Response to Submissions to the Public Exhibition

Spring Farm Resource Recovery Facility S.75W Modification Application (05_0098 MOD 5)

NA89913061

Prepared for
SITA (Australia) Pty Ltd

12 January 2015

Cardno
Shaping the Future

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Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
Final	12/01/2015	John O'Grady		John Riordan	

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1 Introduction

This document has been prepared on behalf of SITA (Australia) Pty Ltd to provide responses to submissions received by the Department with regard to this S.75W Modification Application (05_0098 MOD5).

1.1 Overview

In accordance with the Director General's Requirements for this Application, Cardno and SITA carried out a comprehensive consultation process during the Environmental Assessment (EA) process connected to this Modification Application. Issues raised during this process were addressed in the EA document and accompanying technical reports lodged with the application.

In accordance with Statutory requirements under the Environmental Planning and Assessment Regulation, 2000 the Modification Application was publicly exhibited on the Department's website from 13 November 2013 to 28 November 2013. Five (5) submissions to the exhibition were received, 4 from Government agencies and one from the State Member for Camden (addressed to the Minister for the Environment and Heritage). Cardno is in receipt of these submissions.

SITA has embarked on this project to treat liquid waste in the Spring Farm ARRT Tank Farm in response to an audit of the facility prepared by Suez Environment (April 2011) – Appendix A. The audit was prepared to address ongoing operational issues with the ARRT Facility which had resulted in inefficiencies and regular interruptions to waste treatment. To address the operational problems being experienced at the Facility, the audit recommended re-use of the existing UASB digesters (the Tank Farm) to process liquid wastes. This initiative, the subject of the 75W Modification Application and accompanying Environmental Assessment, will result in effective operation of currently under-utilised waste treatment infrastructure with accompanying ongoing sustainability outcomes.

This response addresses the additional matters raised in submissions to the Exhibition period for the Modification Application. In summary, these include:

- Classification and definitions of waste;
- Disposal of certain forms of waste;
- Visual impacts;
- Input / output balance of the facility;
- Management of de-sludging;
- Odour modelling and odour impacts on residential receptors;
- Trade waste agreement and connections to sewer.

The submissions and specific issues raised in each are addressed below with supporting documentation provided as appendices to this document.

2 NSW Environmental Protection Authority

Letter dated 4 December 2013

The Environmental Protection Authority (EPA) lodged a letter of submission raising various matters. Cardno had previously liaised with the EPA as part of its preparation of the Environmental Assessment. The EPA responded that it would provide a formal response if necessary but no further correspondence was received at the time. Consequent to receipt of the submission made during the statutory exhibition period, SITA (Australia) met with EPA on 22 May 2014 to discuss the details of its submission. Our response to the EPA submission takes into account the outcomes of that meeting.

2.1 Issue 1 – waste classifications and definitions

EPA commented that the waste classifications used in the Environmental Assessment need to be updated for consistency with current classifications, regardless of whether or not the Modification Application applies to the forms of waste described in the Major Project Approval (as currently Modified).

"The use of incorrect waste classifications and definitions in the Environmental Assessment makes the proposal difficult to assess:

- *References to 'inert waste' in the document are incorrect. All waste should be classified in accordance with EPA Waste Classification Guidelines.*
- *When referring to 'solid waste' it is unclear if the writer is referring to general solid waste (non-putrescible) or general solid waste (putrescible).*
- *The term 'biosolids' is incorrectly used to refer to the by-products generated from the waste water treatment process. In accordance with Schedule 1 of the Protection of the Environment Operations Act 1997, biosolids are defined as the organic product that results from sewage treatment processes (sometimes referred to as sewage sludge)."*

Response

Under its current Major Project Approval (as Modified) the ARRT Facility is permitted to:

1. "Receive:
   - 130,000tpa of mixed municipal waste classified as inert or solid waste under Schedule 1 of the Protection of the Environment Operations Act, 1997
   - 25,000tpa of garden waste; and
   - An additional 5,000tpa of garden waste or biosolids; and
2. Process:
   - 90,000tpa of mixed municipal waste classified as inert or solid waste under Schedule 1 of the *Protection of the Environment Operations Act, 1997*;
   - 25,000tpa of garden waste; and
   - An additional 5,000tpa of garden waste or biosolids."

The Modification Application seeks to amend the existing Major Project Approval in order to permit receiving and processing of liquid waste and permit processing of additional quantities of solid waste materials. The Modification does not seek to amend other forms or quantities of waste described in the current Approval. In this regard:

- The reference to "inert waste" in the Environmental Assessment is included for the purposes of consistency with the existing Approval. In response to the EPA's concerns, this reference is deleted and the proposed Modification is amended to read:

  "… modify the Transitional Part 3A Approval in order to permit, in addition to the currently approved waste quantities:

1. *Receiving and processing of 520m3 per day of liquid waste (comprising organic liquid waste, leachate and industrial liquid waste) at the existing facility utilising existing on site infrastructure, for disposal to sewer; and*
2. *Processing of 130,000 tonnes per annum (tpa) of general solid waste (putrescible) as defined in Schedule 1 of the Protection of the Environment Operations Act, 1997 again using existing infrastructure."*

- In consultations between SITA (Australia) and the EPA, it has been agreed for purposes of consistency that by-products or residues of de-sludging of the process tanks can be referred to as "bio-sludge". This terminology can also be applied to the existing consent where it refers to "biosolids". It is to be noted, however, that the approved Operational Environmental Management Plan (WSN, 2008, p.21, S.6.2.6), a copy of which is at Appendix B, refers to the residue of the tank farm processed waste as "dewatered filter cake (biosolids)" and the OEMP proposes that this material "can be sold as a quality soil conditioner or be used as an additive agent for the Garden Organics Composting Plant." By default, the approval where it refers to "biosolids" would be referring to this material. Notwithstanding this, SITA has agreed to carry out tests of the de-sludging residue material for its suitability for use as a high quality soil conditioner in the ARRT Facility Garden Organics Plant.

In summary, using current waste classification nomenclature and substituting the term "bio-sludge" where the current consent refers to "biosolids", it is proposed that the relevant clause in the Modified Consent would read:

"Waste Management
Except as provided by a condition of an EPL, the Proponent shall restrict the waste received at the site to the following:

a) *130,000tpa of general solid waste (putrescible) as defined in Schedule 1 of the Protection of the Environment Operations Act, 1997*

b) 25,000tpa of garden waste; and

c) An additional 5,000tpa of garden waste or bio-sludge; and

d) *520m^3 per day of liquid waste (comprising organic liquid waste, leachate and industrial liquid waste).*

Except as provided by a condition of an EPL, the Proponent shall ensure that the only wastes that are processed at the site are:

a) 130,000tpa of general solid waste (putrescible) as defined in Schedule 1 of the Protection of the Environment Operations Act, 1997

b) 25,000tpa of garden waste; and

c) An additional 5,000tpa of garden waste or bio-sludge; and

d) 520m^3 per day of liquid waste (comprising organic liquid waste, leachate and industrial liquid waste)."

2.2 Issue 2 – classification and streaming of residue or by-products of the leachate stream

The residue or by-products generated from the leachate stream of the treatment processes and the liquid from the sludge dewatering must be classified in accordance with the EPA Waste Classification Guidelines and disposed of to a facility that lawfully accepts that waste type. This stream must be kept separate from the organic stream.

Response

The outputs of the leachate stream would be solid and liquid by-products of the original leachate material which is, in turn, a product of the treatment of General Solid Waste (Putrescible). As such, the residues would be classified as Liquid Waste and General Solid Waste (Putrescible) under the EPA Guidelines. The

solid waste residue will be suitable for use as a soil conditioner. SITA will carry out trials of the material to check its suitability for this use. Subject to the results of these trials, the material will be used as a conditioner in the ARRT composting facility. If necessary, SITA will apply for an amendment to its Environmental Protection Licence to allow use of the solid material in the composting process. The liquid waste component will be trucked off site and sent to sewer, or discharged directly to sewer on site, as described in the Environmental Assessment.

2.3 Issue 3 – classification and streaming of residue or by-products of the organic stream

The residue or by-products generated from the organic stream of the treatment processes must be classified in accordance with the EPA Waste Classification Guidelines and disposed of to a facility that lawfully accepts that waste type. Alternatively to use the by-product and the liquid from the sludge dewatering of the organic stream in the composting process, a specific exemption may be sought from the EPA.

Response

Likewise, the residues of the organic stream treatment process would be solid and liquid by-products of the original liquid waste stream and would also be classified as Liquid Waste and General Solid Waste (Putrescible) under the Guidelines. SITA will again trial this material and potentially use it as an additive in the Composting Plant, subject, if necessary, to an amendment to the EPL.

2.4 Issue 4 – impacts of the existing approved flare

No assessment of potential impacts from the flare, including visual impacts, is included in the Environmental Assessment.

Response

The Modification Application seeks changes to the types and quantities of waste permitted to be received and processed at the ARRT Facility. Some minor changes to tanks within the existing Tank Farm are proposed in order to treat liquid waste but apart from this, no changes to the existing infrastructure within the Facility are proposed. The gas to energy engines and flare on the site are subject to the existing approval and their environmental impacts, including visual impacts of the flare, would have been considered in the assessment of the initial Application. No changes to the engines or flare are proposed by this Modification Application and on this basis it is considered that impacts of the flare are not relevant to the Application.

2.5 Issue 5 – local meteorological station

EPA recommends the requirement for a meteorological station at the Premises to regularly record wind speed, wind direction and temperature (at a minimum).

Response

Clause M4 of Environmental Protection Licence No.5105 (Jacks Gully Waste and Recycling Centre) includes requirements for Weather Monitoring. In response to this requirement, SITA reports that an Automatic Weather Station (AWS) is currently installed and operating at the Spring Farm ARRF. The AWS is located on the roof of the ARRF site office, adjacent to the current weighbridge. Data collected by the weather station is monitored quarterly. For information purposes, the quarterly report for the period 1 July 2013 to 30 September 2013 is attached to this submission at Appendix C.

2.6 Issue 6 – input / output balance

A detailed input / output balance for the site to determine the processing capacity and to manage storage requirements for the proposal has not been undertaken. In addition, volumes of outgoing waste have not been provided in the Environmental Assessment.

Response

An input / output balance is included at Figure 2 in the amended Spring Farm Biotreatment Facility Fit for Purpose Report (Suez Environment, January 2014), a copy of which is attached to this submission at Appendix B.

2.7 Issue 7 – management of tank de-sludging

Management of tank de-sludging has not been included in the Environmental Assessment.

Response

Details regarding management of the tank de-sludging process are included in the Operational Environmental Management Plan that currently applies to the site (WSN, June 2008) – included as Appendix B to this report. The OEMP provides details of the de-sludging / de-watering process that applied to the former and now de-commissioned operations of the tanks farm and Arrow-Bio AWT (Section 6.2.6 of the OEMP). Essentially, this management process is to continue for de-sludging of the re-commissioned tank farm subsequent to approval of this application. The process as it is to be applied to the tank farm in the proposed treatment of liquid waste is described in the Spring Farm Biotreatment Facility Fit for Purpose Report (Suez Environment, January 2014) – included as Appendix D. The process description is quoted from the Report below:

"Excess sludge from the USAB reactor and SBR systems will be sent to the existing balance tank prior to dewatering. The existing Siemens Belt filter will be used to dewater residual solids as originally designed. The dewatered cake may be used as a quality soil conditioner or as an additive for the Garden Organics Facility on site. …… Supernatant from the dewatering system will be recycled back to the leachate receival tank for further treatment or to the treated wastewater storage tank for disposal."

2.8 Issue 8 – adequacy of odour modelling

EPA's review of the odour modelling indicates that the assessment is inadequate and EPA recommends the assessment should be revised to demonstrate impacts have been robustly and realistically assessed.

Response

On a general level, it is notable that a number of changes have occurred at the Spring Farm Resource Recovery Park and SITA has carried out a number of actions in recent times that have had positive results with regard to local odour emissions. These include:

- Cessation of landfilling of putrescible waste since 2009 with the result that gas rates have declined and fugitive emissions from the landfill site have been minimised;
- Installation of increased gas capacity infrastructure in the landfill, extracting available landfill gas.
- Close adherence to operational protocols including:
    - enforcement of roller door closure at the receival hall and immediate removal of any residual waste from tipping activities
    - Policy of immediate transfer of material for landfilling at a licensed putrescible landfill in the event of mechanical breakdown as opposed to the historical policy of 3 days of waste storage within the receival hall.
    - Separation of organic material from the putrescible waste and same day transfer

    - Requirement for all vehicles to use the wheel wash on exiting the site to reduce risk of waste tracking
- Installation of concrete paving around the perimeter of the tank farm area, replacing the original gravel hard stand, improving drainage and minimising risk of build-up of odour producing residue materials
- Installation and use of an odour fence during inversion periods

With respect to the specific odour related issues raised in the EPA submission, Pacific Environment (PE) has carried out a review of the issues in the submission and Attachment and has provided a separate response in the form of a letter to Cardno (attached to this Submission report at Appendix E). The general outcome of the Pacific Environment review is that the proposed treatment of additional waste material and adaptive re-use of the Tank Farm for the purposes of treatment of liquid waste will have a negligible cumulative impact with regard to odour generation. A synopsis of the PE response is provided below.

Sub-issue

Modelling results show compliance with the adopted Project odour criterion however there appears to be a discrepancy between model results and actual odour impacts

Response

There is a history of odour complaints associated with waste management operations in the area and the AWT EcoLibrium facility was a source of odour until it's de-commissioning due to operational difficulties with the wet solid waste stream process. Odour complaints have reduced substantially since the re-commissioning of the facility with a dry process as evidenced by an EPA commissioned odour study which showed a substantial drop in odour complaints since after the EcoLibrium process was taken offline and since that time.

Odour modelling by PE does not conclude that odour will never be experienced at critical receiver locations but rather there will be exceedances of the 2 OU level from time to time, but not for more than 1% of the year and these events would occur under particularly unfavourable weather conditions. This differs from odour complaints which may occur at levels below 2 OU (for particularly sensitive individuals) and would be more comparable to maximum odour impacts (odour impacts at higher percentiles).

Regardless of this, it should be noted that the proposed activities for the ARRT facility (which includes the receival hall, the tank farm, the greenwaste area and the MRF), will have a minimal impact with regard to odour experienced in the local area. They will be insignificant contributors to the cumulative odour impact in the area, with the most significant contributor being the CSM operation.

Sub-issue

A range of factors require consideration to ensure modelled odour impacts are reliable

Response

PE comments that all factors recommended by EPA for consideration on the odour impact assessment have been addressed in the EA. Critically, PE's assessment of cumulative odour impacts has found that the proposed modification would be a minor contributor to cumulative odour, with the landfill area and Camden Soil Mix being the main local contributors. The operation of the ARRT facility alone, including the operations proposed in this Modification is expected to have no measureable odour impact at the nearest residences.

Sub-issue

The Project has the potential to increase the risk of odour impacts at nearby residential receptors

Response

PE's comments to this issue, in summary, are:

- Increased traffic movements and receival times at the ARRT receival hall, including time for the ARRT doors to be open, have been assessed conservatively in the odour modelling and found to be satisfactory with regard to odour impacts.
- Open tanks in the Tank Farm have been included in the assessment. There will also be odour scrubbers used on some of the tanks which would further reduce odour.
- Desludging of tanks will occur intermittently, on average once every 2 weeks, and is not a continuous source of odour.
- New waste streams have been modelled. Any further changes would require an additional development application and therefore warrant further assessment if proposed.

3 Camden Council

Letter dated 12 December 2013

Camden Council has made a submission objecting to the proposal on the basis that there is an inconsistency between the Air Quality and Odour Impact Assessment for the ARRT facility, prepared for SITA, and a Level 3 Odour Assessment for the same area, prepared for Urban Growth. Pacific Environment's response in the attached letter can be summarised as follows.

Response

The inconsistencies between the SITA and Urban Growth reports are due to the inclusion of additional information by Urban Growth in response to a request by Camden Council (subsequent to comments received from EPA). This included further modelling of various facilities on the Camden Soil Mix site, specifically allowing for a proposal for an additional 50,000 tonnes per annum of composting windrows at the facility.

This additional modelling for the Urban Growth report, which included worst case (or "upset") emission conditions and allowed for the increased shredding emissions and additional composting windrows, was submitted subsequent to the submission of the SITA report and as such was not included in the SITA report. The modelling showed, however, that the resulting odour emission increases were minor and did not change the conclusions of the Urban Growth report. In addition, these minor increases were not due to the proposed upgraded operations at the ARRT facility.

To assist in clarification of the results of its modelling, and to illustrate the real predictions for odour impacts at local sensitive receivers including the eastern extremities of the developing Spring Farm Residential Release Area, PE has also included a commentary in its letter on interpretation of odour modelling. In summary, this commentary states:

- That the odour contours illustrated in Figure 1 in the letter (reproduced below) represent worst case "upset conditions" and are also most representative of conditions before the Camden Soil Mix site underwent significant odour mitigation works in 2012. To assume that these conditions would occur all year is a very conservative position.
- That odour contouring is an interpolation of whole number readings. Results for specific locations are therefore better interpreted using tables of predictions made specifically at those location rather than contour plots, which will interpolate (approximate) between grid points within the modelling domain. Predictions were made at six boundary receptors (as shown in **Figure 1**). These results are presented in **Table 1** and show that there are no predicted exceedances of the EPA 2 OU criteria at these receptors located at the site boundary.

Table 1: Predicted 99th percentile nose response time odour concentrations each boundary receptor

Residence ID	Ground level odour concentration (OU) 99th percentile (nose response time)
R1	1
R2	1
R3	2
R4	2
R5	2
R6	2

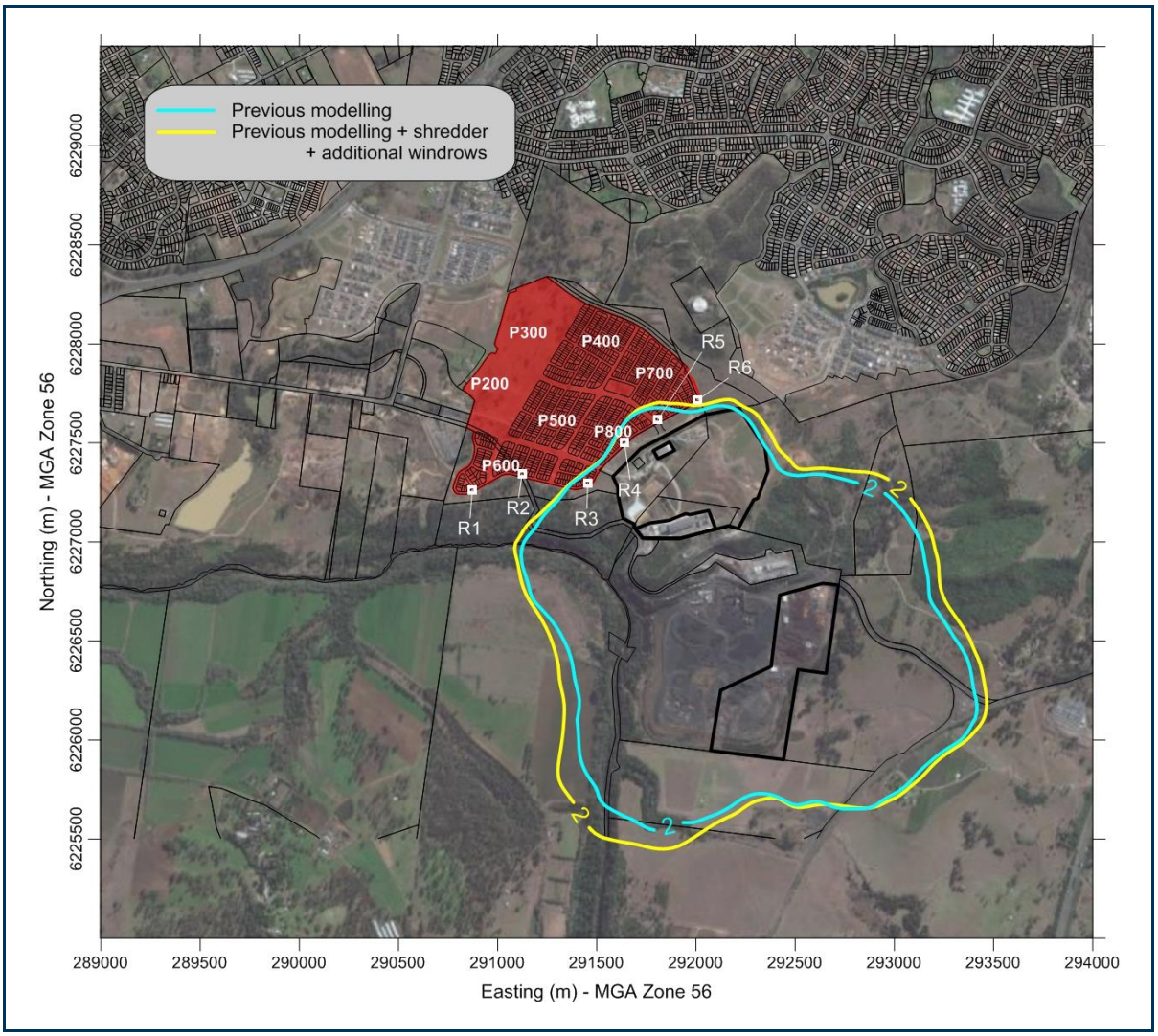

Figure 1: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Landfill, Camden Soil Mix and Tripodi (upset conditions)

- That the contribution of the Spring Farm ARRT Facility to the total odour is very small, and below the level of detection (1 OU) at the proposed residential development area. This can be seen in **Figure 2** which shows the individual contribution from the proposed ARRT Facility under worst case emission conditions.

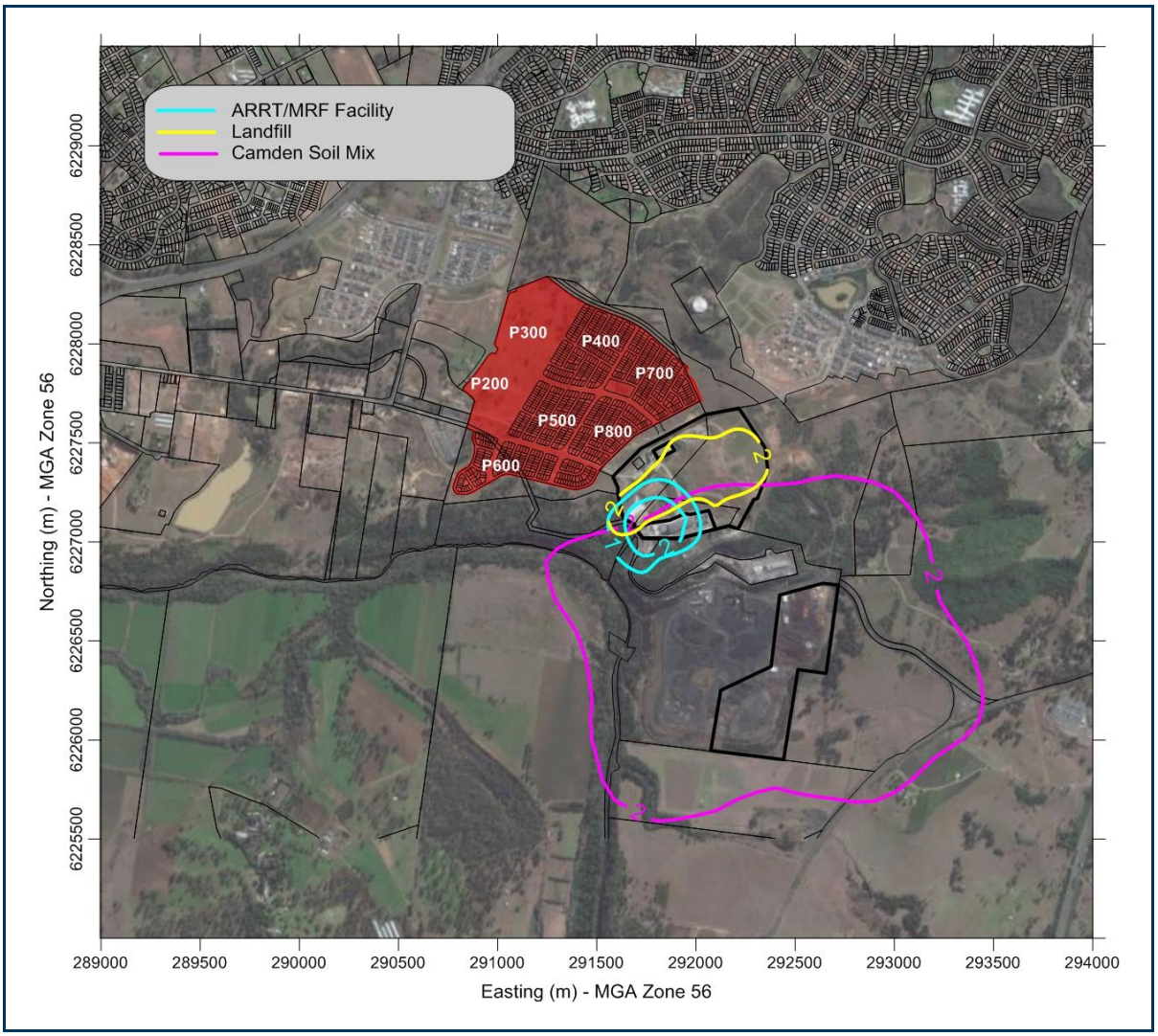

Figure 2: Predicted 99th percentile ground level odour concentration due to emissions from each individual site (ARRT/MRF, Landfill and Camden Soil Mix)

PE also carried out additional odour modelling to provide a more representative indication of odour impacts in general day to day conditions for each of the sites. Specific emissions were modelled from a broad range of potential emitters within the ARRT/MRF, the operating landfill and the Camden Organics facility. The list of emitters was provided to the EPA for comment prior to modelling and EPA agreed that they are representative of the operations occurring at each site. The result of the additional modelling was that there is minimal difference at the residential development boundary receptors between standard and “upset” conditions and both the standard and upset operating conditions remain compliant with the odour criterion at the residential boundary (precincts 700 and 800) as shown in Tables 1 and 3.

Figure 3: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Camden Soil Mix and the Jacks Gully Landfill (standard operating conditions)

Table 3: Predicted 99th percentile 1-hour average odour concentrations each boundary receptor (standard operating conditions)

Residence ID	Ground level odour concentration (OU) 99th percentile
R1	< 1
R2	1
R3	2
R4	2
R5	2
R6	1

These results show that the 2 OU contour extends slightly into the residential development boundary. However, model accuracy is such that it is more reasonable to refer to odour predictions in terms of whole numbers. Where odour units are shown with a decimal place this is typically to show that a modelling has resulted in a change but it should not be interpreted that this change is necessarily detectible to a human receptor.This explains the inconsistencies between the SITA commissioned and Urban Growth commissioned odour impact reporting and indicates that the discrepancies have no consequences with regard to the impact of the proposed Modification to the operations of the ARRT Facility and only minimal consequences with regard to cumulative odour impacts on the locality.

PE has also carried out further additional modelling to illustrate odour impacts after the Jacks Gully landfill ceases to receive waste and is capped at the end of 2017. The results of this modelling, for standard

operating conditions (Scenario 1) and standard operation conditions with the landfill capped) are illustrated in Figure 4 and Table 4.

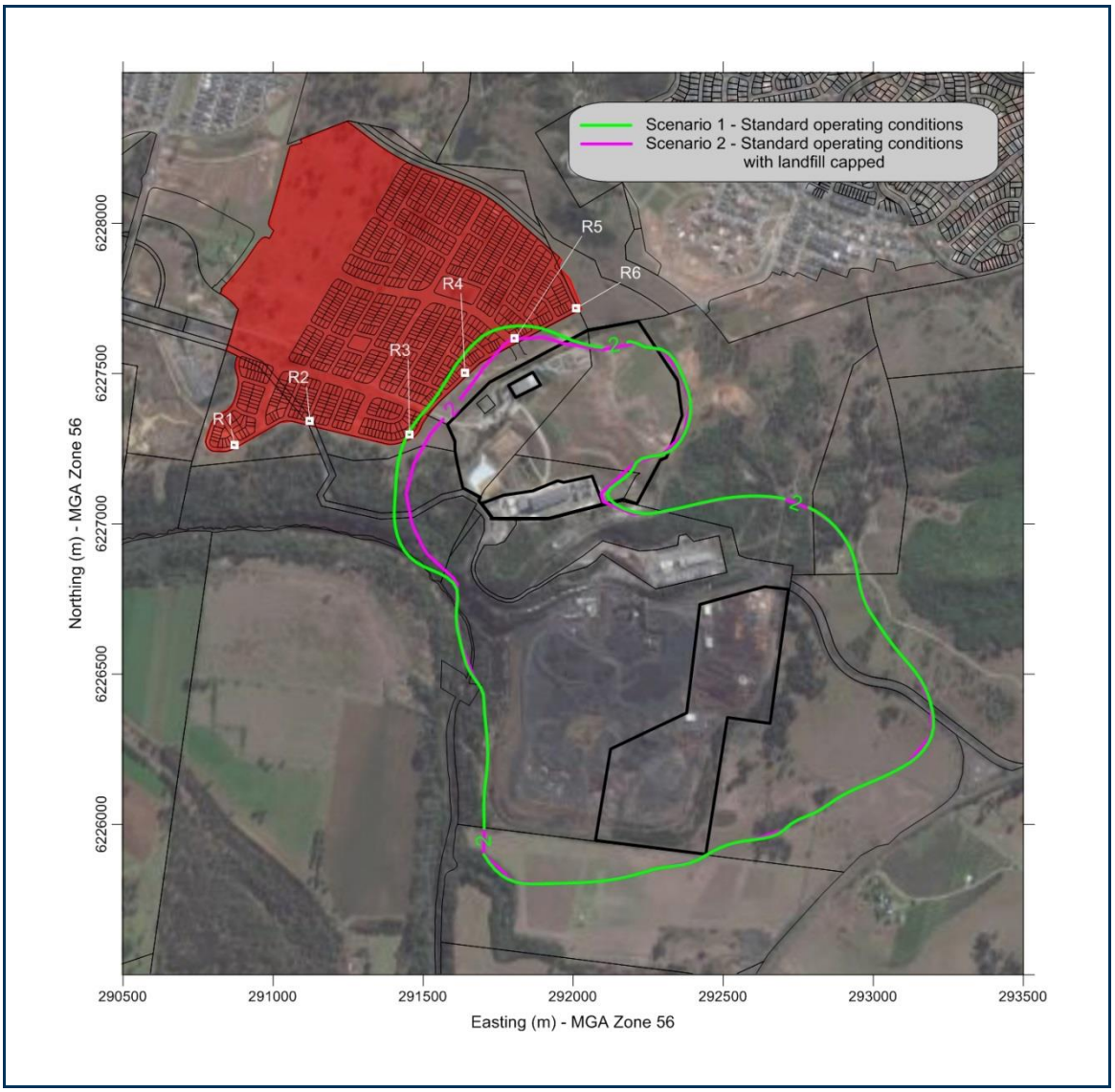

Figure 4: Predicted 99th percentile 2 OU concentration limit for each modelling scenario

Table 4: Predicted 99th percentile 1-hour average odour concentrations boundary receptors (with and without landfill)

Residence ID	Ground level odour concentration (OU) 99th percentile	
	With landfill	Landfill Capped
R1	< 1	< 1
R2	1	< 1
R3	2	< 2
R4	2	< 2
R5	2	2
R6	< 2	< 2

The results, which allow for additional windrow composting at Camden Soil Mix, indicate that there would be a reduction in odour concentrations at the proposed Spring Farm residential precincts 700 and 800, with the 2OU contour contracting from the boundary once the landfill has been capped.

SITA Officers met with Geoff Green, Manager Environmental Health and Mitch Perry on 21st January 2014, to discuss Council's submission.

Council noted their concerns surrounding potential odour and the unqualified impact of proposed additional composting operations on the development. It was agreed at the meeting that SITA would complete revised odour modelling to include the same parameters as modelled in the Air Quality and Odour Assessment prepared for Urban Growth, to ensure consistency. The results of this modelling are summarised above. It was also agreed that SITA would take a number of Council officers to the Spring Farm Facility to explain the development in more detail, as a number of officers involved in the project had not visited the site in recent years.

On the 3rd April 2014, eight Camden Council officers from the Planning and Environmental Health divisions of Council and one elected Councillor, Penny Fischer visited the Spring Farm site for a formal inspection of existing operations and proposed sewer routes. The response from the group was positive, acknowledging the improvements undertaken at the site over the past two years.

On the 8th April 2014, Councillor Fischer and Mr Geoff Green attended the Community Reference Group meeting chaired by SITA. At this meeting Councillor Fischer reported that she was not satisfied that SITA's modelling was thorough enough. Mr Green noted at this meeting that Council had opted to adopt the precautionary principle in their evaluation of this Development Application.

On the 11th of September 2014 SITA officers met with Geoff Green and Mitch Perry to inform that the additional odour assessment had been included in the submission's response and that the response would be soon lodged with the PAC.

4 Chris Patterson MP, Member for Camden

Letter to the Minister for Environment and Heritage dated 12 December 2013

The Member for Camden wrote to the Minister for Environment and Heritage supporting Camden Council's objection to the proposed Modification on the grounds of its potential odour impacts on the Spring Farm Residential Precinct. These issues have been addressed in the body of this response.

SITA senior personnel, Emmanuel Vivant (Executive Director of Infrastructure), Geoff Gerard (Sales Manager) and Nicolas Rampelbergs (Project Manager) have met with Chris Patterson to discuss the submission.

Mr Patterson expressed his concern regarding the history of odour complaints that arose from the facility. SITA explained that the tank farm was used to treat household waste and in fact never designed to efficiently process solid waste. SITA explained that the future use of the facility is fit for purpose, providing minor adjustments to the facility, to process liquid waste. .

In regards to Mr Patterson's concern, Pacific Environment has re-iterated its opinion expressed in its letter to Cardno of 4th December 2014 (Appendix E) with the following comments:

"(We) can confirm that the ground level odour concentrations due to emissions from the ARRT Facility alone, are not expected to exceed the EPA criterion of 2OU (99th percentile) at the additional Urban Growth precincts P700 and P800. This is indicated by the blue line in Figure 2 of the letter we wrote to you on 4th December 2014, which shows the ARRT facility is not a significant contributor to odour at the residential development boundary."

5 Roads and Maritime Services

Letter dated 29 November 2013

RMS wrote in response to a referral by Department of Planning and Infrastructure indicating that it raised no objection to the proposed Modification.

6 Sydney Water

Letter dated 25 November 2013

Sydney Water provided comments regarding connections of the SFRRP to sewer and relevant issues raised by Urban Growth with respect to potential conflicts with development at the Spring Farm Residential Precinct. Sydney Water indicated its agreement to approve an interim pump connection to sewer pending agreement with Urban Growth on a suitable rising main route. It was also indicated that a Trade Waste Agreement will be applicable to this development if approved.

Since receipt of this letter, Sydney Water has granted consent to an interim pump connection to sewer from the SFRRP site.

Appendix A

Jacks Gully Facility (Australia) Tank Farm Audit
(Suez Environment, April 2011)

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Jacks Gully Facility (Australia)

Tank Farm Audit 2011

Author: Gilles CARRAND

Date: 15th April 2011
O/Ref.: PAE/AT/Mmo/042R_11

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Title: Jacks Gully facility (Australia) Tank Farm Audit 2011

Author: Gilles CARRAND **Date:** 15th April 2011

WASTEWATER & ENVIRONMENT DIVISION

Typology: Technical Assistance Report

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KEY WORDS:
Anaerobic digestion
Sludge processing
Combined Heat and Power
Technical optimisation

Confidentiality level

B

EXECUTIVE SUMMARY:

The household waste treatment and recycling facility was built in 2008 by WSN and is designed to take 90,000 tons of raw product annually. The load currently treated is about 52,000 t/year.

The biological treatment system for organic pulp is apparently in good condition and is operated by competent, motivated personnel.

However, the types of equipment installed do not always correspond to their usual applications in the profession, leading to major operating difficulties. A functional audit was therefore carried out from 21 to 25 March 2011.

After a detailed examination of the facility, it would seem that the biological treatment system currently installed uses a proven but extremely sophisticated technology, one that is above all highly sensitive to the suspended solids content of the organic pulp prepared in the sorting hall.

To make the current arrangement more efficient and far more robust, various solutions could be imagined, according to the organic material recycling objectives and the improved operating stability at realistic cost in the biotreatment facility.

Prior to any modification of the existing system, it is important to point out the major handicap which is the absence of a discharge pipe to a conventional sewerage network. All discharges are currently taken away by 7 to 10 trucks every day, which pass through increasingly dense residential areas, and which are in addition to the household waste collection trucks.

We therefore strongly recommend looking at the possibility of rapidly installing a discharge pipe and negotiating the cost of processing the discharge with the relevant local authorities.

The following possible option for improvement of site operations could therefore be envisaged:

- stop producing pulp in the sorting hall and use UASB digesters to process external effluents with a high level of dissolved pollution (effluents from agro industries such as breweries, sugar mills, dairies, distilleries, starch transformation plants, etc.), brought to the site by tanker trucks; requires only minimal modifications to the existing equipment and allows use of the biogas produced in addition to that of the landfill for operation of the existing CHP systems.

It is clear that treatment of external fat-free effluent from the agro industries leads to the minimum amount of rehabilitation and modifications, which implies a relatively short return on investment time (excluding transport).

The installation of a discharge pipe connection to the sewerage network would make operation of the entire plant significantly easier.

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1. PLANT DESCRIPTION

1.1 General overview

The household waste treatment and recycling facility was built in 2008 by WSN and is designed to take 90,000 tons of raw product annually. The load currently treated is about 52,000 t/year.

The facility comprises numerous automatic screening and manual sorting stages, for separating and recycling plastics, ferrous metals, aluminium, paper and textiles.

The organic fraction is extracted by a closed-loop water circuit with an adjacent specific treatment unit on the site. This organic fraction is thus partly transformed and reused in the form of biogas, which is converted into electricity in two cogeneration units (CHP) of 1400 kW each.

A green waste composting unit comprising ten ventilated tunnels completes the picture.

The facility comprises no discharge pipe and the mixture of leachate from the landfill, rainwater and discharges from the plant are taken away by truck to an outside waste treatment plant.

The entire facility is located on the edge of a technical landfill, from which some of the biogas is also sent to cogeneration.

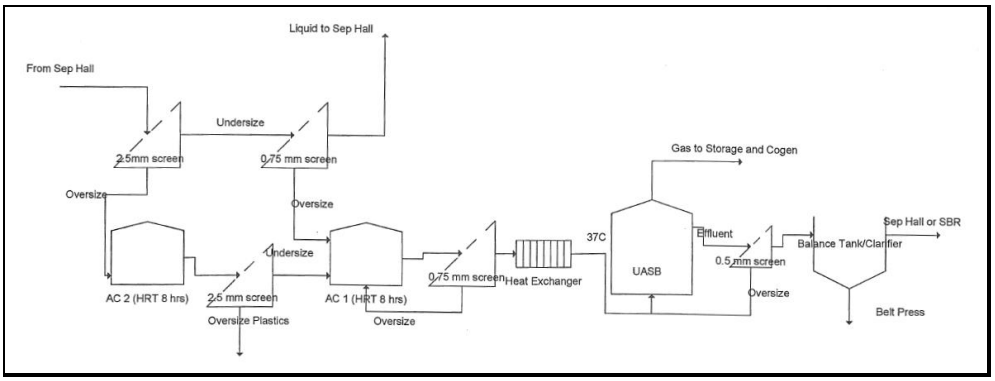
Facility general view

The site and its management were taken over by SITA Australia on 1st February last.

The biological treatment system is experiencing operating difficulties and a functional audit was carried out from 21 to 25 March.

1.2 Biological treatment

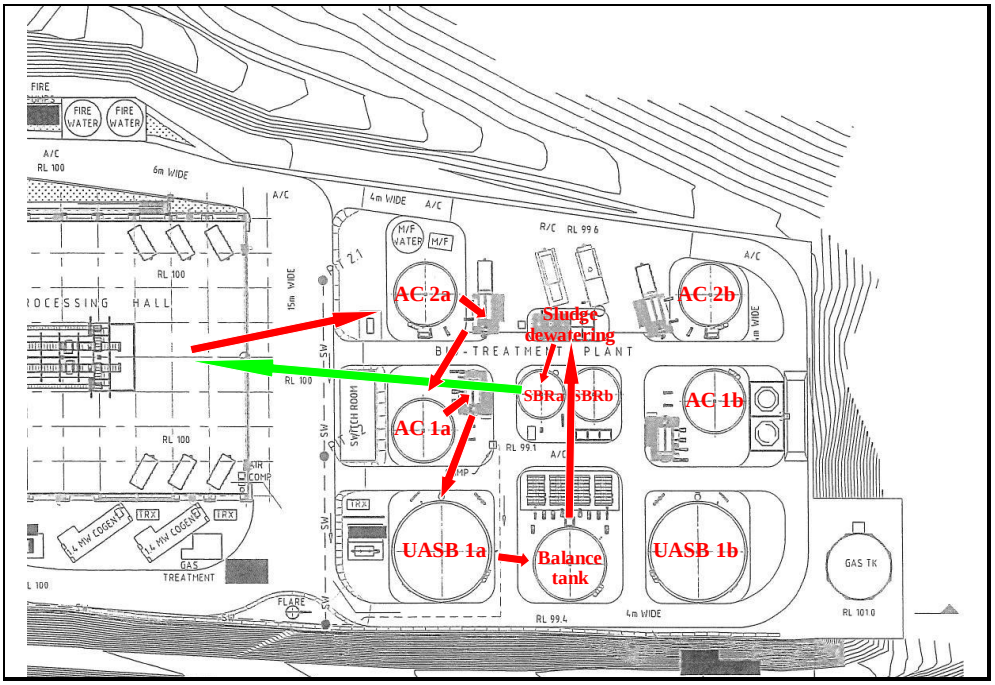
The organic liquid mixture (raw pulp) from the sorting centre is screened at 2.5 mm and then 0.75 mm. The liquor collected is kept in two consecutive tanks per train, for acidogenesis fermentation. After final screening at 0.75 mm, the pulp hydrolysed to about 30 g/l suspended solids is heated to 37°C and sent for UASB (Upflow Anaerobic Sludge Blanket) digestion for methanisation of the carbonaceous matter. The digested pulp is then dewatered on a belt press filter before being sent for composting. The dewatering liquor is treated using SBR (Sequencing Batch Reactor) type biological aeration to reduce it nitrogen ammonia concentration before being sent for recycling to the sorting hall.



Water treatment process (UniQuest report)

The circuit consists of two almost identical trains working in parallel. Only the sludge dewatering unit is unique and common to both trains.

The liquids circuit between the various site equipment items is presented in the following diagram:



Flow scheme of the treatment process (line a)

The four acidogenesis (AC) tanks have a useful volume of 1000 m^3 each and the UASB 3000 m^3 each. The volume of the biogas storage gasometer is 570 m^3. The SBRa has a volume of 300 m^3 and is aerated by a 900 Nm^3/h blower with flexible membrane tube diffusers. The SBRb has a volume of 400 m^3 with two 900 Nm^3/h air blowers and comprises flexible membrane disc diffusers.

The sludges are strained through two Strainpress® with holes (far more efficient than slots) from Huber. After conditioning of the polymer, the digested sludges are dewatered on a Siemens band press filter 2.50 m wide (unusual size, to be checked).

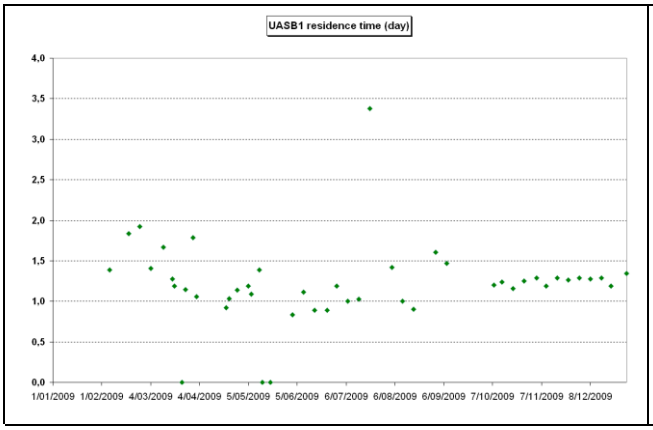
To warm up the pulp to be digested during maintenance shutdowns of the two cogenerators or if extra heat is needed in the winter, there is provision for two mixed biogas/fuel boilers of 2000 kW each, and four spiral exchangers (the best technology!) from Alpha-Laval.

All the equipment is generally of a brand well-known within the profession and most is in apparently good working order.

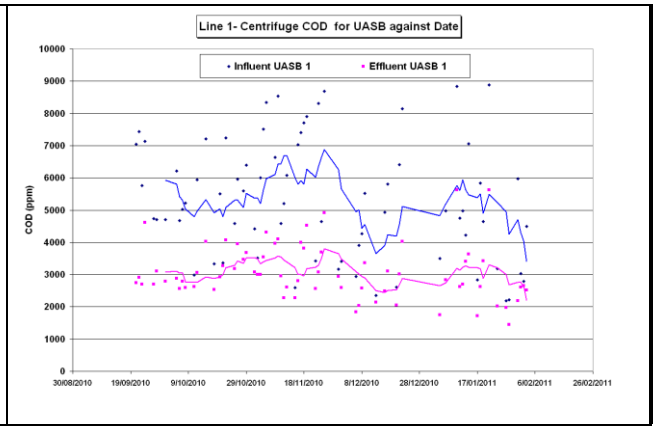
2. PRESENT CAPACITY AND PERFORMANCE

2.1 Operational results

Despite a relatively stable hydraulic residence time, consistent with the design, the apparent UASB results are extremely variable:

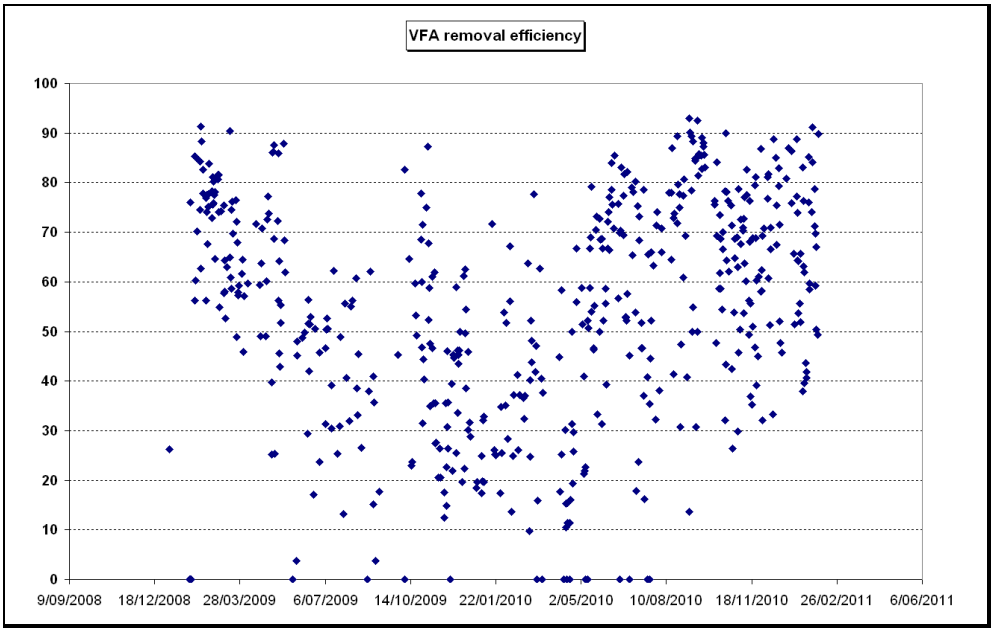


UASB 1: hydraulic residence time



UASB 1: COD removal

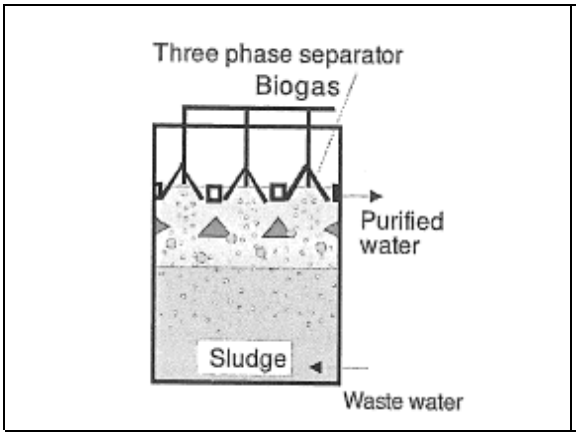
As for the efficiency of removal of volatile fatty acids in the UASBs, this is also highly unstable, with considerable fluctuation amplitude from one analysis to the other:



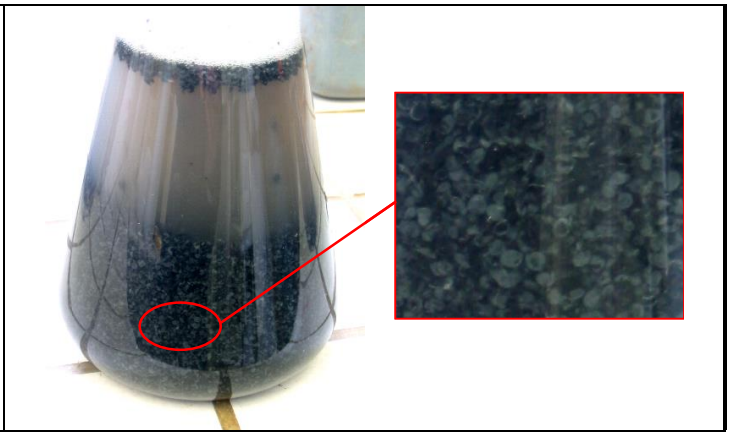
UASB 1: VFA removal efficiency (%)

The UASB (Upflow Anaerobic Sludge Blanket) type digestors consist of a sludge bed a few metres thick, at the bottom of which the liquid to be treated is uniformly distributed and in a few hours regularly moves to the top of the device. The biological sludges consist of granulated methanogenic sludge which remains in the structure simply under the effect of its own weight.

A three-phase separator at the top of the device is a means of separating the biogas, the treated liquid and the few granules that attempt to escape.



UASB: sludge bed bioreactor



Example of granulated methanogenic sludge

In fact, as was most diplomatically pointed out in the report from the BECA engineering firm and that from the University of Queensland, the UASB digesters are not used on this site in the way for which they are normally designed.

These devices are in fact specifically designed to eliminate the pollution **dissolved** in a clear liquid, in other words with a maximum suspended solids content of 1 g/l. However, the average concentration applied on the two devices fluctuates between 20 and 30 g/l!

Moreover, owing to the closed-loop operation, the concentration of dissolved salts is very high and increases the hydrodynamic lift of the fluid, making natural settling of the granules at the bottom of the structure even more difficult.

Consequently, the granules of methanogenic biomass are regularly entrained with the fluid passing through and eliminated from the digestors by the excessively thick and viscous pulp introduced into the two devices.

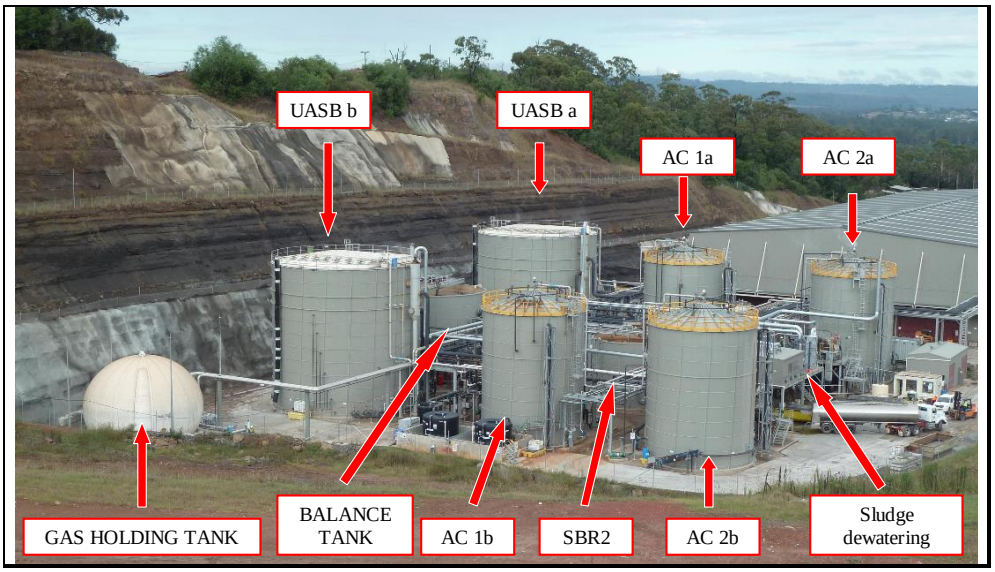
As it takes a very long time to reconstitute the granules, their excessive elimination leads to serious malfunctions in anaerobic digestion.

The sludge must either therefore be separated from the liquid to be treated before it is sent to the UASBs, or the digestion technology needs to be changed, with direct treatment of the organic pulp after having increased its concentration.

2.2 Biotreatment Tank Farm review

At the time of the facility visit, the organic pulp preparation system in the process hall was stopped and was nearing the end of an intensive cleaning process.

The biological treatment device is installed in the most deep-set part of the plant and at present has the following appearance:



Tank farm general overview

The acidogenesis 2 tank on train "a" was being drained. The pump located at the bottom of the tank had been connected to a 1mm rotating screen to extract and eliminate all deposits at the bottom of the structure.

AC2 extraction pump

1 mm rotating screen

Although slotted rather than with holes, the rotating screen extracted a large quantity of absolutely non-fermentable materials, the presence of which hinders acidogenesis and reduces the useful volume of the tank, wears out the pumps and runs the risk of clogging the transfer networks.

The efficiency of the upstream screens will need to be checked before restarting the organic pulp production system.

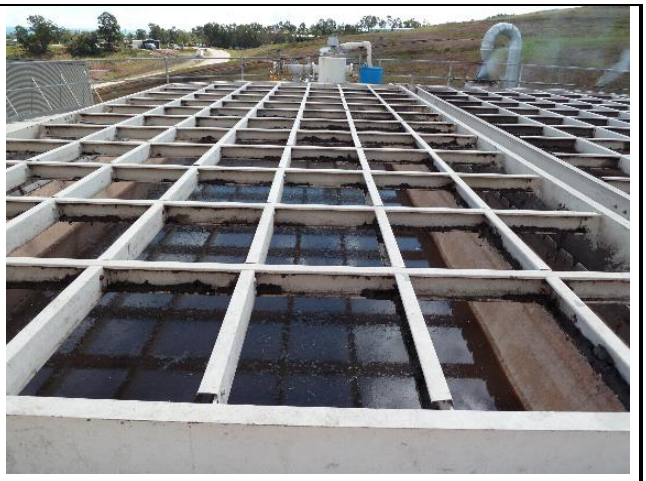
Rotating screen: details of the slits

View of the deposits removed from AC2

The UASB digesters were also being cleaned. As previously explained, this type of device is normally designed to treat liquid products with low suspended solids concentrations (< 1 g/l). This low level of concentration cannot be obtained by screens in financially acceptable conditions.

During anaerobic digestion, the methane produced adheres in the form of very small bubbles to the suspended solids and immediately causes them to float on the surface. This phenomenon inevitably leads to fouling of the three-phase separators and clogging of the transfer pipes.

Top of UASB before cleaning



Top of UASB after cleaning

It would therefore be advisable to insert a flotation unit upstream of the UASBs, to separate the liquid fraction from the raw pulp and to treat only this in this type of digester.

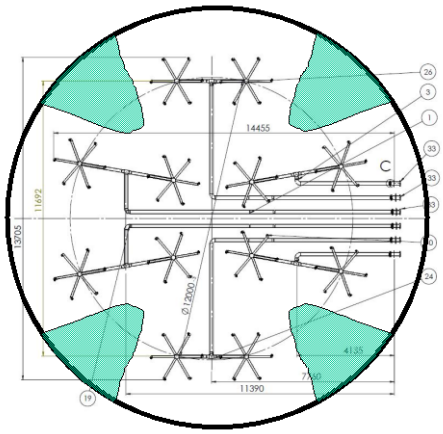
Examples of typical aspect of UASB treated effluent

However, this separation will remove a large quantity of methanisable organic matter from the circuit, which represents a regrettable loss of potential biogas (at least 50%).

Recycling this organic matter in the acidogenesis tanks to increase the solubilisation of the organic matter is however undesirable as this would entail over-sizing the flotation unit and run the risk of causing a drop in pH to 4.5 to 5, owing to the increased concentration of volatile fatty acids. The methanogenic bacteria no longer work at pH levels below 6.5. Compensating the pH with soda increases the salt concentration and will be extremely expensive owing to the quantities needed.

It would be wiser to install sludge digesters specifically designed for this purpose.

Last point: the hydraulic distribution system on the floor of the UASBs leaves large turbulence-free areas in which harmful deposits could build up (green zones in the following diagram). Moreover, the distribution tubes end in elbows (see photo). As all of these elbows are angled in the same direction, this will lead to significant twisting torque on the central weld of the distribution block. To avoid this harmful phenomenon, all these screw elbows should be replaced by "Tees" of the same size.



UASB bottom pipe distribution system

Each digester is correctly equipped with a double pressurisation/pressure drop valve at the top of the structures. However, there is no lockable isolation valve to be able to check the pressurisation/pressure drop calibrations every year.

For some strange reason, the two SBRs are not identical:

SBR 1 (300 m^3)

SBR 2 (400 m^3)

The aeration system in SBR1 (flexible membrane tubes and single air blower) is in a very poor condition and it would be worth replacing it with one identical to that of SBR2 (flexible membrane discs and double blower). This would improve the currently extremely limited capacity for treatment of the residual pollution at the UASB output (carbonaceous but above all nitrogen pollution).

The anti-foam spraying system is a good idea and avoids having to use costly and biologically harmful reagents.

The balance tank requires good cleaning of the bottom of the structure prior to any restart.

Aerial view of the 2 SBR

Balance tank

The Strainpress strainers installed are the best on the market. The saturation problems encountered come from saturation of the upstream strainers which are significantly under-sized for the current use.

It is vital that these Strainpress be retained in the process.

Strainpress® (HUBER technology)

The sludge dewatering belt filter press seems to be in excellent condition. According to local data, the belt width is 2.50 m which is unusual from this supplier. The actual width therefore needs to be precisely checked.

Belt filter press (Siemens)

The initial heating of the liquor before anaerobic digestion uses two twin-energy boilers (biogas/fuel oil), which is an excessive solution, because normally only the burners are doubled.

The flare is also considerably oversized and designed for 1400 m^3/h, which is more than twice the maximum production capacity of the two UASBs supplied by the liquor whose COD is apparently 80% degraded (external liquor rich in sugar for example, whereas the normal degradation of the organic liquor from the sorting hall is generally close to 50%).

Dual fuel heating system

Flare

The flexible gasometer is conventional and is the best brand currently available on the market.

Its 570 m^3 capacity is strangely low, representing only about fifty minutes of consumption by the two CHP, whereas a minimum of three hours is usually recommended. However, as the biogas from the landfill is permanently available, this low capacity has little impact in practice.

The check-valves on the pressurisation fans need to be checked quickly, because one of the machines was being driven by air from the other.

The ends of the condensate bleeds should be immersed about 40 cm into the collection tank (if 30 mbar pressure planned for the gasometer). This would enable the valves to be left open, making bleeding automatic, thus eliminating any risk of omission by the operators.

Air blowers of biogas holding tank

Condensate bleed valves

The two CHP are in excellent condition and of a brand well-known for its robustness. The biogas is correctly thermally treated to eliminate the residual humidity. It would be useful to have the biogas analysed twice a year to check that the level of H_2S and above all siloxanes is very low, as these are particularly harmful for combustion engines.

Double Jenbacher 1400 kW CHP

Summary: most of the equipment examined during the site visit is of an excellent brand and most is also in good condition. Only the choice and dimensioning of the processes need to be closely reviewed prior to any restart.

3. RECOMMENDATIONS

The biological treatment system currently installed uses a proven but extremely sophisticated technology (UASB) that is highly sensitive to the suspended solids in the organic pulp prepared in the sorting hall.

As the composition of household waste is by its very nature extremely variable in terms of organic matter, management of the biological system will require a lot of time and attention on the part of the operators, for a result which is disproportionate to the efforts made. Furthermore, and although primarily of recognised brands, the equipment is subject to considerable stresses requiring frequent and costly replacement.

To make the current arrangement more efficient and more robust, the following solution could be envisaged, in order to provide improved operating stability of the biotreatment facility at realistic cost.

The cost of the electrical energy consumed is at present 75 Australian dollars per 1000 kWh.

A single 1400 kW cogeneration unit at maximum permanent operation therefore saves $2520 per day, or a maximum of about $780,000 / year for a conventional CHP availability of 85% of the time.

Prior to any modification of the existing system, it is important to point out the major handicap, which is the absence of a discharge pipe to a conventional sewerage network. All discharges are currently taken away by 7 to 10 trucks every day (landfill leachate, rainwater collected on the site, internal effluent from cleaning of floors and equipment, operator showers and toilets, salt dilution of biotreatment liquor, etc.).

We therefore strongly recommend looking at the possibility of rapidly installing a (corrosion resistant) discharge pipe and negotiating the cost of processing the discharge with the relevant local authorities.

The proposed improvement is summarised as follows, and described in further detail in Section 3.1 below :

- Stop producing pulp in the sorting hall and use the UASBs to process external effluents with a high level of dissolved pollution (effluents from agro-industries such as breweries, sugar mills, dairies, distilleries, starch plants, etc.), brought to the site by tanker trucks.

- This requires only minimal modifications to the existing equipment and allows use of the biogas produced, in addition to that of the landfill (less rich in methane), for operation of the existing CHP systems.

3.1 External products treatment

A possible solution for using the biotreatment facility would be to utilise the structures, modifying them as little as possible, and using them to treat agro-industry effluent with a low level of suspended solids and a high concentration of dissolved carbonaceous pollution.

These effluents could come from breweries, dairies (concentrated fat-free whey), fruit juices and/or sweetened drinks (sodas), distilleries, starch transformation industry. Only fats and oils would have to be excluded from the range of nutritive matter usable in the UASB.

To obtain acceptable transport costs in the light of the electrical energy supplied by methanisation, these effluents should have a concentration of at least 80 to 100 gCOD/l.

This solution would avoid having to use the entire pulp production system and save the corresponding very high maintenance and personnel costs.

The effluents will be analysed to identify their carbon, nitrogen and phosphorus concentrations, to be able to balance them if necessary by mixing the various sources to maintain suitable anaerobic C/N/P of 350/5/1.

As these effluents at present have to arrive by truck, and only on working days, the treatable volumes will necessarily be limited.

With about 14 trucks per working day, or about 280 m^3/d, this will enable 400 m^3 to be stored for the week-end and it will be possible every week to treat an hourly rate of 1.67 m^3/h. This very low rate means that the digestion system will need to be equipped with internal recirculation to maintain an upwards speed of about 1 m/h, that is 200 m^3/h to be able to ensure relatively uniform distribution on the ground.

A UASB digester is capable of treating about 10 kgCOD/m^3/day, or 30 tons per day, per structure.

The elimination efficiency normally observed is at least 80%, which means that the SBR will have to eliminate 6 tons of COD per day.

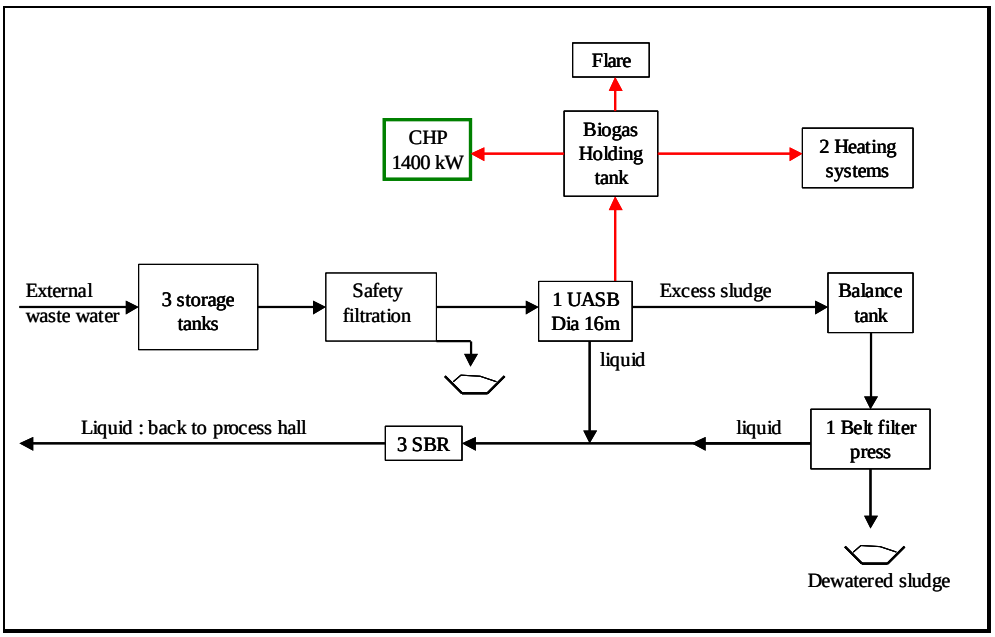
The aeration systems can however at best only provide 2100 kgO_2/d. Nonetheless, if the pollution to be treated is essentially carbonaceous, there will be no nitrogen to eliminate and the oxygen demand will be reduced accordingly. As in the previous solutions, it will then be sufficient to transform an old acidogenesis tank into an SBR to be able to treat a total of 3 tons of COD per day. In this treatment configuration, the SBR are the limiting factor in the system and will require that only a single UASB is operating, at reduced load.

Consequently, the load eliminated by just one of the two UASB will be reduced to about 15 tons of COD per day, or an applied load of 18.8 tons of COD daily.

In the 200 m^3 treated, this represents a concentration of about 94 gCOD/l of agro-industry effluent received, which is relatively consistent with the effluents from the industries previously mentioned.

As deposits can occur in the storage tanks and/or in the transport trucks, it will be prudent to systematically carry out 1mm filter screening of the products to be treated on one of the existing rotating screens.

The following functional diagram shows the various equipment items on the circuit:



Process flow diagram

About 130 tons of dewatered sludge at 18% dryness will be produced per week.

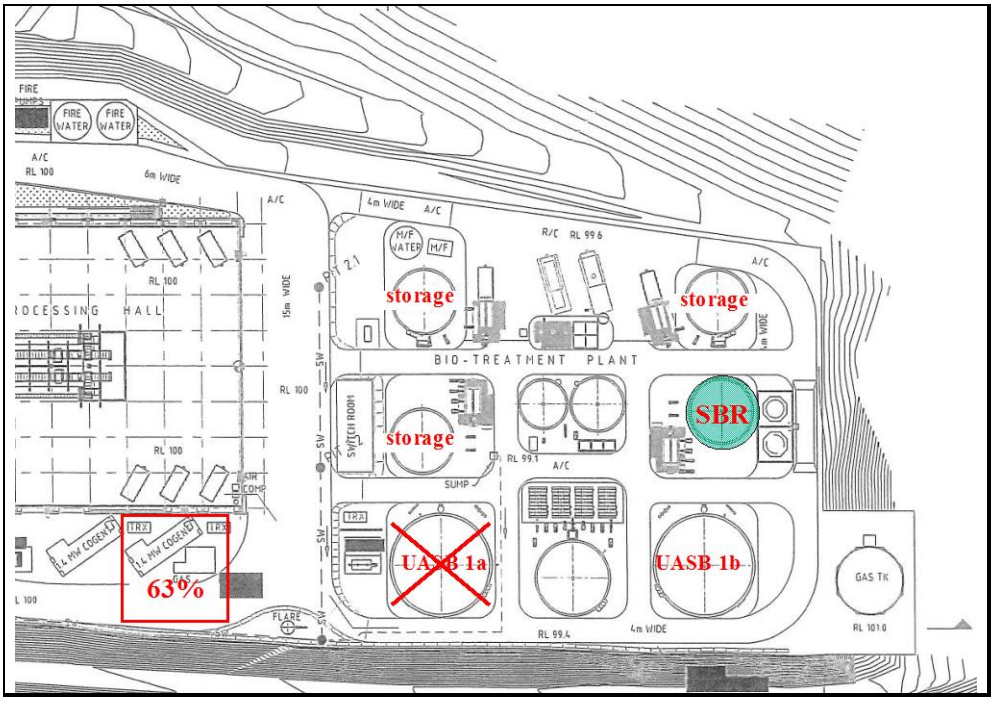
There should be no need for potable water, but as the liquid input will obviously have to be evacuated, it will need to be carried by 14 trucks per working day, in other words, each truck bringing in the effluent to be treated will have to leave with a treated effluent load (transport cost per truck of about $400).

The annual cost of round-trip transport would be about 1.4 million Australian dollars.

With this solution, installing a drainage pipe to a sewerage network is therefore particularly vital.

When installing this drainage pipe, it could be useful to install in the same trench a second smaller-diameter pipe (150 mm) which would make it possible to pump the effluent to be treated from a collection station to the facility, thereby avoiding having large trucks passing through the residential areas around the plant. This would limit the cost of bringing in the agro-industry effluents accordingly.

Here again, all these modifications and new structures will be laid out as follows:



General footprint

In total, the cost of installing/modifying structures and of additional equipment (excluding transport) would be about **0.5** million Australian dollars (to be compared with the $492,000 / year of energy produced by cogeneration at 63%).

3.2 Summary

It is clear that treatment of external fat-free effluent from the agro-industries leads to the minimum rehabilitation and modifications, which implies a relatively short return on investment time (excluding transport).

The installation of a discharge pipe to a sewerage network would make operation of the entire plant significantly easier.

Appendix B

Macarthur Resource Recovery Park –
EcoLibrium Mixed Waste and Organics Facility.
Operational Environmental Management Plan.
(WSN Environmental Solutions, June 2008)

Cardno
Shaping the Future

WSN ENVIRONMENTAL SOLUTIONS

Macarthur Resource Recovery Park – Ecolibrium Mixed Waste and Organics Facility

Operational Environmental Management Plan

JUNE 2008

Prepared by:
WSN Environmental Solutions

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Our Reference: F3529

Revision	Revision Date	Details	Prepared by:	Reviewed By:	Approved By:
			Name/Position	Name/Position	
A	November 2007	First Draft	**D.Stuckey** Environment and Workforce Safety Officer.	**I. Tsui** – Process Engineer **J.Vyse** – Product Manager	
B	February 2008	Second Draft	**R. Muir** Environment and Workforce Safety Officer	**C.Munro** – General Manager Strategic Projects **A.Johansson** – General Manager Liquid Treatment **V.Singh** – Operational Support Manger **J.Vyse** – Product Manager **J.White** – Technical Manager Environment **B.Bailey** – Operations Manager **I.Tsui** – Process Engineer	
C	February 2008	Draft for External Consultation	**R. Muir** Environment and Workforce Safety Officer	**C.Munro** – General Manager Strategic Projects	**C.Munro** – General Manager Strategic Projects
D	June 2008	Revised Draft for DOP Approval	**R. Muir** Environment and Workforce Safety Officer	**C.Ritchie** – DOP Manager Manufacturing and Rural Industries **S.Beaman** – DECC Manager Waste Operations **J.Hunt** – DWE Senior Projects Planner **S.Morris** – Camden Council Director Development & Environment **B.Bailey** – Operations Manager **I.Tsui** – Process Engineer	**C.Munro** – General Manager Strategic Projects
E	June 2008	Final Report	**R. Muir** Environment and Workforce Safety Officer	**B.Bailey** – Operations Manager **I.Tsui** – Process Engineer	**C.Munro** – General Manager Strategic Projects
F	August 2008	Final Report Approved	**R. Muir** Environment and Workforce Safety Officer		**C.Munro** – General Manager Strategic Projects **C.Ritchie** – DOP Manager Manufacturing and Rural Industries (As delegate for the Director General).

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2. LIST OF ABREVIATIONS

AWT	Alternate Waste Technology
CAC	Community Advisory Committee
DA	Development Application
DECC	Department of Environment Climate Change
EMPIRE	Environmental Management Planning and Information Repository
EMWOF	Ecolibrium Mixed Waste and Organics Facility
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
IMS	Integrated Management System
LEMP	Landfill Environmental Management Plan
MRF	Material Recovery Facility
MRRP	Macarthur Resource Recovery Park
MSW	Municipal Solid Waste
OEMP	Operational Environmental Management Plan
OU	Odour Unit
POEO	Protection of the Environment Operations Act
SVDOF	Small Vehicle Drop Off Facility
SOP	Standard Operating Procedure
UASB	Upflow Anaerobic Sludge Blanket
WRC	Waste and Recycling Centre
WSN	WSN Environmental Solutions

3. SCOPE AND OBJECTIVES

3.1 BACKGROUND

WSN Environmental Solutions (WSN), the owner and operator of the Macarthur Resource Recovery Park (MRRP), have prepared this Operational Environmental Management Plan (OEMP). This OEMP has been prepared to mitigate potential environmental impact during the operation of the Ecolibrium Mixed Waste and Organics Facility (EMWOF).

The MRRP is situated in Narellan within the Camden Local Government Area, approximately 55km south west of Sydney. The site is reached from an access road that turns off Richardson Road, Spring Farm. The operation covers an area of approximately 36 hectares. Around 22 hectares of the site has been landfilled or is designated for future landfilling and the site is also host to a Small Vehicle Drop Off Facility (SVDOF) and the newly established EMWOF.

This OEMP focuses on the operation of the Ecolibrium Mixed Waste and Organics Facility (EMWOF), which was established within the southwestern corner of the existing landfill and operates under a separate Environment Protection Licence (No. 12588). The location of the EMWOF and adjoining operations is shown in Appendix 1.

The Mount Annan housing development is currently approximately one kilometre to the north-east of the site, and it is expected to expand towards the facility within the area zoned residential 2(a) immediately to the northeast of the site. The nearest residence is situated to the west, at the corner of the access road and Richardson Road, just over a kilometre from the site entrance.

In September 2006, WSN was given DA approval (DA 05_0098) for the construction of the EMWOF. The development consists of an anaerobic digestion type plant which is capable of processing 90,000 tonnes per annum municipal solid waste (using the patented ArrowBio technology from Arrow Ecology), plus a tunnel composting plant to process up to 30,000 tonnes per annum of separated garden organics and biosolids.

Activities undertaken within the EMWOF include:

- Materials separation and removal of recyclables from the municipal waste stream;
- Biological treatment of the organic fraction of the municipal waste stream;
- Generation of green electricity to supply the energy grid;
- Production of stabilised sludge / soil conditioner; and
- Production of high quality compost from garden organics and biosoilds.

This OEMP has been prepared to address those environmental mitigation and management measures, which will be implemented by WSN during operation of the EMWOF. This plan will be continually reviewed by WSN and performance regularly audited to ensure compliance throughout the operational life of the site.

3.2 SCOPE

This Operational Environmental Management Plan (OEMP) is to provide a basis for the effective management of environmental issues at the site ensuring that management and all staff are aware of their environmental obligations during operation of the EMWOF. The OEMP identifies the processes and actions that have the potential to cause environmental harm or impact on the amenity of surrounding residents and businesses.

It also outlines the measures to be undertaken in order to mitigate or minimise potential environmental impacts and addresses the specific conditions outlined within both the Development Consent and Environment Protection Licence conditions that apply to the operation of the site.

Additionally this OEMP provides an overview of the WSN Corporate Environmental Management System requirements (part of the overall WSN Integrated Management System) relating to the EMWOF established at the Macarthur Resource Recovery Park, and provides a management framework to effectively manage the environmental and other operational activities that may have an adverse effect on the environment.

Other activities that occur at the Macarthur Resource Recovery Park (*not addressed in this OEMP*) include:

- Landfill operations;
- Materials Recovery Facility (MRF);
- Small vehicles transfer station;
- Resource Recovery Centre; and
- Visitors Centre.

Each of the operational facilities listed above are addressed within separate Environmental Management Plans, and are also covered by the WSN Corporate Integrated Management System.

3.3 ENVIRONMENTAL MANAGEMENT OBJECTIVES

Objectives

The principle environmental management objectives are:

- To minimise the overall environmental impact of the facility;
- Identify and initiate environmental mitigation measures where required;
- Manage and respond to potential complaints;
- Report as required and maintain appropriate environmental monitoring records; and
- Ensure that all staff are aware of their responsibilities and appropriately trained in minimising and mitigating environmental impacts.

Further details on environmental management objectives and strategies are provided in sections 9.1 to 9.5. This plan addresses the above stated environmental management objectives and is designed to provide guidance to all staff during the operation of the facility to ensure that the relevant environmental legislation is satisfied. This plan outlines mitigation and monitoring strategies which will ensure compliance with the development Conditions of Consent and establishes a management framework to ensure these are implemented.

3.4 LEGAL AND REGULATORY REQUIREMENTS

3.4.1 Environmental Protection Licence

The EMWOF will operate in accordance with the conditions set out in Environmental Protection Licence (EPL) 12588.

The licence authorises the carrying out of the scheduled activities "Waste Storage, Transfer, Separating or Processing", Composting and Related Reprocessing or Treatment. A copy of the licence (No. 12588) is attached in Appendix 2.

The POEO Act requires that the DECC review the licence at least every 5 years after it's issue, as set out in Part 3.6 of the POEO Act.

The existing Landfill and MRF, located adjacent to the EMWOF, will continue to operate in accordance with the conditions set out in the respective site licence covering these areas.

3.4.2 Environmental Legislation

The following NSW legislation applies to the Municipal Solid Waste Processing and Organics Processing operations:

- Protection of the Environment Operations Act 1997 (POEO Act)
- Protection of the Environment Administration Act 1991
- Waste Avoidance and Resource Recovery Act 2001
- Environmental Planning and Assessment Act 1979
- Environmentally Hazardous Chemicals Act 1985
- Pesticides Act 1999
- Public Health Act 1991
- Ozone Protection Act 1989
- Protection of the Environment Operations (Noise Control) Regulation 2000
- Protection of the Environment Operations (Penalty Notices) Regulation 1999
- Protection of the Environment Operations (Waste) Regulation 2005
- Dangerous Goods Act 1975

3.4.3 Conditions of Consent

On the 7th of September 2006 consent was provided by the Minister for Planning for the construction of the EMWOF. Project approval is subject to the Conditions of Consent. Of these conditions some are relevant to the construction of the Facility while others are relevant to the final commissioning and operation of the Facility.

Those conditions which are relevant to operation of the EMWOF are summarised in Appendix 3, along with a copy of the Site Conditions of Consent in Appendix 4.

4. SITE DESCRIPTION

4.1 FACILITY DESCRIPTION

4.1.1. Location

The EMWOF is sited adjacent to the pre-existing Jacks Gully landfill site, which is located in the Camden Local Government Area of Sydney. It is approximately 55 kilometres south-west of the Sydney CBD and 5 kilometres south-east from

Campbelltown CBD. The area surrounding the facility includes the suburbs of Spring Farm to the west, Mt Annan to the east, Narellan Vale to the north and Glenlee and Menangle to the south. A map displaying the facility location is provided in Appendix 1.

4.1.2 Site Characteristics

The EMWOF comprises of two main plants, these include:

1. An ArrowBio technology plant, which can process up to 90,000 tonnes per annum of MSW (Municipal Solid Waste) using mechanical and water based separation methods to recover recyclable materials and an anaerobic digestion process to treat the organic fraction of the MSW stream and produce biogas suitable for electricity generation.

2. A Garden Organics Composting Plant capable of processing up to 30,000 tonnes per annum of separated green waste, biosolids and other organic materials into a high-grade compost material.

The main components of the EMWOF include:

- MSW receival building;
- Main MSW processing building, housing MSW separation area, baled product storage and primary refining;
- Tank farm comprising equipment including digester tanks, water tanks, dewatering systems, chemical storage tanks and biogas storage tank;
- Biogas power station generators, transformers and switchrooms;
- Garden organics receival building;
- Garden organics shredding and processing area;
- 10 composting tunnels;
- Odour treatment / biofiltration area; and
- Product loading area.

A plan showing the site layout is provided in Appendix 5

4.1.3 Access and Internal Roads

Access to the site is from Richardson Road. Traffic is directed along a private access road before proceeding to the main Macarthur Resource Recovery Park weighbridge. After crossing the weighbridge traffic destined for the EMWOF is directed across the closed areas of the existing landfill and onto the EMWOF platform.

The internal road system at the Facility is designed to allow clear separation of vehicles entering, exiting and accessing various parts of the site. The internal road system is all weather, with line markings and signage to aid traffic flows, a traffic movement plan is provided in Appendix 6.

4.1.4. Office and Weighbridge

The weighbridge office is situated at the main entrance to the Macarthur Resource Recovery Park for the purpose of controlling vehicle movement to and from the site. Weighbridges are located on either side of the office on the entrance and exit roads.

4.1.5 Amenities and Utility Services

Amenities rooms adjoin the Garden Organics Composting Plant and are also located within the ArrowBio Technology Plant at the EMWOF. These facilities are provided for operating staff and include a site operational control room, laboratory, lunchroom, toilets, showers and administration offices.

4.1.6 Manoeuvring Area

At the Western end of the Garden Organics Composting Plant is a large area for the manoeuvring of transfer vehicles. Manoeuvring areas in front of the MSW and Garden Organics receival buildings are also provided to allow adequate turning space for vehicles unloading materials into the Facility.

4.1.7 Signs, Fencing, Security and Parking

Directional and speed limit signage are erected at the Macarthur Resource Recovery Park site entrance. Once beyond the main entrance additional signage provides information on hours of operation, types of materials accepted and excluded, charges and other relevant information. Extra signs have been erected within the site to direct traffic and facilitate safe passage of vehicles.

A two metre high fence surrounds the Macarthur Resource Recovery Park. Security gates are located at the site entrance.

A total of 20 car parking spaces are provided at the EMWOF for use by staff and regular visitors. These spaces are located adjacent to the ArrowBio Technology Plant. Large organised tours with groups of visitors will be directed to the Visitors Centre located near the Macarthur Resource Recovery Park weighbridge.

4.1.8 Drainage

With the exception of the landscaped areas all operational areas of the site are sealed, this assists drainage control and minimises the potential for sediment mobilisation. There are two main elements to drainage control these are "wastewater" and "storm-water runoff". Further details are provided in Section 9.

4.1.9 Landscaping

The northern perimeter of the site and selected internal areas near the EMWOF entrance are landscaped. A mixture of trees, shrubs and ground cover endemic to the area have been chosen to improve the visual amenity of the site. The carefully selected location of the Facility ensures that it is not visible from any of the current or future adjoining residential areas nearby. Further details are provided in Section 9.5 and Appendix 13.

4.1.10 Site Services

The EMWOF is connected to a main potable water supply, telephone and electricity systems. A sewer connection is not provided however all amenities are connected to a Council approved Bioseptic treatment system located adjacent to the site entrance.

5. INTEGRATED MANAGEMENT SYSTEM

5.1 OVERVIEW

WSN Environmental Solutions asserts its commitment to environmentally sustainable practices and the health and safety of its employees, contractors and the public through WSN's Environment Policy and Occupational Health and Safety Policy.

WSN's environmental and occupational health and safety performance is managed across the business through its Integrated Management System (IMS). The IMS is structured and managed to comply with the requirements of the international and Australia/new Zealand standards ISO/ AS/NZS 14001 2004 and AS/NZS 4801:2001.

The IMS documentation is structured into two main tiers: IMS Procedures and Standard Operating Procedures (SOPs). All IMS Procedures, SOPs and related forms are available electronically through the WSN Intranet under IMS Documentation \ Collections. The difference between these two levels of procedures is explained below:

5.1.1 IMS Procedures

IMS Procedures are high level procedures that define the requirements of the system in accordance with the requirements of ISO14001 and AS/NZS 4801, and are relevant across the whole WSN business.

All management personnel are expected to have a detailed understanding of the requirements of the IMS Procedures and are provided with awareness training by the Assurance Systems Manager.

Operators and other staff are provided with an appropriate level of IMS awareness through the induction process by the OHS Manager and the Environment and Workforce Safety Officers.

The IMS Procedures are listed below in Table 1

Table 1

IMS PROCEDURES
• Legal and Other Requirements Procedure
• Statement of Environment Responsibilities and Accountabilities
• Environment and OHS Training Procedure
• Emergency Response Plan Development Procedure
• Incident Reporting and Investigation Procedure
• Corrective and Preventive Action Procedure (Action Log)
• Risk Assessment Procedure
• Environment and OHS Audit Procedure

5.1.2 Standard Operating Procedures (SOPs)

Standard Operating Procedures are procedures that focus on operation level issues and provide detailed guidance on a variety of operational, environmental and OHS issues. All site personnel must be aware of the requirements of SOPs relevant to their work and a hard copy set is kept at relevant locations at the facility.

WSN Environmental Solutions has developed and implemented SOP's across its operational facilities for all work assessed as having environmental and OHS risks.

The WSN SOP's have been prepared in consultation with relevant senior management and relevant operational staff, and reviewed by members of the Environment and Safety Division. The purpose of the SOP's is to assist in the day-to-day operation of the business, incorporating environmental and safety considerations. It is the responsibility of the Operations Manager (EMWOF) to ensure that they are communicated to all relevant staff (including any necessary training), and that they are adhered to.

Site-specific SOPs will be developed for the EMWOF to ensure that all operational and environmental risks are controlled. These will be developed prior to and during the commissioning of the EMWOF in close consultation with the Site Management team, Process Engineers and other relevant personnel. A listing of relevant SOPs and those to be developed for operation of the facility are provided in Appendix 7.

From time to time, SOPs will be updated, or changed to reflect changing processes or activities. Ensuring that the SOPs reflect current field operations is the responsibility of the Operations Manager.

6. PROCESS DESCRIPTION

6.1 OVERVIEW

The EMWOF comprises of two main plants, which are the ArrowBio Technology Plant and the Garden Organics Composting Plant. This section outlines and describes each of these processes in detail.

6.2 ARROWBIO TECHNOLOGY PLANT

6.2.1 MSW delivery and pre-sorting

Collection vehicles unload the MSW into the recival area of the building. A small excavator fitted with a grab, removes large items unsuitable for processing from the waste and deposits them in a bin. The rejected bin material is then disposed of in the on-site landfill.

The remaining waste on the floor is transferred into a loading hopper by a front-end loader. A slow conveyor then transfers the material past a primary manual sorting line, where cardboard and other large items are removed. The material then proceeds into a large trommel. Within the trommel, plastic bags are split open with cutters to allow the material to be sorted into size fractions through the tumbling motion of the trommel. The smaller items and organics (typically <120mm) fall through the screen section of the trommel onto a loading conveyor underneath. The loading conveyor then transfers all of the smaller items and organics into the next stage of the process, where they are transferred into one of the secondary vats.

Larger items (greater than 120mm) that do not pass through the trommel fall into a secondary manual sorting line that removes any non-recyclable material. After passing through the secondary manual sorting line, all items are transferred to one of the primary vats for further treatment or reject bins at the end of the conveyor.

6.2.2 Materials separation

In the vats (primary and secondary), the heavy and light components of the input stream become separated, and organics such as food waste dissolve in the water to become a slurry or light liquid. Heavy inorganic components such as glass, batteries, stones, aluminium and steel cans sink to the bottom of the vat. A conveyor then transfers these heavy materials to a line where a number of mechanisms including magnets (to recover ferrous metals), eddy current separators (to recover aluminium) and manual sorting (to recover glass and also residuals for disposal to landfill), are applied.

Light components such as paper, cardboard, plastics, biodegradable organics (including food scraps) and unopened plastic bags tend to float in the vat and are scraped off the surface onto an inclined conveyor. These items then pass through a bag opener/trommel for opening the plastic bags and separation process. Any large items that do not pass through the bag opener/trommel screen, fall into a manual sorting line for further separation. Plastics films are extracted using a fluidisation blower after passing through the manual sorting line. Any non-recyclable items are removed and disposed of as rejects.

The organic slurry from the vats mixed with biodegradable organics from the solids streams (e.g. bag opener/trommel underside) then enters a hydro-crusher. This forms slightly thicker slurry containing biodegradable material such as organic matter, paper

and other substances. The organic slurry is pumped to the tank farm for biological treatment.

6.2.3 Biological treatment

An anaerobic treatment system is to be used to process the organic slurry. The organic slurry undergoes Acetogenic and Methanogenic stages in the biological reactors, orchestrated by naturally occurring micro-organisms. In the acetogenic reactors, fermentation is initiated to transform complex organic material into simpler organic acids and fatty acids. After the acetogenic stage, the treated slurry is heated to 35-40°C prior to entering the methanogenic reactor, using hot water generated from exhaust gases from the on site gas engines.

The methanogenic reactor is based on an Upflow Anaerobic Sludge Blanket (UASB) design and used to transform simpler organic acid and fatty acids into methane, carbon dioxide, water and biological granules. In this type of system, the slurry (suspension) from the acetogenic reactor is introduced from the bottom of the reactor and then displaced, upward through a sludge blanket composed of biologically formed granules. Treatment occurs as the suspension comes into contact with the granules.

6.2.4 Biogas production

In the methanogenic reactor, pH and temperature are closely controlled to optimise the conversion of the products from the acetogenic stage to biogas rich in methane. The products from this methanogenic stage are:

- Biogas;
- Wastewater; and
- Digested solids (biological granules).

6.2.5 Power generation

The biogas produced on site is stored in an inflatable buffer tank, and is used for generating electricity in two 1.4MW on site gas engines. An on site flare burns any excess gas that cannot be used by the engines. The waste heat from the engine exhausts passes through a heat exchanger, where it is used to heat water. The water is then used to heat the slurry from the acetogenic reactor prior to entering the methanogenic reactor.

In the event that the biological plant shuts down, and during initial startup, the methanogenic reactor needs an external source of heat to bring it up to temperature. This would be provided by a hot water boiler with diesel as the fuel source.

6.2.6 Dewatering and water re-use

A belt filter press is used to dewater digested solids (biological granules) and the supernatant (water component) is recirculated back into the initial pre-sorting water vat. The dewatered filter cake (biosolids) produced from the belt filter press can be sold as a quality soil conditioner or be used as an additive agent for the Garden Organics Composting Plant.

Any remaining water is treated in a sequencing batch reactor treatment plant and stored in separate tanks for re-use. This process water can be used for irrigation, fire-fighting

purposes or for washing waste vehicles. In addition, this process water can also be used for the Garden Organics plant to improve the shredded garden organics moisture content level prior to pasteurisation stage.

Based on the ArrowBio Technology plant in Israel, the quality of process water is expected to be relatively low in organics levels, moderate ammonia content, low heavy metals contamination, and moderate total dissolved solid content. However, continual monitoring of the process water quality will be carried out in any event.

Excess process water and process water that does not meet the quality specifications for water irrigation and reuse will be transported offsite for treatment at a licensed liquid waste treatment plant. To ensure that there is adequate capacity to store excess process water and water that does not meet reuse specifications the storage tanks are controlled via a central process control system as part of the water balance for the tank farm.

6.3 GARDEN ORGANICS COMPOSTING PLANT

6.3.1 Garden organics delivery and pre-sorting

The Garden Organics Composting Plant includes the following processing units:

- Mechanical pre-treatment of green waste and other organic solid wastes including physical contamination removal, shredding, mixing and homogenisation for subsequent composting of the raw material mix;
- Tunnel composting using forced aeration and moistening to produce a guaranteed pasteurised and composted product; and
- Compost refinement and grading in accordance with market requirements for end product storage, marketing and sale.

6.3.2 Material Receival

Separated garden organics sourced from Council kerbside collection, (MGB, loose, bundled), drop-off facilities or commercial sources, contains some level of physical / visual contamination, which needs to be removed. Material is delivered via trucks only and any public traffic is diverted to a separate drop off facility elsewhere at the Macarthur Resource Recovery Park. The trucks reverse back into the designated unloading area and tip materials into the floor of the building through 6m wide-open gates.

Each load is tipped onto a heavy-duty concrete tipping floor to be manually screened for gross contaminants such as plastic bags and glass. Along with the garden organics, the composting process requires a source of moisture and nitrogen. Biosolids from the wastewater treatment plants or ArrowBio Technology Plant is a readily available source of both. Biosolids are stored in a sealed hopper with a lid in another part of the garden organics building, for use as a composting additive agent if required. -

The storage hopper is fully sealed to minimise odour generation and is equipped with an electrical winch system to automatically lift the lid once a tanker / skip bin truck delivers material. This concept has been purpose designed for sludges of up to approx 20% solid content and is very effective in containing emissions. Material is then discharged from the hopper via shaft-less screws.

6.3.3 De-contamination Processing

A front-end loader operator inspects each delivered load of delivered garden organics before it is fed into the process. After the material has been unloaded, bulky and undesired items (e.g. steel, glass bottles) are manually removed from the waste and placed into bins. The front-end loader then pushes the screened waste into a dedicated storage bay or feeds it into the shredder hopper.

6.3.4 Shredding / Metal removal

Screened garden organics are fed into the feeding hopper of the low-speed shredder. This electrically driven unit incorporates a hammermill with an easily replaceable screen to produce various product grades.

6.3.5 Mixing and homogenisation

The most important mechanical treatment step is achieved through mixing, homogenisation and conditioning of the various input materials for the subsequent static composting process. Whilst garden organics are transferred into the mixer automatically via a conveyor, the desired dosing rate of the biosolids is set by loading cells and a time programmed process control. A sequence of screw conveyors transfers the sludge automatically into the mixer. After mixing, the raw material batch is discharged into a storage box, picked up by the front-end loader and put straight into the designated tunnel.

6.3.6 Tunnel Composting

The Garden Organics Composting Plant comprises of 10 tunnels that are 25m in length, 6m wide and 5m high each. Each tunnel is self-operating and comprises an air ducting system, blowers, process water collection and recycling systems, and various process control features (temperature, pressure, etc.). Trenches in the slab run parallel over the full length of the floor slab and are covered with purpose-designed panels. Access to each tunnel is via the front door, which can be lifted using an electrical winch.

During the composting process, the door is locked hermetically to contain any odour and leachate. The input mix is then placed into each tunnel individually and removed after the desired composting conditions are achieved by means of a low entry front-end loader. Each tunnel is equipped with a fan, which blows a mixture of fresh air and recycled air through the trenches into the tunnel. The mixture of fresh and recycled air can be automatically controlled via the central process control for each tunnel.

All exhaust air from the tunnels is eventually discharged into the deodorisation system (Biofilter) for treatment and dispersion. The deodorisation system comprises of biofilter fan, humidifier (scrubber) and biofilter media. The purpose of this system is to eliminate offensive odours and deodorise the exhaust air from the composting tunnels before it is discharged into the atmosphere.

Air volume, moisture and temperature in the biofilter are controlled via central process control. In addition, the central process control with a back-up system shall notify relevant site management (e.g. Operations Manager) when the system fails and following action can be taken by the site management to ensure the system is brought back on-line as soon as possible.

The biofilter structure comprises a segmented sub-ground concrete basement with perimeter walls, a timber grate floor ('false floor') at ground level with a layer of filter

medium on top. The filter medium comprises a 1-1.5m thick layer of compost, bark and/or other mature organic matter. The biofilter is equipped with a sprinkler system, to ensure moisture content of the medium can be maintained at optimum levels.

Exhaust process air from the different sources is drawn via the biofilter fan through the humidifier into the biofilter, which adsorbs odorous compounds from the exhaust air stream and conditions air moisture and temperature. Depending on the conditions of biofilter material, replacement will be required every one to two years.

The performance of the biofilter in reducing odour emissions will be determined using infield olfactometry odour monitoring on a monthly basis or as required. Should an odour performance criterion of >15 OU/m^3 be measured at the biofilter then weekly monitoring will be undertaken and a review of the systems operation and any maintenance requirements. Should odour be measured at >15 OU/m^3 for three consecutive weeks then the filter media will require replacement.

During replacement of the filter media the composting tunnels exhaust system will be shut down to reduce odours. The filter media will be removed in sections that can be replaced in a single day reducing the time that the composting tunnels are with out extraction. Removal and replacement will be undertaken one day a week each week until the whole filter has been replaced.

Should the replacement of the biofilter media be found to generate excessive odours then an odour neutralising agent will be utilised.

If replacement of the biofilter media is anticipated to affect residents then they shall be notified via, regular Community Advisory Committee Meetings and direct mail, of any planned activities which are likely to effect local amenity.

6.3.7 Process water

Leachate from the composting tunnels drains through the duct and piping system via siphons into a sealed process water tank; a drainage facility which is also connected to the biofilter / humidifier unit. The process water is then collected and recycled back into the composting process to establish and/or maintain the desired material moisture content.

A pump mounted on the process water tank is used for topping up the humidifier and for supplying process water to the tunnel spraying system. Each tunnel is equipped with an array of nozzles, mounted onto the tunnel ceiling to ensure coverage of the entire tunnel surface area.

During the dry/hot period of the year, some fresh water may be required to cover the water demand for the tunnel system. This make-up water is drawn from harvested rainwater from the roof of the Garden Organics Composting plant and ArrowBio Technology plant.

6.3.8 Compost Production

After the composting process, the raw material is pasteurised and has low odour emissions. Composted material is subsequently removed from the tunnel and loaded into trucks for transport offsite to another licenced facility, where it undergoes curing and screening to produce various grades of compost that are ready for a variety of final applications or end markets.

Prior to loading pasteurised compost into trucks for transport offsite an assessment of the current weather conditions and time will be made to determine if they are appropriate (wind direction and intensity) in reducing odours and dust generation.

7. SITE OPERATIONS

7.1 OPERATIONAL CONDITIONS

Vehicles entering the Macarthur Resource Recovery Park utilise the pre-existing Landfill, small vehicles and Materials Recovery Facility weighbridge. Collection vehicles carrying either source separated garden organics, biosolids, or municipal solid waste are directed to the EMWOF. Small vehicles and recycling vehicles are directed to the small vehicle transfer station or Materials Recovery Facility respectively.

The EMWOF processes up to 90,000 tonnes per annum of MSW and 30,000 tonnes per annum of garden organics, biosolids and other organic materials. The facility will employ approximately 30 full time employees when operating at full capacity.

MSW is delivered to the northern side of the MSW building where initial screening occurs in the main receival part of the building. Reject material will be removed to the southern side of the building with all materials to be processed moving in an easterly direction toward the facilities tank farm.

Deliveries of garden organics from separate collections will be made at the northern side of the garden organics receival building. Processing of garden organic (green waste) occurs in the main garden organics receival building, and the material would flow in a westerly direction through this building. Finished compost, which is suitable for making high-grade products, will be removed from the western end of this building.

The following activities will take place within the EMWOF:

- Material separation and recovery of recyclables;
- Mechanical treatment of MSW;
- Biological treatment of MSW;
- Biogas production;
- Electricity generation;
- Garden organics preparation; and
- Tunnel composting.

7.2 WASTE CONTROLS

7.2.2 Permitted Wastes

The EMWOF is currently licensed to accept the following wastes.

- Council collected solid waste including residential and commercial waste;
- Garden Organics; and
- Biosolids.

The ArrowBio Technology Plant only accepts the non-sorted putrescible waste component, and garden organics and biosolids are to be directed to the Garden Organics Composting Plant.

7.2.3 Removal of contaminants from garden organics

Garden organics delivered to the facility may contain some level of physical / visual contamination which needs to be removed. After the material has been unloaded onto the floor or the main building, bulky and undesired items (e.g. steel, glass bottles) are manually removed from the garden organics and placed into bins. Once screened, the

garden organics is pushed into a dedicated storage bay or it is fed into the hopper of the low speed shredder.

7.2.4 Excluded Wastes

The following categories of waste are not accepted at the Landfill weighbridge and therefore are not accepted at the EMWOF:

- Radioactive wastes:
- Liquid wastes;
- Pesticides
- Chemical Wastes listed in Schedule A of the Chemical Wastes Control Order 1994;
- Polychlorinated Biphenyl (PCB) wastes as defined in the PCB Wastes Chemical Control Order;
- Clinical Wastes; and
- Toxic Wastes

7.2.5 Screening of Waste on arrival at the Facility

The following screening practices are applied to incoming wastes at the facility:

- Signs at the entrance clearly indicate the types of wastes that are accepted and not accepted at the facility;
- When a truck enters the weighbridge, the weighbridge operator weighs the vehicle, records the data and asks the driver to describe the contents of the load. If the content cannot be clearly described or identified, the weighbridge operator will direct the load to a separate area for closer examination. If the wastes are identified as excluded wastes, the Shift Supervisor will respond in accordance with the "Excluded Waste – management and handling" Standard Operating Procedure". If the waste is rejected, this will be recorded in the weighbridge data system and recorded on a "Rejection of Load" form.

7.3 OPERATIONAL HOURS

The EMWOF will be opened for the acceptance of Council delivered materials, at a minimum, during the following hours:

- 7:00 am to 5:00 pm, Monday to Fridays, inclusive;
- 8:00 am to 4:00 pm, Saturdays and Sundays; and
- 7:00 am to 2:00 pm on public holidays.

8. RESPONSIBILITIES

8.1 ROLES AND RESPONSIBILITIES

This section outlines staff responsibilities and accountabilities for administering the Actions contained within OEMP. An organisation chart below provides an overview of key positions (below) with further detail regarding the individual roles outlined in the following sections.

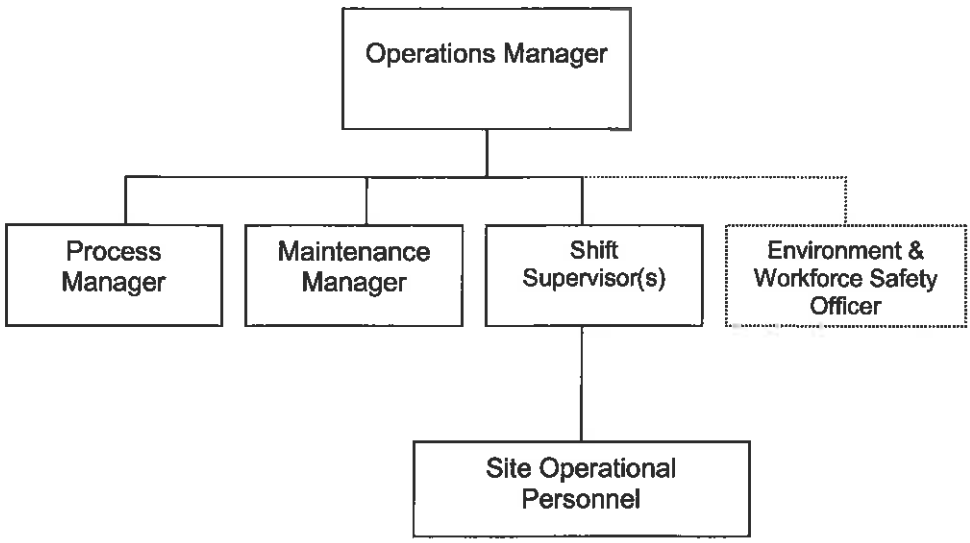


Figure 1: EMWOF Organisation Chart

8.1.1 Operations Manager

The Operations Manager is responsible for:

- Overall management of the EMWOF;
- Ensuring the EMWOF is operating at best practices; and
- Managing all complaints to the EMWOF.

8.1.2 Process Manager

The Process Manager is responsible for:

- Supervising of all processes related to the EMWOF;
- Optimising the performance of the EMWOF;
- Establishing effective operational system and SOP;
- Implementing and maintaining quality assurance systems for processes and product control; and
- Ensuring that the Shift Supervisor(s) is inducted and trained in his/her tasks.

8.1.3 Maintenance Manager

The Maintenance Manager is responsible for:

- Ensuring servicing and maintenance schedules for all equipment and machinery are followed accordingly;
- Updating drawings, servicing and maintenance schedules as required;
- Maintaining drawing lists, spare parts and consumable at site; and
- Ensuring all equipment and machinery are operated in good condition.

8.1.4 Shift Supervisor

The Shift Supervisor is responsible for:

- Day to day supervision of all site personnel;
- Induction of all site personnel;
- Identification and provision of all relevant OHS, Environmental and operational training including SOP awareness;
- Ensuring that all operators of plant are appropriately trained, and where relevant, hold relevant Certificates of Competencies;
- Keep records of all training and keep the Training Needs Matrix up to date;
- Tool box talks / communication of environmental and OHS information; and
- Report and investigate any environmental incidents in conjunction with the Environment and Workforce Safety Officer

8.1.5 Environment and Workforce Safety Officer

The Environment and Workforce Safety Officer is responsible for:

- Advising the relevant managers and Shift Supervisor(s) of new environmental legislative requirements that may affect the sites operation;
- Conducting weekly environmental inspections using the electronic checklist system;
- Responding to enquiries from staff regarding environmental compliance and due diligence;
- Training of all staff in relevant environmental Standard Operating Procedures and Environmental Due Diligence;
- Coordinating environmental monitoring at the facility, including internal monitoring and by external consultants where required;
- Undertaking environmental compliance audits at the facility, including auditing against the site Environment Protection Licence requirements and the requirements of this OEMP;
- Preparing and coordinating all environmental reporting requirements; and
- Providing support in the investigation and reporting of any environmental incidents at the facility.

8.16 Site Operational Personnel

Site personnel are responsible for:

- Completing all training as required;
- Ensure safety of self, work colleagues and the public;
- Following all Standard Operating Procedures, Work Instructions and reasonable directives;
- Follow company policy and procedures; and
- Work within their Enterprise Bargaining Agreement i.e. skills level.

9. ENVIRONMENTAL MANAGEMENT

9.1 STORMWATER MANAGEMENT PLAN

The primary objectives of stormwater management at the EMWOF are to ensure that the maximum amount of water is retained for use and re-use on site, and to ensure that the quality of surface water run off from the site is maintained at acceptable levels.

9.1.1 Surface Water

The nature of activities at the EMWOF results in the need for effective surface water management. The surface water management system at the Facility is based on the following key principals:

- Rainwater harvesting is maximised with all water from the roof of the facility being diverted to various on-site water storage tanks. Harvested rainwater is used for a number of purposes including, the garden organics composting plant, MSW processing "make-up" water, internal cleaning and wash down.

- Stormwater falling on the paved areas of the site is collected in the 110m^3 first flush storage tank. First flush water is treated, if required, and used for a number of purposes. These uses are determined by the quality of the water and the suitability and demand for its end use. End use applications include, process water "make up", dust suppression at the adjoining landfill, and on-site irrigation.

- All first flush water is retained and treated on site until it meets the required water quality criteria. Should the water quality be highly contaminated or unable to meet the quality criteria it is tankered to a licensed liquid waste treatment facility.

- A stormwater capture drainage system around the building ensures that no stormwater can run into the building area envelope. All water within the facility is captured with the internal drainage system and pumped back into the treatment process.

9.1.1.1 Environmental Objectives

Site operational activities must be carried out in a manner that will mitigate stormwater contamination and limit impacts on surface water quality. Environmental objectives include:

- Eliminating transport of sediment laden and contaminated stormwater off site.
- Effective operation of all stormwater control measures around the site for anticipated rainfall events.
- Ensuring any pumped discharges from stormwater containment systems comply with the stated performance targets.
- Ensuring any reuse of first flush water is tested as fit for intended end use.
- Ensuring all discharges of accumulated stormwater from the tank farm are inspected and tested prior to release.

9.1.1.2 Management Strategy

To minimise stormwater impacts during site operations WSN Environmental Solutions will undertake the following management strategies.

- Ensure the existing stabilised entry / exit point from the landfill onto the Facility platform is maintained and operating effectively;

- Surface Water runoff from all non-contaminated areas, including all roadways, manoeuvring areas, is collected in the stormwater system. All stormwater is collected by the local stormwater system and directed to the first flush storage tank located at the western perimeter of the facility. The storage tank enables catchment of first 10mm of rainfall which may be potentially sediment laden or polluted. The storage tank provides capacity for treatment and further reuse within the facility or on-site;

- Regular monitoring and treatment of stormwater runoff contained in the first flush tank is undertaken to ensure the water quality meets the target criteria before it is pumped for storage, discharged or reused;

- Any additional rainfall, >10mm flows past the first flush tank and is relayed into the adjacent landfill sedimentation dam where it is subject to the landfill surface water management regime and licence conditions prior to reuse or discharge offsite;

- The drain along the southern perimeter of the site passes through a constructed silt trap and weir. This trap assists in containing any material and suspended material prior to it transfer into the first flush storage tank. This trap is regularly serviced and maintained to remove deposited material and sediment;

- The drainage benches along the slopes to the south of the EMWOF platform capture stormwater through a dedicated drainage line. This drainage system is separately relayed through concrete lined drains and a sediment trap, located at a lower point where all benches converge. Stormwater then flows over a weir before being discharged into the adjacent Landfill stormwater dam via a dedicated 600mm pipe.

- All stormwater drains have "socks" installed at their entrances to intercept and filter any unwanted pollutants from the recival tipping areas, general manoeuvring and loading areas before stormwater is relayed to the first flush storage tank;

- All wash down water within the building envelope is collected by the wastewater collection system, which comprises of a number of floor drains and sumps. This water does not enter the stormwater system and remains within the system being automatically fed back into the waste and enclosed garden organics processing systems;

- All sealed surfaces are regularly swept, sediment traps cleaned and drainage socks installed to minimise and prevent contaminated stormwater entering the system;

- Accidental spills are carefully managed to minimise contamination of stormwater. Spills can occur under a range of circumstances and may consist of waste, oil, distillate, hydraulic fluids and other liquids such as cleaning products.

- The tank farm is bunded to accommodate 110% of the largest tank, stormwater that collects within the tank farm bund is directed toward a storage sump where it can

be inspected and tested prior to manual release into the site stormwater system. An inspection of all tanks within the bund to ensure that there are no signs of leakage is also undertaken prior to pump out of the stormwater sump.

- All major maintenance of plant and equipment is carried out away from the site;
- All customers are made aware of the requirement for loads to be delivered and exported from site in covered or enclosed vehicles;
- In the event of a spill of waste outside the receival areas, the material is recovered either by hand shovel or front-end loader, and transported to the receival pit. The street sweeper collects any minor quantity of debris remaining. If the waste is particularly odorous or dusty, it is sprayed during the cleanup process.
- All chemicals used within the process, e.g. ferric chloride, sodium hydroxide are delivered and unloaded within the tank farm containment bund.
- Spillages of any liquids are absorbed using 'dri-sorb' (where appropriate) or an approved similar absorbent material. The contaminated material is collected and transported to a suitable disposal location (contact the Operations Manager at the time of the spill for advice on disposal).
- Quantities of suitable absorbent material are kept on site at all times. Once the bulk of the spill has been removed, the area is cleaned in a manner appropriate to the material concerned. Every effort is made to prevent contaminated material entering the stormwater.

An overview of the stormwater drainage system including the first flush tank and tank farm bund is provided in Appendix 8.

9.1.1.3 Performance Indicator / Targets

- No significant impact on existing water quality of downstream waterways.
- Ensure any pumped discharge from the first flush detention tank into receiving waters complies with the following:
    - <50mg/L Total Suspended Solids;
    - <0.9mg/L Ammonia
    - pH Not less than 6.5 or greater than 8.5.
- Any treatment strategies required to meet water quality standards will be developed in consultation with the Environment and Workforce Safety Officer.

9.1.1.4 Activities and Frequency

- Maintenance and operational check of the site entry rumble grid and access road by the Shift Supervisor to ensure it is operating effectively to prevent tracking of soil onto the EMWOF platform - *Daily*

- Water quality monitoring within the first flush tank and tank farm stormwater sump to be undertaken by the Environment and Workforce Safety Officer –*Following rainfall events and as required prior to onsite reuse or discharge.*

- Site inspections including the stormwater drain socks, sediment traps, first flush tank and tank farm bund undertaken by the Shift Supervisor - *Weekly and during rainfall events.*

- Inspection of internal sump pumps within the processing hall to ensure proper operation by the Shift Supervisor – *Daily.*

- Dry sweeping of all maneuvering areas and hardstand areas by Shift Supervisor – *Daily and as required.*

- Pump out of tank farm stormwater sump following tank farm inspection and water quality testing by the Operations Manager – *Following all rainfall events.*

- Prompt removal and cleaning of all waste materials or other spillages onsite by the Shift Supervisor – *As required.*

- Maintenance of spill kits at required locations to be undertaken by the Shift Supervisor – *As required.*

9.2 PROCESS WATER

All process water within the EMWOF is carefully managed to optimise reuse and ensure that wastewater generation is minimised.

Harvested rainwater and residual process water is added to shredded garden organics within the Garden Organics Composting plant. Sprinkler systems installed in the roof of the enclosed tunnels apply this water to the material and slotted grates under the floor of the tunnels collect and recirculate any accumulated process water. This ensures that the optimal moisture content of the material is maintained.

The ArrowBio Technology Plant is designed as a water based technology, and therefore it is important that the amount of water re-used is maximised, and the amount leaving the site as wastewater minimised. The process water management is based on the following principals:

- Harvesting of rainwater is maximised with 240m^3 of rainwater storage capacity provided onsite;
- Any waste water collected within the recival and processing hall floor drains is re-introduced directly into the materials separation vats;
- All process water from the methanogenic and acetogenic reactors is treated on site within a sequential batch reactor treatment tank before being reintroduced into the process;
- Water collected from the sludge dewatering system is pumped back into the treatment tanks for treatment and subsequent reuse in the process;
- Treated water is used to maintain and clean belt filter presses as part of the sludge dewatering system;
- Rain water harvested on roof areas is used primarily for all wash down and cleaning purposes onsite and as process make-up water when required; and
- Any additional wastewater that cannot be reused is transported offsite for treatment at a licensed liquid waste treatment plant. This applies to all water that is required to be periodically discharged from the biological reactors to prevent accumulation and elevated salt levels that can effect system performance.

A general schematic showing the process water flow within the facility is provided in Appendix 9.

9.2.1 Environmental Objectives

Process water is managed in a manner that mitigates any potential for stormwater contamination and maximises onsite process reuse. Environmental objectives include:

- Maximise reuse of all process water.
- Limit the generation or need to transport wastewater offsite for disposal.
- Maximise the harvesting and storage of all rainwater for onsite use.
- Minimise the onsite use of potable water.
- Maintain quality of process water to avoid the accumulation of salts and other contaminants, which may affect system performance.
- Effective isolation of processing water from all stormwater and surface water systems.

9.2.2 Management Strategy

Key process water management strategies include:

- Using all harvested rainwater for internal cleaning and washdown purposes and process "make-up" water;
- Capturing all waste water from within the receival and process areas for reuse;
- Reuse of water from the sludge dewatering process;
- Isolation of all process water from the site stormwater / surface water collection system;
- Periodic wasting of process water from the reactors, undertaken to reduce accumulated salt levels within the system and ensure optimal reactor performance.
- Process water is replenished using harvested rainwater "make-up" water; and
- Periodic testing of process water quality to establish and maintain system performance and monitor waste water quality for offsite tankering and subsequent treatment;
- Excess process water and process water which does not meet DECC quality specifications for water irrigation and reuse will be transported offsite for treatment at a licensed liquid waste treatment plant.

9.2.3 Performance Indicator / Targets

- All process water / waste water contained within building envelope, effectively captured and separated from the onsite stormwater system.

- All water within the process and receival areas collected in floor sumps for reintroduction into the system.

9.2.4 Activities and Frequency

- The Shift Supervisor to obtain daily grab samples of process water from the various sampling points, located on the process water storage tank.

- The Environment Workforce Safety Officer to undertake ad-hoc process water quality monitoring to monitor and system performance and identify and isolate potential process issues – *as required.*

- The Shift Supervisor to inspect all floor drains to ensure correct operation and maintenance – *Daily.*

- Inspection of internal sump pumps within the processing hall to ensure proper operation by the Shift Supervisor – *Daily.*

- The Environment Workforce Safety Officer to undertake process water quality monitoring for analytes tabulated in the Weekly Process Water Analyte List contained in Appendix 10– *Weekly or more frequently as required.*

- The Environment Workforce Safety Officer to undertake process water quality monitoring for some or all of the analytes, tabulated in the Full Process Water Analyte List contained in Appendix 10– *As agreed with the Process Manager, and DECC as required.*

- The Environment Workforce Safety Officer to report the results of any process water quality monitoring to the Process Manger – *as results are available.*

- The Shift Supervisor to arrange offsite tankering of excess process water from the plant – *as required.*

9.3 AIR QUALITY

The primary objective of air quality management is to ensure that impacts on air quality are minimised and good air quality is maintained for surrounding residents and workers on the site.

9.3.1 Odour Management

Solid Waste Management by its very nature can lead to the generation of odours. These odours are managed and mitigated in a number of ways using both engineered systems and onsite management practices. Potential point sources of odour from the operation of the EMWOF can be identified as follows:

- MSW Receival Hall;
- Residual loading storage and transport bays;
- Garden Organics Receival and Shredding Area;
- MSW Processing building;
- Compost tunnel and offsite transport loading areas;
- Tank farm;
- Biofiltration system;
- Biogas production, transfer and storage systems; and
- Belt filter press and digested solids (biosolids) storage bins.

9.3.1.2 Environmental Objectives

- No noxious odour emissions offsite
- Effective maintenance and operation of all odour management systems

9.3.1.3 Management Strategy

The following management strategies will be adopted to minimise and mitigate odours onsite:

- The ArrowBio Technology plant employs a water based process and enclosed waste receival building as its primary odour control;
- The ArrowBio Technology plant is located on an engineered platform that maximises the distance from the nearest residential area (Spring Farm) to the north.
- An active air extraction system is installed within the municipal solid waste receival hall and main processing hall;
- Two air extraction systems are employed for the ArrowBio Technology plant, one for extracting air within the main waste receival area and one for extraction of air from the process hall. Air is passed through three separate ozone injection systems prior to discharge outside of the building envelope;

- ArrowBio Technology plant receival areas are fitted with high speed roller shutters which are only opened during waste receival to prevent the emission of odours;
- Composting is undertaken within 10 fully sealed and enclosed tunnels each with a dedicated top hinged rubber sealed door system. Each tunnel has air extraction ducting, which relays odorous air through a 440m^2 biofiltration system prior to release.
- All odour complaints are investigated and validated with meteorological data using the WSN Pollution Complaint Validation Work Instruction;
- Processing of all odorous wastes is undertaken as soon as possible after delivery;
- Process water is managed to maintain aerobic conditions in collection areas to prevent odour;
- All biogas is captured for electricity generation or flaring when required.
- All loads of waste entering the facility (ie – garbage trucks) will be within closed containers, trucks involved in waste transfer and transportation of composted material will be covered.
- Wastes are not to be left unprocessed / exposed for significant periods of time;
- Floors in the Receival Halls and Processing building are cleaned daily including the regular clean-up of litter and scum from conveyors and plant;
- Regular removal of all residual wastes for offsite disposal and management;
- Unloading of composting tunnels directly into vehicles for offsite storage;
- Weekly odour monitoring will be undertaken in the suburbs surrounding the EMWOF and at various site boundary locations. Should an odour be detected off-site or at the boundary of the facility then odour monitoring will be conducted at the locations within the facility detailed in Appendix 11.
- The presence of odours will be assessed continuously during site operations to assess the effectiveness of the odour control measures being implemented
- When complaints are received, they will be logged on the complaints register and investigated, and corrective / preventive actions will be initiated;
- Complaints will be validated through the WSN Pollution Complaint Validation Work Instruction, correlating complaint with meteorological data.

9.3.1.4 Performance Indicator / Targets

- No odour complaints
- Odour at site boundaries to be maintained at <2 OU
- Effective operation of Biofilter and Ozone odour management systems

9.3.1.5 Activities and Frequency

- The Shift Supervisor to check odour levels onsite – D*aily.*
- Infield olfactometry odour monitoring undertaken in the suburbs surrounding and at the site boundary by the Environment and Workforce Safety Officer – *Weekly.*
- The Shift Supervisor to check operation of biofilter – *Daily.*
- The Shift Supervisor to check all ozone treatment systems to ensure proper operation – *Daily.*

- Site operational personnel to ensure cleaning of processing and receival areas is completed– *Daily.*

- The Shift Supervisor to check door seals on compost tunnel doors and high-speed roller shutters – *Weekly.*

- The Maintenance Manager to arrange the replacement of Biofiltration media and ozone system servicing – *Annually.*

9.3.2 Dust Management

Dust generation during operation of the ArrowBio Technology Plant is minimal due to the nature of the water based process and moisture content within all incoming waste materials. There is the potential for minimal dust to be generated at the Composting Plant, particularly during the shredding of garden organics prior to composting within the enclosed tunnels.

In order to mitigate sources of dust from vehicle movements and garden organics shredding activities a number of onsite management strategies are employed. These strategies are discussed in more detail below.

9.3.2.1 Environmental Objectives

- All potential dust generating activities effectively mitigated to reduce or eliminate the generation of dust.
- Effective maintenance of all site access roads to limit the opportunity for tracking of sediment onto sealed surfaces, where it will result in dust generation.

9.3.2.2 Management Strategy

The following control measures will be in place to limit the potential for dust generation:

- All main site access roads at the EMWOF are sealed;
- All Garden Organics receival occur within a partially enclosed building;
- All garden organics are shredded using a slow speed electric shredder with dust suppression spray heads;
- All MSW is deposited directly into the enclosed ArrowBio building;
- All materials are delivered in enclosed compactor body vehicles;
- All processing operations occur within the building envelope with much of it occurring within a water stream;
- Pre treated waste materials removed from the site are transported off site in covered trucks;
- The access road, which traverses the landfill before linking to the EMWOF platform is sealed to limit the tracking of soil onto the site.

9.3.2.3 Performance Indicator / Targets

- No offsite dust impacts.
- No dust related complaints from the community or adjoining landholders.

9.3.2.4 Activities and Frequency

- The Shift Supervisor, to ensure correct operation and use of the dust suppression system when shredding garden organics – *During all shredding activities.*
- The Shift Supervisor is to ensure the sealed access road from the adjoining landfill is well maintained and in good repair, to limit tracking of material onto the EMWOF platform – *Weekly.*
- The Environment and Workforce Safety Officer to undertake visual assessment of dust levels onsite and work with operational personnel to implement further management strategies if required – W*eekly.*

9.3.3 Engine and Flare Management

Biogas generated at the facility is stored in a 570m^3 biogas storage tank and combusted via two 1.4MW gas engines to produce green energy to both power the facility and export unutilised electricity into the main electricity grid. Any additional gas that cannot be stored or immediately used in the engines is combusted via an onsite flare. This flare is also used when engines are temporarily out of service for maintenance or other reasons.

9.3.3.1 Environmental Objectives

- Flaring of all excess biogas to prevent emission and potential odour.
- Optimal operation of engine and flare systems to ensure complete combustion of gas and minimise emissions.

9.3.3.2 Management Strategy

- The onsite engines and flare will be managed in accordance with the manufacturers specifications and operational manuals.
- Emissions from the onsite flare and engine exhaust systems may be monitored periodically to assess operational performance and ensure all equipment is performing in accordance with manufactures specifications.
- Electricity generation and export will be constantly monitored to ensure optimal power output
- The flare is operated when engines are routinely shut down for maintenance.

9.3.3.3 Performance Indicator / Targets

- Operation of flares and engines in accordance with manufacturers specifications.
- Emissions from flare and engines in accordance with manufacturers prescribed specifications and standards.
- Optimal power generation and export of green electricity.

9.3.3.4 Activities and Frequency

- The Process Manager is to ensure the optimal biogas generation and operation of electricity generation infrastructure – *Daily*;
- The Shift Supervisor is to report any engine down time or unplanned shut downs to the Environment and Workforce Safety Officer – *As required;*
- The Shift Supervisor is to ensure that the flare is operated effectively during any engine downtime, excess biogas generation or during periods where export load restrictions apply – *As required;*
- The Shift Supervisor is to undertake checks of engines and flare systems to ensure proper operation – *Daily*;
- The Maintenance Manager is responsible for scheduling all engine and flare maintenance or servicing in accordance with the manufactures standards – *As prescribed in maintenance / operation manuals*; and
- The Process Manager is responsible for monitoring system performance and electricity/ biogas production to ensure optimal operation using online monitoring systems and physical checks – *Daily*.

9.4 NOISE AND VIBRATION

The major sources of noise at the EMWOF include:

- The main processing building housing large machines such as conveyors, trommels and screens that separate recyclables from the waste and prepare it for digestion;
- The outdoor tank farm consisting of reactor vessels, tanks and pumps;
- Plant and machinery operating within the Facility;
- Garbage Trucks and Garden Organics Trucks delivering materials to site
- Gas electricity generation engines and flare; and
- The low speed electric shredder operation.

9.4.1 Environmental Objectives

Noise and Vibration control on site is aimed at:

- Control of noise pollution to within specified limits outlined within the Conditions of Consent.
- To minimise the vibration impacts of the Facility on sensitive receivers during Site Operation
- To compile relevant information in a manner which will provide ongoing guidance regarding emission control strategies for noise and vibration.
- Preventing degradation of local amenity.
- Meeting the specific requirements of the conditions of consent at all existing and proposed residences, including Glenlee House.

9.4.2 Management Strategy

The following mitigative measures will be adopted to reduce noise impacts:

- All installed plant is designed to reduce noise levels including gas engines, and garden organics shredder;
- Use of an enclosed building to limit noise impacts;
- Operation of the facility during the approved hours as specified in the site Development Consent;
- All plant and equipment to be used onsite are to be properly maintained and serviced in accordance with manufacturers recommendations;
- No new equipment will be used on site unless it complies with the manufacturers specified noise emission limits;
- All plant will be turned off when not in use;
- Notification of residents via, regular Community Advisory Committee Meetings and direct mail, of any planned construction activities which are likely to effect local noise amenity.

9.4.3 Performance Indicator / Targets

- No noise complaints;
- Compliance with development consent conditions;
- Maximum allowable noise levels from the development are within;

a) a LAeq (15 minute) noise emission criterion of 39 dB(A) during the day/evening;
b) a LAeq (15 minute) noise emission criterion of 35 dB(A) during the night; and
c) a LA1 (1 minute) noise emission criterion of 45 dB(A) during the night.

at the monthly monitoring locations identified in Appendix 12.

9.4.4 Activities and Frequency

- Site inspection by the Shift Supervisor for excessive noise levels - *Daily;*
- Fixed and mobile machinery; and the vicinity of the operational area inspected for excessive noise levels by the Shift Supervisor – *Daily*;
- Noise monitoring carried out by the Environment and Workforce Safety Officer in the following areas – *Quarterly;*

    a) 173 Richardson Road Mt Annan;
    b) Tea Tree Place;
    c) Glenlee House; and
    d) Mt Annan Botanical Gardens.

- Locations of monitoring points are shown in Appendix 12.
- Due to the planned residential developments approaching the EMWOF monitoring locations will be reviewed – *Annually*;
- Any Noise complaint responded to within 24 hours by Operations Manager in consultation with The Shift Supervisor and Environmental Management Representative. Detailed response provided to complainant within 7 days, - *As required*
- Site inspections undertaken for excessive noise levels by the Environment and Workforce Safety Officer – *Weekly;*
- Direct Mail contact will be arranged by the Operations Manager to notify all affected local residents and businesses should there be any planned construction activities which are likely to effect local noise amenity – *As required*;
- Community consultation will be undertaken through the Jacks Gully WRC Community Advisory Committee (CAC), - *Quarterly.*

9.4.5 Noise Monitoring

To ensure that noise is effectively controlled on the site, WSN will:

- Perform daily inspections of the site boundaries for excessive noise;
- Where excessive noise is noted or suspected, noise monitoring will be undertaken using a noise meter
- Log, investigate and validate all noise complaints;
- If noise is found to be excessive, changes will be implemented on site to ensure noise levels remain below limits set in the Environment Protection Licence.

9.5 PEST, VERMIN AND WEED CONTROL

Pests and vermin may be attracted to stored MSW or to litter that is generated during the operation if it is not removed in adequate time. Clean up and control of litter will be the main method for minimising the potential for the presence of pests and vermin.

The operation of the EMWOF is not expected to increase the presence of weeds on the site, as green waste is only tipped and processed with in the semi inclosed Garden Organics Building and does not come in direct contact with any unsealed areas on site.

Designated areas on site will be rehabilitated using native plant species identified as being indigenous to the Mount Annan area within three months of commencement of operation. No natural watercourses or riparian areas will be disturbed or altered during the operation of the EMWOF. A Vegetation Plan is provided in Appendix 13.

9.5.1 Environmental Objectives

- Minimise the degradation of the local amenity caused by pest, vermin and noxious weeds;
- Eliminate the occurrence and proliferation of weeds; and
- Successful revegetation of areas disturbed during site construction.

9.5.2 Management Strategy

The following mitigative measures will be adopted to minimise the presence of pests and vermin and control of weeds:

- Waste will be sorted on the day of arrival and will not be stored on the sorting floor overnight;
- Practicing good housekeeping including cleaning of the receival and sorting floor, and regular cleaning of areas where waste tends to accumulate;
- If insect infestations are detected in incoming waste, the material will be treated with a suitable biological pesticide;
- Inspect the perimeter for litter, pests and vermin (and weeds under the Landfill EMP);

- Significant weed growth is controlled through the application of a biodegradable herbicide;
- If noxious weeds are identified, a noxious weed management plan should be developed, implemented and maintained;
- Arrange for annual inspections to be carried out by a licensed pest controller.
- Disturbed areas to be rehabilitated using native species in accordance with the Vegetation Management Plan

9.5.3 Performance Indicator / Targets

- No outbreaks of pests, vermin or weeds.

9.5.4 Activities and Frequency

- Site inspection by Environment and Workforce Safety Officer to check weed control - monthly;

- The Process Manager to arrange for annual inspections to be carried out by a licensed pest controller. – *Annually and as required;*

9.5.5 Pest, vermin and weed monitoring

To ensure that pests, vermin and weeds are controlled on site, WSN will:

- Inspect the perimeter for litter, pests and vermin (and weeds under the Landfill EMP)
- Arrange for annual inspections to be carried out by a licensed pest controller.
- Carry out any other inspections in accordance with the Environment Protection Licence

10. RESPONSE PROCEDURES

10.1 COMPLAINTS HANDLING

The WSN is committed to responding to complaints quickly and efficiently to ensure that they are resolved in timely manner.

Complaints come to WSN in two ways – directly to the WSN Customer Service line, and via the DECC hotline. These complaints are logged in the WSN Complaints data-base, and are forwarded to the Operations Manager, the designated site Environment and Workforce Safety Officer and other relevant internal stakeholders.

All complaints are investigated and validated using the Pollution Complaint Validation Work Instruction. Once it has been determined that the complaint relates to the particular facility, the causes of the complaint are investigated and appropriate actions raised through the WSN Corrective and Preventive Action process.

Once the complaint has been resolved, the Operations Manager will contact the complainant to explain what actions have been taken to resolve the issue if the complainant has indicated a response is required/wanted. The complaint will then be closed out and kept as a record in the complaints handling database.

10.2 RISK MANAGEMENT

WSN Environmental Solutions, through its Environmental and OHS Risk Assessment IMS Procedure, ensures the effective control of environmental hazards across its facilities so that environmental impacts are prevented or minimised. Two main types of risk assessment are used by WSN at operational / project level to assess environmental and OHS risk:

10.2.1 Job Safety and Environmental Analysis (JSEA)

The JSEA process is used for new projects, new tasks, any unusual, abnormal or non-routine work or projects and tasks where there is likely to be an increase in the level of risk. This may include but is not limited to any unusual task not normally executed in day-to-day operations. All contractors are required to complete the JSEA process prior to commencing any work on the site.

10.2.2 Project / Site Based Risk Assessments

Project based risk assessments are carried out to assist in identifying additional environmental risks that may not have been assessed in the preparation of the EMP for the site (following commencement of operations).

Site/Project Based Risk Assessments are performed when;

- A change in legislation requires a change in WSN practices and processes
- Additional processes or activities are introduced that have may increase the level of environmental risk;
- When new and additional information concerning an environmental hazard becomes available
- When required by existing legislative requirements

ENTAL INCIDENT MANAGEMENT

WSN Environmental Solutions Incident Reporting and Investigation IMS Procedure outlines the requirements for the reporting and investigation requirements of environmental and OHS incidents. The procedure also outlines the personnel involved in incident reporting, notification and investigation.

The Operations Manager is responsible for ensuring that all environmental incidents are reported to the Director Environment and Safety. The Operations Manager is also responsible for consulting and liaising with the relevant Environment and Workforce Safety Officer for assistance in minimising the immediate impacts, coordinating assistance and investigating the causes of the incident.

All site personnel are responsible for reporting all incidents to the Operations Manager as soon as practicable following an incident. Where required, the Director Environment and Safety must also report incidents to the DECC and the Director General Planning within 24 hrs and in writing within seven days.

10.4 EMERGENCY RESPONSE

An Emergency Response Plan (ERP) will be prepared for the MSW Facility, based on the WSN template document and customised to site requirements and will be available as a separate document. A copy of the ERP will be kept in the site Emergency Box and at relevant locations at the site. The MSW ERP will be consistent with the overall site ERP.

All site personnel must be made aware of the contents of the ERP through initial and ongoing training. The ERP will be reviewed at least annually by the Operations Manager with assistance from members of the Environment and Safety as necessary, and will be updated when key contact information changes.

10.5 CORRECTIVE AND PREVENTATIVE ACTION

The Corrective and Preventive Action IMS Procedure outlines the requirements for identifying, correcting and preventing actual and potential OHS, environmental and other non-conformities within WSN Environmental Solutions.

The key purpose of this procedure is to ensure that any identified issues/problems are effectively addressed and prevented from recurring. These issues are generally identified through incident reporting and investigation reports, audits, inspections and risk assessments.

The mechanism by which corrective and preventive actions are addressed within WSN is through the electronic Action Log System. Access to the Action Log system is through the WSN Intranet Home Page. The Action Log is designed as an interactive management tool and central repository for all issues relating to OHS and environmental management. The Process Manager and other relevant management staff are required to undergo specific training from the Integrated Systems Manager in the use of the Action Log system.

11. AUDITING AND DOCUMENTATION

11.1 INSPECTIONS AND AUDIT

The WSN audit and inspection requirements are outlined in the Environment and OHS Internal Audit IMS Procedure. The following environmental inspection and audit regime will be followed:

Audit / Inspection type	Frequency	By:
Regular operational inspections	Weekly	Process Manager
Regular environmental (including OHS) inspections	Weekly	Environment and Workforce Safety Officer
Environmental compliance audit	Quarterly	Technical Manager, Environment
Integrated Management System Audit	Annually	Integrated Systems Manager

11.2 DOCUMENTATION AND RECORDS

Documents and records required to be retained on site in accordance with the corporate Records Management procedure:

11.2.1 Personnel

- Induction records
- Training records/training matrix
- Certificates of Competency
- Blue Card training records / certificates

11.2.2 Environmental Monitoring

Environmental Monitoring records are to be kept either at Head Office (for consultants monitoring) or on site

- Water quality monitoring
- Odour monitoring
- Dust monitoring
- Noise monitoring results

11.2.3 Other

- Action Log Register
- Incident Reports
- Register of PPE issued
- Plant Maintenance records (MAINPAC)

11.3 REVIEW OF ENVIRONMENTAL MANAGEMENT PLAN

This plan is to be reviewed annually by the EMWOF Operations Manager with assistance from members of the Environment and Safety Division as necessary. The review should take into account the following items:

- Audit and Inspection Reports
- Incident Reports
- Action Log Corrective and Preventive Actions
- JSEA's and other field based risk assessments
- Employee feedback via consultation
- Legislative changes
- WorkCover or EPA recommendations
- Information from other sites or sources.

11.4 ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

An Annual Environmental Management Report (AEMR) is prepared and forwarded to The Director General of the Department of Planning, Camden Council and the Department of Environment and Climate Change annually. Scheduling of AMER submission is set to coincide with the Environment Protection Licence annual return date. The AEMR addresses a number of key areas as prescribed in the site Development Consent. These include:

- Details of compliance with the site Development Application
- Details of any licence changes or variations to approvals
- Details of any complaints during the preceding 12 months and a description of how these were addressed and resolved;
- An assessment / audit of the sites environmental performance against the OEMP;
- Identification of any trends in monitoring data over the life of the development;
- Details of site environmental management targets and strategies which will be employed for the impending 12 months.

11.5 REFERENCE AND RELATED DOCUMENTS

- Emergency Response Plan
- IMS Procedures and SOP manual
- WSN Intranet Policies and Procedures system
- Risk Assessments of Plant and Machinery from Manufacturers
- Conditions of Consent
- Environment Protection Licence

12. STAFF TRAINING REQUIREMENTS

12.1 ENVIRONMENTAL TRAINING

Training in environmental and OHS requirements is fundamental to ensure the safe and effective operation of WSN Environmental Solutions operation. The Environmental and OHS Training IMS Procedure sets out the requirements to ensure that:

- Staff are trained and competent to perform their required duties in a safe and environmentally sound manner and that appropriate training records are retained.
- Appropriate environmental and OHS training is given to suppliers and contractors to ensure that their performance meets WSN Environmental Solutions requirements.

The Environmental training needs of the Process Manager, operators and other personnel will be documented in the MSW facility Training Needs Matrix. Training Needs Matrix will be prepared for the MSW facility in line with other WSN facilities. The matrix will list all WSN Environmental Solutions staff related to the MSW facility in the left hand column, and will identify and record all relevant Environmental and OHS training needs and appropriate trainers at the top of the table.

The assessment of training needs is set up to consider identified environmental and safety risks which include internal Integrated Management System requirements and other specialist areas which may require external training.

Inductions are provided to all personnel, contractors and suppliers prior to commencing work on WSN Environmental Solutions sites. Inductions address environmental matters associated with:

- WSN Environmental Solutions information, policies and procedures;
- Environmental due diligence;
- Legal and site licence requirements;
- IMS requirements;
- Standard Operating Procedures (SOP's); and
- Risk management and assessment (JSEA) procedures;

The Process Manager is responsible for ensuring that all training needs are identified and delivered to all site personnel as per the above requirements. Assistance in training is available from members of the Environment and Safety team.

APPENDIX 1 SITE LOCATION MAP

APPENDIX 2 ENVIRONMENTAL PROTECTION LICENCE

APPENDIX 3 SUMMARY OF CONDITIONS OF CONSENT

No	Condition	Where addressed in this document
3.3	Prior to the commencement of operations, the Proponent shall prepare (and following approval implement) an Operation Environmental Management Plan (OEMP) for the project. This plan must describe the environmental management framework, practices and procedures that would be followed during operations, and include:	
	a) Identification of all statutory and other obligations that the proponent is required to fulfill in relation to operation of the development, including all approvals, licences, approvals and consultations;	Section 3.4 Legal and Regulatory Requirements
	b) a description of the roles and responsibilities for all relevant employees involved in the operation of the development;	Section8.1 Roles and Responsibilities
	c) overall environmental policies, principles and performance measures that will be applied to the operation of the development; and	Sections 9 Environmental Management
	d) the management plans listed under condition 3.4	Section 9.1 and Appendix 12
	Operations shall not commence until the Director-General has approved the OEMP.	
3.4	The OEMP for the project shall include the following Management Plans:	
	a) a **Strormwater Management Plan** outlining the measures that would be implemented to manage the stormwater generated by the project. This plan shall be prepared in consultation with the DECC, and include:	Section 9.1 Stormwater Management Plan
	i) details of the proposed stormwater management system for the project, which must be designed as a fist flush system to capture the first 10mm of stormwater for each m^3 of catchment; and	
	ii) details of the program for the reuse of captured first flush stormwater, whether as process water in the ArrowBio plant, as discharge to sewer, or tankering to an off site treatment facility, until such time as the proponent has demonstrated to the satisfaction of the DECC that the stormwater is suitable for other management approaches.	

	b) a **Vegetation Management Plan** outlining the measures to be implemented to minimise the impacts of the project on surrounding vegetation. This plan must be prepared in consultation with DNR and Council, and include: i) details of the proposed program for the rehabilitation of disturbed areas; and ii) details of the proposed program for weed control at the site.	Appendix 12 Vegetation Management Plan
3.5	**Odour Monitoring** Prior to the commencement of operations associated with the development, the proponent shall prepare an ongoing odour monitoring program to ensure compliance with condition 2.1of this approval throughout the life of the development, consistent with *Approved Methods for the Modeling and Assessment of Air Pollutants in NSW* (DEC, 2005). The program shall be submitted for the approval of the Director-General and operations shall not commence until written approval has been received from the Director-General.	Section 9.3 Air Quality
3.6	**Noise Monitoring** Within 90 days of the commencement of operations associated with the development, and annually thereafter, the proponent shall assess the noise emission performance of the development during a period in which the development is operating under normal operating conditions. The assessment shall include, but not necessarily be limited to: a) Noise monitoring, consistent with the guidelines provided in the New South Wales Industrial Noise Policy (EPA, 2000), to assess compliance with condition 2.13 of this approval; b) A comparison of the results of the noise monitoring required under a) above, and the predicted noise impacts detailed in the documents listed under condition 1.1 of this approval; and c) Details of any entries in the Complaints Register (condition 6.3 of this approval) relating to noise impacts. A report providing the results of the program shall be submitted to the Director-General and DECC within 28 days of completion of the testing required under a).	Section 9.4 Noise and Vibration
3.7	If the results of the monitoring required under conditions 3.5 and 3.6 indicate that the operation of any component of the development, when operating under design loads and normal operating conditions, exceeds the limits, imposed under conditions 2.1 and/ or 2.13 of this approval, the proponent shall provide the details of remedial measures to be implemented and a timetable for implementation to reduce emissions to the levels required.	

	Details of the remedial measures shall be submitted to the Director-General for approval, and be accompanied by evidence that the DECC is satisfied that the remedial measures are acceptable.	
5.1	**Incident Reporting** The proponent shall notify the DECC and the Director-General of any incident with actual or potential significant off-site impacts on people or the biophysical environment as soon as practicable after the occurrence of the incident. The Proponent shall provide written details of the incident to the DECC and the Director-General within seven days of the date in which the incident occurred.	Section 10 Response Procedures
5.2	**Annual Performance Reporting** Within 12 months of the commencement of operations, and annually thereafter, the Proponent shall submit an Annual Environmental Report (AEMR) for the project to the DEC, Council and the Department. The AEMR shall include: a) details of compliance with the conditions of this approval, and any other licences and approvals for the project; b) a list of variations obtained to approvals applicable to the development and to the site during the preceding twelve-month period; c) a copy of the Complaints Register for the preceding twelve month period (exclusive of personal details), and a description of how these complaints were addressed and resolved; d) a comparison of the environmental impacts and performance of the development against the environmental impacts and performance predicted in the documents listed under condition 1.1; e) identification of trends in monitoring data over the life of the development to date; and f) environmental management targets and strategies for the following twelve –month period, taking into account identified trends in monitoring trends.	Section 11.4 Annual Environmental Management Report
6.2	**Complaints Procedure** Prior to the commencement of construction the Proponent shall establish a community complaints system to the satisfaction of the Director-General. This system must include: a) a 24-hour telephone number on which complaints about operations on the site may be registered; b) a postal address to which written complaints may be sent; and c) an email address to which electronic complaints may be transmitted, should the Proponent have email capabilities. The Proponent must record the details of all complaints received about the project in an up-to-date Complaints Register. This	Section 10.1 Complaints Handling

	register must record, but not necessarily be limited to: The date and time, where relevant of the complaint; a) the means by which the complaint was made (telephone, mail or email); b) any personal details of the complainant that were provided, or if no details were provided, a note to that effect; c) the nature of the complaint; d) any action(s) taken by the Proponent in relation to the complaint, including any follow up contact with the complainant; and e) if no action was taken by the Proponent in relation to the complaint, the reason(s) why no action was taken. The Complaints register must be made available for inspection by the Director-General upon request.	

APPENDIX 4 CONDITIONS OF CONSENT

APPENDIX 5 SITE LAYOUT

APPENDIX 6 TRAFFIC MOVEMENT PLAN

APPENDIX 7 STANDARD OPERATING PROCEDURES

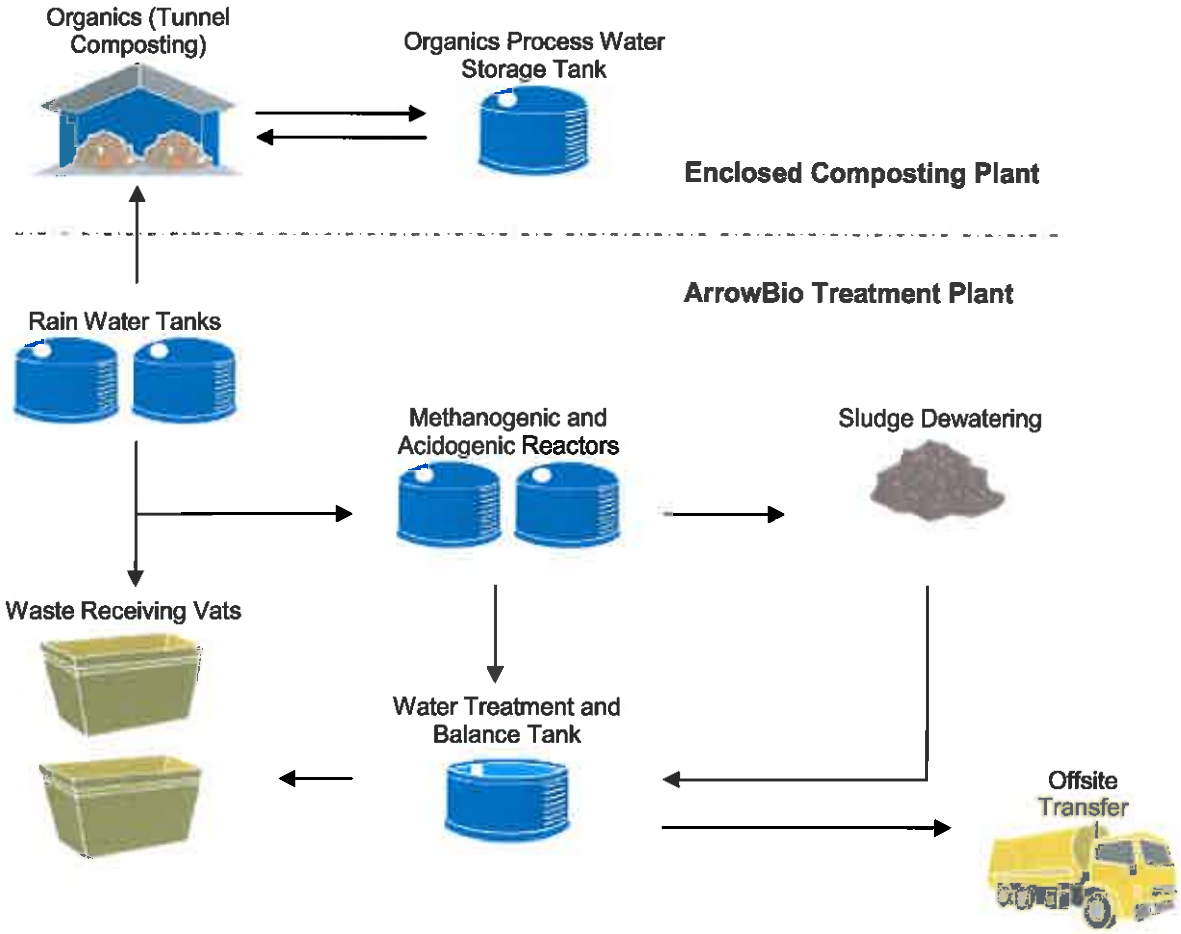
Environmental and Operational SOPs relevant to Site Operations (including proposed SOPs)
• Asbestos Handling Receival and Disposal • Biofilter Operation and Maintenance (TBD) • Biogas Capture and Management (TBD) • Biological Hazards (Common) • Biological Process Control (TBD) • Biological Treatment Plant Operations and Maintenance (TBD) • Bund construction and maintenance (Common) • Conditions for the Operation of Truck Wash (Landfill site) • Customer Diversion Strategy (Common) • Confined Space Entry (Common) • Excluded Waste – Management and Handling (TBC) • General Site Environmental Management (TBC) • General Site Operation (TBC) • Green waste separation and pre-treatment (TBD) • Hazardous Substance and Dangerous Goods (Common) • Job Safety and Environmental Analysis (Common) • Mobile Plant Operation and Maintenance (Common) • National Certificates of Competency (WorkCover) (Common) • Noise Management (Environmental and Occupational) (Common) • OH&S and Environmental Induction Requirements (Common) • Personal Protective Equipment (Common) • Plant Operation and Management (TBC) • Shredder Operation and Maintenance (TBD) • Power Generation Management (TBD) • Pre-sorting of MSW (TBD) • Process Water Management (TBD) • First Flush Stormwater Management (TBD) • Tank Farm Bund - Stormwater Management (TBD) • Traffic Management (TBC) • Trade Waste System Management and Maintenance (Common) • Waste and Product Transfer and Handling • Weighbridge Operations Manual (Common)
* TBC = To be customised to EMWOF Operations from existing facilities SOPs

Environmental and Operational SOPs relevant to Site Operations (including proposed SOPs)
* TBD = To be developed for EMWOF specific processes

APPENDIX 8 STORMWATER DRAINAGE DIAGRAMS

APPENDIX 9 PROCESS WATER MANAGEMENT

Diagram of Process Water Management at the EMWOF



APPENDIX 10 PROCESS WATER ANALYTE LIST

Daily Process Water Analyte List

pH	DO	Conductivity

Weekly Process Water Analyte List

pH	Ammonia as N	COD
DO	Conductivity	BOD

Full Process Water Analyte List

pH	Chromates	Sulphur
Alkalinity (as calcium carbonate)	Cyanides	Selenium
Benzene	Silver	Strontium
Chloride	Aluminium	Titanium
Conductivity	Arsenic	Vanadium
Ethyl benzene	Barium	Zinc
Fluoride	Beryllium	Ammonia
Magnesium	Calcium	Grease
Nitrate	Cadmium	Sulphite
Nitrite	Copper	Total Petroleum Hydrocarbons
Nitrogen (ammonia)	Iron	Phenolic Compounds
Sodium	Mercury	Polycyclic Hydrocarbons
Sulphate	Potassium	Total Dissolved Solids
Toluene	Lithium	Total Suspended Solids
COD	Manganese	Organochlorine Pesticides
General Oils	Molybdenum	Organophosphate Pesticides
Mineral Oils	Nickel	Total Organic Carbon
Sulphides	Phosphorus	Xylene

Total Suspended Solids	Lead	BOD_5
Boron (B)	Cobalt	Turbidity

APPENDIX 11 ODOUR MONITORING LOCATIONS

APPENDIX 12 NOISE MONITORING LOCATIONS

APPENDIX 13 VEGETATION MANAGEMENT PLAN

1 BACKGROUND

A study conducted by Eco Logical Australia Pty Ltd in September 2004 reported a total of 18 native flora species and 26 weed species were present on or adjacent to the building envelope. No native species were located on the site of the EMWOF, but some weed species were observed in the area. None of the native species identified were listed as threatened on either the State or Commonwealth threatened species legislation.

Existing vegetation surrounding and within the Facility envelope consists of a mix of indigenous and introduced species.

2 PURPOSE

This Vegetation Management Plan has been prepared to address how potential operations will impacts on native vegetation and how they will be mitigated and managed during site operations.

3 ENVIRONMENTAL OBJECTIVES

Site operational activities must be carried out in a manner that will minimise impacts on the local environment. The objectives include:

- Minimise the extent of disturbance to existing vegetation during operational activities.
- Eliminate the occurrence and proliferation of weeds.
- Successful revegetation of areas disturbed during site construction works.

4 MANAGEMENT STRATEGY

To minimise impacts to existing vegetation during site operational activities the following measures will be undertaken.

- Given the capacity of weed species to spread, removal should be undertaken using the appropriate methods including the use of weedicide such as *Roundup*®. Care should be taken in order to reduce weed seed dispersal;
- All noxious weed species within the project area are to be destroyed;
- Staff shall ensure that local Cumberland Plain Woodland vegetation located adjacent to the site is protected during site operations;
- Revegetation works will be undertaken with species that are locally native, refer to table 1 below, and will include sporadic groupings of indigenous species like those found in the existing Cumberland Plain Woodland and the Sydney Coastal River-flat Forest in accordance with *'Jacks Gully AWT Facility Landscape Plan'*.
- There are no natural watercourses located on the site and no operational activities are to take place within riparian areas.
- Watercourses down stream of the site will be protected from discharged water by all discharges meeting the requirement of the landfills Environmental Protection Licence.

- When planting new vegetation, temporary protection should be placed around the tree until the tree is stable. If necessary trees should be staked for support.

- Stabilisation of steep banks and bare earth areas will be undertaken as soon as possible after construction using locally native grasses on suitable areas to limit gully and sheet erosion which could affect adjacent vegetation communities and watercourses.

5 ACTIVITIES / FREQUENCY

WSN staff to remove noxious weed species within the facilities boundaries to minimise their spread to adjacent areas – *As required*;

Stabilisation of steep banks and bare earth areas to minimise gully and sheet erosion which may effect adjacent vegetation communities and watercourses by Contractors – *Prior to commencement of operations;*

Revegetation / landscaping works by Contractors to include planting of species which are endemic to the local area, refer to table 1 below, including those representative of the Cumberland Plain Woodland in accordance with the *'Jacks Gully AWT Facility Landscape Plan' – Prior to commencement of operations.*

Site Inspections undertaken to ensure protection and retention of identified flora when works are undertaken in vacinity by the Process Manager – *Daily*.

Site inspections undertaken by the Environment and Workforce Safety Officer to ensure protection and retention of identified flora, occurrence of weeds and the protection and maintenance of revegetated areas – *Weekly*.

6 REPORTING AND REVIEW

- Daily site inspection by Shift Supervisor;

- Weekly reporting by Environmental and Workforce Safety Officer to the Operations Manager through electronic checklist;

- Weekly inspection checklist by the Operations Manager; and

- Maintaining electronic checklists and records by the Operations Manager.

7 MONITORING

Daily operational and weekly environmental site inspections and electronic checklists will be undertaken, to ensure compliance with this plan. All records which include details of all site inspections, are to be kept for at least three years after the inspection and monitoring takes place.

Environmental Checklists will be completed by the Environment and Workforce Safety Officer in accordance with the Internal Audit and Inspection IMS Procedure.

8 PLANTING SPECIES LIST

Table 1: Plant Species Indigenous to Mount Annan Botanic Garden

	Common Name	Scientific Name
Trees		
	Narrow-leaved Ironbark	Eucalyptus crebra
	Grey Box	Eucalyptus moluccana
	Forest Red Gum	Eucalyptus tereticornis
	Prickly-leaved paper-bark	Melaleuca styphelioides
	Kurrajong	Brachychiton populneus
	Black/Green Wattle	Acacia decurrens
	Hickory	Acaia implexa
	Sydney Green Wattle	Acacia parramattensis
Shrubs		
	Blackthorn	Bursaria spinosa
	Native Indigo	Indigofera australis
	Hop Bush	Dodonaea viscose ssp cuneata
Grasses		
	Kangaroo Grass	Themeda australis
	Weeping Grass	Microlaena stipoides
	Tall chloris	Chloris ventricosa
	Windmill Grass	Chloris truncata
	Red-leg Grass	Bothriochloa macra
	Wallaby Grass	Austrodanthonia fulva

Appendix C

Automatic Weather Station Report Spring Farm (Jacks Gully) for July to September 2013 (Coffey Environments Australia, 28 October, 2013)

Cardno
Shaping the Future

28 October 2013

SITA Environmental Solutions Pty Ltd
275 Richardson Road
Spring Farm NSW 2570

Attention: Adam Philip

Dear Adam

RE: Automatic Weather Station Report Spring Farm (Jacks Gully) for July to September 2013

Coffey Environments is pleased to provide the Automatic Weather Station (AWS) Report for the July to September 2013 quarter. The following report provides factual data of the meteorological conditions of the AWS at Spring Farm Advanced Resource Recovery Facility (formerly Jacks Gully Waste and Recycle Centre) for the period 1 July to 30 September 2013. Please contact Philip Hutson or the undersigned on (02) 9406 1000 if you have any queries regarding this report.

This report must be read in conjunction with the Statement of Limitations presented in Section 3 of this report.

For and on behalf of Coffey Environments Pty Ltd

Edward Wu
Senior Associate

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RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	ENVIRHOD00451AA-R26.docx	Final	28 October 2013	SITA Environmental Solutions Pty Ltd	PH
1	ENVIRHOD00451AA-R26.pdf	Final	28 October 2013	SITA Environmental Solutions Pty Ltd	PH
1	ENVIRHOD00451AA-R26.docx	Final	28 October 2013	Coffey Environments Pty Ltd	PH

CONTENTS

LIST OF ATTACHMENTS

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Appendices

1 INTRODUCTION

Coffey Environments Australia Pty Ltd (Coffey Environments) was engaged by SITA Environmental Solutions (SITA) to maintain and monitor meteorological conditions of the automatic weather stations (AWS) at Spring Farm Advanced Resource Recovery Facility (Spring Farm ARRF, formerly Jacks Gully Waste and Recycle Centre).

The following report provides a factual representation of the meteorological conditions for the period between 1 July 2013 and 30 September 2013.

1.1 Background

Spring Farm ARRF is located approximately 50km south-west from the Sydney CBD. It is an operational site with an active landfill and recycling centre. The AWS is located on the roof of the site office, adjacent to the current weighbridge. The AWS measures and records the following parameters:

- Wind speed and direction
- Rainfall
- Relative Humidity
- Barometric Pressure
- Temperature at 7m
- Solar Radiation
- Evaporation

2 SPRING FARM AWS

2.1 Summary of Daily Meteorological Data

Graphical representations of weekly downloaded daily meteorological data from the Spring Farm ARRF AWS are shown in Appendix A and summarised below.

Table 2.1.1: Daily meteorological data – Spring Farm ARRF

	July 2013	August 2013	September 2013
Min. Air Temperature	2°C	2°C	8°C
Avg. Air Temperature	14°C	18°C	22°C
Max. Air Temperature	29°C	30°C	34°C
Min. Relative Humidity	21%	17%	13%
Avg. Relative Humidity	75%	59%	63%
Max. Relative Humidity	100%	99%	100%
Min. Barometric Pressure	993mBar	990mBar	986mBar
Avg. Barometric Pressure	1011mBar	1004mBar	1004mBar
Max. Barometric Pressure	1024mBar	1014mBar	1023mBar
Avg. Solar Radiation	107W/m^2	151W/m^2	208W/m^2
Max. Solar Radiation	758W/m^2	1007W/m^2	1162W/m^2
Avg. Rainfall	0.2mm	0.2mm	0.8mm
Max. Rainfall	2.0mm	4.8mm	15.6mm
Avg. Evaporation	1.6mm	3.2mm	4.4mm

2.2 Wind Roses

Wind Roses indicate the distribution of 15 minute averaged wind speed and wind direction recorded by the AWS. Wind Roses from the Spring Farm ARRF display wind conditions at a height of approximately 13m above ground level.

Wind Roses for the July to September 2013 quarter at Spring Farm ARRF are presented in Figures 1A-1C. A summary of monthly wind speed and wind direction at Spring Farm ARRF is given below.

2.2.1 July 2013

Winds were predominantly from the south-east quadrant (Figure 1A). Average wind speed ranges varied from 0-3m/s to 6-9m/s.

2.2.2 August 2013

Winds were predominantly from the south-east and south-west quadrants (Figure 1B). Average wind speed ranges varied from 0-3m/s to 9-12m/s.

2.2.3 September 2013

Winds were predominantly from the south-east quadrant (Figure 1C). Average wind speed ranges varied from 0-3m/s to 9-12m/s.

2.3 AWS Maintenance Report

Maintenance was conducted on the AWS at Spring Farm ARRF on 5 September 2013. The maintenance round scheduled for August was delayed to early September.

General condition checks, maintenance and cleaning of the AWS temperature gauge, wind sensor, mast and securing cables, GSR sensor and rain gauge were completed. The AWS was cleaned using a cloth and plastic water-filled spray gun. The AWS mast was lowered to allow access to the upper instruments. Upon completion of maintenance and cleaning, the mast was raised and straightened by adjusting the securing cable tension accordingly.

No abnormal conditions were reported for the AWS components. Some higher than expected maximum temperature readings were recorded in June 2013 and as a results the temperature sensor was replaced with a loan sensor and the primary sensor sent to MEA for calibration during the maintenance round in July 2013. During the maintenance round conducted on the 5 September 2013 the loan temperature sensor was removed and replaced with the calibrated primary sensor.

Real time meteorological data recorded by the Starlogger was assessed against weather conditions (wind speed, temperature and solar radiation) observed in the field at the time of the field maintenance. Checks of parameters recorded by the Starlogger were generally consistent with weather conditions observed during field maintenance.

3 STATEMENT OF LIMITATIONS

The work was conducted, and the report has been prepared, in response to specific instructions from SITA Environmental Solutions, within practical time and budgetary constraints, and in reliance on certain data and information made available to Coffey Environments. The data presented in this report has been obtained from the Automatic Weather Station. These monitors have been maintained by Coffey Environments in accordance with the scope of services specified in proposal ENVIRHOD00451AA-L05 Contract Ext 2013 JG, dated 11 April 2013.

Important information about your Coffey Environmental Report

Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but

steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

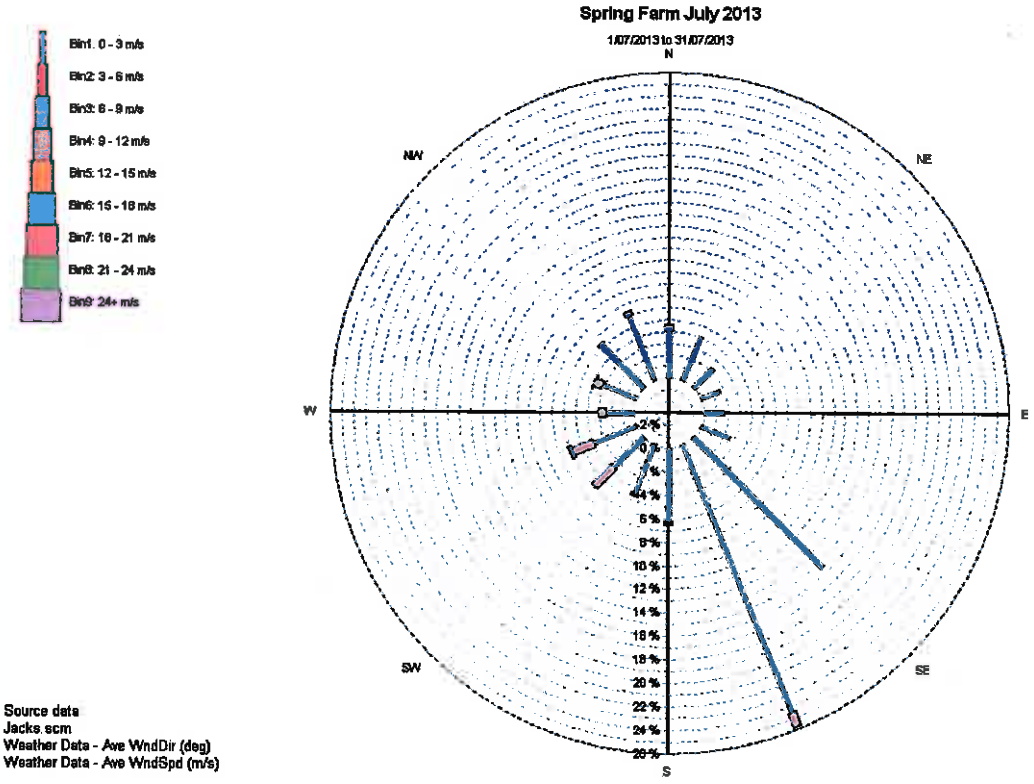
This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Figures

AWS Report
July to September 2013



Source data
Jacks.scm
Weather Data - Ave WndDir (deg)
Weather Data - Ave WndSpd (m/s)

drawn	PGH	coffey	client:	SITA Environmental Solutions
approved	EW		project:	AWS and Realtime Dust Monitoring – July to September 2013
date	16/10/2013		title:	Wind Rose – Spring Farm WRC AWS - July 2013
scale	N/A		project no: ENVIRHOD00451AA	figure no: FIGURE 1A
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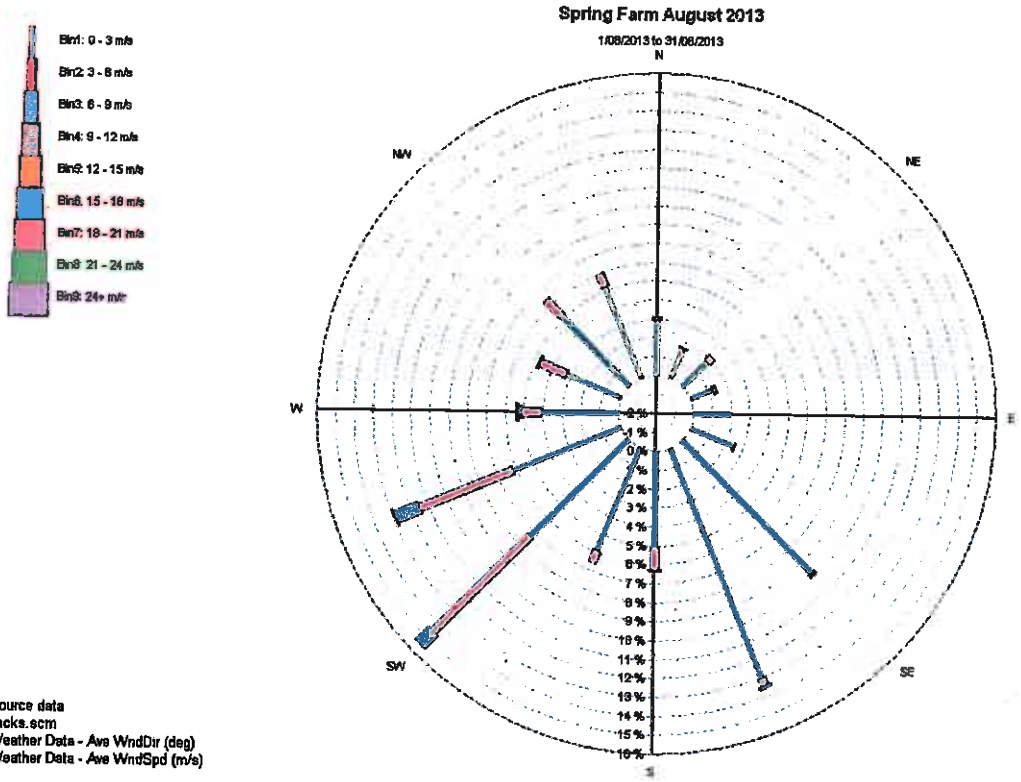

Source data
Jacks.scm
Weather Data - Ave WndDir (deg)
Weather Data - Ave WndSpd (m/s)

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approved	EW		project:	AWS and Realtime Dust Monitoring – July to September 2013
date	16/10/2013		title:	Wind Rose – Spring Farm WRC AWS - August 2013
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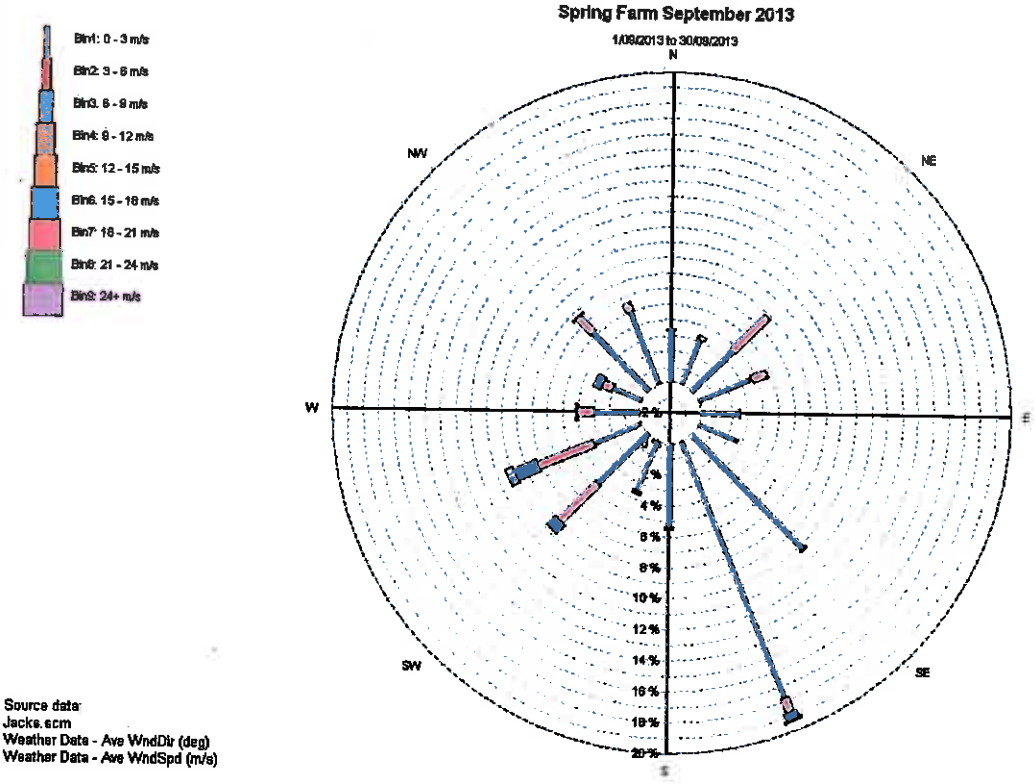

Source data:
Jacks.scm
Weather Data - Ave WndDir (deg)
Weather Data - Ave WndSpd (m/s)

drawn	PGH	coffey	client:	SITA Environmental Solutions
approved	EW		project:	AWS and Realtime Dust Monitoring – July to September 2013
date	16/10/2013		title:	Wind Rose – Spring Farm WRC AWS - September 2013
scale	N/A		project no: ENVIRHOD00451AA	figure no: FIGURE 1C
original size	A4			

Appendix D

Spring Farm Biotreatment Facility –
Fit for Purpose Report – Amended Version
(Suez Environment, January, 2014)

Cardno
Shaping the Future

SPRING FARM BIOTREATMENT FACILITY

FIT FOR PURPOSE REPORT

Amended Version

Authors: Gerardo Aguilera Soriano

Robert F. Kelly

January, 2014

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INTRODUCTION

The proposed Spring Farm Biotreatment Facility, formerly known as the Jacks Gully mixed solid waste treatment and recycling facility, is currently the subject of a development application with the NSW Department of Planning and Infrastructure, as submitted by SITA Australia. The objective of this document is to provide a brief technical summary of the proposed design configuration for treatment of both high organic liquid trade waste and leachate, so as to demonstrate that the site is "fit for purpose" in support of consent approval for the project.

The original Jacks Gully facility was constructed in 2008 by WSN on a site shared by an existing landfill. The process was comprised of two identical treatment trains operating in parallel and was sized for a total design capacity of 90,000 tons/year. The original treatment process consisted of numerous automatic screening and manual sorting stages, for separating and recycling plastics, ferrous metals, aluminium, paper and textiles from household waste. The organic fraction was extracted for additional screening and biological treatment (anaerobic digestion) for the production of biogas which was subsequently converted into electricity via two 1.4MW gas engines (combined heat and power systems). The digested pulp was dewatered via belt press and the solids treatment process was completed by a green waste composting scheme. The dewatering filtrate was treated biologically via Sequencing Batch Reactor (SBR) to eliminate ammonia nitrogen prior to recycling of the treated effluent for use within the sorting hall. A general overview of the original facility is shown below. A list of the main facilities and pieces of equipment is provided in Appendix 1. A list of the main equipment installations is provided in Appendix 2.

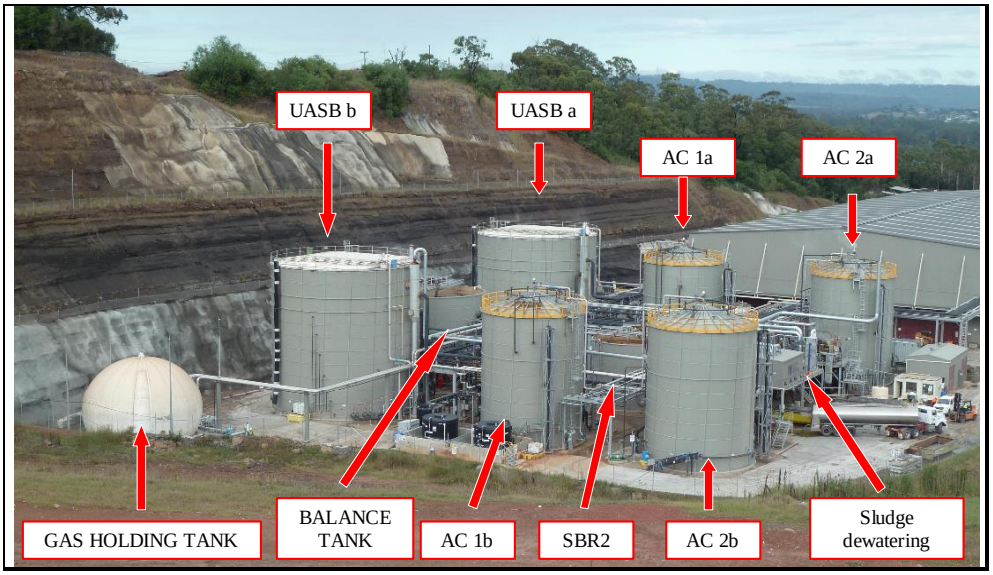

FIGURE 1. Tank farm general overview

Management and operation of the Jacks Gully Mixed Solid Waste Treatment and Recycling facility was assumed by SITA AUSTRALIA on February 1, 2011. A detailed functional audit of the treatment process was conducted in March, 2011, which revealed a number of significant operational difficulties due to various design and infrastructure issues despite process operations at a waste loading well below the design capacity (Appendix 3 – Jacks Gully Facility: 2011 Tank Farm Audit Report).

A key aspect of the investigation focused on the fact that some of the core equipment design functions, notably the UASB anaerobic reactors, did not correspond to their usual applications, directly leading to major operating difficulties. The Upflow Anaerobic Sludge Blanket (UASB) reactor technology is typically used for treating dissolved organic streams having a maximum suspended solids of 1 g/L and not a concentrated pulp stream as was installed at the Jacks Gully facility. In fact, this design "deficiency" was also highlighted in a report prepared by the University of Queensland. Furthermore, the UASB reactors received a large quantity of non-fermentable materials, hindering biological treatment and reducing the working volume of the tanks.

A project was therefore launched by SITA AUSTRALIA in order to determine the optimal direction for the future design and operation of the facility to ensure a robust and efficient process while complying with the site's organic matter recycling and energy recovery objectives.

MODIFIED PROCESS DESIGN PROPOSAL

The modified process design which was ultimately selected by SITA AUSTRALIA was to discontinue the production of organic pulp within the sorting hall and to adapt site treatment objectives to process two parallel waste streams:

- anaerobic treatment of high organic liquid trade waste to produce a maximum amount of biogas and subsequent electricity generation; and
- aerobic treatment of leachate from SITA operated facilities such as landfills or other leachate-generating activities.

The modified biotreatment facility will be designed to ensure the treated effluent meets the acceptance standards for sewerage connection to inland sewage treatment plants, as defined by Sydney Water. A discharge permit of 520 m^3 per day is currently under discussion with effluent concentration limits of $<$ 600 mg/L BOD and $<$ 100 mg/L ammonia as regards the future sewage connection. The project design will ensure achievement of this performance standard from facility start-up when treated effluent will be removed from site by tanker for delivery to a trade waste system for disposal. The modified process design will allow sufficient flexibility such that either waste stream can be handled up to a maximum capacity of 520 m^3 per day, as a function of waste availability.

The advantage of the proposed modified biotreatment facility design includes the ability to provide improved operating stability while maximizing the use of existing infrastructure and minimizing the necessary site modifications. A brief description of the various treatment stages is presented below along with a schematic illustration of the proposed process configuration and the quality of the various process streams (Figure 2*).

High Organic Liquid Trade Waste Treatment (320 m^3/d design capacity)

One of the existing UASB reactors (UASB a; 3000 m^3) will be used to treat liquid trade waste having a high level of dissolved organic carbon, such as effluents from the agri-food industry, breweries, sugar mills, dairies, distilleries and starch transformation plants. Typically, such trade wastes will have a low level of suspended solids while varying in COD concentration between 20 and 60 g/L. For the purposes of the project design calculations a value of 40 g/L COD was used.

The high organic liquid trade waste will be transported to the site via tanker truck with one of the existing anaerobic tanks (AC 1a; 1000 m^3) transformed into a storage / buffer tank in order to provide a constant feed to the anaerobic reactor (UASB a).

Based upon the effluent discharge target of 320 m^3/day and assuming 40 000 mg/L COD influent yields a design loading of approximately 4.3 kg COD/m^3/day, a conservative value for this type of application.

The high organic wastewater undergoes anaerobic biological treatment via naturally occurring microorganisms (granulated methanogenic sludge) which transform simpler organic acids and fatty acids into biogas (methane, carbon dioxide and water).

The typical performance efficiency observed with a UASB reactor is approximately 80% COD removal, however, as the site plans to specifically target highly biodegradable liquid waste, a digestion performance of 90% COD removal at a working temperature of 35°C has been considered as the design guideline, in-line with industry performance standards.

A three-phase separator at the top of the UASB reactor allows for collection of the produced biogas. The typical volume of biogas produced for this type of application is approximately 0.37 Nm^3 per kg of COD removed, yielding a daily biogas production of 6,384 Nm^3/d. Based upon a biogas composition of 60% methane, this represents an hourly flow of methane of approximately 160 m^3/h, or 30% of the capacity of one of the existing gas engines (CHP unit).

Figure 3. Double Jenbacher 1400 kW CHP

One of the existing CHP units will be dedicated to anaerobic digester biogas while the second CHP unit will continue to run as presently using landfill gas collected on-site. Excess biogas will be flared using the existing flare, designed for 1400 m^3/h, well above the maximum production capacity of a single UASB treating high organic liquid trade waste.

The liquor from the UASB will contain residual carbonaceous pollution that will be transferred to the existing SBR units, SBR1 (300 m^3) and SBR2 (400 m^3), for aerobic biological treatment. The existing UASB reactor, UASB b, (3000 m^3) will be converted into an intermediate storage (feed balancing) tank. SBRs operate in batch mode with aeration and

sludge settling occurring within the same vessel. Based on 90% removal of COD via anaerobic digestion in UASB a, the existing SBRs will have to remove a total of 1,216 kg COD per day. As the pollution to be treated is essentially carbonaceous, with little requirement for nitrification, the oxygen demand will be reduced accordingly.

Figure 4a. SBR 1 (300 m^3)

Figure 4b. SBR 2 (400 m^3)

The existing SBRs exhibit an aeration capacity of 900 and 1800 Nm^3/h, respectively for SBR1 and SBR2. However the SBR1 aeration system is undersized as regards the future design loading and therefore will be replaced with a system identical to that of SBR2, thereby increasing the treatment capacity of SBR1 to meet the design guidelines for the modified Biological Tank Farm proposal.

Leachate treatment (200 m^3/d design capacity)

Design guidelines for the leachate treatment system were based upon typical leachate characteristics observed for landfills (ammonia = 900 mg/L / COD = 1500 mg/L).

One of the existing anaerobic tanks (AC 1b; 1000 m^3) will be transformed into an additional SBR reactor (SBR3) dedicated for the aerobic treatment of leachate streams generated at various SITA operated facilities. SBRs operate in batch mode with aeration and sludge settling occurring within the same vessel. This aerobic reactor will be primarily used for ammonia removal at a working temperature of 24°C. Design calculations illustrate that the reactor will likely require alkalinity addition to support nitrification.

One of the existing anaerobic tanks (AC 2b; 1000 m^3) will be used as a buffer tank to store leachate prior to aerobic treatment in SBR3.

One of the existing anaerobic tanks (AC 2a; 1000 m^3) will be converted to a treated wastewater storage tank. The treated leachate will be transferred to the treated wastewater storage tank prior to discharge from site.

Residual solids treatment

Excess sludge from the UASB reactor and SBR systems will be sent to the existing balance tank prior to dewatering. The existing Siemens Belt filter press will be used to dewater residual solids as originally designed.

The dewatered cake may be used as a quality soil conditioner or as an additive for the Garden Organics Facility on-site. It shoud be noted that the present facility licence currently authorises up to 5000 tonnes per year of biosolids (digestate) entry.

Supernatant from the dewatering system will be recycled back to the leachate receival tank for further treatment or to the treated wastewater storage tank for disposal.

Figure 5. Belt filter press (Siemens)

Air Quality

Historic issues with nuisance odours generated via the original Jacks Gully facility design **were strongly correlated to the treatment of mixed solid waste and the preparation of an organic pulp** which was incompatible with the objective of anaerobic digestion in a UASB type reactor.

The current application targets high organic liquid trade wastes, such as out-of-date or off-spec consumer beverage products, including soft drinks, beer and energy drinks, and as such are not anticipated to generate nuisance odours in and of themselves.

Process operating guidelines will serve as a primary mitigation of nuisance odour generation during trade waste storage in the feed balancing tank (Ac 1a) as storage times will be kept to a strict minimum in order to prevent fermentation and corresponding loss of valuable carbon for subsequent conversion to biogas during the anaerobic digestion stage. This operational mode is essential to preserve the economic interest of the project.

Nuisance odour issues are typically not a concern during the anaerobic digestion phase as the UASB reactors are equipped with a dedicated system for biogas collection and the resulting treated effluent will contain relatively little fermentable organics for treatment in the subsequent aerobic stage (SBR reactors). Furthermore, the high organic liquid trade waste to be treated is expected to contain very low concentrations of sulphate (precursor to H_2S production).

As regards the leachate treatment line, the leachate storage / buffer tank is an enclosed vessel and while SBR3 is an open, well-aerated tank thereby creating conditions for stripping of volatile odorant compounds potentially present in leachate, this phenomenon will be mitigated via application of odour neutraliser agents using dedicated horizontal spray systems.

In any event, SUEZ ENVIRONNEMENT has developed the NOSE approach (No Odours for SUEZ ENVIRONNEMENT) to manage nuisance odours which may be associated with industrial facilities. The NOSE approach delivers a sustainable control of nuisance odours by addressing both technical and human approach (Appendix 4 – NOSE reference articles).

CONCLUSIONS

It can be concluded that the SPRING FARM Biotreatment Facility is indeed “fit for purpose” for site operations in line with those outlined in SITA AUSTRALIA’s proposal to the NSW Department of Planning and Infrastructure, specifically to process two parallel waste streams:

- anaerobic treatment of high organic liquid trade waste to produce a maximum amount of biogas and subsequent electricity generation; and
- aerobic treatment of leachate from facilities such as landfills or other leachate-generating activities.

Furthermore, operation of the modified Biotreatment Facility per the design considerations established herein is not anticipated to generate additional nuisance odour emissions.

Accordingly, the site may be ready to operate upon completion of the site / equipment modifications as described herein.

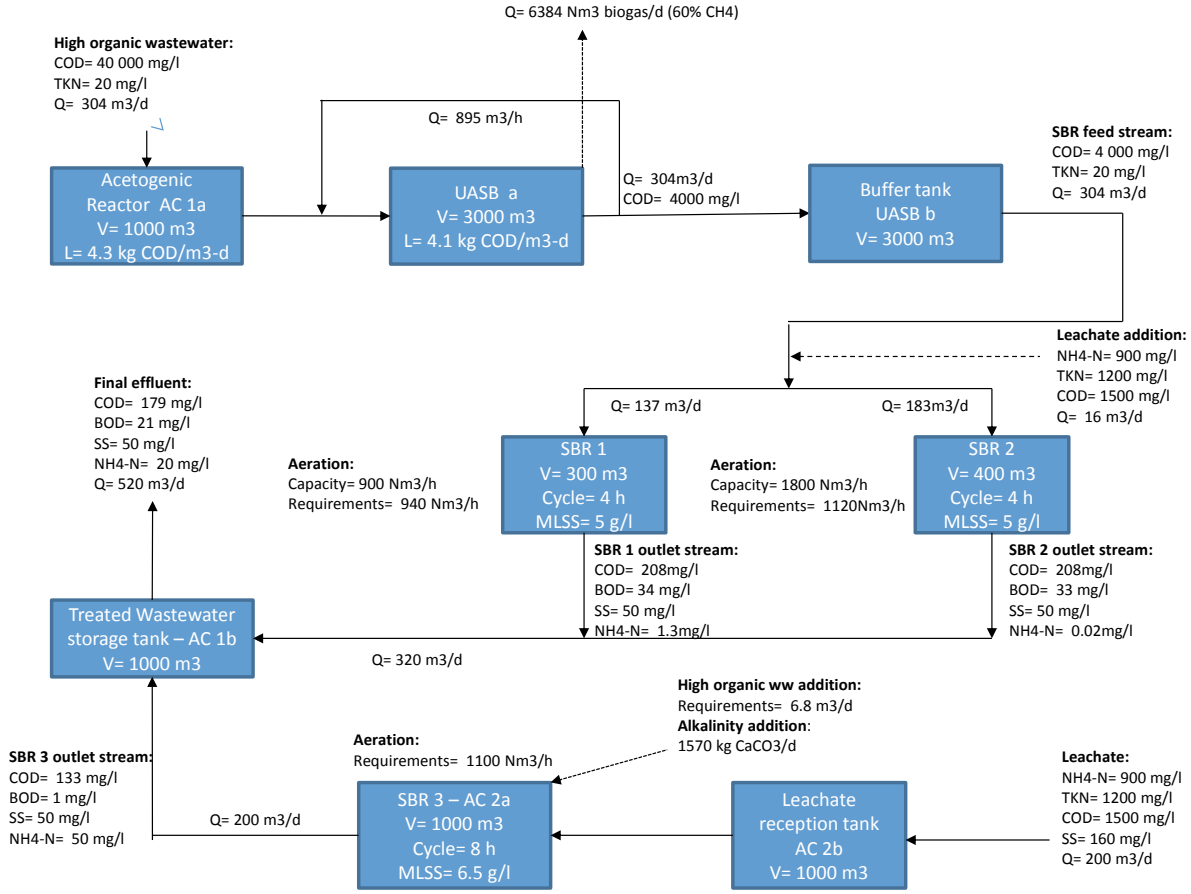

FIGURE 2*. Modified Biotreatment Facility - proposed process flow diagram.

* The following design considerations were used to arrive at the process flow diagram presented in Figure 2.

High organic liquid waste (based upon representative data using soft drink characteristics) :

- COD= 40 000 mg/l (95% soluble / 5% settleable COD)
- Biodegradability: COD/BOD = 2.20
- TN = 20 mg/l and NH4-N = 10 mg/l

UASB reactor:

- Performance: 90% COD removal
- Working temperature: 35°C
- Biogas production: 0.370 Nm^3/kg COD removed

SBR1 and SBR2 :

- Working temperature: 28°C
- Operations Cycle : 4 h (2 h feed & aeration / 1h settling / 1h decanting)
- Nutrient addition (eg. Urea) to compensate for nitrogen deficit in the influent.
- Probable requirement for phosphorous addition to compensate for deficit in the influent.

Landfill leachate characteristics :

- NH_4-N = 900 mg/l with NH_4-N/TKN = 0.75
- COD = 1500 mg/l
- Biodegradability: COD/BOD = 10
- Suspended solids = 160 mg/l

SBR3 :

- Working temperature : 24°C
- Operations Cycle : 8 h (4 h feed & aeration / 2 h anoxic / 1h settling / 1h decanting)
- Addition of high organic effluent to provide carbon for denitrification.
- Leachate alkalinity considered to be 150 mg CaCO3/l which is the usual value for freshwater.

It must be emphasized that the influent quality specifications and corresponding process parameters provided in Figure 2 (Modified Biotreatment Facility - Process Flow Diagram) represent design values based upon SUEZ ENVIRONNEMENT's operational expertise and certain local project assumptions (particularly as concerns the characteristics of the waste streams to be treated). These design criteria will be validated during a subsequent project phase.

Specifically, this will include but is not necessarily limited to:

- Characterisation of locally-available high organic liquid trade waste streams;
- Characterisation of relevant leachate streams; and
- Biochemical methane potential assays on identified high organic liquid trade waste streams.

Ultimately, such results will be used to support the project's technical feasibility and associated financial model in order to enable a Go / No Go decision by SITA AUSTRALIA.

APPENDIX 1. GLOSSARY OF TERMS

UASB - Upflow Anaerobic Sludge Blanket Reactor

Upflow anaerobic sludge blanket (**UASB**) technology, normally referred to as UASB reactor, is a specific type of anaerobic digester that is frequently used in the treatment of industrial effluents.

The UASB technology uses an anaerobic process to form a blanket of granular or flocculent sludge which exists in suspension within the reactor vessel. Wastewater flows upwards through the blanket and is processed (degraded) by the microbial consortia via anaerobic pathways.

Biogas with a high concentration of methane is produced as a by-product, which may be captured, purified and used as an energy source via various pathways, including combined heat and power systems for generation of electricity and beneficial use of recovered heat.

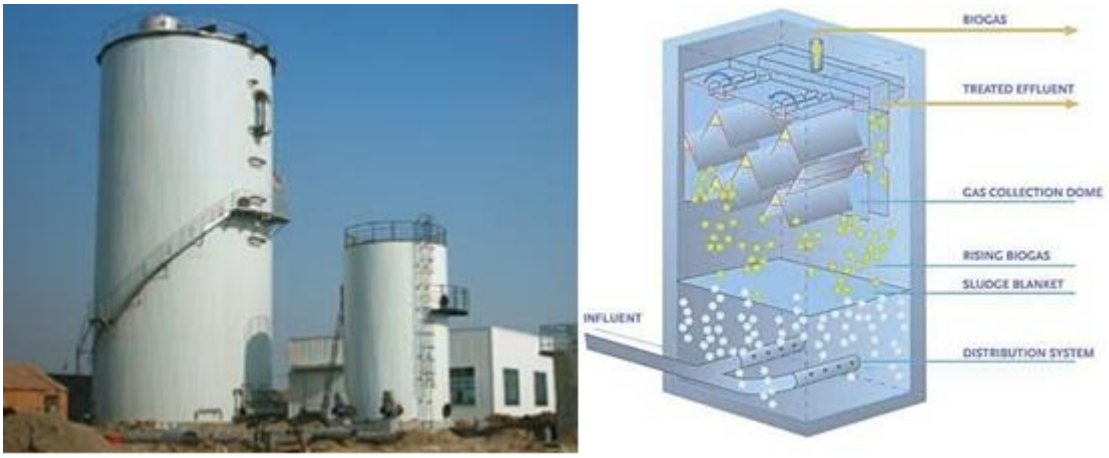

Figure A1. UASB photo and schematic illustration.

SBR – Sequencing Batch Reactor

Sequencing batch reactors (SBRs) are a commonly used process for the biological treatment of municipal and industrial wastewaters. In its most basic form, the SBR system is a set of tanks that operate on a fill-and-draw basis. Typically, the cycle for each tank in an SBR is divided into five discrete periods: Fill, React, Settle, Draw and Idle.

Each tank in the SBR system is filled during a discrete period of time and then operated as a batch reactor. Oxygen is introduced via the aeration process in order to support the microbial activity responsible for biological treatment. Following the desired treatment interval, the mixed liquor is allowed to settle and the clarified supernatant is then drawn from the tank.

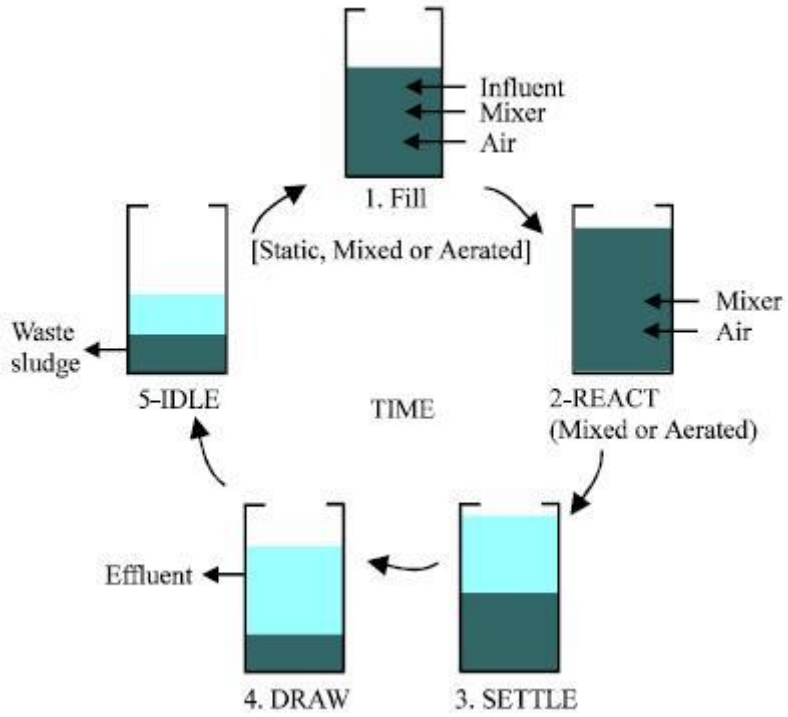

Figure A2. Schematic illustration of SBR Cycle.

APPENDIX 2

Summary of existing equipment installations.

SPRING FARM BIOTREATMENT FACILITY		
Facility		**Characteristics**
Acetogenic reactor 1 Line1 – AC 1a		V= 1000 m^3
Acetogenic reactor 2 Line 1 – AC 1b		V= 1000 m^3
Acetogenic reactor 1 Line 2 – AC 2a		V= 1000 m^3
Acetogenic reactor 2 Line 2 – AC 2b		V= 1000 m^3
Sequencing batch reactor 1 – SBR 1		V= 300 m^3
Sequencing batch reactor 2 – SBR 2		V= 400 m^3
Upflow anaerobic sludge blanket reactor 1 – UASB a		V= 3000 m^3
Upflow anaerobic sludge blanket reactor 2 – UASB b		V= 3000 m^3
Balance tank		
Gas holding tank		V= 570 m^3
Ferric chloride storage tank		
Sodium hydroxide storage tank		
Hydrochloric acid storage tank		
Anti-scalant storage tank		
Flocculant storage tank		
Diesel storage tank		
First flush tank		
Equipment	**Brand**	**Characteristics**
SBR1 blower		Capacity= 900 Nm^3/h
SBR2 blower 1		Capacity= 900 Nm^3/h
SBR2 blower 2		Capacity= 900 Nm^3/h
CHP 1 (Combined Heat and Power)	Jenbacher	1400 kWe
CHP 2 (Combined Heat and Power)	Jenbacher	1400 kWe
Belt press	Siemens	2.5 m
Screw press 1	Huber	
Screw press 2	Huber	
Spiral heat exchanger 1	Alpha Laval	
Spiral heat exchanger 2	Alpha Laval	
Spiral heat exchanger 3	Alpha Laval	
Spiral heat exchanger 4	Alpha Laval	
Mixed biogas/fuel boiler 1		200 kW
Mixed biogas/fuel boiler 2		200 kW
Acetogenic reactor recirculation pumps		160 m^3/h @ 20 m
Compressors		
2.5 mm screens		
0.75 mm screens		
0.5 mm screen		
Scrubber		
Flare		1400 m^3/h

APPENDIX 3

SUEZ ENVIRONNEMENT REFERENCE SITES

KRONENBOURG BREWERY (France)

- Industrial STP operated by Lyonnaise des Eaux.
- Plant capacity of 350,000 population equivalent.
- Anaerobic Digestion of yeast-laden water and waste beer yields 18% of site energy requirements.
- 3 methanisation reactors produce 16,000 MWh (thermal).
- Produced biogas powers industrial boilers.

MEISTRATZHEIM (FRANCE)

- Plant operations by Lyonnaise des Eaux.
- Plant capacity varies from 60,000 to 205,000 population equivalent based upon sauerkraut waste volumes.
- Anaerobic Digestion of sauerkraut production waste.
- On-site production of 5,500 MWh of primary biogas (85% methane content).

Appendix E

Letter to Cardno from Pacific Environment in response to odour issues raised in the submissions (4 December 2014)

Cardno
Shaping the Future

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

4 December 2014

John O'Grady
Cardno
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St Leonards NSW 2065

SPRING FARM ARRT FACILITY
ODOUR AND AIR QUALITY ASSESSMENT

Pacific Environment are pleased to provide this response to the NSW Environmental Protection Authority (EPA) comments as outlined in Attachment A of their letter dated 4 December 2013, which sought clarification of issues regarding the "Spring Farm Advanced Resource Recovery Treatment Facility – Air Quality and Odour Impact Assessment". This letter also responds to an issue of inconsistency raised in a letter from Camden Council dated 29 November 2013, for the same assessment. This concern is addressed first to provide context.

1 ISSUE RAISED BY CAMDEN COUNCIL – LETTER DATED 29 NOVEMBER 2013.

The issue raised in this letter is one of inconsistency between the Air Quality and Odour Impact Assessment for the ARRT facility, prepared for SITA, and a Level 3 Odour Assessment for the same area, prepared for Urban Growth. The following summary of the Project background will clarify the difference in these two reports.

1.1 Project background

There have been two recent reports completed for operations in the same area, each for a slightly different purpose, as follows:

- The Spring Farm Advanced Resource Recovery Treatmeant (ARRT) Facility – Air Quality and Odour Impact Assessment, prepared for SITA for the proposed modification of the ARRT facility. This will be refered to as the SITA report and was submitted in September 2013.
- The Spring Farm Residential Development – Level 3 Odour Impact Assessment, prepared for Urban Growth to assess the potential odour impacts on proposed residential development precincts P400 and P500. This will be referred to as the Urban Growth report and was submitted in May 2013 with subsequent additions in August and November 2013.

The Urban Growth report assessed the combined operations at the Spring Farm ARRT facility, the existing landfill and Camden Soil Mix (CSM), all operated by SITA. This report was submitted to Camden Council, who in turn requested that the EPA provide comment on the adequacy of this assessment.

The EPA provided their comments on the technical aspects of the Urban Growth report, and raised some questions regarding the odour emission rates and other model inputs. Pacific Environment responded to these comments in August 2013.

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Pacific Environment then received further comments from the EPA in late September that queried the odour emission rates used, in particular for the greenwaste shredding operation at Camden Soil Mix. To clarify and resolve this issue, Pacific Environment met with Camden Council and EPA representatives on 4 November 2013, by which time the SITA report had been submitted.

As a result of this meeting, it was agreed that further modelling should be undertaken to clarify the odour predictions from the greenwaste shredder as well as its potential impact on the subject development application for precincts P400 and P500. Since that meeting, the EPA raised another potential odour source located adjacent to the Camden Soil Mix site (on land owned by Tripodi and subject to a pending licence application from the EPA), that proposes additional 50,000 tonnes per annum of composting windrows.

Pacific Environment then carried out further assessment and provided Camden Council a letter describing the results of the additional modelling agreed at the meeting held on 4 November 2013, to the satisfaction of the EPA.

This additional modelling for the Urban Growth report, which included worst case (or upset) emission conditions at the Camden Soil Mix site, increased shredding emissions and additional composting windrows, was submitted subsequent to the SITA report and as such was not included in the SITA report. As the modelling showed, however, the increases were minor and did not change the conclusions of the Urban Growth report (see **Figure 1**). In addition, it is important to note that these minor increases were not due to the proposed upgraded operations at the ARRT facility.

It is noted that the model inputs for both of these investigations were the same. This should now clarify the issue of inconsistency between the two reports.

The modelling presented in **Figure 1** represented upset or pre-mitigation conditions before Camden Soil Mix had made significant efforts to mitigate the odour emissions from the the area of the compost block and the shredding and storage areas.

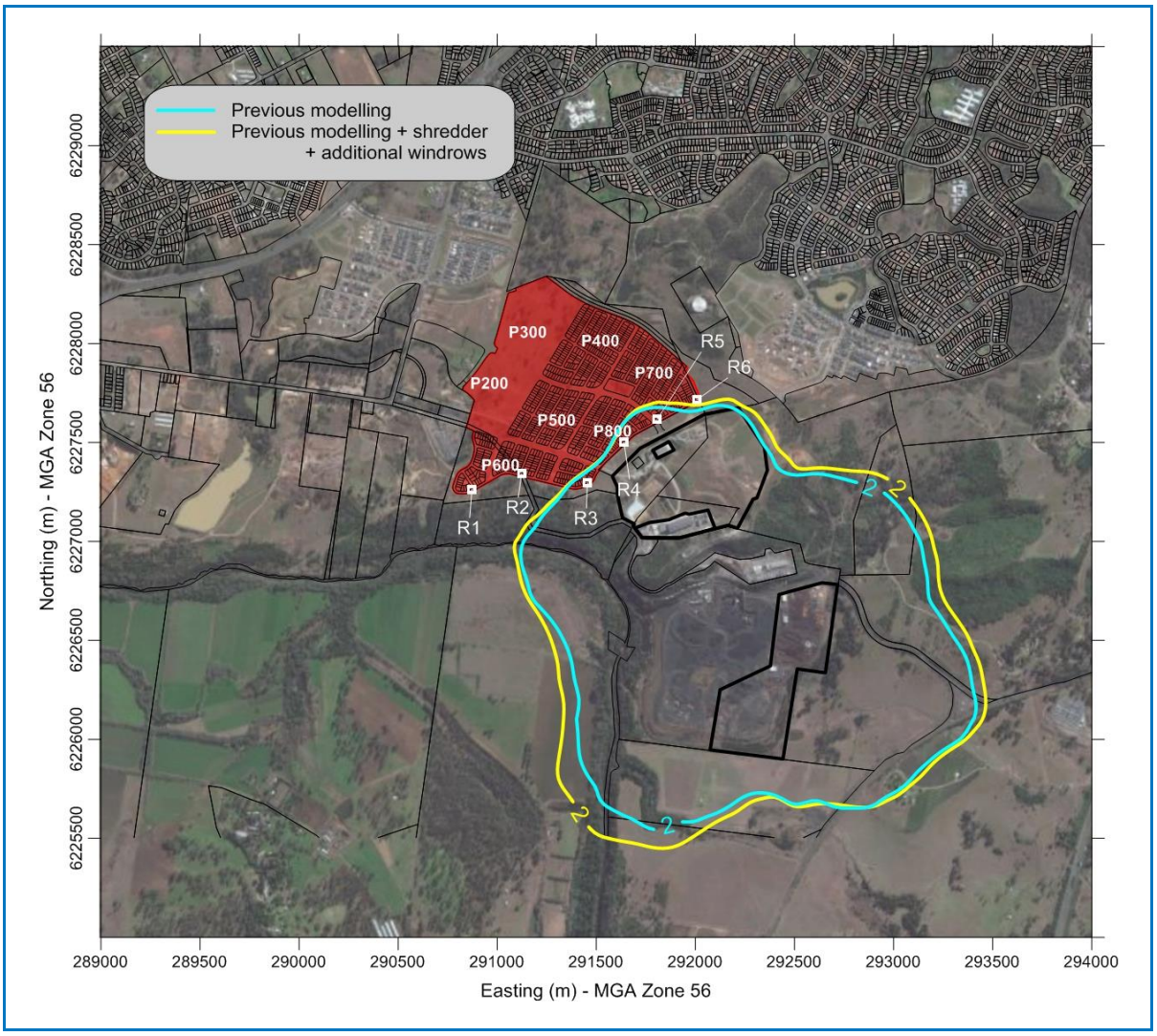

Figure 1: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Landfill, Camden Soil Mix and Tripodi (upset conditions)

1.2 Interpreting odour modelling results

The two contours presented in **Figure 1** represent the predicted 2 odour unit (OU) concentration (99th percentile, expressed as a 1-second, nose-response average), associated with the Camden Soil Mix operations under upset conditions. A value of 2 OU, expressed in this manner, represents the most stringent odour performance criterion invoked by the NSW Environment Protection Authority (EPA). Odour performance criteria are generally applied at nearest off-site sensitive receptors (residences, places of business, etc.)

This modelling was done to investigate the potential impact 'envelope' under upset conditions. These upset conditions were intended to represent potential worst case odour emissions occurring all days of the year and were also more representative of conditions before the Camden Soil Mix site underwent significant odour mitigation works in 2012.

Assuming these upset conditions occur all year (i.e. under all potential meteorological conditions) is clearly a very conservative assumption. Some refinement of those emission rates, in consultation with the EPA, has been completed since the original assessment was carried out in 2013.

It is important to note is that odour concentrations are reported as whole numbers. Results for specific locations are therefore better interpreted using tables of predictions made specifically at those location rather than contour plots, which will interpolate (approximate) between grid points within the modelling domain. Predictions were made at six boundary receptors (as shown in **Figure 1**). These results are presented in **Table 1** and show that there are no predicted exceedances of the EPA 2 OU criteria at these receptors located at the site boundary.

Table 1: Predicted 99th percentile nose response time odour concentrations each boundary receptor

Residence ID	Ground level odour concentration (OU) 99th percentile (nose response time)
R1	1
R2	1
R3	2
R4	2
R5	2
R6	2

It is also worth noting that the contribution of the Spring Farm ARRT Facility to the total odour is very small, and below the level of detection (1 OU) at the proposed residential development area. This can be seen in **Figure 2** which shows the individual contribution from the proposed ARRT Facility under worst case emission conditions.

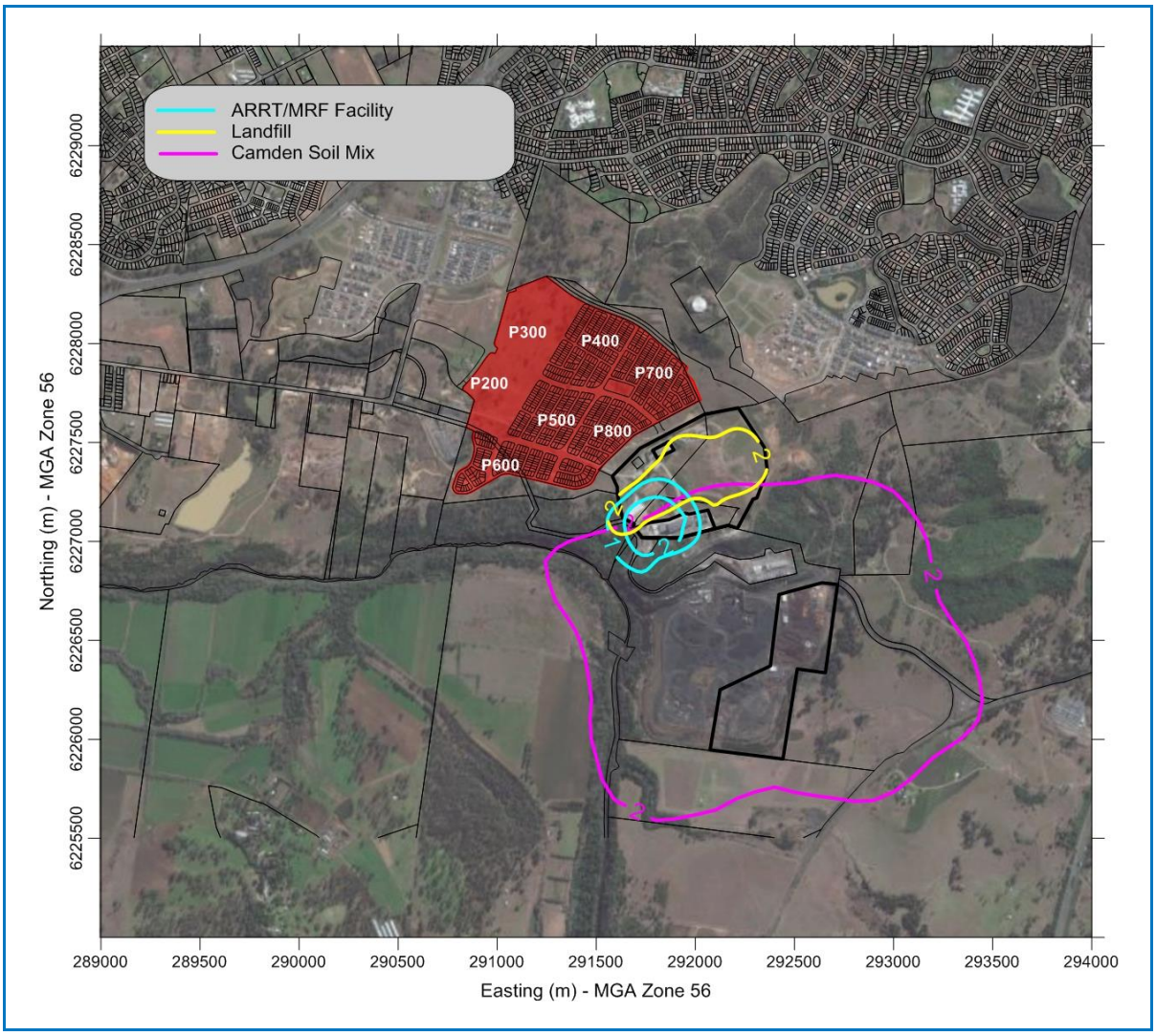

Figure 2: Predicted 99th percentile ground level odour concentration due to emissions from each individual site (ARRT/MRF, Landfill and Camden Soil Mix)

1.3 Standard operating conditions

In addition to this upset condition modelling, further modelling has been undertaken for the area which is more representative of general day-to-day conditions at each of the sites.

The Specific Odour Emission Rates (SOERs) for area sources (OU per unit time per unit area) were determined using site-specific odour measurements and analyses using olfactometry by NATA accredited laboratories. These sampling and analysis results have been included in previous air quality assessment reports.

Odour emissions from sources such as the ARRT Receival Hall and the MRF occur within buildings and require a different method of determining odour emission rates. In the case of the Receival Hall at the ARRT facility, this remains closed for the majority of the time, with doors opening and closing throughout the day as deliveries are made to the site. Taking into account the approximate area of the doors (four in total) and the number of times they open and close each day (number of deliveries), combined with a nominal exit velocity for air exiting the building while the doors are open, an estimate of flow rate from the building was calculated. This value was then multiplied by the measured odour concentration to obtain the total odour emission rate (in OU-volumes per unit time) from the building.

A listed summary of the odour emissions inventory adopted is provided in **Table 2**. These values were provided to the EPA for comment prior to modelling, who have agreed they are representative of the operations occurring at each site.

Table 2: Odour emission rates used for each site for standard operating conditions

Source	Measured odour concentration (OU)	Specific odour emission rate for area sources ($ou.m^3/m^2/s$)	Odour emission rate ($ou.m^3/s$)	Comment
ARRT/MRF				
Greenwaste area	2,230	1.279		Direct measurement
Open tanks (proposed tank farm)	-	0.06		Not operational yet. Assumed measurement for leachate as representative of liquid to be held in these tanks.
Biofilter	181		1,484	Direct measurement
Receival hall	2,660		439	Direct measurement
MRF	140		49	Direct measurement
Landfill				
Active tipping face	724	0.424		Direct measurement
Freshly placed	235	0.135		Direct measurement
Covered 6-12 months	118	0.069		Direct measurement
Covered 12 months	32	0.019		Direct measurement
Capped	45	0.026		Direct measurement
Camden Organics				
Fresh manure	208	0.122		Direct measurement
Treated manure	166	0.098		Direct measurement
Unturned windrow	256	0.149		Direct measurement
Freshly turned windrow	4,710	2.654		Direct measurement
Greenwaste receival area	-	3.7		Measured by TOU
Greenwaste shredder	-		42,200	Measured by TOU
Compost Block	315	1.58		Measured by TOU
Leachate pond	99	0.06		Measured by TOU

Modelling results are presented in **Figure 3** and also in **Table 3** for individual boundary receptors. There is very little difference at the residential development boundary receptors to those presented in **Table 1** for the upset conditions. The main differences are around the Camden Soil Mix area to the south where the majority of emissions are. In summary, both the upset and standard operating conditions remain compliant with the odour criterion at the residential development boundary (precincts 700 and 800 (as shown in **Table 1** and **Table 3**).

Figure 3: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Camden Soil Mix and the Jacks Gully Landfill (standard operating conditions)

Table 3: Predicted 99th percentile 1-hour average odour concentrations each boundary receptor (standard operating conditions)

Residence ID	Ground level odour concentration (OU) 99th percentile
R1	< 1
R2	1
R3	2
R4	2
R5	2
R6	1

These results show that the 2 OU contour extends slightly into the residential development boundary. However, model accuracy is such that it is more reasonable to refer to odour predictions in terms of whole numbers. Where odour units are shown with a decimal place this is typically to show that a modelling has resulted in a change but it should not be interpreted that this change is necessarily detectible to a human receptor.

2 ISSUES RAISED BY THE ENVIRONMENT PROTECTION AUTHORITY – DATED 4 DECEMBER 2013

1. Modelling results show compliance with the adopted Project odour criterion however there appears to be a discrepancy between model results and actual odour impacts

The concern here is that the model results do not adequately represent the history of ongoing odour complaints in the area surrounding the Project site and as such do not adequately assess the risk of adverse odour impacts. There are two main reasons why modelling predictions may not align with odour complaint history, explained below.

That there has been a history of odour complaints in the area of this project is not disputed. As discussed in the SITA report (Section 2.1), there were significant odour issues associated with the original design of the AWT EcoLibrium facility since it was commissioned in 2008. The original design of the anaerobic digestion component used the patented ArrowBio technology which separated the organic material of the mixed solid waste (MSW) using a wet process. There were significant operational difficulties experienced with the design and infrastructure related to the AWT EcoLibrium process which was decommissioned in 2011 and replaced the solid waste stream process line with a dry process. This reduced the number of odorous sources at the site. The EPA commissioned an odour study to review odour impacts in the area before and after the EcoLibrium process was taken offline and there has been a substantial drop in odour complaints since that time.

The predicted odour concentrations presented in the report are based on modelling predictions of 2 odour units (OU) expressed as the 99th percentile of 1 year of hourly predictions. This equates to the 88th highest prediction and not the maximum predicted odour concentration. In other words, this does not mean that odour will never be experienced at that location but rather there will be exceedances of the 2 OU level from time to time, but not for more than 1% of the year. The maximum concentrations will be more than 2 OU, and would occur under particularly unfavourable weather conditions. This differs from odour complaints which may occur at levels below 2 OU (for particularly sensitive individuals) and would be more comparable to maximum odour impacts (odour impacts at higher percentiles). For example, unless more than 88 complaints are received at a particular location, this cannot be compared to a contour plot showing modelling predictions presented as a 99th percentile.

Regardless of this, it should be noted that the proposed activites for the ARRT facilitiy (which includes the receival hall, the tank farm, the greenwaste area and the MRF), are not the significant contributors to the cumulative odour impact in the area. **Figure 2** shows the predicted individual concentrations from each of the three SITA operations at the site, with the ARRT facility (blue line) being relatively minor, to the point of being below the level of detection. The most significant contributor is clearly the Camden Soil Mix operation.

2. *A range of factors require consideration to ensure modelled odour impacts are reliable*

In relation to this comment, the EPA recommends the following be considered in order to increase the robustness of the model performance;

- Identification of all signitifcant ongoing and intermittent emission sources
  - All continuous sources have been considered in the modelling. The most odorous sources, in terms of directly measured odour concentrations, are the greenwaste and receival hall areas (see Table 6 of the SITA report). The receival hall is also included as an intermittent source as it is only opened for receival of waste from delivery trucks (as described in the report).
  - Sources at the other adjacent operations (the landfill and CSM) have also been modelled.
- Operating scenario representativeness, including upset conditions
  - The scenario modelled is reasonable and represents typical operating conditions at the ARRT facility based on available information. It is not reasonable to model upset conditions for a whole year as the EPA odour criteria are based on the frequency of occurrence (i.e. expressed as the 99th percentile) rather than a maximum odour concentration.
- Quantification of odour emissions data
  - Direct measurements of odour have been made by Pacific Environment at all three sites in accordance with Australian Standard AS/NZS 4323.4:2009 (Area source sampling – Flux chamber technique) with analysis in accordance with Australian Standard AS/NZS 4323.3:2001 (Determination of odour concentration by dynamic olfactometry).
- Existing mitigation methods and management strategies
  - Mitigation and management strategies, both existing and proposed, are discussed in Section 8 of the assessment report.
- Cumulative odour impacts
  - As discussed above for Issue 1, cumulative impacts have been considered and show that the proposed Project is a minor contributor to cumulative odour, with the landfill area and Camden Soil Mix being the main local contributors. There is not expected to be a measureable contribution to the cumulative odour levels at the nearest residences, due to the operation of the ARRT facility, including the operations proposed in this Modification.

3. *The Project has the potential to increase the risk of odour impacts at nearby residential receptors*

The concerns on this point relate to the potential addition of new emission sources and changes to the amount of waste received. The letter lists these changes the Project, having potential to affect odour emissions, as follows:

- Increased deliveries and amount of time the ARRT receival hall is open
  - The number of deliveries is based on the traffic assessment carried out for this project. These can not be increased without additional assessment. Conservaitve estimates were made of time required to open the doors to receive these deliveries.
- Changes to tank farm operation including use of open and additional tanks and reactors
  - Open tanks have been included in the assessment. There will also be odour scrubbers used on some of the tanks which would further reduce odour.
- Desludging of tanks

- Excess sludge from the UASB reactor and SBR systems will be dewatered periodically using the existing belt filter press within an enclosed area. The enclosed area is connected to a wet scrubber which treats the air from the belt press dewatering system area before it is released to the atmosphere.
- This will occur intermittently, on average once every 2 weeks, and is not a continuous source of odour.

- Changes to existing waste streams and processing of new waste types
  - New waste streams have been modelled. Any further changes would require an additional development application and therefore warrant further assessment if proposed.

In summary, the proposed processing and tank farm facility is very different to the originally designed ArrowBio EcoLibrium process, which was a significant source of odour and caused substantial odour impacts for local residents. This has been shown in the drop in odour complaints since the decommissioning of that process. It is also noted that the ARRT facility, including the greenwaste receival and processing area, the MRF, the receival hall and the tank farm, is not expected to be the main source of odour in the area.

3 FURTHER MODELLING

Jacks Gully landfill will cease receiving waste and be capped at the end of 2017. Additional modelling has been undertaken which represents this landfill closure scenario and the potential reductions in odour that may therefore be achieved at the adjacent Spring Farm residential development.

Modelling results for the following scenarios are presented in **Figure 4** and **Table 4**:

Scenario 1: Existing operations under standard operating conditions

Scenario 2: Existing operations under standard operating conditions after the Jacks Gully Landfill has been finalised and capped.

It should be noted that these results contain a contribution from a potential future area of composting windrows adjacent to the southwestern boundary of the Camden Soil Mix site. This additional input utilised the maximum volume of 50,000 tonnes, as identified on the current licence application from Tripodi pending with the EPA. The source is currently not operating but allowance has been made should it become so in the future. Modelling has established that this source also is not predicted to have any impact on the results at the residential development boundary.

The results show that there is an anticipated reduction in odour concentrations at the proposed Spring Farm residential development precincts 700 and 800, with the 2 OU contour contracting from the boundary once the landfill has been capped. In reality, there is anticipated to be a small amount of residual odour from the capped landfill but this will reduce over time. Modelling has assumed the odour emission rate for capped landfill (as shown in **Table 1**) across the entire landfill area. This is conservative as a large proportion of the site is already capped and so is likely to be less odorous than current sampling indicates.

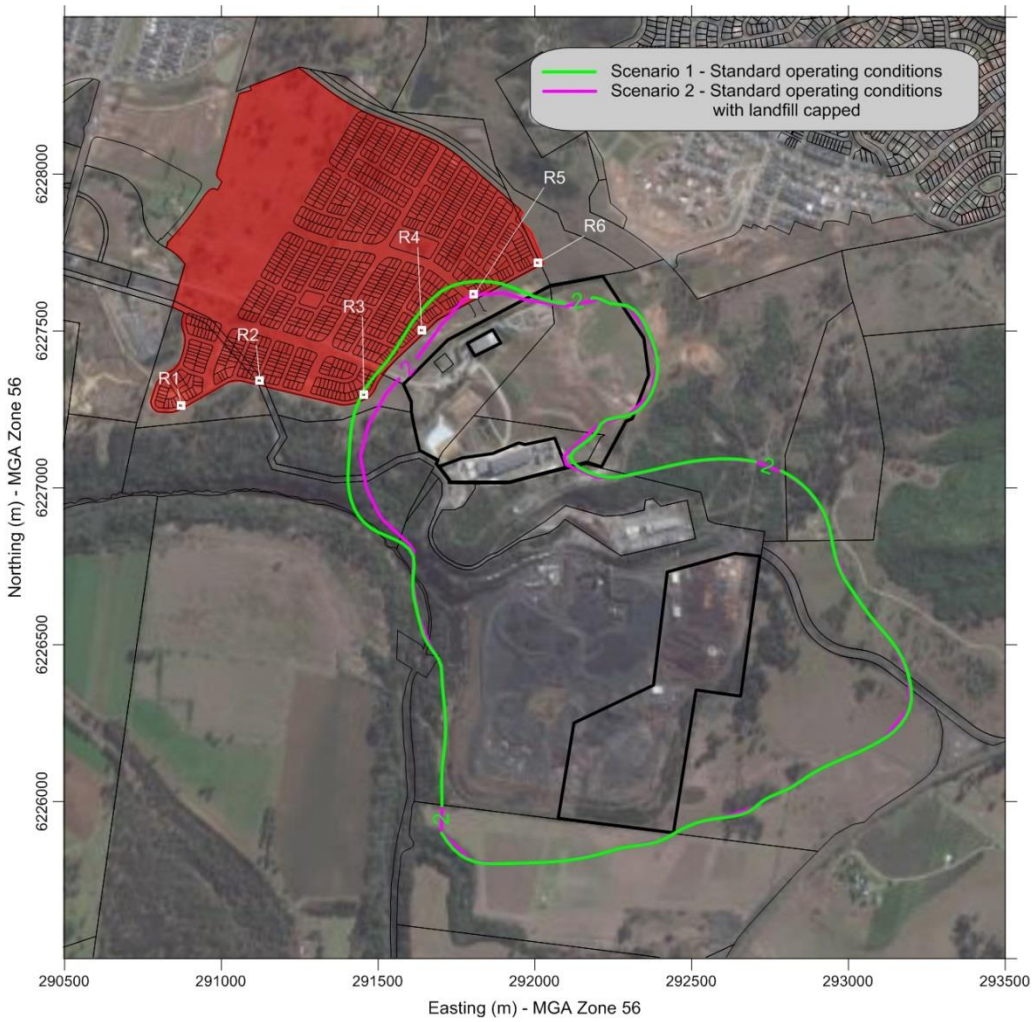

Figure 4: Predicted 99th percentile 2 OU concentration limit for each modelling scenario

Table 4: Predicted 99th percentile 1-hour average odour concentrations boundary receptors (with and without landfill)

Residence ID	Ground level odour concentration (OU) 99th percentile	
	With landfill	Landfill Capped
R1	< 1	< 1
R2	1	< 1
R3	2	< 2
R4	2	< 2
R5	2	2
R6	< 2	< 2

4 FURTHER COMMENTS REGARDING ODOUR

The EPA has developed odour criteria and the way in which they should be applied with dispersion models to assess the likelihood of nuisance impact arising from the emission of odour.

There are two factors that need to be considered:

1. what "level of exposure" to odour is considered acceptable to meet current community standards in NSW, and
2. how can dispersion models be used to determine if a source of odour meets the goals which are based on this acceptable level of exposure

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors the most important of which are:

- the **F**requency of the exposure,
- the **I**ntensity of the odour,
- the **D**uration of the odour episodes, and
- the **O**ffensiveness of the odour, (the so-called FIDO factors).

Whether or not an individual considers an odour to be a nuisance will depend on the FIDO factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

Frequency and duration are accounted for in the modelling process assuming (conservatively) that worst case emissions occur for every day of the year. Odour intensity relates to the perceived strength of an odour. The Association of German Engineers (Verein Deutsche Ingenieure or VDI) has developed a standard scale for describing odour intensity which is summarised in **Table 5**.

Table 5: VDI 3882 (1) Odour Intensity Descriptors

Odour	Intensity Level
Extremely strong	6
Very strong	5
Strong	4
Distinct	3
Weak	2
Very weak	1
Not perceptible	0

The limit of detection is represented by a concentration of 1 OU and would correspond to an odour intensity of between 'non-perceptible' and 'very weak' (using the relationship detailed in the German Standard VDI 3882(1)). According to that same relationship, the odour concentration would need to double to 2 OU before increasing intensity to 'very weak' (Intensity level of 1). It would then need to more than double again (4 OU) before reaching the next intensity level of 'weak' (Intensity level of 2).

The relationship between odour intensity and concentration is therefore non-linear. An example of an odour intensity – concentration curve is shown in **Figure 5**, where the concentration (x-axis) is plotted on a logarithmic scale. The non-linear relationship between intensity and concentration is relevant when interpreting modelling results. Dispersion modelling of odour deals with odour concentration, rather than intensity. It is a useful tool however, to determine the increases in odour concentrations that are required to perceive that increase. In other words, as the odour concentration increases, the perceived strength or intensity increases by a much smaller amount.

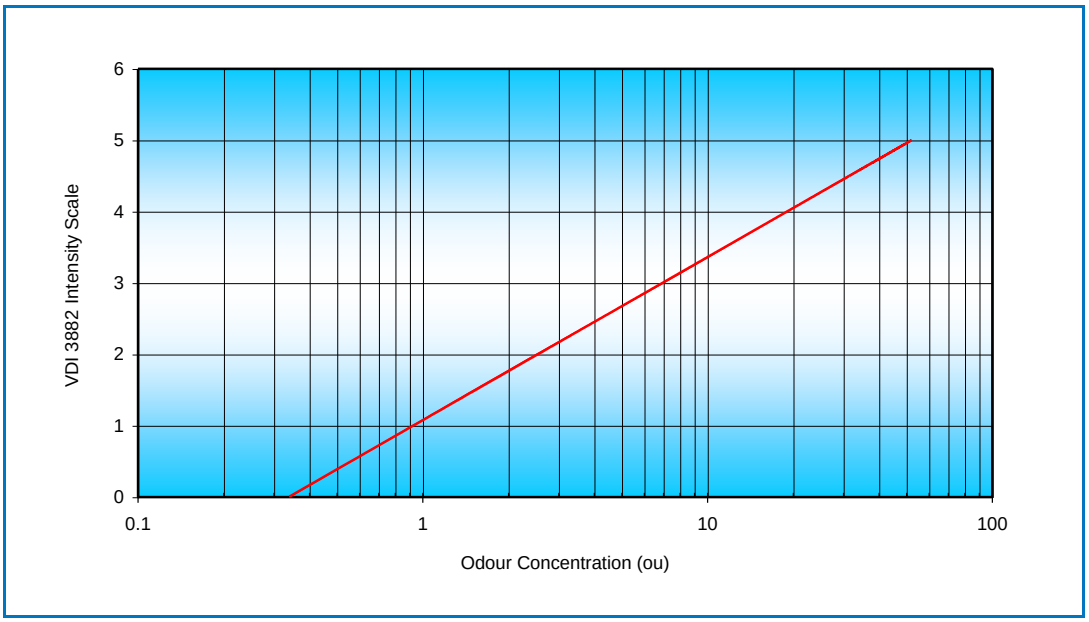

Figure 5: Example of the odour intensity – concentration relationship[1]

In light of this discussion and in relation to the current project, the proposed ARRT Facility is likely to make an imperceptible difference to the general odour in the area, but more specifically at the Spring Farm residential development.

[1] T. H. Misselbrook, C. R. Clarkson and B. F. Pain, Relationship Between Concentration and Intensity of Odours for Pig Slurry and Broiler Houses. Journal of Agricultural Engineering Research Volume 55, Issue 2, June 1993, Pages 163-169.

5 SUMMARY

Further discussion on the interpretation of odour modelling results has shown that the the predictions at the proposed Spring Farm residential development are anticipated to comply with the the most stringent EPA odour criteria.

In addition to this, it has been shown that the individual contribution of the proposed ARRT Facility to the cumulative odour predictions is unlikely to be detected at the boundary of the proposed residential development.

Additional modelling was also carried out to determine the reductions in odour which may result from the future closure of the Jacks Gully landfill adjacent to the residential development. Modelling showed, not surprisingly, that there would be slight reductions and that the 2 OU contour is anticipated to contract from the residential development area. Again, these small differences may be imperceptible to the human nose as the concentrations are low, but nonetheless there is compliance with the EPA criterion.

Kind regards,

Jane Barnett
Principal Consultant – Air Quality
Pacific Environment Limited

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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Cardno®
Shaping the Future

Revised response to submissions Spring Farm Resource Recovery

Facility S.75W Modification
Application (05_0098 MOD 5)
Prepared by SITA Australia

Prepared for
the Department of Planning and Environment

10 April 2015

1. OVERVIEW

This document has been prepared by SITA Australia, now rebranded to Suez Environnement, to provide revised responses to submissions received by the Department with regard tp this S.75W Modification Application (05_0098 MOD5). In Australia, SITA Australia joins Degremont and process group under one global brand: SUEZ environnement. Although the brand has changed, we will continue to operate under the same legal entity.

1.1 Overview

In accrodance with the Director General's Requirements for this Application, Cardno and SITA Australia carried out a comprehensive consultation process during the Environmental Assessment (EA) process connected to this Modification Application. Issues raised during this process were addressed in the EA document and accompanying technical reports lodged with the application.

In accordance with the Statutory requirements under the Environmental Planning and Assessment Regulation, 2000 the Modification Application was publicly exhibited on the Department's website from 13 November 2013 to 28 November 2013. Five (5) submissions to the exhibition were received, 4 from Government agencies and one from the State Member for Camden (addressed to the Minister for the Environment and Heritage). Cardno and SITA Australia responded to the submissions raised during public exhibition period. Following the submissions response, the Environmental Protection Authority (EPA) and Camden Council have requested further clarification to some of the detail provided in the submission's response.

SITA Australia has embarked on this project to treat liquid waste in the Spring Farm ARRT Tank Farm in response to an audit of the facility prepared by Suez environnement (April 2011). The audit was prepared to address ongoing operational issues with the ARRT Facility which had resulted in inefficiencies and regular interruptions to waste treatment. To address the operational problems being experienced at the Facility, the audit recommended re-use of the existing UASB digesters (the Tank Farm) to process liquid waste. This initiatve, the subjec tof the 75W Modification Application and accompanying Environmental Assessment, will result in effective operation of currently under-utilised waste treatment infrastructure with accompanying ongoign sustainability outcomes.

This response addresses the additional matters raised in submissions to the Exhibition period for the Modification Application. In Summary, these include:

- Input / output balance of the facility
- Managemement of de-sludging
- Cummulative odour impacts on residential receptors

The submissions and specific issues raised in each are addressed below with supporting documentation provided as appendices to this document.

2. NSW Environmental Protection Authority

Letter dated 6 February 2015

The Environmental Protection Austhority (EPA) lodged a letter of submission raising 2 additional issues that were not adequately addressed in the initial submissions response titles "Response to Submissions to the Public Exhibition" (RTS) dated 12 January 2015 and prepared by Cardno on behalf of SITA Australia.

2.1 Issue 6 – input / output balance

Detailed input / output balance for the site to determine the processing capacity and to manage storage requirements for the proposal has been omitted from the report and could therefore not be assessed.

Response

The input / output balance figure is included in the report on the final page before to the appendix section. Please refer to "*Figure 2*. Modified Biotretament Facility – proposed process flow diagram*". Figure 2 and accompanying information of the Fit for Purpose Report, Appendix D to the initial submission's response, has been attached to this submission as **Appendix A**.

2.2 Issue 7 – Tank De-sludging

Management of tank de-sludging; The EPA requires details for the tank de-sludging of all treatment of tanks as part of the Environmental Assessment including odour mitigation measures as this has the potential to generate offensive odours.

Response

SITA Australia has engaged Suez Environment's; No Odours for Suez environnement (NOSE) division who have worked on the fit-for-purpose report in 2014 and the decomissioning report in 2011 when SITA Australia took operational control over the Spring Farm ARRT facility. The report in **Appendix B** provide details for the de-sludging of all treatment tanks, including associated odour mitigation measures, as part of the site's Environmental Assessment. In addition, a list with reference facilities operated by Suez environnement in has been included. SITA Australia will include the measures recommended by Suez Environnement in the Operational Environmental Management Plans (OEMP) for the facility.

3. Camden Council

Letter dated 16th February 2015.

Camden Council has reviewed the correspondance from Cardno responding to the public submissions dated 12th January 2015 and does not accept that the cummulative odour levels at receptor locations reflected within Tables "1" and "3". Council mentions that Suez environnement and Pacific Environment have previously stated with reference to those tables that there are no predicted exceedances of the EPA 2 OU criteria at those receptors located at the site boundary." Council replies by stating that it can clearly identify that a number of receptor locations are located within the 2-3 OU contour line. **Pacific Environment's response** in the attached letter can be summarised as follows.

Response

Section1.2 of the Pacific Environment letter report discusses the way in which odour modelling results should be interpreted. Most importantly;

> '… odour concentrations are reported as **whole numbers.**'

Appendix C includes a letter from Pacific Environment in addition to their letter dated 12 December 2013 that was included for the purpose of responding to the submission's raised during the public exhibition period from 13 November 2013 to 28 November 2013. In addition, SITA Australia understands Council's concern that they do not have the guarantee that the landfill will be capped by the end of 2017. However SITA Australia are willing to provide Council with the guarantees that the landfill will be closed prior to that date should this be required.

Appendix A

Spring Farm Biotreatment Facility – Figure 2 - Fit for Purpose Report – Amended version (Suez Environnement, January 2014)

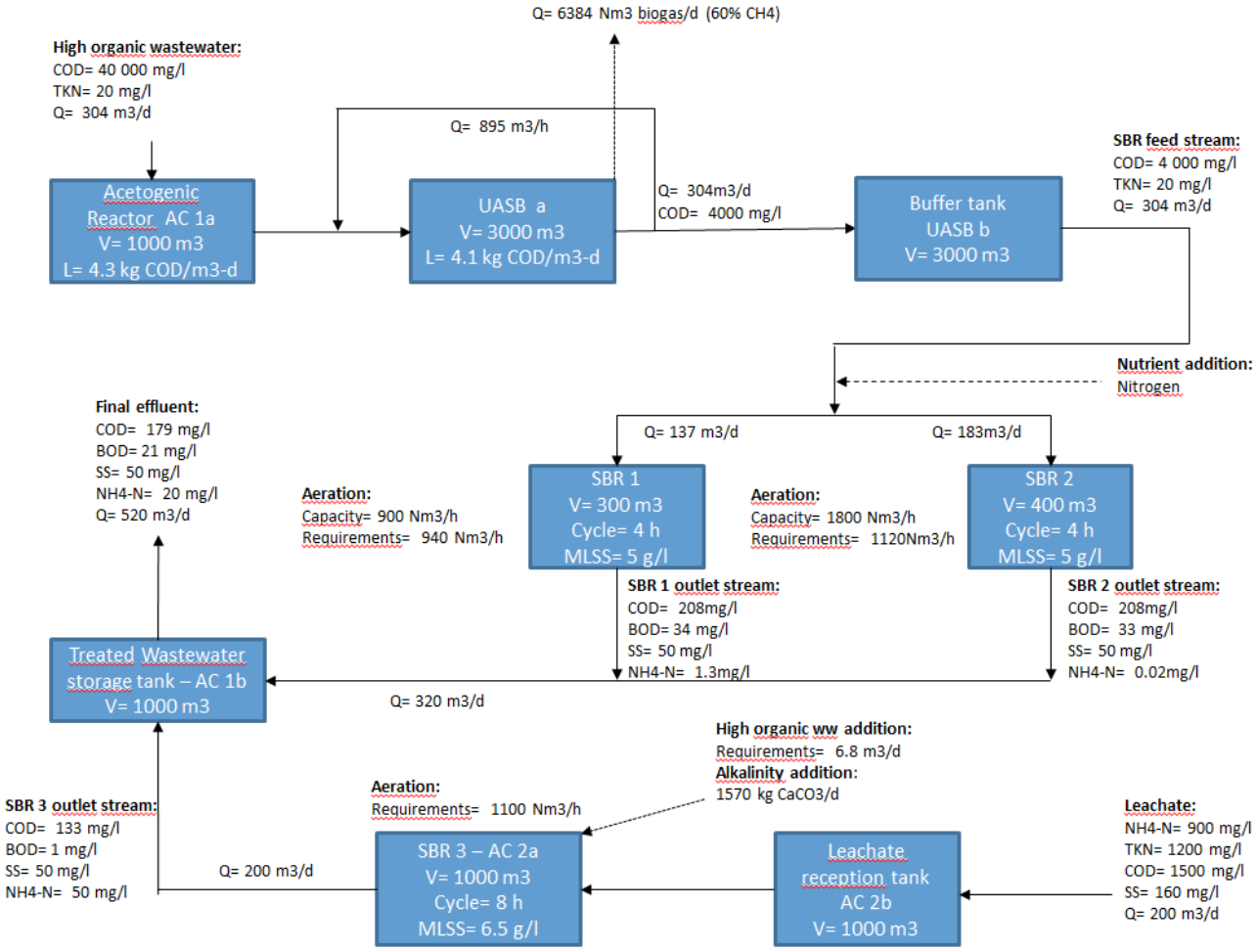

FIGURE 2*. Modified Biotreatment Facility - proposed process flow diagram.

* The following design considerations were used to arrive at the process flow diagram presented in Figure 2.

High organic liquid waste (based upon representative data using soft drink characteristics) :

- COD= 40 000 mg/l (95% soluble / 5% settleable COD)
- Biodegradability: COD/BOD = 2.20
- TN = 20 mg/l and NH4-N = 10 mg/l

UASB reactor:

- Performance: 90% COD removal
- Working temperature: 35°C
- Biogas production: 0.370 Nm^3/kg COD removed

SBR1 and SBR2 :

- Working temperature: 28°C
- Operations Cycle : 4 h (2 h feed & aeration / 1h settling / 1h decanting)
- Nutrient addition (eg. Urea) to compensate for nitrogen deficit in the influent.
- Probable requirement for phosphorous addition to compensate for deficit in the influent.

Landfill leachate characteristics :

- NH_4-N = 900 mg/l with NH_4-N/TKN = 0.75
- COD = 1500 mg/l
- Biodegradability: COD/BOD = 10
- Suspended solids = 160 mg/l

SBR3 :

- Working temperature : 24°C
- Operations Cycle : 8 h (4 h feed & aeration / 2 h anoxic / 1h settling / 1h decanting)
- Addition of high organic effluent to provide carbon for denitrification.
- Leachate alkalinity considered to be 150 mg CaCO3/l which is the usual value for freshwater.

It must be emphasized that the influent quality specifications and corresponding process parameters provided in Figure 2 (Modified Biotreatment Facility - Process Flow Diagram) represent design values based upon SUEZ environnement's operational expertise and certain local project assumptions (particularly as concerns the characteristics of the waste streams to be treated). **These design criteria will be validated during a subsequent project phase.**

Specifically, this will include but is not necessarily limited to:

- Characterisation of locally-available high organic liquid trade waste streams;
- Characterisation of relevant leachate streams; and
- Biochemical methane potential assays on identified high organic liquid trade waste streams.

Ultimately, such results will be used to support the project's technical feasibility and associated financial model in order to enable a Go or No-Go decision by SITA Australia.

Appendix B

Spring Farm Bio treatment Facility – Tank de-sludging

Prepared by Suez environnement: NOSE

Note

From :	Robert KELLY	To :	Nicolas RAMPELBERGS
Direction :	Business Incubator NOSE	Date :	March 23, 2015
Subject :	SPRING FARM Biotreatment Facility – Tank Desludging Response to EPA	Cc :	Peter HUNT, Kim FINNIMORE, Isaac TSUI

SITA Australia has submitted a development application with the NSW Department of Planning and Infrastructure for operation of the proposed Spring Farm Biotreatment Facility. Recently, the EPA has provided feedback concerning this submission, with an outstanding issue concerning the management of tank de-sludging operations and the associated potential for nuisance odour generation.

This note is intended to support consent approval for the project by addressing the EPA's requirement to provide details for the de-sludging of all treatment tanks, including associated odour mitigation measures, as part of the site's Environmental Assessment.

The proposed process design for the Spring Farm Biotreatment Facility incorporates parallel treatment of two waste streams:

- anaerobic treatment of high organic liquid trade waste via Upflow Anaerobic Sludge Blanket (UASB) reactors;
- aerobic treatment of leachate from SITA Australia operated facilities such as landfills or other leachate-generating activities via Sequencing Batch Reactors (SBR).

The facility design will allow sufficient flexibility such that either waste stream can be handled up to a maximum capacity of 520 m^3 per day, as a function of waste availability.

Tank De-sludging Operations

Execution of tank de-sludging and servicing operations at prescribed intervals is of key importance towards extending the working life of the associated equipment and also to prevent a deterioration in effluent quality.

The treatment tanks within the Spring Farm Biotreatment facility that will be subject to de-sludging operations, include:

- **UASB Reactor**

  The UASB process will be subject to two distinct types of "de-sludging" operations:

  - routine evacuation of excess sludge, and
  - reactor emptying for annual maintenance.

  The UASB process is characterized by a very limited sludge production, which limits the frequency of routine evacuation of excess sludge. Reference installations operated by SUEZ environnement yield typical sludge production ratios of 0.15 tonnes of granular sludge (70 g/L) per tonne of COD eliminated. In the case of the Spring Farm Biotreatment facility, the anticipated influent COD loading yields an estimated frequency of excess sludge removal of 6X per year (bi-monthly). Excess sludge

from the UASB reactor will be sent to the existing balance tank prior to dewatering by the existing Siemens belt filter press.

Reference facilities operated by SUEZ environnement (see attached list) show that this type of sludge is not anticipated to generate nuisance odours and therefore no specific odour mitigation measures are associated with this task.

Execution of annual maintenance procedures will require complete emptying of the UASB reactor vessel under inert conditions). As this operation entrains the potential for fugitive emissions of biogas containing odorant impurities, such as hydrogen sulphide, it is recommended that such measures are accompanied by the application of odour neutralising agents via mobile application units.

- **Buffer Tank (Digestate)**

  The UASB reactors will treat liquid trade waste having a high level of dissolved organic carbon, such as effluents from the agri-food industry, breweries, sugar mills, dairies, distilleries and starch transformation plants. Typically, such trade wastes will have a low level of suspended solids and the resulting digestate will be essentially “solids free”.
  Annual maintenance procedures will consist of tank emptying, removal of accumulated deposit via vacuum truck for off-site disposal, tank rinsing and return to service. No specific odour mitigation procedures are required for such operations.

- **Leachate Reception Tank**

  Based upon characteristic leachate composition having elevated suspended solids levels, tank de-sludging is recommended every 6 months. Tank level will be reduced to minimum volume by processing leachate through the system, the remaining sediment will be removed by vacuum truck for off-site disposal. As such operations can result in diffuse emission of nuisance odours, it is recommended that such measures are accompanied by the application of odour neutralising agents via mobile application units.

- **SBR Reactors**

  The SBR process will be subject to two distinct types of “de-sludging” operations:

  - routine evacuation of excess sludge, and
  - reactor emptying for annual maintenance.

  During routine SBR operation, excess sludge is wasted periodically as a necessary control strategy to regulate mixed liquor suspended solids (MLSS) concentration, mean cell residence time (MCRT) and associated effluent quality. Excess sludge from the SBR reactor will be sent to the existing balance tank prior to dewatering by the existing Siemens belt filter press. This process is not associated with the generation of nuisance odours due to under aerobic condition and as such no specific odour mitigation measures are required.

  Execution of SBR tank de-sludging is recommended every 12 months in association with annual maintenance program initiatives, so as to avoid any potential deterioration in treated effluent quality. The bulk of the settled sludge will be transferred to the existing balance tank per routine operations for subsequent dewatering. The remaining sludge will be removed via vacuum truck for off-site disposal. As such operations can result in diffuse emission of nuisance odours, it is recommended that such measures are accompanied by the application of odour neutralising agents via mobile application units.

- **Balance Tank**

  Excess sludge from the UASB and SBR systems will be sent to this sludge holding tank prior to dewatering via belt filter press. In some cases, off-gas emissions from sludge holding tanks are treated via dedicated odour control misting system, however several of the reference installations ventilate off-gases directly to atmosphere with no reported nuisance odour complaints

  Tank de-sludging is recommended every 12 months in association with annual maintenance program initiatives. The bulk of the sludge will be processed via the dewatering system with any remaining deposits removed by vacuum truck for off-site disposal. As such operations can result in diffuse emission of nuisance odours, it is recommended that such measures are accompanied by the application of odour neutralising agents via mobile application units.

UASB METHANISATION REFERENCE LIST - FRANCE

CLIENT	INDUSTRIAL SECTOR	LOCATION	DATE COMISSIONED
FARMFRITE	FOOD AND BEV	MONTIGNY (68)	1995
KRONENBOURG	FOOD AND BEV	OBERNAY (67)	1997
Saurkraut Residual at WWTP	FOOD AND BEV	MEISTRATZHEIM (67)	1997
WRIGLEY	FOOD AND BEV	BIESHEIM (68)	2001
TEREOS	FOOD AND BEV	ORIGNY STE BENOITE	2006
GRAND CHAIS DE France	FOOD AND BEV	LANDIRAS (33)	2006
CASTEL FRERES	FOOD AND BEV	La Chapelle Heulin (44)	2009
SIEUR DARQUES	FOOD AND BEV	LIMOUX (11)	2006

Appendix C

Spring Farm Biotreatment Facility – Letter to SITA Australia in response to Camden Council's response to Response to Submissions to the Public Exhibition dated 24 February 2015: "*Appendix C Spring Farm ARRT Facility SITA 2OU Compliance Letter*".

Prepared by Pacific Environment Limited

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

24 February 2015

Nicolas Rampleburgs
Project Manager
SITA Australia
70 Anzac Street
Chullora NSW 2190

SPRING FARM ARRT FACILITY
RESPONSE TO CAMDEN COUNCIL OBJECTION

Dear Nicolas,

In response to the letter from Jane Flanagan of the Department of Planning and Environment (DP&E), we note that Camden Council has raised an objection to one of the findings in our letter dated 4 December 2014 (**Pacific Environment 2014**[1], hereafter 'the Pacific Environment letter report').

Specifically, Council states that they do not accept that the results presented in Table 1 and Table 3 of the Pacific Environment letter report reflect the results presented in the contour plots in Figure 1 and Figure 2, respectively. We acknowledge how this conclusion could be drawn by comparing the tables directly with the figures in the absence of additional contextual information around the interpretation of odour modelling results.

Section 1.2 of the Pacific Environment letter report discusses the way in which odour modelling results should be interpreted. Most importantly;

'... *odour concentrations are reported as* ***whole numbers***.'

Table 1 and Table 3 of the Pacific Environment letter report present these results at the six specific receptor locations to the nearest whole number. In other words, to record a value of 1 OU, the model prediction will be in the range 0.5 – 1.4 OU. In the same way, a value of 2 OU represents the range 1.5 - 2.4 OU. To report odour concentrations as less than whole numbers would be stating an unrealistic level of accuracy, as well as detectability (the human nose is unable to detect the difference between, say, 2 OU and 3 OU)[2].

Figure 1 and Figure 3 in the Pacific Environment letter report present the same information, but as contours across the whole prediction grid, which have been interpolated (approximated) between prediction points. When these results are presented as contours in this way, the contouring technique references values to greater than one decimal place. For this reason, there is an apparent mis-match between values in tabular form, and those shown in our Figures.

[1] Letter from Pacific Environment to Cardno dated 4 December 2014, prepared in response to comments from both the NSW EPA and Camden Council, on the Air Quality Assessment prepared for the Spring Farm Advanced Resource Recivery Treatment Facility.

[2] Response to change in odour concentration is logarithmic. For example, if a doubling of OU will cause only a small change in perceived strength.

A valid and more effective way of presenting these data in contour format is as shown in **Figure A** below, which uses the identical modelling results for those presented in Figure 3 in the Pacific Environment letter report.

The yellow shading shows the areas which represent a predicted odour concentration of 2 OU (99th percentile). This area thus shows model predictions that are in the range >1.5 OU but <2.5 OU. It is clear from this figure that the predicted concentrations at the proposed Spring Farm residential development comply with the the most stringent EPA odour criteria for odour assessment.

It should also be noted that these concentrations will reduce further once the landfill is completed, as shown in the Pacific Environment letter report.

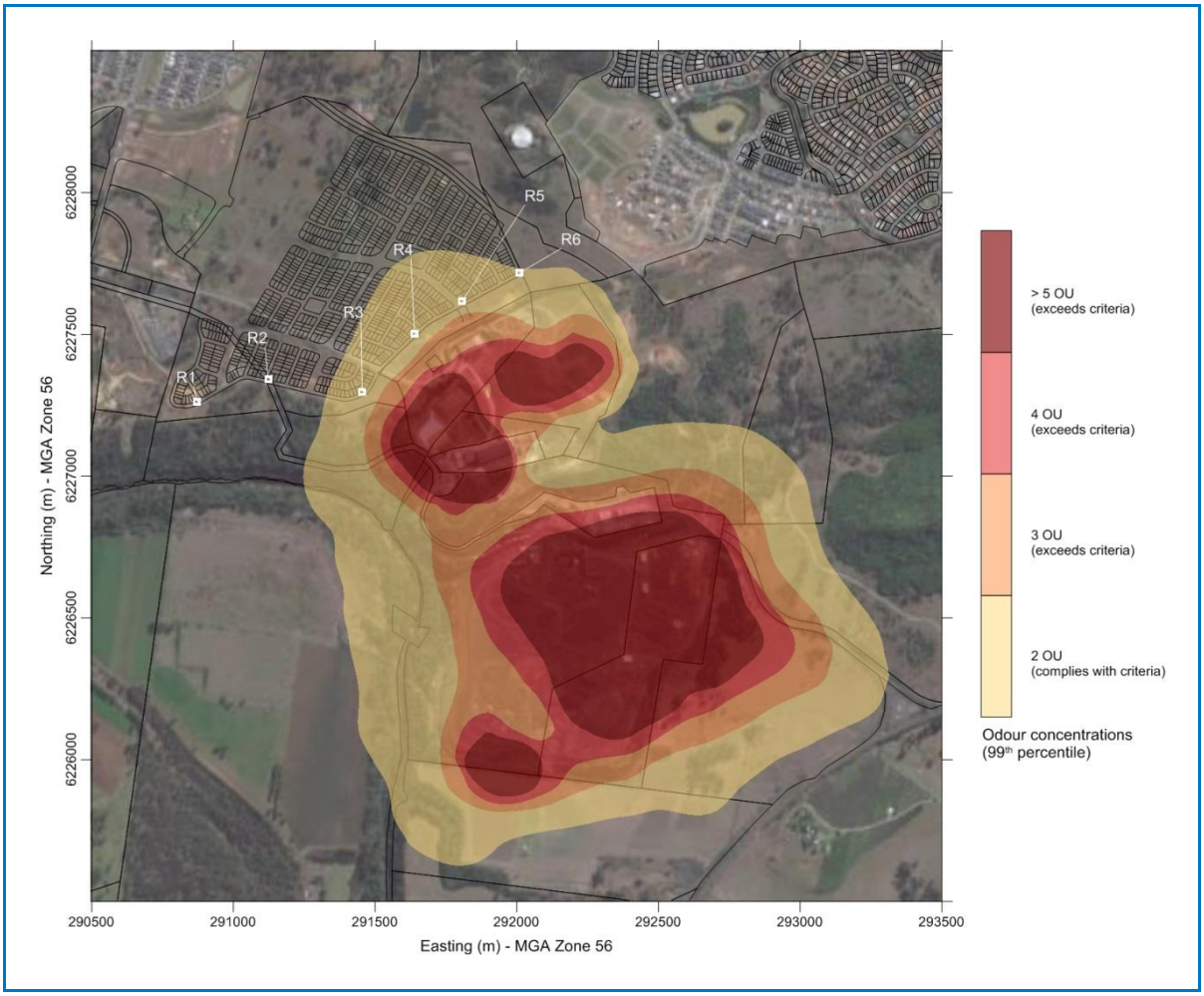

Figure A: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Camden Soil Mix and the Jacks Gully Landfill (standard operating conditions)

I hope this addresses the issue raised by Camden Council and clarifies the interpretation of dispersion modelling results for odour.

Please call me if you have any further questions.

Kind regards,

Jane Barnett
Principal Consultant – Air Quality
Pacific Environment Limited

Recycling and waste recovery Australia

Final response to submissions Spring Farm Advanced Resource Recovery Treatment (ARRT) facility

Facility S.75W Modification
Application (05_0098 MOD 5)
Prepared by SITA Australia

Prepared for
the Department of Planning and Environment

01 June 2015

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A joint venture with Sembcorp

1. OVERVIEW

This document has been prepared by SITA Australia, now rebranded to Suez Environnement, to provide the final response to submissions received by the Department with regard to this S.75W Modification Application (05_0098 MOD5).

1.1 Overview

In accordance with the Director General's Requirements for this Application, Cardno and SITA Australia carried out a comprehensive consultation process during the Environmental Assessment (EA) process connected to this Modification Application. Issues raised during this process were addressed in the EA document and accompanying technical reports lodged with the application.

In accordance with the Statutory requirements under the Environmental Planning and Assessment Regulation, 2000 the Modification Application was publicly exhibited on the Department's website from 13 November 2013 to 28 November 2013. Five (5) submissions to the exhibition were received, 4 from Government agencies and one from the State Member for Camden (addressed to the Minister for the Environment and Heritage). Cardno and SITA Australia responded to the submissions raised during public exhibition period. Following the submissions response, the Environmental Protection Authority (EPA) and Camden Council have requested further clarification to some of the detail provided in the submission's response, which has been provided in a revised response to submissions to the Department of Planning and Environment on the 9th May 2015. A request for further information has been received by the EPA and Camden Council which is further clarified in this final response to submissions.

SITA Australia has embarked on this project to treat liquid waste in the Spring Farm ARRT Tank Farm in response to an audit of the facility prepared by Suez environnement (April 2011). The audit was prepared to address ongoing operational issues with the ARRT Facility which had resulted in inefficiencies and regular interruptions to waste treatment. To address the operational problems being experienced at the Facility, the audit recommended re-use of the existing UASB digesters (the Tank Farm) to process liquid waste. This initiatve, the subjec tof the 75W Modification Application and accompanying Environmental Assessment, will result in effective operation of currently under-utilised waste treatment infrastructure with accompanying ongoign sustainability outcomes.

This response addresses the additional matters raised in submissions to the Exhibition period for the Modification Application. In Summary, these include:

- Guarantee that the landfill will close prior to the end of 2017
- Tank de-sludging
- Maintenance procedures

The submissions and specific issues raised in each are addressed below with one supporting documentation provided as an appendix to this document.

2. NSW Environmental Protection Authority

Letter dated 15 April 2015

The Environmental Protection Authority (EPA) lodged a submission raising 2 requests for further information following the revised response to submissions that was send to the Department of Planning and Environment on the 9th April 2015.

2.1 Tank De-sludging

Was the annual de-sludging of the tanks included in the odour modelling previously supplied? If so, which scenario relates to this process? If not, odour modelling will need to be supplied to the EPA for assessment.

Response

A similar question has been raised by Camden Council in their letter dated 12th December 2013 regarding tank de-sludging. A response has been provided in the submission response dated 12 January 2015 in appendix E; Letter to Cardno from Pacific Environment in response to odour issues raised in the submissions (4 December 2014). The detailed response is provided in Appendix A.

A summary of the response is detailed below:

"Excess sludge from the UASB reactor and SBR systems will be dewatered periodically using the existing belt filter press within an enclosed area. The enclosed area is connected to a wet scrubber which treats the air from the belt press dewatering system area before it is released into the atmosphere…"

Appendix A: Issues raised by Camden Council – Letter dated 29 November 2013 / Spring Farm ARRT facility odour and air quality assessment

2.2 Detailed procedure for maintenance;

a. **Length of the procedure to desludge each tank**

Response
It could take between 2 to 4 weeks to 'entirely' de-sludge the tank subject to the volumes being processed and would typically occur every three years. SITA will provide the level of detail as required in the Operational Environmental Management Plans (OEMP) prior to applying for the operational licence of the facility.

b. **Proposed annual timetable for maintenance**

Response
Typically, anaerobic tanks should be emptied every three years for inspection. Maintenance work may be required subject to the inspection. Aerobic tank can be emptied anytime for inspection and carrying out maintenance work due to no odour should be generated under aerobic condition. SITA will provide that level of detail as required in the OEMP prior to applying for the operational licence of the facility.

c. **Details of the specific odour mitigation measures to be used including whether the odour neutraliser incorporates a deodoriser.**

Response

Mobile odour equipment will be available on site at any time as requir. Further 2 examples of odour neutralisers include; (1) mixture of cationic & non-ionic surfactant coupled with essential oils or (2) odour oxidising agent such as Chlorine Dioxide. Similarly, SITA will provide more detailed information in the OEMP as required prior to applying for the operational license of the facility to adress the above concern.

3. Camden Council

Letter dated 27 April 2015.

Camden Council provides the following advice to the additional information:

- The additional information clarifies that odour tables and contour diagrams were reported as “whole numbers” and acknowledges this method of reporting was the cause for Council staff to draw the conclusion that data within the odour tables and odour contour diagrams appeared to show different outcomes.
- To address the misinterpretation, the additional information provides a more effective method of presenting data for contour diagrams to show that the odour complies with the 2OU (99th Percentile) criteria during standard operating conditions.
- Further to address the concern about whether Council has a guarantee that the landfill will be capped by the end of 2017, further reducing the concentration of odour for Spring Farm, the submission document advises that SITA are willing to provide Council with a guarantee that the landfill will be closed prior to the end of 2017.
- Council staff acknowledges that the contour diagrams now show that the 2OU contour is outside of the future residential boundaries for Spring Farm for Standards Operating conditions.

It is requested that a guarantee that the landfill will be closed prior to the end of 2017 is submitted to Council in writing.

Response

SITA has provided Council written confirmation on the 30th April 2015 that the Jacks Gully landfill will cease receiving waste prior to the 1st of January 2018.

Appendix B provides a copy of the letter that was send to Council.

Appendix A

Response to issues raised by Camden Council – Letter dated 29 November 2013 / Spring Farm ARRT facility odour and air quality assessment

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

4 December 2014

John O'Grady
Cardno
Level 9, 203 Pacific Highway
St Leonards NSW 2065

SPRING FARM ARRT FACILITY
ODOUR AND AIR QUALITY ASSESSMENT

Pacific Environment are pleased to provide this response to the NSW Environmental Protection Authority (EPA) comments as outlined in Attachment A of their letter dated 4 December 2013, which sought clarification of issues regarding the "Spring Farm Advanced Resource Recovery Treatment Facility – Air Quality and Odour Impact Assessment". This letter also responds to an issue of inconsistency raised in a letter from Camden Council dated 29 November 2013, for the same assessment. This concern is addressed first to provide context.

1 ISSUE RAISED BY CAMDEN COUNCIL – LETTER DATED 29 NOVEMBER 2013.

The issue raised in this letter is one of inconsistency between the Air Quality and Odour Impact Assessment for the ARRT facility, prepared for SITA, and a Level 3 Odour Assessment for the same area, prepared for Urban Growth. The following summary of the Project background will clarify the difference in these two reports.

1.1 Project background

There have been two recent reports completed for operations in the same area, each for a slightly different purpose, as follows:

- The Spring Farm Advanced Resource Recovery Treatmeant (ARRT) Facility – Air Quality and Odour Impact Assessment, prepared for SITA for the proposed modification of the ARRT facility. This will be refered to as the SITA report and was submitted in September 2013.
- The Spring Farm Residential Development – Level 3 Odour Impact Assessment, prepared for Urban Growth to assess the potential odour impacts on proposed residential development precincts P400 and P500. This will be referred to as the Urban Growth report and was submitted in May 2013 with subsequent additions in August and November 2013.

The Urban Growth report assessed the combined operations at the Spring Farm ARRT facility, the existing landfill and Camden Soil Mix (CSM), all operated by SITA. This report was submitted to Camden Council, who in turn requested that the EPA provide comment on the adequacy of this assessment.

The EPA provided their comments on the technical aspects of the Urban Growth report, and raised some questions regarding the odour emission rates and other model inputs. Pacific Environment responded to these comments in August 2013.

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Pacific Environment then received further comments from the EPA in late September that queried the odour emission rates used, in particular for the greenwaste shredding operation at Camden Soil Mix. To clarify and resolve this issue, Pacific Environment met with Camden Council and EPA representatives on 4 November 2013, by which time the SITA report had been submitted.

As a result of this meeting, it was agreed that further modelling should be undertaken to clarify the odour predictions from the greenwaste shredder as well as its potential impact on the subject development application for precincts P400 and P500. Since that meeting, the EPA raised another potential odour source located adjacent to the Camden Soil Mix site (on land owned by Tripodi and subject to a pending licence application from the EPA), that proposes additional 50,000 tonnes per annum of composting windrows.

Pacific Environment then carried out further assessment and provided Camden Council a letter describing the results of the additional modelling agreed at the meeting held on 4 November 2013, to the satisfaction of the EPA.

This additional modelling for the Urban Growth report, which included worst case (or upset) emission conditions at the Camden Soil Mix site, increased shredding emissions and additional composting windrows, was submitted subsequent to the SITA report and as such was not included in the SITA report. As the modelling showed, however, the increases were minor and did not change the conclusions of the Urban Growth report (see **Figure 1**). In addition, it is important to note that these minor increases were not due to the proposed upgraded operations at the ARRT facility.

It is noted that the model inputs for both of these investigations were the same. This should now clarify the issue of inconsistency between the two reports.

The modelling presented in **Figure 1** represented upset or pre-mitigation conditions before Camden Soil Mix had made significant efforts to mitigate the odour emissions from the the area of the compost block and the shredding and storage areas.

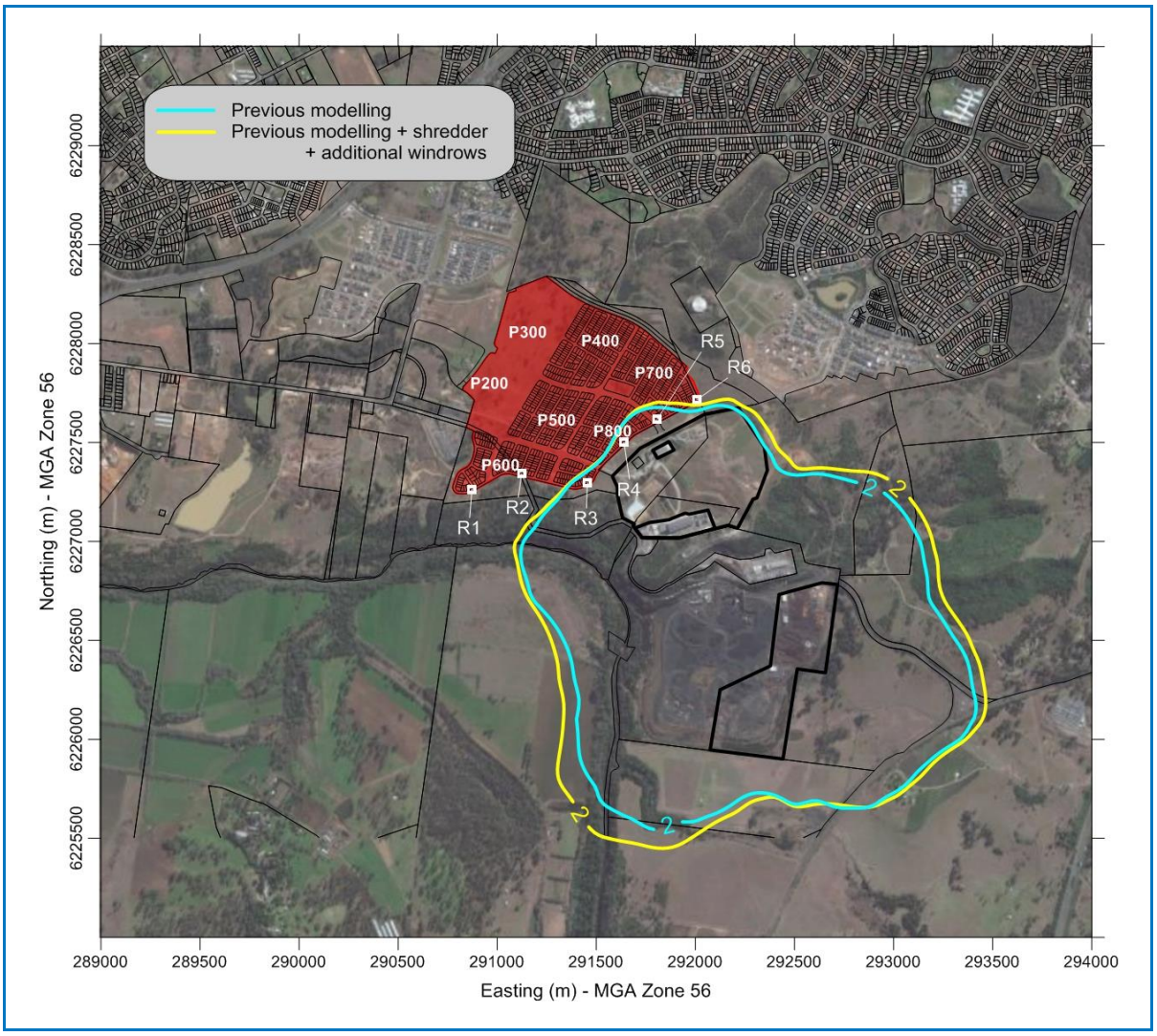

Figure 1: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Landfill, Camden Soil Mix and Tripodi (upset conditions)

1.2 Interpreting odour modelling results

The two contours presented in **Figure 1** represent the predicted 2 odour unit (OU) concentration (99th percentile, expressed as a 1-second, nose-response average), associated with the Camden Soil Mix operations under upset conditions. A value of 2 OU, expressed in this manner, represents the most stringent odour performance criterion invoked by the NSW Environment Protection Authority (EPA). Odour performance criteria are generally applied at nearest off-site sensitive receptors (residences, places of business, etc.)

This modelling was done to investigate the potential impact 'envelope' under upset conditions. These upset conditions were intended to represent potential worst case odour emissions occurring all days of the year and were also more representative of conditions before the Camden Soil Mix site underwent significant odour mitigation works in 2012.

Assuming these upset conditions occur all year (i.e. under all potential meteorological conditions) is clearly a very conservative assumption. Some refinement of those emission rates, in consultation with the EPA, has been completed since the original assessment was carried out in 2013.

It is important to note is that odour concentrations are reported as whole numbers. Results for specific locations are therefore better interpreted using tables of predictions made specifically at those location rather than contour plots, which will interpolate (approximate) between grid points within the modelling domain. Predictions were made at six boundary receptors (as shown in **Figure 1**). These results are presented in **Table 1** and show that there are no predicted exceedances of the EPA 2 OU criteria at these receptors located at the site boundary.

Table 1: Predicted 99th percentile nose response time odour concentrations each boundary receptor

Residence ID	Ground level odour concentration (OU) 99th percentile (nose response time)
R1	1
R2	1
R3	2
R4	2
R5	2
R6	2

It is also worth noting that the contribution of the Spring Farm ARRT Facility to the total odour is very small, and below the level of detection (1 OU) at the proposed residential development area. This can be seen in **Figure 2** which shows the individual contribution from the proposed ARRT Facility under worst case emission conditions.

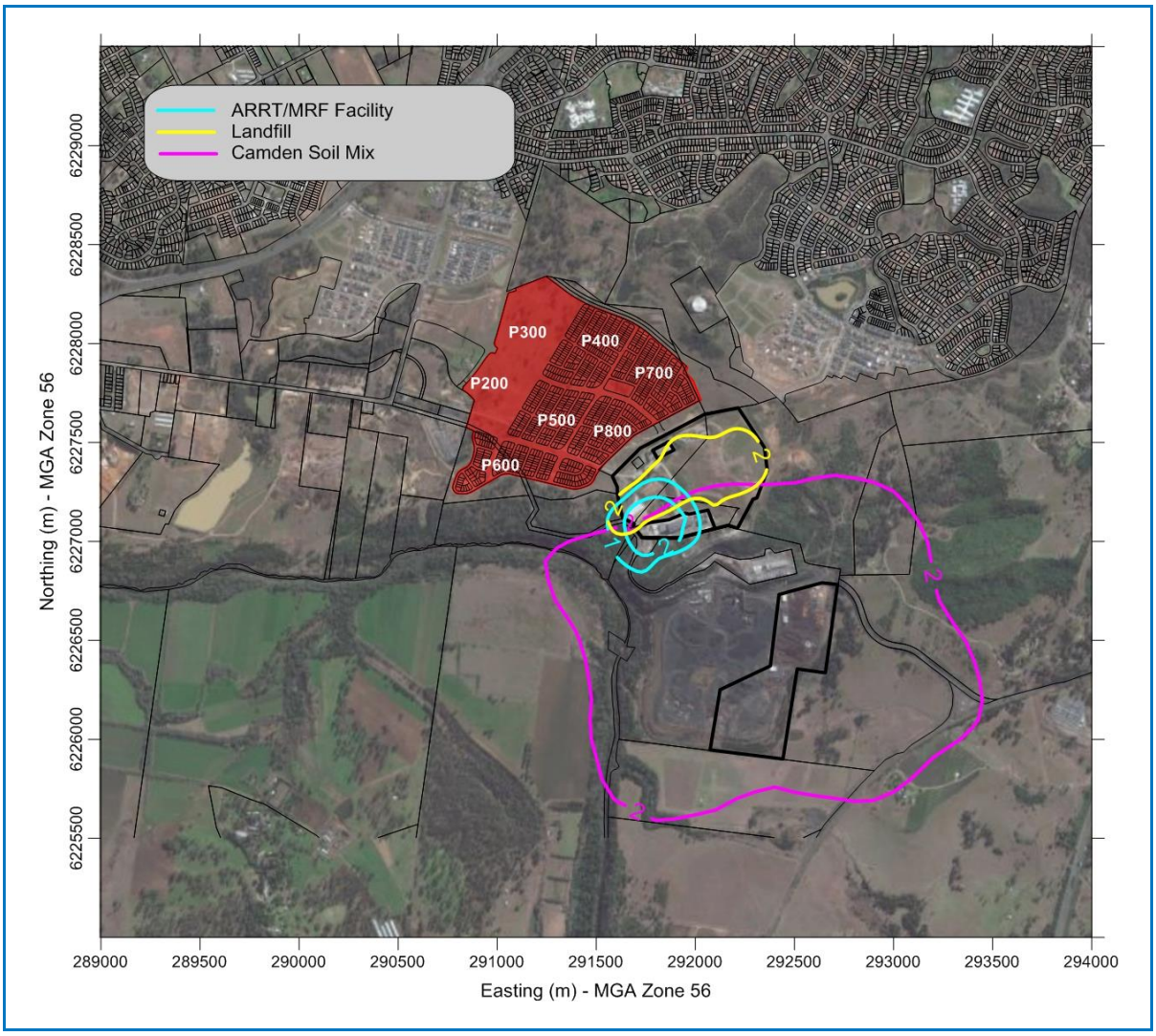

Figure 2: Predicted 99th percentile ground level odour concentration due to emissions from each individual site (ARRT/MRF, Landfill and Camden Soil Mix)

1.3 Standard operating conditions

In addition to this upset condition modelling, further modelling has been undertaken for the area which is more representative of general day-to-day conditions at each of the sites.

The Specific Odour Emission Rates (SOERs) for area sources (OU per unit time per unit area) were determined using site-specific odour measurements and analyses using olfactometry by NATA accredited laboratories. These sampling and analysis results have been included in previous air quality assessment reports.

Odour emissions from sources such as the ARRT Receival Hall and the MRF occur within buildings and require a different method of determining odour emission rates. In the case of the Receival Hall at the ARRT facility, this remains closed for the majority of the time, with doors opening and closing throughout the day as deliveries are made to the site. Taking into account the approximate area of the doors (four in total) and the number of times they open and close each day (number of deliveries), combined with a nominal exit velocity for air exiting the building while the doors are open, an estimate of flow rate from the building was calculated. This value was then multiplied by the measured odour concentration to obtain the total odour emission rate (in OU-volumes per unit time) from the building.

A listed summary of the odour emissions inventory adopted is provided in **Table 2**. These values were provided to the EPA for comment prior to modelling, who have agreed they are representative of the operations occurring at each site.

Table 2: Odour emission rates used for each site for standard operating conditions

Source	Measured odour concentration (OU)	Specific odour emission rate for area sources ($ou.m^3/m^2/s$)	Odour emission rate ($ou.m^3/s$)	Comment
ARRT/MRF				
Greenwaste area	2,230	1.279		Direct measurement
Open tanks (proposed tank farm)	-	0.06		Not operational yet. Assumed measurement for leachate as representative of liquid to be held in these tanks.
Biofilter	181		1,484	Direct measurement
Receival hall	2,660		439	Direct measurement
MRF	140		49	Direct measurement
Landfill				
Active tipping face	724	0.424		Direct measurement
Freshly placed	235	0.135		Direct measurement
Covered 6-12 months	118	0.069		Direct measurement
Covered 12 months	32	0.019		Direct measurement
Capped	45	0.026		Direct measurement
Camden Organics				
Fresh manure	208	0.122		Direct measurement
Treated manure	166	0.098		Direct measurement
Unturned windrow	256	0.149		Direct measurement
Freshly turned windrow	4,710	2.654		Direct measurement
Greenwaste receival area	-	3.7		Measured by TOU
Greenwaste shredder	-		42,200	Measured by TOU
Compost Block	315	1.58		Measured by TOU
Leachate pond	99	0.06		Measured by TOU

Modelling results are presented in **Figure 3** and also in **Table 3** for individual boundary receptors. There is very little difference at the residential development boundary receptors to those presented in **Table 1** for the upset conditions. The main differences are around the Camden Soil Mix area to the south where the majority of emissions are. In summary, both the upset and standard operating conditions remain compliant with the odour criterion at the residential development boundary (precincts 700 and 800 (as shown in **Table 1** and **Table 3**).

Figure 3: Predicted 99th percentile ground level odour concentration due to combined emissions from Spring Farm ARRT/MRF, Camden Soil Mix and the Jacks Gully Landfill (standard operating conditions)

Table 3: Predicted 99th percentile 1-hour average odour concentrations each boundary receptor (standard operating conditions)

Residence ID	Ground level odour concentration (OU) 99th percentile
R1	< 1
R2	1
R3	2
R4	2
R5	2
R6	1

These results show that the 2 OU contour extends slightly into the residential development boundary. However, model accuracy is such that it is more reasonable to refer to odour predictions in terms of whole numbers. Where odour units are shown with a decimal place this is typically to show that a modelling has resulted in a change but it should not be interpreted that this change is necessarily detectible to a human receptor.

2 ISSUES RAISED BY THE ENVIRONMENT PROTECTION AUTHORITY – DATED 4 DECEMBER 2013

1. Modelling results show compliance with the adopted Project odour criterion however there appears to be a discrepancy between model results and actual odour impacts

The concern here is that the model results do not adequately represent the history of ongoing odour complaints in the area surrounding the Project site and as such do not adequately assess the risk of adverse odour impacts. There are two main reasons why modelling predictions may not align with odour complaint history, explained below.

That there has been a history of odour complaints in the area of this project is not disputed. As discussed in the SITA report (Section 2.1), there were significant odour issues associated with the original design of the AWT EcoLibrium facility since it was commissioned in 2008. The original design of the anaerobic digestion component used the patented ArrowBio technology which separated the organic material of the mixed solid waste (MSW) using a wet process. There were significant operational difficulties experienced with the design and infrastructure related to the AWT EcoLibrium process which was decommissioned in 2011 and replaced the solid waste stream process line with a dry process. This reduced the number of odorous sources at the site. The EPA commissioned an odour study to review odour impacts in the area before and after the EcoLibrium process was taken offline and there has been a substantial drop in odour complaints since that time.

The predicted odour concentrations presented in the report are based on modelling predictions of 2 odour units (OU) expressed as the 99th percentile of 1 year of hourly predictions. This equates to the 88th highest prediction and not the maximum predicted odour concentration. In other words, this does not mean that odour will never be experienced at that location but rather there will be exceedances of the 2 OU level from time to time, but not for more than 1% of the year. The maximum concentrations will be more than 2 OU, and would occur under particularly unfavourable weather conditions. This differs from odour complaints which may occur at levels below 2 OU (for particularly sensitive individuals) and would be more comparable to maximum odour impacts (odour impacts at higher percentiles). For example, unless more than 88 complaints are received at a particular location, this cannot be compared to a contour plot showing modelling predictions presented as a 99th percentile.

Regardless of this, it should be noted that the proposed activites for the ARRT facilitiy (which includes the receival hall, the tank farm, the greenwaste area and the MRF), are not the significant contributors to the cumulative odour impact in the area. **Figure 2** shows the predicted individual concentrations from each of the three SITA operations at the site, with the ARRT facility (blue line) being relatively minor, to the point of being below the level of detection. The most significant contributor is clearly the Camden Soil Mix operation.

2. *A range of factors require consideration to ensure modelled odour impacts are reliable*

In relation to this comment, the EPA recommends the following be considered in order to increase the robustness of the model performance;

- Identification of all signitifcant ongoing and intermittent emission sources
  - All continuous sources have been considered in the modelling. The most odorous sources, in terms of directly measured odour concentrations, are the greenwaste and receival hall areas (see Table 6 of the SITA report). The receival hall is also included as an intermittent source as it is only opened for receival of waste from delivery trucks (as described in the report).
  - Sources at the other adjacent operations (the landfill and CSM) have also been modelled.
- Operating scenario representativeness, including upset conditions
  - The scenario modelled is reasonable and represents typical operating conditions at the ARRT facility based on available information. It is not reasonable to model upset conditions for a whole year as the EPA odour criteria are based on the frequency of occurrence (i.e. expressed as the 99th percentile) rather than a maximum odour concentration.
- Quantification of odour emissions data
  - Direct measurements of odour have been made by Pacific Environment at all three sites in accordance with Australian Standard AS/NZS 4323.4:2009 (Area source sampling – Flux chamber technique) with analysis in accordance with Australian Standard AS/NZS 4323.3:2001 (Determination of odour concentration by dynamic olfactometry).
- Existing mitigation methods and management strategies
  - Mitigation and management strategies, both existing and proposed, are discussed in Section 8 of the assessment report.
- Cumulative odour impacts
  - As discussed above for Issue 1, cumulative impacts have been considered and show that the proposed Project is a minor contributor to cumulative odour, with the landfill area and Camden Soil Mix being the main local contributors. There is not expected to be a measureable contribution to the cumulative odour levels at the nearest residences, due to the operation of the ARRT facility, including the operations proposed in this Modification.

3. *The Project has the potential to increase the risk of odour impacts at nearby residential receptors*

The concerns on this point relate to the potential addition of new emission sources and changes to the amount of waste received. The letter lists these changes the Project, having potential to affect odour emissions, as follows:

- Increased deliveries and amount of time the ARRT receival hall is open
  - The number of deliveries is based on the traffic assessment carried out for this project. These can not be increased without additional assessment. Conservaitve estimates were made of time required to open the doors to receive these deliveries.
- Changes to tank farm operation including use of open and additional tanks and reactors
  - Open tanks have been included in the assessment. There will also be odour scrubbers used on some of the tanks which would further reduce odour.
- Desludging of tanks

- Excess sludge from the UASB reactor and SBR systems will be dewatered periodically using the existing belt filter press within an enclosed area. The enclosed area is connected to a wet scrubber which treats the air from the belt press dewatering system area before it is released to the atmosphere.
- This will occur intermittently, on average once every 2 weeks, and is not a continuous source of odour.

- Changes to existing waste streams and processing of new waste types
  - New waste streams have been modelled. Any further changes would require an additional development application and therefore warrant further assessment if proposed.

In summary, the proposed processing and tank farm facility is very different to the originally designed ArrowBio EcoLibrium process, which was a significant source of odour and caused substantial odour impacts for local residents. This has been shown in the drop in odour complaints since the decommissioning of that process. It is also noted that the ARRT facility, including the greenwaste receival and processing area, the MRF, the receival hall and the tank farm, is not expected to be the main source of odour in the area.

3 FURTHER MODELLING

Jacks Gully landfill will cease receiving waste and be capped at the end of 2017. Additional modelling has been undertaken which represents this landfill closure scenario and the potential reductions in odour that may therefore be achieved at the adjacent Spring Farm residential development.

Modelling results for the following scenarios are presented in **Figure 4** and **Table 4**:

Scenario 1: Existing operations under standard operating conditions

Scenario 2: Existing operations under standard operating conditions after the Jacks Gully Landfill has been finalised and capped.

It should be noted that these results contain a contribution from a potential future area of composting windrows adjacent to the southwestern boundary of the Camden Soil Mix site. This additional input utilised the maximum volume of 50,000 tonnes, as identified on the current licence application from Tripodi pending with the EPA. The source is currently not operating but allowance has been made should it become so in the future. Modelling has established that this source also is not predicted to have any impact on the results at the residential development boundary.

The results show that there is an anticipated reduction in odour concentrations at the proposed Spring Farm residential development precincts 700 and 800, with the 2 OU contour contracting from the boundary once the landfill has been capped. In reality, there is anticipated to be a small amount of residual odour from the capped landfill but this will reduce over time. Modelling has assumed the odour emission rate for capped landfill (as shown in **Table 1**) across the entire landfill area. This is conservative as a large proportion of the site is already capped and so is likely to be less odorous than current sampling indicates.

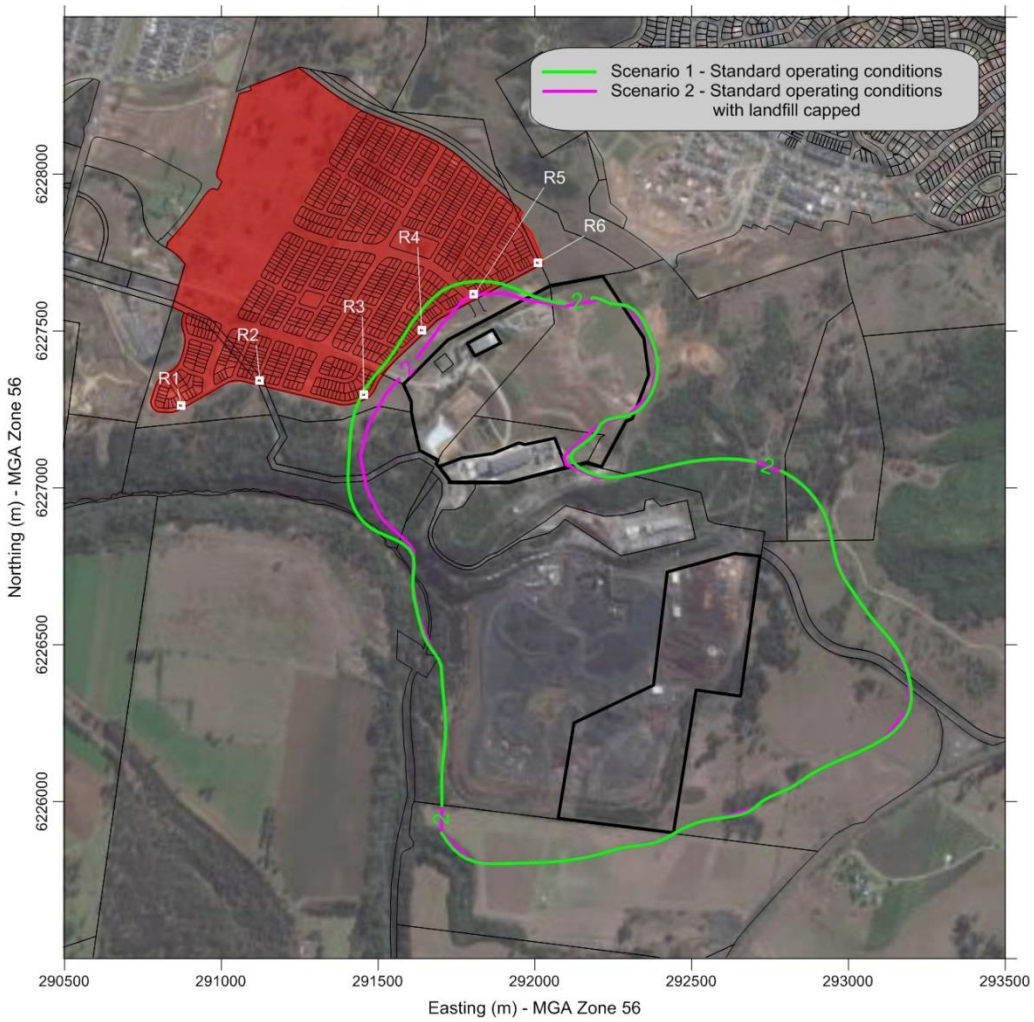

Figure 4: Predicted 99th percentile 2 OU concentration limit for each modelling scenario

Table 4: Predicted 99th percentile 1-hour average odour concentrations boundary receptors (with and without landfill)

Residence ID	Ground level odour concentration (OU) 99th percentile	
	With landfill	Landfill Capped
R1	< 1	< 1
R2	1	< 1
R3	2	< 2
R4	2	< 2
R5	2	2
R6	< 2	< 2

4 FURTHER COMMENTS REGARDING ODOUR

The EPA has developed odour criteria and the way in which they should be applied with dispersion models to assess the likelihood of nuisance impact arising from the emission of odour.

There are two factors that need to be considered:

1. what "level of exposure" to odour is considered acceptable to meet current community standards in NSW, and
2. how can dispersion models be used to determine if a source of odour meets the goals which are based on this acceptable level of exposure

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors the most important of which are:

- the **F**requency of the exposure,
- the **I**ntensity of the odour,
- the **D**uration of the odour episodes, and
- the **O**ffensiveness of the odour, (the so-called FIDO factors).

Whether or not an individual considers an odour to be a nuisance will depend on the FIDO factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

Frequency and duration are accounted for in the modelling process assuming (conservatively) that worst case emissions occur for every day of the year. Odour intensity relates to the perceived strength of an odour. The Association of German Engineers (Verein Deutsche Ingenieure or VDI) has developed a standard scale for describing odour intensity which is summarised in **Table 5**.

Table 5: VDI 3882 (1) Odour Intensity Descriptors

Odour	Intensity Level
Extremely strong	6
Very strong	5
Strong	4
Distinct	3
Weak	2
Very weak	1
Not perceptible	0

The limit of detection is represented by a concentration of 1 OU and would correspond to an odour intensity of between 'non-perceptible' and 'very weak' (using the relationship detailed in the German Standard VDI 3882(1)). According to that same relationship, the odour concentration would need to double to 2 OU before increasing intensity to 'very weak' (Intensity level of 1). It would then need to more than double again (4 OU) before reaching the next intensity level of 'weak' (Intensity level of 2).

The relationship between odour intensity and concentration is therefore non-linear. An example of an odour intensity – concentration curve is shown in **Figure 5**, where the concentration (x-axis) is plotted on a logarithmic scale. The non-linear relationship between intensity and concentration is relevant when interpreting modelling results. Dispersion modelling of odour deals with odour concentration, rather than intensity. It is a useful tool however, to determine the increases in odour concentrations that are required to perceive that increase. In other words, as the odour concentration increases, the perceived strength or intensity increases by a much smaller amount.

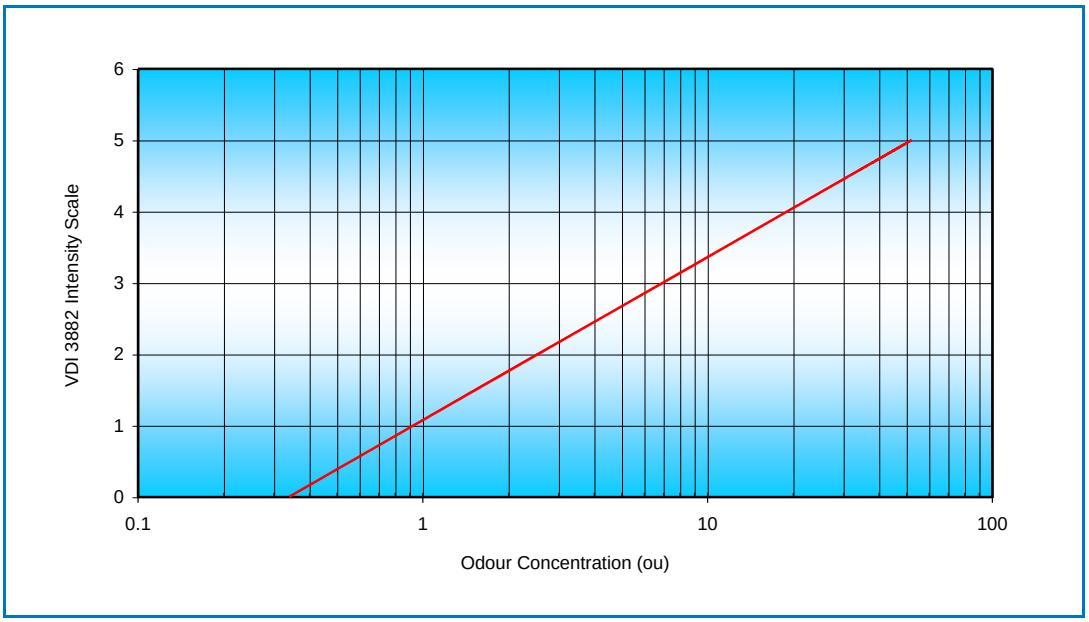

Figure 5: Example of the odour intensity – concentration relationship[1]

In light of this discussion and in relation to the current project, the proposed ARRT Facility is likely to make an imperceptible difference to the general odour in the area, but more specifically at the Spring Farm residential development.

[1] T. H. Misselbrook, C. R. Clarkson and B. F. Pain, Relationship Between Concentration and Intensity of Odours for Pig Slurry and Broiler Houses. Journal of Agricultural Engineering Research Volume 55, Issue 2, June 1993, Pages 163-169.

5 SUMMARY

Further discussion on the interpretation of odour modelling results has shown that the the predictions at the proposed Spring Farm residential development are anticipated to comply with the the most stringent EPA odour criteria.

In addition to this, it has been shown that the individual contribution of the proposed ARRT Facility to the cumulative odour predictions is unlikely to be detected at the boundary of the proposed residential development.

Additional modelling was also carried out to determine the reductions in odour which may result from the future closure of the Jacks Gully landfill adjacent to the residential development. Modelling showed, not surprisingly, that there would be slight reductions and that the 2 OU contour is anticipated to contract from the residential development area. Again, these small differences may be imperceptible to the human nose as the concentrations are low, but nonetheless there is compliance with the EPA criterion.

Kind regards,

Jane Barnett
Principal Consultant – Air Quality
Pacific Environment Limited

Appendix B

Letter to Camden Council dated 30th April 2015: RE Review of Revised Response to Submissions Document – Spring Farm Resource Recovery Facility.

30 April 2015

Attention: Jeremy Swan
Camden Council
Manager Development
37 John Street
Camden NSW 2570

Dear Jeremy,

RE: Review of Revised Response to Submission Document – Spring Farm Resource Recovery Facility
Property: Spring Farm Waste Resource Recovery Facility

I refer to your letter dated 27 April 2015 regarding your response to our S.75W Modification Application (05_0098 MOD 5). I am pleased to note that the issues raised in your letter dated 16 February 2015 have generally been addressed in our revised response to submissions provided to the Department on the 10th April 2015.

Further, I understand that Council is seeking guarantees that the Jacks Gully Landfill located at our Spring Farm Resource Recovery Facility will cease to receive waste prior to the 1st of January 2018. In order to provide Council with the necessary guarantees, I am pleased to confirm to you in writing that our Jacks Gully landfill will cease to receive waste from the date no later than the 31st of December 2017.

Should you have any further questions regarding this correspondence please contact Nicolas Rampelbergs by phone on 02 9708 7837 or alternatively via e-mail nicolas.rampelbergs@suez-env.com.au

Yours sincerely,

Emmanuel Vivant
Executive Director NSW Infrastructure
Cc
Phil Carbins
Peter Hunt
Nicolas Rampelbergs