L6882/1997/13. Tyres are also stored at the site under Category 57, Schedule 1 of the *Environmental Protection Regulations 1987* with a limit of 250 tyres stored on site at any time.

Shire records indicate that the landfill commenced operation in 1986 to service the Esperance community. Prior to 2004 the satellite communities of Salmon Gums, Condingup, Grass Patch, Cascade and Scaddan had small rural landfills to service the towns and adjacent areas. However these were closed between 2004-2010 with the Wylie Bay becoming the sole sanitary waste facility for the Shire.

Lot 5 on Plan 61342 Wylie Bay Road is approximately 119 hectares, situated 2.5 km east of Bandy Creek Harbour and 820 m inland from the coastline. The site has been reserved for the purpose of "Rubbish Disposal Site" and is currently vested to the Shire of Esperance. The boundary of the nearest resident's property is approximately 1.4 km from the landfill. The distance from the active land filling area from the coast is approximately 650 m.

The landfill uses the "benching" method, or "mound method" for disposal of the majority of waste, where the unlined landfill is located above ground level on a sandy base with waste buried in layers creating a mound. In situ sand at the site is used as cover in the absence of clean fill. The final landform is not expected to exceed 18 metres AHD. Landfilling occurs within a designated "active landfill area" within the premises boundary.

Phase 1 of the landfill rehabilitation and closure plan has begun under Works Approval W5624/2014/1 and is running concurrently with active tipping. Phase 1 involves the extension of the landfill footprint by approximately 20 m (as depicted in Schedule 1) to allow for landfill capping. Works will also require the excavation of approximately 7,000 cubic metres (m^3) of existing waste for redeposition in other areas of the cell. Strict works approval conditions have been applied to manage the unforeseen uncovering of asbestos and biomedical wastes within the landfill. To minimise the disturbance to land, the Shire of Esperance have also proposed to crush and screen building material for use in landfill capping. Screened material will also reduce the volume of waste going to the landfill as it will be reused for aggregates, road sub-bases and drainage.

Landfilling is expected to be complete by 2019 with the four-phased capping program to span over nearly 7.5 years, most of which will be concurrent to landfilling.

This Licence is the result of an amendment sought by the Licensee to add Category 13 to allow the crushing and screening of building material. Initially the inert materials will be crushed on top of the Phase 1 area on the landfill where they are currently stockpiled. Once this has happened, the crushed product will be utilised to develop the hardstand area for the Bulk Processing and Stockpile Area. The Shire has already obtained a Clearing Permit for the Designated Bulk Waste Processing and Stockpiling Area and will utilise the sand material extracted from the area for the capping works. Construction of this area is expected to result in the loss of four groundwater monitoring bores. Improvement conditions have been added to the Licence to install new monitoring bores that are positioned to track the contaminant plume beneath the landfill.

In addition, this licence amendment also incorporates Category 62, at DER's request, to appropriately licence the solid waste depot already operating on site. The licence has also been converted to the REFIRE format. No other emissions have been reassessed in the conversion of this Licence.

4 Decision table

All applications are assessed in line with the Environmental Protection Act 1986, the Environmental Protection Regulations 1987, DEC's Policy Statement - Limits and targets for prescribed premises (2006), and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

OSC = Optional standard condition
NSC = Non-standard condition

DECISION TABLE				
Licence section	**Condition number L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
General conditions	L1.3.1 – 1.3.11	OSC	Standard premises operation conditions of the original licence have been transferred across to the new Licence as conditions 1.3.1 to 1.3.11. New OSC requirements have been incorporated within condition 1.3.2 of the Licence to require the Shire to prevent disposal of special wastes within two metres of the final tipping surface of the landfill. Construction of rehabilitation capping Phases 2 to 4 will be permitted under conditions 1.3.18 and 1.3.19 under this Licence amendment. Maintenance and operation of the associated landfill gas system will be required under condition 1.3.20. Former condition 28(e) requires landfilling operations to cease by 9 August 2019. This condition has been removed from the Licence, which already expires on this date. DER's assessment and decision making for implementing crushing and screening conditions (OSC1.3.12-1.3.13) are detailed in Appendix A.	Environmental Assessment and Management Plan – Wylie Bay Landfill Closure and Rehabilitation" Tails Consultants (February 2014) EPA Victoria's *Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills* (2010) (the BPEM guidelines) Landfill Waste Classification and Waste Definitions 1996 (as amended) DER Asbestos Guidelines. Environmental Assessment and Management Plan – Wylie Bay Landfill Closure and Rehabilitation
Emissions general	W2.1.1	OSC	Descriptive limits have been set through conditions 2.7.1 to 2.7.3 of this Licence and therefore an OSC regarding recording and investigation of exceedance of limits or targets has been included.	*Environmental Protection (Unauthorised Discharges) Regulations, 2004.*
Point source emissions to air including	L2.2	N/A	Point source emissions to air are not anticipated during landfilling operations. However, once each Phase of the landfill is closed and rehabilitated the Shire propose to release gas buildup beneath landfill capping using spiromatic cowls.	"Environmental Assessment and Management Plan – Wylie Bay Landfill Closure and Rehabilitation" Talis

DECISION TABLE				
Licence section	**Condition number L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
monitoring			Once the entire landfill is capped, there are expected to be 26 air emission point sources (spiromatic cowls). Indicative locations of the cowls have been provided in the Wylie Bay Landfill Closure and Rehabilitation Management Plan. For the purposes of permitting these emission locations an improvement condition (IR3) has been placed on the Licence in the event that the point source emission locations change. To DER's knowledge and based on information provided by the Shire, there are no buildings within 1.4 km of the landfill and therefore no gas monitoring conditions are required. Air emissions at closure of the landfill will be localised to the 26 spiromatic cowls which are likely to diffuse the air emissions to low concentrations per emission point. The nearest residence is not expected to be impacted by released landfill gases.	Consultants (February 2014)
Point source emissions to surface water including monitoring	L2.3	N/A	No point source emissions to surface water are anticipated during landfill operations or closure.	
Point source emissions to groundwater including monitoring	L2.4	N/A	No point source emissions to groundwater are anticipated during landfill operations or closure.	
Emissions to land including monitoring	L2.5	N/A	No emissions to land are anticipated during landfill operations or closure other than the waste to be landfilled. See monitoring of inputs and outputs and general conditions sections.	
Fugitive emissions	L2.6.1 – 2.6.3	OSC	DER's assessment and decision making are detailed in Appendix B.	
Odour	L2.7.1	OSC	<u>Emission Description</u> *Emission:* Putrescible landfills have the potential to cause odours through the deposition of odorous loads, inadequate covering and decomposition of buried waste over time. The need to excavate into and move old waste may give rise to	Application supporting documentation

DECISION TABLE				
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			increased odour emissions. *Impact:* Potential amenity impacts. The closest residential property is 1.6km west of the site and there is a 650m separation to potential beach-users, so the risk of off-site odour issues during the excavation is low. *Controls:* The Shire cover waste on a daily basis and maintain sufficient cover material on the premises to prevent fly away litter and offensive odours. <u>Risk Assessment</u> *Consequence:* Minor *Likelihood:* Rare *Risk Rating:* Low <u>Regulatory Controls</u> There are existing licence conditions relating to management of landfill activities, including daily covering of waste to reduce odour, and there is a large separation to sensitive receptors. However due to the need to excavate waste for the closure and rehabilitation works, OSC 2.7.1 has been included to ensure that odour from the site does not unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person who is not on the Premises. <u>Residual Risk</u> *Consequence:* Minor *Likelihood:* Rare *Risk Rating:* Low	
Noise	N/A	N/A	<u>Emission Description</u> *Emission:* Noise from vehicle movement, construction and landfill activities. *Impact:* Potential amenity impacts. The closest residential property is 1.6km west of the site and there is a 650m separation to potential beach-users. *Controls:* The following measures will be applied to manage potential noise impacts: • Closure and rehabilitation works will only be undertaken during current operational hours (8am – 4pm, 7 days/week);	Application supporting documentation *Environmental Protection (Noise) Regulations 1997*

DECISION TABLE				
Licence section	**Condition number L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			• Vehicles will be restricted to a maximum speed of 10km per hour (km/h) on site; and • All equipment and machinery will be maintained in good working condition and utilised in a conservative manner. Risk Assessment *Consequence:* Insignificant *Likelihood:* Unlikely *Risk Rating:* Low Regulatory Controls The number of traffic movements associated with the closure and rehabilitation works is anticipated to be small in comparison to those occurring through the continuation of current operations at the site. As the nature of the works and machinery for the closure works are similar to those currently undertaken at the site, noise emissions are not anticipated to increase significantly. The distance to sensitive receptors (650m to potential beach-users and a residential property located 1.6km west of the site) is considered large enough that noise impacts on surrounding land users is anticipated to be minimal. The Licensee is required to comply with the *Environmental Protection (Noise) Regulations 1997,* so no conditions are required to be added to the Licence. Residual Risk *Consequence:* Insignificant *Likelihood:* Unlikely *Risk Rating:* Low	
Monitoring general	L3.1.1	OSC	OSC 3.1.1 has been included in the Licence to ensure that the general monitoring specified in condition 3.1.1-3.1.4 is undertaken at acceptable intervals, in accordance with relevant standards and that all monitoring equipment is calibrated appropriately. As there are no buildings within 1.4 km of the landfill no gas monitoring conditions are required in the Licence.	Application supporting documentation The BPEM guidelines DPaW (Formerly DEC) 1999. Environmental Weed Strategy for

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	L3.1.5 L5.2.1	NSC	DER's assessment and decision making in relation to NSC 3.1.5 is detailed in Appendix C.	Western Australia
Monitoring of inputs and outputs	L3.6.1 L5.1.6 L5.2.1	OSC	OSCs relating to the monitoring of inputs and outputs have been transferred across to the Licence. An additional OSC5.1.6 has been placed in the Licence to record the details of rejected loads and their carriers in cubic metres as there is no weighbridge on the premises. This condition has been added for the consistent regulation of landfills and crushing and screening facilities around Western Australia.	N/A
Process monitoring	N/A	N/A	No process monitoring is required under this Licence.	N/A
Ambient environmental quality monitoring	L3.8.1 L5.2.1	OSC	Groundwater monitoring bore conditions have been transferred across to the new Licence as OSC3.8.1. Groundwater monitoring bores indicate that groundwater to the south of the landfill site (down-gradient in the direction of groundwater flow) contains elevated concentrations of Total Nitrogen (TN) at levels consistent with the landfill being the source of contamination. Nutrient samples taken to the south west of the landfill have shown an increasing trend for TN between 2003 and 2010. A declining trend has started to occur although recorded concentrations of 51 mg/L are still well above background concentrations identified up hydraulic gradient of the landfill that vary between 1.8 mg/L and 3.5 mg/L. Groundwater flow to the landfill is estimated to be about 73 m/year and is heading in a southerly direction toward Wylie Bay and the ocean. WBL28 is the closest monitoring bore to the ocean and has a TN of 1.6 mg/L. It is anticipated that TN concentrations will begin to rise at this bore in approximately 5 years assuming that there is negligible retardation of contaminants in groundwater Groundwater contamination is evident through previous sampling results although is poorly defined. As there is insufficient information to quantify the potential impacts of contaminant discharge on the aquatic environment further parameters have been added to the required sampling regime in OSC3.8.1. Along with the improvement conditions to install additional bores to the south of the landfill, this will assist with the determining the severity of groundwater	The Shire of Esperance, 2014. Wylie Bay Waste Management Facility. 2013 Annual Audit Compliance and Environmental Report Application supporting documentation

DECISION TABLE				
Licence section	**Condition number L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			contamination from the landfill. Additional monitoring bores will be required to replace bores WBL 2, 3, 5, 18 and 19 which will all be destroyed during the construction of the Designated Bulk Waste Processing and Stockpiling Area and covered by the extended landfill footprint. New bores will also act to determine the extent of contamination and to track the movement of the contaminant plume over time. Provided that waste materials in the landfill have been deposited above the water table, capping of the landfill site is expected to reduce the amount of leachate discharged from waste materials into groundwater.	
Meteorological monitoring	N/A	N/A	Meteorological monitoring is not required under this Licence. The Shire will ensure that closure, rehabilitation and clearing works will be stopped during periods of high winds or other extreme weather conditions. Spraying for weed control will not be undertaken during high winds to minimise down-wind impacts on adjacent native vegetation.	Application supporting documentation
Improvements	IR1 – IR3		Improvement conditions (IR1 and IR2) have been placed on the licence to gain a greater understanding of the extent and severity of groundwater contamination from the landfill. Additional monitoring bores to the south will determine the full spatial extent of groundwater contamination and allow DER to track the movement of the contaminant plume over time. A risk assessment requirement under IR2 has been placed in the Licence to determine the potential environmental impacts of groundwater contamination on the receiving environment. Depending on the results obtained from the above investigations, additional management measures may be required to ameliorate the impacts of groundwater contamination on the receiving environment. Improvement condition IR3 has been placed in the licence to require the Shire to notify DER of any changes to proposed spiromatic cowl locations (air emission points) those depicted in Schedule 1.	NA

DECISION TABLE				
Licence section	**Condition number L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
Information	W5.1.3	NSC	Monitoring information and records of landfill operations shall be submitted as a part of the Annual Environmental Report provided to DER each year.	Application supporting documentation. The BPEM guidelines.
Licence Duration	N/A	N/A	The Licence was previously issued with an expiry date of Friday 9 August 2019, when waste acceptance for disposal is expected to be complete. There are no factors that warrant the limiting of the licence period.	

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
6/2/2015	Proponent sent a copy of draft instrument	Comments included: • Requesting increase approved throughput capacity for category 13; • Seeking clarification on environmentally hazardous material received on site; • Clarification on used tyre storage requirements; • Rehabilitation phases reduced from 4 to 3; and • Minor corrections	Comments considered and wording amended where appropriate.

6 Emissions and discharges risk assessment framework

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High

Appendix A

General Conditions

Emission Risk Assessment – Crushing and Screening

Emission Description
Emission: Crushing and screening operations is likely to result in dust emissions. As construction and demolition material will be accepted to site for crushing and screening, there is a potential for Asbestos Containing Material (ACM) to be found within waste piles targeted for crushing and screening.
Impact: Dust from the crushing of ACM may result in human health impacts to site workers and persons attending the site should asbestos fibres become airborne.
Controls: The Shire have committed to the following controls to minimise dust emissions from crushing and screening operations:

- water mist sprays on feed transfer points;
- regular watering of operating areas and stockpiles;
- routine maintenance of plant and equipment; and
- locating the crushing and screening equipment to provide suitable protection from the wind.

Risk Assessment
Consequence: Major
Likelihood: Possible
Risk Rating: High

Regulatory Controls
OSC 1.3.12 aims to reduce the likelihood of ACM being crushed by limiting the weight for weight percentage of asbestos within construction and demolition waste designated for crushing. Sampling of waste in accordance with DER Asbestos Guidelines will be required under 1.3.13 to assess the Shire's ability to prevent ACM from being crushed.

Residual Risk
Consequence: Major
Likelihood: Unlikely
Risk Rating: Moderate

Appendix B

Fugitive Emissions

Emission Risk Assessment – Waste disturbance during rehabilitation

Emission Description
Emission: The closure and rehabilitation works have the potential to generate dust as the result of the following activities:

- disturbing former waste cells to build profiles;
- clearing of vegetation;
- earthworks associated with the development of the capping system; and
- vehicle movements.

Due to historic and current waste acceptance at the landfill, there is the potential to disturb Special Waste Type 1 (Asbestos Containing Material (ACM)) and Special Waste Type 2 (Biomedical and Clinical Waste) leading to airborne release of hazardous material.

Impact: Off-site impacts are not expected due to the distance to potential sensitive receptors (650m to potential beach-users and a residential property located 1.6km west of the site). Potential human health impacts to site workers and persons attending the site. Elevated total suspended particulates (TSP) can impact ambient environmental quality resulting in amenity impacts and can smother vegetation. Particulate matter that are less than 10 (PM_{10}) or 2.5 ($PM_{2.5}$) micrometres in diameter can be drawn deep into the lungs causing human health impacts. The chemical and physical properties of the particles, the size of the particles and the duration of exposure are all factors which may affect human health. Exposure to asbestos fibres can cause serious diseases including cancers.

The rehabilitation periods where the risk to human health is greatest occur during Phases 3 and 4. Special Waste burial mapping conducted by the Shire under condition 3(c) of the old Licence indicates that the majority of ACM is buried in the areas designated for Phase 3 and 4 waste disturbances (Figure 1).

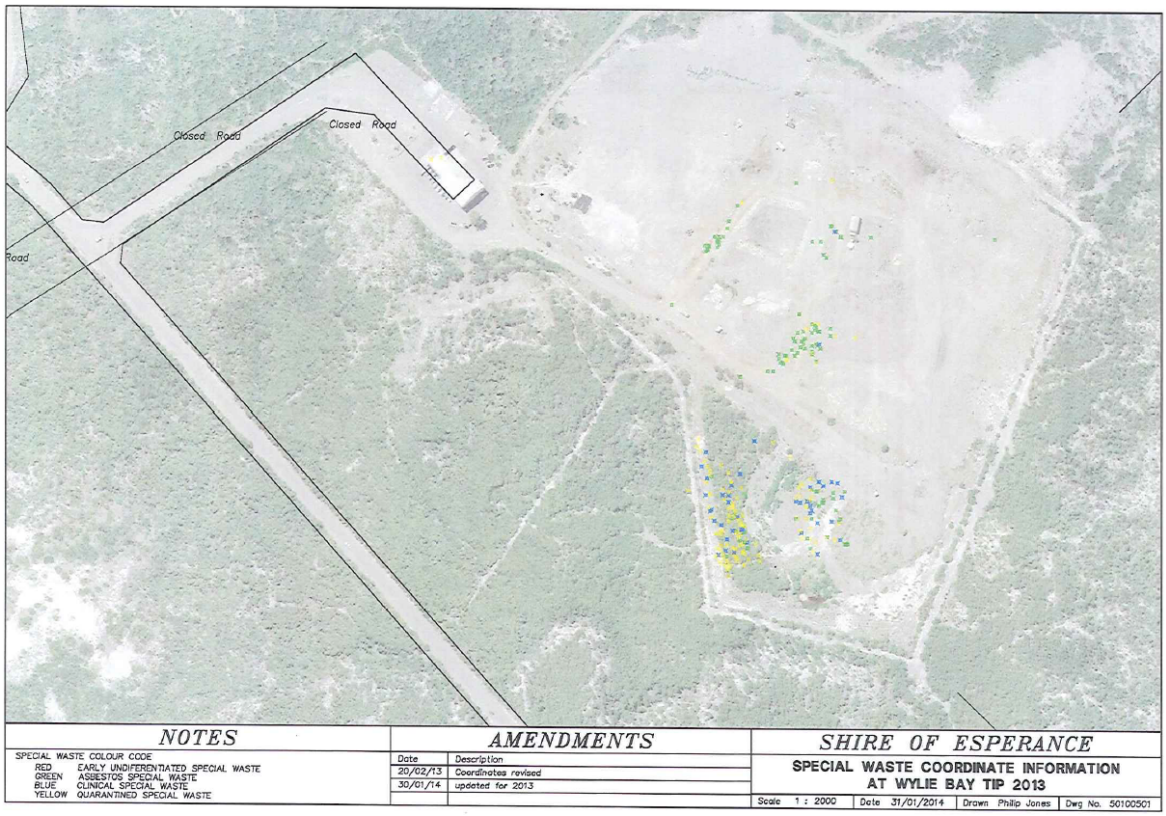

Figure 1: Burial locations of Special Waste (green dots signify ACM burial locations)

Controls: Final fill profiles of the rehabilitation and closure design have been developed to minimise the quantity of waste required to be excavated, in particular in locations where special waste is recorded to have been disposed. The proponent intends to implement control measures which will be defined at the detailed construction design phase.

More general approaches to minimising generation of dust at the site include the following management measures:

- vehicles will be restricted to a maximum speed of 10km/h;
- closure and rehabilitation works will be stopped during periods of high winds;
- vehicles will enter and exit the site via the sealed access road; and
- dust generated as the result of wind erosion will be minimised through the implementation of an engineered, stabilised capping system.

To ensure that wind erosion is minimised, the Shire will:

- undertake clearing in a phased approach and on a needs basis only, which will minimise the area required to be cleared at any one time;
- utilise cleared vegetation to cover areas that have previously been excavated to minimise exposure to wind;
- ensure that clearing is not undertaken during periods of high wind or other extreme weather conditions;
- undertake regular inspections of the cleared area to ensure that no significant erosion is occurring;
- implement a Revegetation Plan for the landfill footprint and temporary cleared areas to stabilise the capping system and prevent soil and water erosion;
- place jute matting over topsoil following each phase of the rehabilitation works;
- install sand trap fencing along the windward edge of the revegetation area; and

- stockpile inert materials to be placed over areas to be permanently cleared for future resource recovery activities at the site.

Risk Assessment
Consequence: Major
Likelihood: Possible
Risk Rating: High

Regulatory Controls
OSCs 2.6.1 and 2.6.2 are included in the Licence to ensure adequate management of fugitive dust emissions on site. This relates to the potential for dust during excavation of waste to achieve final fill profiles, earthworks and construction of the cap and to the potential to disturb Special Waste Types 1 and 2 during the rehabilitation and closure works.

More prescriptive NSCs 1.3.22 and 1.3.23 have also been applied to ensure that, in the event that Special Waste Types 1 and 2 are disturbed during the works, the risks are very carefully managed.

Residual Risk
Consequence: Major
Likelihood: Unlikely
Risk Rating: Moderate

Emission Risk Assessment – Crushing and Screening

Emission Description
Emission: Crushing and screening operations is likely to result in dust emissions.
Impact: Dust emissions have the potential to smother nearby vegetation, reducing its ability to photosynthesise. No priority species exist in the vicinity of the landfill.
Controls: The Shire have committed to the following controls to minimise dust emissions from crushing and screening operations:

- water mist sprays on feed transfer points;
- regular watering of operating areas and stockpiles;
- routine maintenance of plant and equipment; and
- locating the crushing and screening equipment to provide suitable protection from the wind.

Risk Assessment
Consequence: Minor
Likelihood: Possible
Risk Rating: Moderate

Regulatory Controls
OSC 2.6.3 has been placed on the Licence to prevent continued dust generation following events where dust is seen to be emanating across the landfill boundary. Under this condition the Shire will be required to cease all crushing and screening until dust preventative measures have been put in place.

Residual Risk
Consequence: Minor
Likelihood: Unlikely
Risk Rating: Moderate

Appendix C

General Monitoring

Emission Risk Assessment – Construction and operation

1. Landfill Gas Management System

Emission Description
Emission: Post capping, the landfill presents a risk due to the presence and production of landfill gas. The decomposition of putrescible waste generates landfill gas which comprises a mixture of methane, carbon dioxide and small quantities of trace elements. Methane and carbon dioxide are greenhouse gases.
Impact: In high concentrations, methane can pose a human health risk. Landfill gas generated within the waste mass travels primarily vertically and is currently released to the atmosphere as a diffuse source. Once the capping system is in place, there is the potential for landfill gas to be trapped beneath the capping layer. If allowed to build up, pockets of pressurised gas may explode, presenting a safety risk to personnel on site and damaging the integrity of the capping system. The likelihood of landfill gas buildup increases with the completion of each phase of rehabilitation. The anticipated timeframes for capping are shown in Table 1.

Table 1: Rehabilitation timeframes

Cell Number(s)	Timescales
Phase 1	31 December 2017
Phase 2	31 December 2019
Phase 3	30 June 2022
Phase 4	30 June 2023

Controls: A landfill gas management system will be constructed at the site consisting of spiromatic cowls distributed over the fill profile. This system will allow the landfill gas generated within the waste mass to be released to the atmosphere and prevent build up beneath the capping system. To ensure that landfill gas is managed throughout and following closure and rehabilitation works, the landfill gas management system will be installed on a phased approach, in conjunction with the construction of the capping system.

Risk Assessment
Consequence: Moderate
Likelihood: Unlikely
Risk Rating: Moderate

Regulatory Controls
NSC 3.1.2 has been included to ensure that adequate monitoring of the landfill gas management system infrastructure is conducted. Monitoring is to be recorded and reported to DER at the time compliance document submission. NSC 1.3.25 has also been added to ensure that maintenance of the rehabilitation and closure infrastructure is conducted and that, if identified as required by monitoring, that repair is undertaken.

Improvement condition IR3 has been placed in the licence to require the Shire to notify DER of any changes to proposed spiromatic cowl locations (air emission points) those depicted in Schedule 1.

Residual Risk
Consequence: Moderate
Likelihood: Rare
Risk Rating: Moderate

2. Surface Water Management

Emission Description
Emission: Clean stormwater will be diverted off the capping system and diverted down gradient where it will infiltrate into the existing dune system, recharging groundwater.
Impact: No impact is expected from water quality as the stormwater is not expected to be contaminated by waste due to the presence of the capping system, but erosion may occur if surface water is not adequately managed.
Controls: The Shire will continue its current landfilling operations at the site until 2019 in order to ensure that the final fill profiles are achieved. Existing licence conditions relating to stormwater management will continue to be implemented (OSC1.2.5). The implementation of the phased capping system and surface water management will minimise the area of the landfill exposed to surface water.

To ensure surface water management is effective during the phased construction of the capping system, one spillway pipe is located within each phase of the capping system. Surface water collected in the perimeter ditch will be discharged via two drainage points, located hydrogeologically down gradient of the landfill cell. The divert points from the surface water management system will extend approximately 10m from the perimeter drain and be constructed utilising a concrete 'apron' to promote flow away from the landfill to ensure that infiltration does not occur near the waste mass itself.

The surface water management system has been designed for a 1 in 20 year event with a freeboard within the drainage system of 0.25m to accommodate a 1 in 100 year event. The gradients of slope range between 1:5 around the batters of the cell and 1:16 (post settlement) on the upper slopes. These gradients are in accordance with the BPEM guidelines and will ensure the stability of the capping system and movement of surface water off the capping system. The maximum post settlement elevation will not exceed 18 mAHD.

Risk Assessment
Consequence: Insignificant
Likelihood: Unlikely
Risk Rating: Low

Regulatory Controls
NSC 3.1.5 has been included to ensure that adequate monitoring of the surface water management system infrastructure is conducted to ensure it remains free from sediment, debris and vegetation. The integrity of the capping system is key to minimise leachate generation and to proactively manage surface water. Therefore condition 3.1.5 includes visual inspection of cap integrity and an annual survey of site topography to monitor settlement rate. Monitoring is to be recorded and reported to DER at the time of compliance document submission.

Residual Risk
Consequence: Insignificant
Likelihood: Unlikely
Risk Rating: Low

3. Revegetation, weed and erosion control

Controls
Revegetation, weed and erosion control progress will be monitored in spring and autumn by qualified personnel for a minimum period of 2 years and annually thereafter. Vegetation cover monitoring will be undertaken using the line-intercept method along transects within each quadrat. Transects will be installed at precise points so as to be repeatable during each monitoring survey. In addition, photo points will be established within each quadrant for visual monitoring of the revegetation and weed

control success. Analogue sites will be established to develop and inform specific completion criteria, such as:

- vegetation cover;
- species richness;
- dominant species (those which account for greater than 10% of the total foliar cover);
- structure (over-story, mid-story, and under-story species); and
- weed cover and weed species composition.

Revegetated areas will be visually monitored for presence of weeds. The density and environmental risk rating (DPaW 1999) of any weeds present will be noted at each monitoring event. Follow-up weed control is to be undertaken if required within the revegetated area to ensure that weed cover does not exceed the levels recorded in analogue sites. Weed control will focus on Environmental Weeds with high and moderate ratings (DPaW 1999).

Erosion will be visually assessed during each monitoring event. Any evidence of erosion will be recorded (photos, GPS coordinates, and dimensions) and appropriate remedial action will be taken to rehabilitate the affected area.

Regulatory Controls

Cap integrity is important to prevent erosion and leaching from the landfill. Therefore revegetation success is key to minimising erosion of the capping system. NSC 3.1.5 has been included to ensure that monitoring of the revegetation, weed and erosion control is adequately conducted, recorded and reported to DER at the time compliance document submission. NSC 1.3.24 has also been added to ensure that revegetation and/or weed control on the landfill cap is conducted if required.