Appendix F

AWT Situational Analysis

Benjas (2008)

Alternate Waste and Resource Recovery Technologies

Situation Analysis for Tweed Shire Council

November 2008

Benjas Pty Ltd

This report was researched and prepared by

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1.0 Background

Tweed Shire Council has a Concept Plan and Stage 1 Project Application before the New South Wales Department of Planning that incorporates a landfill component with an estimated life span to the year 2025, based on current waste generation projections. The proposal is located on three allotments on Eviron Road, a site located adjacent to the current landfill operations at Stotts Creek.

The Department of Environment and Climate Change (DECC) in their response to the Department of Planning have provided a preliminary environmental assessment of the project.

In this response the DECC has provided comment that Council is to include as part of its submission a more detailed consideration to the investigation and reporting of available alternate waste treatment technologies or pre-treatment to landfill. As a result of this, Council commissioned an independent report to determine the validity, inclusive of the effectiveness and efficiency of and expected cost of the currently operating parameters and / or emerging alternative waste technologies that may be of use and applicable to Council to consider into the future in support of the application.

2.0 Project Objectives

The intent of the report was to conduct a desktop audit on these alternate waste processing facilities (AWT) now operating in Australia and identify any possible emerging facilities that provide Council with an independent assessment of the practicality of incorporating such alternatives into its current planning phase.

This report provides Council with a summary of the available options, and assessment of the alternate technologies.

3.0 Project Methodology

Benjas Pty Ltd has conducted a desktop assessment of the available information on alternate waste technologies operating and currently on offer to Councils in Australia with an update to potentially available but as yet non commercially proven operations. The analysis includes commentary provided for in published articles, including company annual reports, Australian Stock Exchange information, commentary obtained directly from stakeholders of some of the technology providers as well as internet and other available reports of substance and relevance.

The report provides Council with a summary of the latest information and project status for its consideration and possible inclusion as part of the forward planning process.

4.0 Tweed Shire Council Base Line Information for Consideration

It is of fundamental importance and core to the outcomes of this report that a thorough investigation and analysis of the current as well as planned waste volumes Council has control and responsibility of be completed.

The importance of this not only rests with providing guidance to Council of its range of possible options but the core requirement was to determine the specific sources and volumes of wastes available that can be processed utilising an alternate waste processing facility (AWT).

Council provides that over the last three years it has land filled on average 60,000 tonnes per annum of waste material. In 2006, the figure was 63,000 tonnes, 2007, 67,000 tonnes and 2008 projected to fall to 62,000 tonnes. The reduced total in 2007-08 is primarily due to Council's education program which has significantly increased the amount of recyclable material diverted from the domestic waste stream aligned with the introduced differential waste disposal charges for customers using its facilities particularly from outside the Council area. This has directly resulted in a major increase in the separation of green waste and of the diversion of construction and demolition waste recovered for beneficial reuse. The estimated percentage of wastes recycled has increased from an average 24% to approximately 36% of the totals. The majority of wastes being land filled are from the domestic waste sector (kerbside weekly collection) from households, and from commercial and industrial sources delivered by the private sector operators. (C&I) .

The majority of all waste managed by Council, apart from Commercial and Industrial streams, is sourced from inside the Tweed Shire Council area. It is estimated that as much as 60 % of the Commercial and Industrial waste land filled at Councils' facilities is generated directly from the adjacent Gold Coast City Council (GCC) precinct. It is noted that Councils' landfill is more centrally located to service the Southern Gold Coast Council area than for waste transporters to travel to the main GCC landfill and transfer station infrastructure, which is located at Reedy Creek and further north, at the City Links and Labrador areas.

In 2007 Council completed an extensive and comprehensive waste management strategy for the Shire. The strategy contains 35 recommendations, the majority of which involve measures to increase the diversion of recyclable materials from landfill for more beneficial reuse. The current year projected waste diversion statistics are testament to this strategy being implemented, which has seen the increase in the percentage of waste diverted from landfill.

Council is committed to continuing to implement all of the recommendations in the strategy, but it is also cognisant of the reality that not all wastes in its control can or will be recycled or reused.

Council continues to monitor the development of alternate waste and pre-treatment technologies to divert further proportions of waste from landfill, but is also acutely aware that

a one size, or solution that fits all communities, may not necessarily be practical, either for cost, or volumes of product available.

It has significant funds held in reserve which would prove adequate to finance the construction of an Alternate Waste Treatment Facility when such a technology was commercially proven and economically viable to it, but it is also mindful that regardless of the technology currently in use, all AWT facilities rely at some stage on landfill for the residuals or other technical or process failures. Until such AWT technologies are both commercially viable and proven reliant for its limited volumes of waste Council is committed to continue to implement its waste diversion initiatives but it also must rely on landfill as a core disposal option for the estimated 60,000 tonnes it manages every year.

It has identified that it must have at its disposal for perpetuity, an environmentally sound and fully engineered landfill for all of the wastes it is responsible for that are generated by its residents, thus the imperative to develop the new and expanded landfill option for this community generated waste. Council may decide and opt at some point in time to use private industry owned facilities located to the North of its boundary (SE QLD) but any decision in this regards must be both community acceptable and in the best interest long term of them, both on long term environmental and financial grounds.

Council's existing landfill at Stotts Creek has approximately two years of landfill capacity left based on current projections. Its future domestic waste collection and disposal contract commences in December 2009, and will offer a short term Contract (1 x 1 year) to complete landfilling operations by 2011. Council will then offer a longer term Contract (7 to 10 years with possible extensions) to conduct landfill operations at the proposed new site at Eviron Road. It is anticipated that Council will require landfill space to dispose of up to ten years of waste currently estimated at 60,000 tonnes per annum but reducing, following the closure of the existing Stotts Creek Landfill expected in 2010 / 11.

Allowing for a compaction ratio of 0.7 tonnes per cubic metre with cover material an additional 10%, the volume of airspace required is between 560,000 and 600,00 cubic metres. Council proposes that the Stage 1 Project Application will provide adequate landfill airspace for the future long term Contract.

5.0 Tweed Shire Council Waste Statistics

The following waste statistical information was provided by Council for consideration and is used in assessing Alternate Waste Treatment options

Solid Waste Streams 2007/08	Total Tonnes Managed	Tonnes to Landfill	Tonnes Recycled	Percentage Recycled
Domestic Waste	32,697	23,356	9,341	28.57
Commercial and Industrial	26,692	26,692	0	0
Construction and Demolition	15,365	4,274	11,091	72
Green Waste	9,537	0	9,537	100
Hazardous	694	694	0	0
Kerbside Hard Waste Collections	1,877	877	1000	53.27
Other	4,691	4,691	0	0
Bio Solids	N/A	N/A	N/A	100%
Total Waste Managed	**91,557.02**	**60,584**	**30,970**	**33.83**

6.0 Waste Composition

Prior to reporting the available AWT options to Council, it was important to review the baseline information to identify specific components of the available wastes that might be diverted to an alternate treatment plant rather than for disposal to landfill. Such an assessment can only be confirmed if the opportunity is sound, both commercially, (best value to the community) and such technology is environmentally sustainable, robust and commercially proven.

Waste auditing, or characterising the waste stream, is imperative for accurately understanding the current composition and to be able to accurately plan, predict and undertake a cost benefit analysis on various system options for improving resource recovery and increasing diversion from landfill.[1]

Tweed Council was one of the participating councils in a Regional Municipal Waste Characterisation Study co-ordinated by the North East Waste Forum for domestic waste and recycling collections in February and March 2005.

The objectives of the study at the time were to:

- determine the composition of each of the six participating councils
- determine the composition of the region as a whole and ,
- determine current performance of recycling and organics collection programs.

In addition the Council's Waste Management Services Contract requires its current waste collections contractor to conduct quarterly waste audits.

The findings of the audits have been used to identify the streams available and if diverted to an AWT facility expected to be processed at such an operation.

6.1 Regional Municipal Waste Characterisation Study

This study was co-ordinated by the North East Waste Forum and conducted by Full Circle Environmental Solutions.

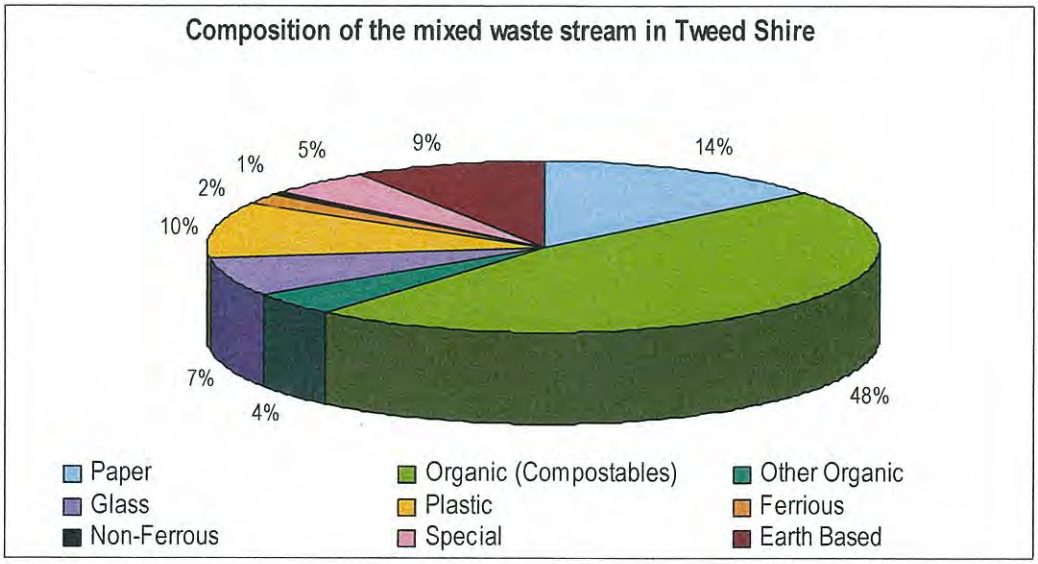
The audit at the time found that the average resident places out 17.2 kilograms of waste for collection weekly, of which 11.7 kilograms consist of garbage and 5.4 kilograms consist of recyclables, representing a diversion rate at the time of almost 27%.

6.2 Composition of the Residential Garbage Stream[2]

Organic materials were estimated to be 52%, representing the largest component of the bin contents, followed by recyclable paper and cardboard, at 14%, and glass containers at 7%.

[1] Tweed Shire Council Waste Strategy 2007
[2] Chart from Full Circle Environmental Solutions' 2005 Waste Characterisation Study of Tweed Shire Council.

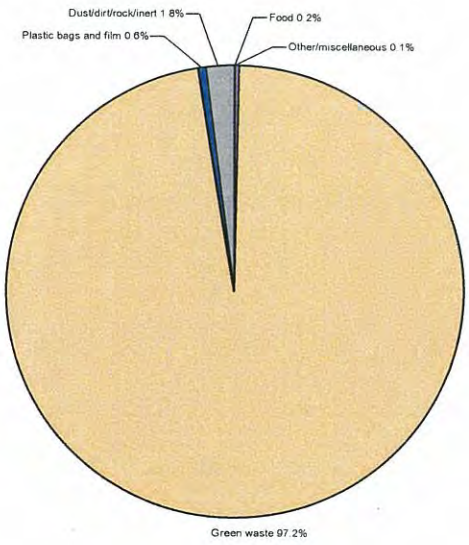
6.2.1 Composition of the Domestic Waste Stream



The audit conducted by the North East Waste forum focussed on domestic streams only, thus for the purposes of completing this report additional data for the other streams has been used from alternate waste audits which have been conducted in other New South Wales local Government jurisdictions.

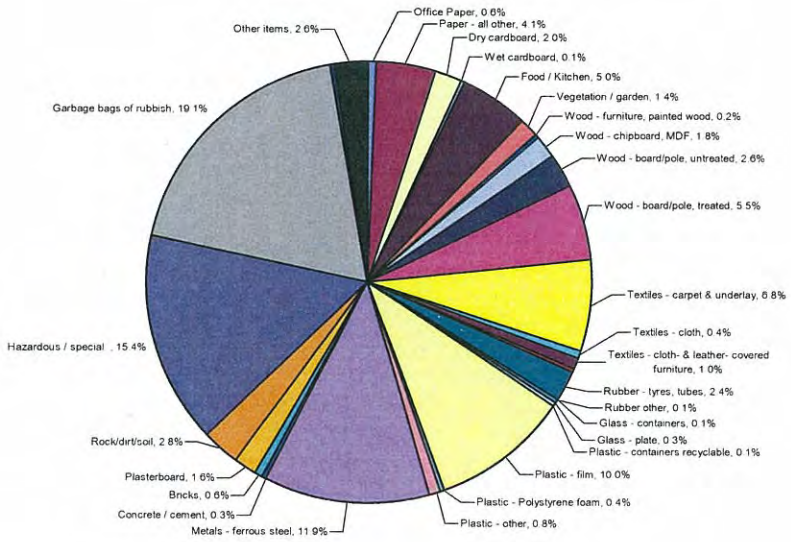
All data reviewed was been benchmarked to DECC own audit information and was found to be comparable and robust in nature for this assessment and applicable to Tweed Shire Council's waste streams.

6.3 Greenwaste General Composition



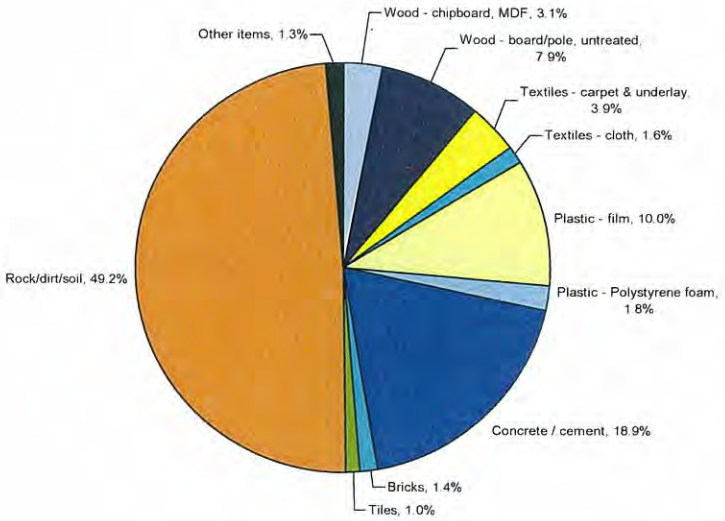
Organic composition is 97.2% of the total.

6.4 Commercial and Industrial Streams Composition by Volume



Organic streams contribute 25.5% of the total composition

6.5 Construction and Demolition Streams Composition by Volume



No significant organics stream data is reported.

Limited data is available on the actual composition of kerbside hard waste collections, however no putrescibles or green organics are collected as part of this biannual campaign. It is assumed that the other category is made up by items such as those collected by its contractor in litter and park bins thus these would be 100% processable in AWT facilities. Typically kerbside hard waste collections are items householders deem to be waste ie old whitegoods, garden items or timber and furniture thus also for the purpose of this report have been excluded from AWT options. They have no organic value to such an AWT operation, but rather are more likely to be a cost burden on such an operation.

6.0 Alternate Waste Treatment Facilities

6.1 Situation Analysis

United Kingdom specialist Juniper Consultancy Services LTD in 2007 reported that the independent review completed by it of all currently available waste technologies, assessed from more than 300 separate waste processes operating in 25 countries globally, only 43% had limited operational experience and that 25% of the total had not been operationally demonstrated[3].

The Juniper group, regarded as the world's leading independent specialist organisation on Alternate Waste Treatment processes, released a ratings report that outlined parameters for

[3] Juniper Consultancy LTD UK 2007

assessing technologies and confidence levels of commercially viable and proven outcomes and of the levels of risk associated with each.

Juniper reported that whilst there are credible technology providers, two more recent applications aside of traditional incineration processes have the greater focus and ongoing commercial development. These were:

- anaerobic digestion for bio gas applications and
- plasma systems designed to manage household waste.

In respect to the plasma technologies, Juniper's ratings unequivocally confirm none of the 39 companies' technologies are commercially proven or have been fully proven for MSW treatment, although for hazardous waste processing some have strong credentials but that very high processing costs can be expected.

It also reports that the situation is far more complex for the bio gas sector, the sector most prevalent from an Australian context for AWT processing. It found that whilst there are many proven anaerobic digestion systems available that are capable of processing singular waste streams, great care must be taken with respect to matching the technology to the feedstock to which it purports capable of processing. Municipal waste by its very nature being heterogeneous in composition provides extended complexities when advanced waste treatment is carried out. The most successful anaerobic outcomes to date have been demonstrated on single stream organic composed materials.

The best anaerobic outcomes assessed by Juniper were from single streams eg offal generated at abattoirs, or bio gas generation from farmed crops. It reports that many local authorities globally were making long term commercial decisions for managing their wastes based on largely non-commercially proven technologies[4] and cautioned against this.

8.0 Australian Context

In 2000, in response to a perceived crisis of landfill capacity and of its availability in New South Wales the State Government at the time commissioned and a report into the use and practices of Alternative Waste Treatment options.

Released and referred to as the Wright Report, the report laid claims as to the fundamental importance of developing and changing the paradigm for waste processing and disposal in Australia from landfill, to alternate treatment options and from this moment some states have with much vigour pursed this objective.

Unlike its European drivers where Alternate Waste Technologies have been driven from a crowded Europe and limited landfill expansion, in Australia the drivers have been to reduce the quantity of waste to landfill (some claims to be as high as 80 %), stabilise the organic materials, that in turn reduces long term methane generation and thus leachate formation in

[4] www.WasteReports.com

landfill. Outputs from these processes are commonly reported to be energy capture (internal plant methane generation from the process itself) compost derivatives, gas (methane) conversion for use in power generation and expanded recyclables generation.

Typically, Alternate Waste Technologies for the treatment of waste in Australia can be characterised into the following three (3) processes

- *Mechanical Biological Treatment (MBT)*
- *Thermal Treatment or Waste-To-Energy (WTE)*
- *Combination of both WTE and MBT*

8.1 Mechanical Biological Treatment (MBT)

This technology essentially splits the as received waste into 3 fractions:

- a recyclable stream (glass, mixed plastics, metals),
- converts the organic fractions into a biological stream (for composting or for anaerobic digestion or similar hybrid systems)
- the fuel stream for energy recovery.

The majority of Australian AWT facilities are hybrid operations utilising this core MBT technology. — Aerobic ; or — Anaerobic.

Typically an MBT facility is designed to operate its organic processes according to either aerobic or anaerobic processes.

8.1.1 Aerobic

This type of technology is used in a bioreactor landfill. Leachate is removed from the bottom layer of the placed waste, and is piped to a liquids storage tank, and is then re-circulated into the landfill in a controlled manner. Air is injected into the waste mass, using vertical or horizontal wells, which promote aerobic activity and accelerate waste stabilization. and gas production?.

8.1.2 Anaerobic

In an anaerobic situation, moisture is added to the waste mass in the form of re-circulated leachate and other sources to obtain optimal moisture levels. Biodegradation occurs in the absence of oxygen (anaerobically) and produces methane gas. The methane is captured to minimize greenhouse gas emissions and can be used for power generation.

It is important to note that the core technology used in these facilities relies on processing organic waste streams specifically and unless the plant is designed to produce a product directly for use in a WTE facility, the residuals or non organic streams contained in the waste inputs must be landfilled as per normal disposal practices.

8.2 Thermal Treatment or Waste-To-Energy (WTE)

Thermal waste treatment technologies are well established in Europe and North America. The first facility of this type was commissioned in Hamburg, Germany in 1890. WTE or incineration as it is more commonly known is the most widely used alternate waste treatment process commercialised globally. Energy is recovered in the form of heat and electricity, quite often used to generate and drive steam turbines that in turn are used to generate electricity. There are no mixed waste AWT thermal plants (WTE) currently operating in Australia, the closet being the application of the technology by the cement industry that uses limited and singular forms of waste material ie used tyres.

In the global perspective the standard categories for these WTE operations usually take the form of one of the following

8.2.1 Incineration

These mature technologies recover the calorific energy contained in residual waste streams. Conventional 'mass burn' incinerators use reciprocating grates to move waste through the combustion chamber, usually with a design capacity of between 200–400 tonnes per day. The stages of combustion are usually:

- drying and preheating the solid waste,
- emission and combustion, and
- burnout and residual removal.

Solid incombustible material is removed as a slag, and is typically reliant on landfill for the disposal. Flue gas from combustion contains water, combustion gases, oxygen and nitrogen. Air pollution is a critical consideration in incineration because particulates and dust, NOx acid gases and dioxins, furans, polyaromatic hydrocarbons and heavy metals may be generated depending on the process, combustion temperatures and feedstocks[5]. Some limited use of the ash or slag is used in secondary applications but in general residuals are landfilled.

8.2.2 Co Generation

Cogeneration harnesses waste heat from electricity production for useful purposes. It captures the heat that comes out of the steam or gas turbine for use in other parts of the process usually in the form of heating. The Visy Paper Mill in Brisbane utilises this technology and is an example of a company using cogeneration to capture 'waste' heat for power generation purposes. [6]

8.2.3 New Thermal Processes

Several new thermal treatment processes including gasification, pyrolysis and combinations of these, have recently been adapted and are being developed to handle municipal solid waste. These technologies require a homogeneous input stream to ensure reliable operation. For mixed municipal wastes, some form of sorting/separation pre-treatment is usually required to remove unsuitable materials and ensure consistency[7].

[5] Alternate Waste Technologies – Zero Waste SA
[6] Alternate Waste Technologies – Zero Waste SA
[7] Alternate Waste Technologies – Zero Waste SA

8.2.4 Pyrolysis

Pyrolysis treatment involves indirect heating of carbon rich material with the specific aim of achieving thermal degradation of the material typically at temperatures of approximately 500°C in the absence of oxygen and under pressure. Useable energy of some 200–400 kilowatt hour per tonne of waste is generated. Energy production and greenhouse gas production are lowered in the absence of oxygen. Heavy metals that are less volatile remain as char, while volatile species need to be captured by gas cleaning systems and treated as hazardous materials. A liquid fraction is produced which may be used, with additional processing, as a synthetic fuel oil[8]

8.2.5 Gasification

Gasification heats carbon rich material in an atmosphere with slightly reduced oxygen Most of the carbon is converted to a gaseous form, leaving an inert residue. Very high temperatures are used – around 1000° C in air or 1200° C in oxygen. Gasification is considered an energy efficient technique for reducing the volume of solid waste and for recovering energy with a heating value 10–15% that of natural gas (Environmental Engineering Corporation at www.eeco.net)9 The failed Brightstar Environmental SWERF plant attempted to commercialise a hybrid type of technology in Wollongong New South Wales in 2004. It failed due to the heterogeneous nature of the waste inputs and the inability to process and clean these effectively.

8.3 Combination of both WTE and MBT

Typically this type of facility generates two streams from the waste inputs. Outputs from the process are similar in nature to each other, the differences are one is of low calorific value, the other high. These types of facilities are common practice in Europe but as yet are not operating in Australia. The closest to such an operation in Australia is the Refuse Derived Fuel operation in Adelaide, South Australia, operated by Adelaide Brighton Cement.

The low calorific value fuel is usually land filled as it has a high inert or similar structure, the high calorific value product generated from the timber, plastic and textile, paper and cardboard streams is used for a fuel to co fire or single fire a facility, eg cement kiln or furnace.

9.0 Currently Operating AWT Plants in Australia

For the purpose of this report the context of AWT reporting in Australia is focussed on treatment options for Council controlled wastes only. Some single stream Waste Treatment plants are operating in some states but these are largely used to power internal and on site operations only. They are not covered nor reported in the context of this report.

Australia currently has 13 operating Alternate Waste Treatment facilities that are treating Council generated and other commercially mixed wastes. The facilities are located in four States. New South Wales has the greatest concentration with six, Western Australia has four

[8] Alternate Waste Technologies – Zero Waste SA
[9] Alternate Waste Technologies – Zero Waste SA

with a fifth currently being commissioned, Victoria one with a second facility announced and Queensland one.

All of the assessed technologies use a hybrid of, or single MBT technology of Aerobic or Anaerobic processes. The principal driver for these being the high cost of landfill disposal and in the Western Australia example the geographical challenges the state has with respect to locating landfills in water table impacting environs being pivotal for these developments.

9.1 Australian AWT Plants and their Location

Company	Location and Capacity	Waste Streams Managed	Technology
Global Renewables ***WSN Environmental***	Eastern Creek 150,000 -250,000 tonnes MSW Streams	MSW Only Limited Wet C&I Streams	Hybrid Anaerobic / Aerobic processing
Veolia Environmental Transpacific Joint Venture	Camellia 50,000 tonnes	Market wastes and, commercial organic streams only	Anaerobic Only
Sita Environmental	Port Stephens, and Cairns 110,000	MSW organic streams, Biosolids and Organics in C&I waste streams	Anaerobic in vessel
Remondis	Port Macquarie 20,000 Clean Organics only	Source Separated garden waste and commercially sourced organics and biosolids	Aerobic Processing
Bio Mass Solutions	Coffs Harbour 40,000 tonnes MSW Garden Organics Tunnel Composting	MSW mixed waste autoclaved Green Waste for rehabilitation purposes	Autoclaving of MSW, and in tunnel Composting for Green waste.
Commercial Organics	Dandenong Victoria Unknown Capacity	Household Green Waste and source separated Organics	Aerobic MBT
Sita Environmental	Kwinana Food Organics and Biosolids Only Unknown Throughput	Food Organics and Biosolids Only	Aerobic MBT

EMRC Perth WA	Canning Vale 100,000 Capacity	MSW Organics, Biosolids only	Anaerobic in vessel
Anaeco ***Under Construction***	Shenton Park 55,000 tonnes MSW Only	MSW Organics only	Hybrid Aerobic / Anaerobic
Atlas	City of Stirling 60,000 MSW only, limited C&I	MSW Organics	Aerobic MBT
Arrow Bio ***(WSN Environmental)***	Jacks Gully Facility New South Wales	MSW Streams Only Composting in Tunnel	Anaerobic Water based Technology
SITA Environmental Solutions	Elizabeth Drive Landfill 40,000 Tonne Food and Separated Organics 80,000 Residual Waste	Food and separated organics Mixed MSW wastes	Mechanical Biological Treatment Hybrid in vessel Tunnel composting operation

Under pinned by the substantive waste disposal levy in New South Wales, Sydney currently has the highest concentration of AWT facilities of any region in the world. Melbourne is catching up with the Victorian Government announcing it wants two additional facilities under construction by 2010, supporting this policy directive with a $10 million 'Victorian Advanced Resource Recovery Initiative [10].

10.0 AWT Processed Waste Inputs and Outputs

All of the operating and under construction AWT facilities investigated have been commissioned on the basis of them processing only Council controlled and generated organic

[10] Inside Waste September - October 2008

waste streams (MSW as well as select garden wastes and bio solids).

Several of the facilities investigated do receive commercial and industrial waste streams and one in Sydney has been purpose built to process specific organic wastes only, ie market and city restaurant streams. Wastes of this type are delivered directly by private commercial sector operators to select facilities but wastes received from these sources are *sorted for their organic streams only* prior to treatment.

In all typical AWT facilities built to process MSW or similar Council managed streams , those that are capable of receiving and processing some wastes from the C&I delivered loads, separation of the organic streams must be done by an operator and an excavator in the facilities receivals hall eg SITA Bedminster facilities, prior to the plant processing these. Typically of the non processable wastes separated these are hauled to landfill for their disposal. Processing of organic streams are core to all of the technologies operating and assessed, although when researched and investigated in depth ie conversations made directly with stakeholders and reports reviewed,[11] limited real commercial information as to the full mass balance equation could be confirmed. All stakeholders contacted at select operations cited 'Commercial in Confidence' the reasons for not supplying the mass balance information, although all provided comment waste diversion from landfill was always higher than 70%.

One stakeholder stated a landfill diversion figure as high as 86% from their technology was possible (currently 70%) but when questioned regards which materials contributed to this figure over and above the organics estimate no confirmation was provided to this statement on the basis the information was 'commercial in confidence' and that recyclables were collected. Whereas another facility operator confirmed 65% diversion current with an expected estimate as high as 70%.

[11] Richard Adams , WSN, Martin Gravett, Anaeco,

Residuals for landfill

Residual waste streams requiring disposal post organic processing operations.

None of the stakeholders contacted or information obtained in a public forum [12] provided any real and actual mass balance outputs with respect to where the processed organic streams post the MBT or anaerobic treatment went, although a number reported and confirmed that these were being used for onsite remediation at landfills, and in the agricultural sector. It could not be confirmed if the organic outputs were in fact being used as a value add in these operations, although it has been confirmed that most operations post the stabilising process do send the organic fractions to either old mine sites, existing landfills and other similar sites where the materials are used for a variety of cover purposes[13]

[12] WSN, ANAECO, Individual company web sites and published marketing documents, including annual reports

[13] Pers Comms with general industry stakeholders and landfill operators

Processed Waste with Organic and Residuals Mixed

Stakeholders contacted did confirm that where separate green waste processing was being done as a part of the facility operations and separate to MSW processing, the outputs were generally sold or given to the landscape and other local agricultural markets.

The Remondis facility at Port Macquarie reports all of its organics are sold and used locally by either landscapers or in other agricultural locations. Out of specification or contaminated streams are sent to landfill. The input streams at Remondis are specialised, single organics streams such as bio solids, green waste and food waste thus contamination of these is limited as compared to mixed MSW generated operations.

A similar result has been confirmed at the SITA facility in Perth, Western Australia. Similar single stream inputs ie bio solids, green and garden wastes, food and vegetable market generated streams are processed at the facility, with quality product outputs easily marketed and used in the agricultural sector. Out of specification or contaminated batches are land filled.

11.0 Applicability of AWT technologies for Tweed Shire Council

Prior to establishing the validity for Tweed Shire Council to consider AWT, it is important to establish specifically which wastes currently land filled would be applicable and available for such technology use.

11.1 AWT Facility Waste Acceptance Criteria

All AWT facilities in Australia are confirmed as being capable of processing Domestic Waste (MSW) streams either in total or elements of these. Most facilities accept green wastes and bio solids for processing within or as separate to the core facility. Where it is processed

separately 'tunnel or in vessel' technology is used and design capability is usually in excess of 30,000 tonne modules.

Limited AWT facilities or technologies exist that accept and process mixed commercial and industrial waste streams. Where such a facility does accept these streams only the organic fraction contained within the mix is considered processable. All other components are currently land filled. Most of the identified AWT facilities accept street litter and other wastes typically under Council control. No facilities accept Construction and Demolition Wastes as a part of the product mix as they have no organic value to such an operation.

Most AWT facilities accept and use bio solids (wastes generated from Sewerage and Water Treatment Plants) as a part of their waste stream process mix. These are not considered a waste requiring possible AWT management by Tweed Shire Council as none of these wastes are currently land filled by Council. Long standing commercial arrangements ongoing are in place for the management and controlled disposal (recycling) of this particular stream.

Council has ongoing commercial arrangements in place for the processing of its green garden and other wood wastes and these are not considered available for possible processing at an AWT facility. No facility was identified as being capable of accepting for processing Hazardous or Kerbside hard wastes.

11.2 Tweed Shire Council Waste Composition Applicability for Possible AWT Treatment.

According to Council's own waste and other industry audit advice, organic percentages identified as being suitable for treatment in an AWT facility for wastes managed by Tweed Shire Council were confirmed as follows:

- *Domestic Waste (MSW)* — *52.0% Organic Streams*
- *Commercial and Industrial Wastes* — *18.5% Organic Streams*
- *Construction and Demolition Wastes* — *Nil Organic Stream*
- *Hazardous (Regulated) Wastes* — *Nil Organic Stream*
- *Kerbside Collected Hard Waste (Bulky Household)* — *Nil Organic Stream*
- *Other (including street litter bins)* — *100% AWT Suitability*

Using Council's own data and other industry benchmark percentiles the total tonnes available for possible treatment at an AWT facility have been identified as follows

Solid Waste Streams 2007/08	Total Tonnes Available	Percentile of Organic Streams	Organic Stream Tonnes	Tonnes Remaining for non AWT treatment and disposal
Domestic Waste	*23,356*	52 0 %	14,563	***8,793***
Commercial and Industrial	*26,692*	18.5 %	4,938	***21,754***
Construction and Demolition	4,274	N/A	Nil	***4274***
Hazardous	694	N/A	Nil	***694***
Kerbside Hard Waste Collections	877	N/A	Nil	***877***
Other	4,691	100%	4,691	***N/A***
Bio Solids	N/A	N/A	N/A	***N/A***
Total Tonnes Breakdown	**60,584**		**24,192**	***36,392***

11.3 Percentile Breakdown of AWT Treatable Tonnes and Residuals requiring management

The following waste quantities are managed for land fill by Council.

- *Domestic Waste (MSW)* — *23,356 Tonnes per annum*
- *Commercial and Industrial Wastes* — *26,692 Tonnes per annum*
- *Construction and Demolition Wastes* — *4,274 Tonnes per annum*
- *Hazardous (Regulated)Wastes* — *694 Tonnes per annum*
- *Kerbside Collected Hard Waste (Bulky Household)* — *877 Tonnes per annum*
- *Other non descript wastes* — *4,691 Tonnes per annum*

Total tonnes under management for land filling are estimated at 60,584 tonnes per annum

12.0 Conclusion

Of the potentially available 60,584 tonnes of wastes Tweed Shire Council landfills annually only 24,192 tonnes or 40 % of the total have been identified as being of appropriate composition for possible processing at an AWT facility.

The remaining 43,220 tonnes of mixed and general wastes representing 60 % of the total, including regulated waste streams (excluding the green organics which are processed in separate operations), all require long term sound and safe management with proper disposal by Council to maintain and protect community health standards.

Furthermore, of the possible 24,192 organic tonnes available for AWT treatment, a sustained and viable option for further reuse or treatment must be required post any AWT operation if these processed wastes are not to to be reliant on site remediation or other applications at landfills, as is mostly the case with AWT outputs in operation around Australia.

None of the commercialised AWT facilities operating in Australia have been identified as being capable of commercially operating below a 50,000 tonne design threshold limit. The current processing costs of facilities in the Sydney basin with a design capacity in excess of 100,000 tonnes throughput per annum has been confirmed at more than $100 per tonne processing cost according to stakeholder interviews..[14].

Only the Anaeco technology facility currently under development in Perth, Western Australia was deemed to be capable of being modularised to around 50,000 tonne annual capacity, and as yet the first plant has not been commercially commissioned or demonstrated. Its design capability in the future will require a single MSW stream of 50,000 tonnes and the technology cannot use biosolids , green organics en masse, or C&I streams in its operation.

Future Anaeco plants with 50,000 tonnes capacity of MSW only streams will incur a processing cost of around $100 per tonne, conditional on contractual matters such as land provision for siting operations, residual disposal costs and length of contract periods.

Process rates at other facilities where stakeholders were contacted again claimed 'commercial in confidence' actual processing costs and it is publicly reported that a fee of around $ 100-$120 tonne is an industry benchmark for operations of this nature in the Sydney metropolitan area, with a design capacity of more than 100,000 tonnes.

Based on all the available evidence assessed, stakeholders interviewed reports and other research undertaken into AWT operations internationally as well as those operating within Australia, no commercial, environmental or community best value grounds can be concluded for pursuit by Council for disposing of its wastes utilising this type of technology at this point in time.

[14] Pers Comms Anaeco and WSN

Issues aside of the technology applicability itself for the available volumes, that requires finite resolution are the core facts that Council has more than 43,000 tonnes of wastes incapable of being processed at or through an AWT facility that still will require long term sound environmental disposal solutions. Residual disposal of the processed waste remains pivotal to the economics of an AWT operation, in addition to back up options in the event of facilities technical breakdown.

On the basis of the review until such time as a facility design capacity for Tweeds limited organic streams can be commercially proven and financially afforded it cannot be proven that AWT treatment is viable either on the basis of environmental or any other commercial or sound grounds.

Council should maintain a watching brief on the development of these plants for small communities but it is unlikely that in the short to medium term solutions other than sound fully engineered landfills will be proven for these small communities.

Council should also continue to maintain & build upon financial reserves in the event that an appropriate treatment technology should become available.

Council however should also be cognisant of the facts , that it may find itself in a difficult position with respect probity of the full analysis for AWT implementation in its community, alternate to using landfill for waste disposal when this is compared to using best practice landfill design and operations including gas capture.

All AWT operations have been identified as being reliant on landfill for residuals management, their process failures and in the event facilities have technical problems or are unable in some circumstances to accept and process wastes as collected, either for a day, week or longer. It is proven that in these possible and likely events a disposal solution ie sound landfill practices will always be required, regardless of the technical solution available to manage a communities wastes.