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City of SouthPerth

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Hon Sheila Mills MLC
Chair
Legislative Council
Standing Committee on Environment and Public Affairs
Parliament House
PERTH WA 6000

Dear Sheila

INQUIRY INTO MUNICIPAL WASTE MANAGEMENT IN WESTERN AUSTRALIA

I refer to my letter dated 23 January 2009 seeking an extension of the closing date for submissions in relation to the Inquiry into Municipal Waste Management in Western Australia and note that as yet no reply has been received.

Attached is the City's submission in response to the Inquiry into Municipal Waste Management in Western Australia.

Yours sincerely

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City of South Perth

SUBMISSION TO THE ENVIRONMENT AND PUBLIC AFFAIRS STANDING COMMITTEE

Inquiry into Municipal Waste Management in Western Australia

February 2009

This submission has been prepared by the City of South Perth. Any questions pertaining to this submission may be addressed to -

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In making this submission it is the City's intention to seek to give evidence to the Standing Committee.

GLOSSARY OF ACRONYMS

AWT	Alternative Waste Technology
BOO Contract	Build, Own and Operate Contract
DEC	Department of Environment and Conservation
the Act	*Local Government Act 1995*
MOU	Memorandum of Understanding
MRF	Materials Recovery Facility
RRF	Resource Recovery Facility
RRC	Rivers Regional Council
SMC	Southern Metropolitan Regional Council

1. INTRODUCTION

On 26 November 2008 the Legislative Council's Standing Committee on Environment and Public Affairs resolved to inquire into Municipal Waste Management in Western Australia.

On 26 November 2008 the Legislative Council Standing Committee on Environment and Public Affairs resolved to inquire into Municipal Waste Management in Western Australia.

The City was not directly informed of this Inquiry by the Legislative Council Standing Committee but became aware of it through public advertising and through the Rivers Regional Council which was formally advice by the Standing Committee.

This submission is in response to the invitation extended to the Rivers Regional Council, of which the City of South Perth is a member, by the Standing Committee on Environment and Public Affairs dated 28 November 2008 in relation to its Inquiry into municipal waste management in Western Australia.

Before providing detailed comment on the proposed changes, it must be stated that the City is extremely disappointed that the consultative measures established between State and Local Government have again been ignored.

The City again takes the opportunity of reminding the Committee of the Partnership Agreement between State and Local Government that exists for the purpose of Communication and Consultation and some of the principles that this Agreement contains.

Signed in December 2002, the *State and Local Government Partnership Agreement* provides the framework under which both spheres of government can work together to enhance the sustainable social, environmental and economic development of Western Australia through consultation, communication, participation, co-operation and collaboration at both strategic and project levels.

The City of South Perth considers the State has failed to meet its obligations by not providing Local Government with sufficient time to adequately address the issues raised by the Committee's Inquiry.

As with the Committee's Inquiry into the introduction of a Preferential Proportional System for Local Government elections, it is also clear that many of the principles contained in the Partnership Agreement have again been breached by the State as it has not followed the agreed process for communicating proposed changes to legislation.

The Partnership Agreement is quite clear and specifies the circumstances when the State should communicate and consult with Local Government. The Agreement requires that consultation should occur when developing or reviewing State policy or legislation that may affect Local Government.

Obviously, Local Government is a major stakeholder in many State Government decisions. Municipal waste management is clearly one such issue. Management of domestic waste and its disposal has always been the responsibility of Local Government, forming one of the "3R's of Local Government's responsibilities – roads, rates and rubbish.

It is noted that one of the benefits that can be obtained through effective consultation is that the relevant parties have the opportunity to gain a thorough understanding of the nature and benefit of the proposed changes and this is what has been lacking on this occasion. Whilst recognising the Committee's timelines for completion of this Inquiry, the City of South Perth does not believe that Local Government has been given sufficient time to provide the detailed responses required for an issue as complex as waste management. Nor does the Committee's timeline recognise that in its efforts to secure the most sustainable method of municipal waste management that the issue is rarely managed at an individual Council level but across a region with increasing numbers of local governments forming regional groupings. This is done because of the significance of the activity and the costs involved and with the specific aim of developing co-operative waste management practices that further enhance the individual Council's sustainability.

The City of South Perth urges the Committee to provide Local Government with further opportunity to comment on this important Local Government function and follow the principles and protocols established in The *State and Local Government Partnership Agreement*. Only through effective consultation can the two spheres of Government work effectively.

This submission looks at waste management practices used within the City of South Perth, both at a local level and in terms of its involvement with the Rivers Regional Council. In doing this regard is given to each of the Inquiry's three terms of reference, with each term of reference covered separately.

2. TERM OF REFERENCE ONE

Current municipal waste management practices in Western Australia and in particular:

(a) The function, effectiveness and efficiency of rural and Metropolitan Regional Councils with respect to the management of waste; and

(b) The role of the Waste Authority under the Waste Avoidance and Recovery Act 2007 in municipal waste management.

2.1 Response to Terms of Reference 1(a): The function, effectiveness and efficiency of rural and Metropolitan Regional Councils with respect to the management of waste

In discussing this portion of Term of Reference 1 it should be noted that the City's submission only covers those matters with which it has an understanding and appreciation for - that is matters that relate specifically to the City and the Rivers Regional Council, of which it is a member Council.

Before considering waste management issues it is perhaps relevant to briefly detail the City's profile.

The City of South Perth is an inner metropolitan local government, located 4 km from the centre of Perth. With an area of approximately 20 square kilometres, it is predominantly a residential area. There are however, pockets of commercial land and parkland areas dotted throughout the City's boundaries.

The Kwinana Freeway and the Mandurah rail line both pass through the City. A ferry service also operates from the Perth CBD to the area along the South Perth foreshore.

Domestic waste disposal has always been the responsibility of Local Government. It forms one of the "3R's of Local Government's responsibilities – roads, rates and rubbish and until relatively recently the majority of local governments throughout the State employed people to collect household waste which was disposed of in Council maintained sites, generally on any convenient vacant land, often as landfill. Once full, these sites were rehabilitated and used for various purposes, but usually for parklands and sporting facilities.

With increasing labour costs and the need for greater efficiency coupled with greater volumes of waste being generated by their residents, Local Governments have looked to alternative methods of domestic waste collection and disposal. The assortment of rubbish bins so common on the streets of residential streets for many decades have been replaced by uniform 120 or 240L bins that are mechanically emptied by specialised vehicles.

The City currently disposes of its household waste in a variety of ways, including as:

- Municipal Solid Waste - 240 litre green bin (weekly collection) collected by an external Contractor (Cleanaway) and transported to the Southern Metropolitan Regional Council treatment plant at Canning Vale, for processing into compost;

- Recycling - 240 litre yellow lidded bin (fortnightly collection) collected by external contractor (Cleanaway) and transported to the Bayswater Materials Recovery Facility (MRF) at Bayswater for processing and separation into recyclable material types;

- Greenwaste - From City operations and the district street tree pruning program is composted on-site at the City Operation Centre and is transported throughout the district for re-use on public reserves/gardens. Any mulch surplus to the City's requirements is made available South Perth residents free of charge;

- Greenwaste separated from the City's Collier Park Waste transfer station is transported to the Southern Metropolitan Regional Council (SMC) for processing into mulch for commercial re-sale; and

- Verge side collections – The City provides two verge side collections annually, one in spring and the other in autumn. Waste from these collections is transported to various locations dependent upon the material type. Metals and white goods etc are transported to Sims Metals at Spearwood. Un-contaminated Greenwaste is transported to the SMC's Canning Vale plant. All other non-recyclable material is transported for disposal in landfill at the Tamala Park landfill site in Mindarie.

The utilisation of various methods of waste disposal is recognition of the fact that landfill is no longer an acceptable means of disposing of all household waste and has resulted in alternative solutions being developed, with emphasis on using technologies that look to recycle the waste materials collected and minimise waste to landfill.

And as with almost all Councils throughout the metropolitan area, the City of South Perth is a member of a regional local government that was established for the purpose of dealing with domestic waste.

The City of South Perth is a member of the Rivers Regional Council (RRC). Formerly known as the South Eastern Metropolitan Regional Council, membership to the RRC consists of:

The City of Armadale;
The City of Gosnells;
The City of Mandurah;
The City of South Perth;
The Shire of Murray; and
The Shire of Serpentine-Jarrahdale.

It should also be noted that the Shire of Waroona has recently resolved to seek membership to the RRC.

The willingness for a diverse group of local governments such as those listed above – from small inner metropolitan to large fringe metropolitan and south-west local governments experiencing population growth – highlights the importance that Local Government places being part of a regional council approach to waste management. Providing a means of waste disposal that is both sound financially and environmentally sustainable, whilst meeting community expectations across a number of parameters is a costly undertaking which individual Councils do not have the capacity to undertake.

The costs associated with modern waste management practices are high, both in terms of capital and operational costs. The need for appropriate tonnages to ensure a commercially viable waste disposal operation is also a significant factor in Councils coming together to share waste disposal facilities.

Forming some form of alliance or co-operative with other local governments is a means for Councils, such as the City of South Perth, to provide a method of waste disposal that is both sound financially and environmentally sustainable. This was the objective in the establishment of the RRC.

As outlined in its Establishment Agreement, the RRC is established for the following regional purposes:

(a) *to undertake the processing, recycling, treatment, sale and disposal of Household Waste delivered by its Participants;*

(b) *to investigate and assess the possibilities and methodologies of carrying out and to identify funding opportunities for, any serviced or facility on a regional basis;*

(c) *without limiting any of the other regional purposes set out in this clause:*

  (i) *to investigate and assess the possibilities and methodologies of undertaking the processing, recycling, treatment, sale and disposal of waste, other than Household Waste, which is delivered by the Participants (but not to carry out that undertaking); and*

(ii) *to acquire any interest in land considered by the RCC to be necessary or desirable to accommodate facilities for the processing, recycling, treatment, sale and disposal of waste referred to in sub-paragraph (i):"*

(d) *to influence and liaise with local, State and Federal Governments in the development of policies and legislation for the benefit of the Region;*

(e) *to provide advice, information and education to the Participants and the communities of the Participants in relation to the functions of the Participants; and*

(f) *to carry out and to do all other acts and things which are reasonably necessary for the bringing into effect of the purposes referred to in paragraphs (a) to (e) inclusive of this clause.*

As with all regional local governments, the RCC is established and bound by the relevant sections of the *Local Government Act 1995* (the Act).

Copies of the Establishment Agreement and the Deed of Amendment of the Establishment Agreement for the Regional Council are available if required.

One of the major tasks of the RRC in recent years has been to conduct a study into identifying the most suitable site for the location and development of an alternative waste treatment (AWT) facility.

In late 2005 the Regional Council commenced the Feasibility Study for a Resource Recovery Facility (RRF) Investigation for the Region. The Feasibility Study considered the environmental, economic, social and political factors, as well as ownership, participant requirements and technology.

Community consultation, through the establishment of a Community Reference Group, was an important part of the study. The Group was seen as a key stakeholder in the process over the years, as it was considered extremely important to keep the Group fully informed of the project and involved as much as possible.

To date a number of keys decisions have been made regarding the RRF facility, including that the;

- Technology for the facility is to be limited to aerobic or anaerobic digestion; and
- Facility capacity is to be approximately 100,000 tonnes.
- Delivery mechanism for the facility is to be one of a Build, Own and Operate (BOO) Contract.

A major focus of the Study was the identification of a preferred site for development of the RRC's AWT facility. A site on McLaughlin Road in Kwinana owned by the Water Corporation has been chosen as the RRC's preferred site for the development of its AWT facility. The land is suitably zoned.

Currently, the RRC is seeking Department of Environment and Conservation (DEC) clearance approvals before progressing to the tender stage for the construction of the facility.

Tender documentation is under preparation, to provide for a seamless transition into the construction phase once all environmental approvals have been obtained. It is anticipated that the RRC will enter into a "Build Own Operate (BOO)" arrangement, whereby a contractor, as the name suggests builds, owns and operates the AWT facility on the RRC site. The contractor would recover its capital and operating costs through setting annual tonnage disposal rates from member councils of the RRC.

A Memorandum of Understanding (MOU) between the Water Corporation and the RRC has been signed. The MOU sets out terms of a relationship between the RRC and the Water Corporation in seeking to develop a RRF at the McLaughlin Road Waste Water Treatment Plant site in Kwinana. The land leased from the Water Corporation would be done so on the basis of a long term lease.

Once operational the facility will recover the organic content of the domestic refuse along with some metallic and plastic recyclables. It is anticipated that approximately 70% of the refuse generated across the Region will be diverted from landfill.

The City of South Perth is of the view that participation in a Regional Council is the most appropriate way for household waste to be treated. The manner in which the RRC plans to manage waste disposal for member Councils is considered to be the most effective and efficient way to deal with the issue of household waste management. It provides for both a cost effective and environmentally sustainable approach to a complex problem.

The calling of an Inquiry by the Public Affairs Standing Committee into AWT's places in doubt the development of the RRC's AWT facility. It had been hoped that that the RRF would be operational by early 2011.

It is perhaps unlikely that the Regional Council will be able to receive all relevant approvals until such time as the Committee makes its recommendations. Even then, the report recommendations may initiate legislative change before the RRC could progress to tender with certainty. This will obviously result in unacceptable delays for the RRC and its members and at the very least will result in the continuation of current municipal waste practices being followed. Given that a high percentage of refuse generated within the region is currently deposited at landfill sites, any delays will result in landfill sites being used for a greater period than would otherwise be the case.

For the City of South Perth this is an unacceptable situation as it works towards implementing more sustainable management systems across all facets of its operations.

Waste disposal is and should remain a core Local Government function. The manner in which an individual Council resolves to manage household waste should be a matter for it to determine.

The City believes that the RRC is an appropriate vehicle for it to facilitate waste disposal both in the short and long term.

This view is based on the fact that the RRC was established pursuant to provisions of the Act. The Act establishes all the powers, liabilities and responsibilities attributed to the operations of the RRC. All actions of the RRC are governed by the Act.

The City is also concerned that any recommendations contained within the Committee's final report may impact on the direction provided to the RRC in its Establishment Agreement and place in jeopardy the significant investment in the studies already conducted.

The City, would hope, however, that the Committee's report will endorse the critical role of Regional Councils, such as the RCC, in the waste treatment and disposal process and the efficient and effective manner in which they conduct such operations.

In supporting the work of Regional Councils, the Committee could look to recommending ways in which such organisations could be assisted by the State Government to work still more effectively and efficiently.

The City believes that the Committee should consider recommending to the State Government that it work with Local Government to ensure zoning of land for waste treatment plants that have sufficient buffer land such that noxious odours (if they escape) if carried on the prevailing wings will not impact on residents.

These dedicated sites should be strategically located in the outer metropolitan areas where encroachment from residential development will not be permitted. In addition, there should be sufficient dedicated zones provided in these areas that will cater for projected long-term population growth, perhaps for the next 50 years. By that time there may be technologies that would allow for AWT's to be placed closer to residential areas without compromising amenity to residents.

Sites earmarked for regional resource recovery facilities should be appropriately designated under the Metropolitan Scheme so that no confusion could occur. The WA Planning Commission should be informed about and should take into account such sites in considering applications for subdivision of land in the vicinity.

If subdivisions are approved by the WA Planning Commission on nearby buffer land contrary to the advice of Local Government, then the WA Planning Commission should be held responsible for any future liability that may arise from the AWT caused by encroachment of residential development.

2.2 Response to Terms of Reference 1(b): The role of the Waste Authority under the *Waste Avoidance and Resource Recovery Act 2007*

The City of South Perth is concerned that the State, through agencies such as DEC or the Waste Authority, does not provide guidance with respect to the technologies available or which are recommended for use under WA conditions. This results in each Regional Council with a role in municipal waste management having to conduct its own research and investigation which can result in Councils using technologies that have not been fully tested in the market place.

Furthermore, given that within WA few of the various types of technologies available have been installed and operational that it is not always apparent as to how successful (or otherwise) these plants are. A further problem in installing the most appropriate technology is that, as a result of increasing environmental awareness of the general community the State imposes conditions which lead to the installation of AWTs that whilst alleviating public concern may have limited performance history. This results in a process that may well be inefficient and costly.

Given the costs associated with AWTs the City believes this to be a flawed means of choosing AWT. Indeed, the City finds it surprising that the State, through the relevant agencies does not provide guidance as to what are acceptable technologies. As a consequence, the City believes that the Committee should look to recommending that State agencies be directed to provide advice on such matters and be more supportive of the Regional Councils efforts in developing acceptable AWT options for the overall betterment of the community and the environment.

It is unacceptable for the State, through is various agencies to avoid involvement in the research, investigation, selection and provision of very costly waste management technologies and then become involved in monitoring compliance with guidelines etc once the facility is operational.

There are therefore opportunities for the State to provide a central co-ordination role in providing information to organisations such as Regional Councils and Local Governments. Care should be taken to ensure that this role does not involve a State approval process as an objective of this and any involvement should minimise bureaucracy.

The City believes that the Waste Authority, as established through the *Waste Avoidance and Resource Recovery Act 2007*, has the potential to assist Local Government providing for better waste management across the State.

With the RRC, the City believes that the Waste Authority should be independent of other State departments and agencies. In particular, the Waste Authority must be independent of the DEC to avoid the conflict of interest that has to some degree existed since the Office of Waste Management became a division within the Department of Environmental Protection in 1994. The proper role of the DEC has been hindered by the degree to which its employees assigned to waste management and the Waste Board could assist as a proponent or facilitator in the research, planning, establishment an operation of waste management facilities.

This conflict of interest explains the difficulty the State Government has had in developing a State Waste Management Strategy or actively assisting Local Government in the planning and development of waste management facilities, including identifying suitable locations for future landfill disposal and Resource Recovery Facilities (RRF) sites.

In preparing its report, the City hopes that the Committee will make recommendations that will lead to greater cooperation between the Waste Authority and Local Government. With the RRC, the City hopes that the recommendations will lead to:

- Planning (including siting and community consultation) in respect of future waste treatment and disproval facilities, including AWT facilities to process municipal waste and the landfills required to dispose of residual wastes.

- Adoption of realistic and achievable waste reduction/waste management goals and the development of appropriate plans to achieve these goals.

- Concentrating efforts in reducing the major elements of the waste stream made up by construction and demolition waste, commercial and industrial waste; and the organic waste that makes up the majority of municipal waste.

- Developing and supporting local markets for recovered materials with the aim of reducing reliance on the export of our waste to developing countries; maximising the environmental benefits of our recycling efforts; and minimising the economic and financial cost to the community.

- Conducting triple bottom line assessments of all relevant waste management options such that better informed decisions can be made when choosing between various macro options (e.g. landfill versus RRF) or micro options (e.g. recovering glass containers from the Kimberley region for transport to Perth and then on to Adelaide for recycling versus landfill or some other disposal option).

- Supporting local and regional government's efforts in examining the feasibility of waste treatment technologies, in particular by providing guidance on:

    - Appropriate assessment and siting criteria;
    - Providing generic financial models to assist with business planning and tender evaluations;
    - Providing advice on the procurement techniques and contracting; and
    - Ensuring appropriately zoned land and buffer land is available.

- Providing a strategic framework for the future of the landfill levy to provide greater certainty of knowledge over the future cost of landfill.

3. TERM OF REFERENCE TWO

Response to Terms of Reference 2:
Resource recovery technologies

As detailed earlier in this submission, the RRC's RRF feasibility study determined that any resource recovery technology should be limited to either aerobic or anaerobic digestions. Such facilities are also referred to as Alternative Waste Treatment (AWT) facilities. Aerobic and anaerobic AWT facilities accept domestic MSW refuse collections and recover the organic matter, forming compost. Generally speaking an AWT facility recovers approximately 70% of the refuse it accepts. The remaining 30% will require management and will be disposed of to landfill.

The City does not propose to provide any detailed information on either of the two preferred technologies as comprehensive explanations can be found in an incomplete and draft discussion paper prepared by the WA Local Government Association on alternative waste treatment technologies (AWT). A copy of this discussion paper forms Attachment 1.

The RRC's RRF will be designed to accept approximately 100,000 tonnes of waste per annum. The project delivery mechanism of a BOO contract has been decided on which will allow for a future service provider to build, own and operate the facility.

The major concern of the City is that the Regional Council, having invested significantly in time and money is conducting detailed investigations regarding the most appropriate type of technology, rules may be subsequently imposed by some form of State authority. If the State has concerns with a particular recovery technology, this should be made clear from the outset, and then the Regional Council/Local Government can make an informed decision to proceed with its studies fully armed with this knowledge.

Retrospective views, opinions, pronouncements or direction is not considered relevant, practical or useful. This will only add to an already protracted planning and development process which is both comprehensive and costly.

The City hopes that the Committee will make recommendations that will support the work being undertaken by bodies such as the RRC in finding technologies that best suit the needs of its members in management of municipal waste.

4. TERM OF REFERENCE THREE
Response to Terms of Reference 3:
Any other relevant matter

The City of South Perth wishes to raise the matter of land use classification for Regional Resource Recovery facilities with the Committee.

The City sees land use classification as an important issue and strongly recommends that the land on which Regional Resource Recovery facilities stand be set aside as a Reserve for Public Purposes with a Special Use, namely a Regional Resource Recovery facilities.

The benefit of this would be that all persons who contemplated purchasing a property in the vicinity would then be aware of the Regional Resource Recovery facility even if it is not proposed to be constructed for many years into the future.

No such land use classification exists at the present time, but such an additional use would add clarity and would promote a greater degree of certainty and public accountability.

5. CONCLUSIONS

It is hoped the above views will be given careful consideration by the Standing Committee in its final deliberations before preparing its report to the Parliament.

The City also urges the Committee to make strong comment on the need for the State Government to recognise and uphold The *State and Local Government Partnership Agreement* and all the consultative mechanisms that have arisen from this collaborative measure.

WALGA

Alternative Waste Treatment (AWT) Technology
Discussion Paper
Part One

Introduction

The reality of climate change and globalwarming is creating a shift in the business, industrial and commercial sectors leading to development and implementation of more sustainable practices. The waste sector is not outside of this shift and when coupled with the increasing pressure on land availability, alternatives to landfill are sought. Some Regional Councils have installed AWT technology for the treatment of municipal solid waste (MSW) for their region, however, with more regions investigating options, it has become apparent that there is a need for a state wide collective plan to accompany this. Furthermore, in order for MWAC to make informed decisions with regard to AWT, it is imperative that Regional Councils and Local Governments have a tool assist with this. Decisions made on AWT today will have long term impacts and hence there is a need for a collaborative approach from industry, Local Government and State Government to relating to decisions and plans for AWT.

The WALGA *Background Paper: Policy Statement on Standards For Recycled Organics Applied to Land*, December 2007 highlights the 2004 State Government Sustainability Strategy, which set a strategic direction for the staged reduction of waste being disposed to landfill and the *Towards Zero Waste 2020* vision. The Background Paper clearly outlines one of the principle issues that must be resolved if the State's Toward Zero Waste Vision is to be achieved, is the diversion of organics from landfill. The Background Paper further identifies that AWT can assist the waste sector achieve socially, commercially and environmentally sustainable options and ultimately reduce greenhouse gas emissions. This discussion paper aims to identify AWT options, highlighting their benefits and constraints from an environmental, economic and social perspective. It will then introduce AWT in Western Australia currently and into the future.

What is Alternative Waste Treatment Technology?

As the world's population continues to rise, municipal waste grows from being an environmental problem for Local Government to an issue of national and global importance. Australia is one of the highest produces of domestic and commercial waste in the world, with over 14 million tonnes produced per year. This equates to an average of 1 tonne per person per day (Research Institute for Sustainable Energy, 2008). Growing concern over the management of landfill sites, coupled with the pressure on land availability has seen the development of technologies that convert waste into energy, or useful by-products. This technology is termed 'alternative waste treatment technology (AWT), designed to recover more resources from the waste stream while minimising the impact on the environment.

AWT can be placed into four broad categories, which include:

- Modifications to conventional landfilling;
- Thermal treatment; and
- Biological treatment.

Figure 1 shows the two main AWT for the treatment of MSW and their outputs.

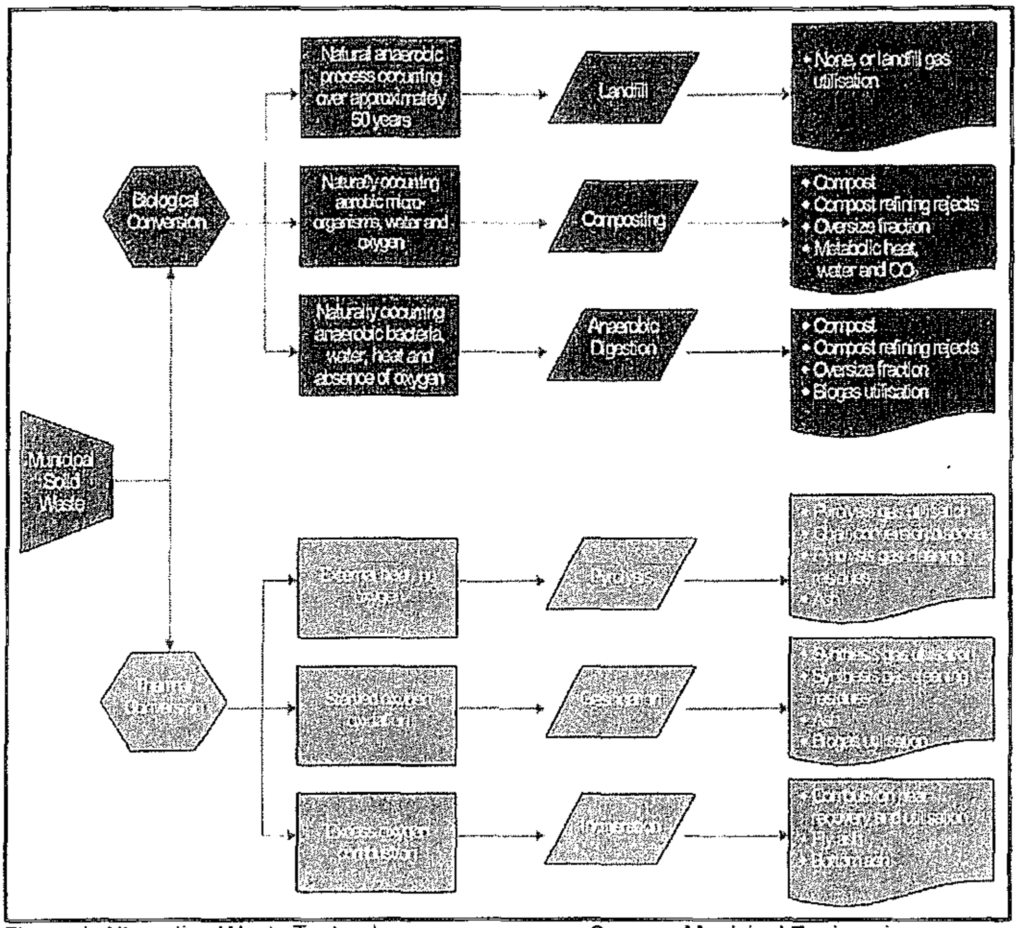


Figure 1: Alternative Waste Technology Source: Municipal Engineering Foundation Victoria, 2004

Decisions made by Local Government and Regional Councils on the management of MSW today, will have long term impacts on the community. Decision making bodies must be well informed and act with caution to ensure that the technology selected is effective and does not leave a burden for future generations. Rather than there be a focus on absolute avoidance of risk to health or the environment, policy makers need to acknowledge the potential impacts of the various technologies and direct resources where they will yield greatest return to society.

It is clear that no single AWT process that presents solutions to all of the waste problems and challenges currently experienced. Local Governments have varying waste management systems in place, environmental, social and economic conditions and hence will have different criteria and parameters to assess when considering AWT. Therefore what is appropriate technology for one area may not be useful in others. The objective for AWT should be to achieve socially, commercially and environmentally sustainable options for managing MSW today and into the future.

Overview of Technologies

There are many AWT available however only the four main technologies outlined above will be addressed in this document.

Modifications to Conventional Landfill

Modifications to landfills can be categorised into bioreactor landfills and pre-treatment landfills.

Bioreactor Landfills

Bioreactor Landfills are wet landfills which promote the anaerobic degradation oforganic components of waste within a reasonable timeframe. Specific management protocols are implemented to increase this degradation, with the most important being the additon of water. This addition of water ensures that the decomposition process is increased through an anaerobic component. Not only can water be added directly to the process but leachate may be recirculated and in some cases sewage sludge added. Other protocols to assist in the process may include waste shredding, pH adjustment, nutrient addition and temperature management.

The flow rate of the liquid through the landfill must be monitored and controlled through hydraulic conductivity. This flow rate must be adjusted according to compaction of the landfill, which changes over time. Settlement varies with rapid initial settlement from compaction, capping and future waste placed above. Waste rearranges and settlement continues until finally biodegradation releases gas for energy and leachate for reuse in the system.

The main challenges with bioreactor landfills are operational. Existing landfill practices results in barriers to water contacting and moving uniformly through the waste. Furthermore infrastructure for the injection and drainage of fluid through the landfill is prone to biochemical fouling. Any excess leachate requires treatment prior to disposal.

The cost associated with bioreactor landfills both in terms of their construction and operational costs are relatively unknown.

Pre-treatment Landfill

Pre-treatment landfills are landfills where the biodegradable or putrescible waste undergoes mechanical and biological pre-treatment to reduce pollution potential of the waste over the lifecycle of the landfill it's placed in. Mechanical processes includes the shredding and sorting of materials with the extraction of ferrous metals.

The shredding of waste is designed to increase surface area of materials so as to enhance biological processes. The screening process separates the high calorific materials such as plastic and paper from organic components. Biological treatment of organic components will be addressed further on in this paper. The product however is disposed of to landfill rather than used as compost or reapplied to land.

The operating costs for a pre-treatment landfill range from $160-$200 per tonne (EPA, 2003).

Biological Conversion
Biological Conversion technologies include

- Aerobic Decomposition
- Anaerobic Digestion

Aerobic Decomposition
Aerobic decomposition involves the decomposition of organic materials by microbial activity under aerobic conditions. The end product is dependant on waste systems and process configurations achieving either waste stabilisation, fuel production or a stable organiccompost containing plant nutrients. The quality of material is determined by the quality of feedstock and adequate control in the form of aeration, moisture and temperature.

There are numerous different techniques used in aerobic decomposition which include;

- Green Waste Composting in open windrows – the decomposition of green organics, gardenwaste and sewage sludge through microbial activity in moist rich aerobic conditions. Piles are turned and watered in order to control moisture content and minimise anaerobic processes from occurring. The process takes 6-12 weeks. Different grades of material require different lengths of composting to ensure weeds or pathogens are destroyed.
- Aerated Static Pile – Green waste and food waste are piled on perforated concrete and covered by mature compost or wood chips with air drawn through the stationary pile. Material is cured for four to six weeks before being screened and processed to produce compost.
- Drum systems – Aerobic drums can process either source separated organics ormixed waste. Drums are generally 40 – 60 meters long and about four and a half meters in diameter. Waste is mixed and homogenised within the rotating drums. Waste is loaded into the drums from the storage/tipping floor and biosolids and water added to obtain the right moisture content. Material is processed in the drums for approximately 3-4 days at temperatures between 55 – 65 degrees Celsius. Materials are then screened, with recyclables removed and large solid waste disposed of. Screened material is then placed into open windrows of aerated static piles for a further 30 – 40 days. Material is then processed into a range of compost products. The cost of operating such as system is eapproximately$70 - $110 per tonne of waste input (EPA, 2003).
- Enclosed Tunnel system – Common in Europe, this system not only produces good quality compost, but can also act as a mechanical and biological pre-treatment of waste for landfill. Enclosed composting controls the atmosphere and moisture, improving organic waste decomposition and odour control. MSW is pre-treated to reduce particle size then mixed with organic andgreen waste. After steel is removed magnetically, the material is loaded into a primary tunnel, sealed and composted for 14 days. After this primary composting, material is screened and processed to remove metals and unwanted items. Undersize material is placed in a secondary tunnel and further composed for 14 days and oversized material returned to the primary tunnel to repeat the process. Finished compost is processed further to remove any contaminants to produce a saleable product. The estimated costof this technology is $60 - $90 per tonne of waste, based on 20,000 – 100,000 tonnes of waste per year processing plants (EPA, 2003).
- Aerobic Digestion – The Canadian company, International Bio-Recovery Corporation (IBR) has developed a system where by solid waste is shredded and contaminants removed. Material is made into a slurry which is aerated in digesters. Following this digestion phase, material is cleaned and dewatered, resulting in a solid fertiliser. The solid is then dried, pelleted and used as fertiliser for commercial or private use. The cost of this technology is approximately $50-$70 per tonne with plants in operating in Ireland, Northern Ireland and England (EPA, 2003)

Vermicomposting
Vermicomposting uses worms to consume food waste, biosolids, animal wastes and organic material to produce a high quality soil conditioner. Vermicomposting aims to achieve the following outcomes:

- earthworm biomass for worm farming purposes
- produce vermicast for agricultural and environmental management
- reduce organic waste volumes through vermistabilisation.

There are a variety of instruments, processes and strategies in the management of Vermicomposting systems. Vermicomposting and systems generally vary based on the set up of the unit. The environmental management is generally the same for all systems, however there are slight variations depending on the species of worms used. With this in mind, the general environmental conditions are outlined below;

- o Bedding should be 'tossed' to loosen and aerate, however care must be taken not to bury food. This process assists to maximise oxygen penetration and keep the system in an aerobic state.
- o Temperature is one of the most important factors in Vermicomposting. Optimum temperatures for bedding mass varies from 20°C-30°C depending on the species of worms employed.

- Moisture is an important consideration, with too much moisture pushing the system into an anaerobic state, and too little resulting in dehydration of the worms. 80% moisture is considered ideal
- pH of a system decreases and waste decomposes. The ideal pH range is between 4.5 – 9
- Particle size of feedstock should be varied so as to maintain optimum aerobic conditions. The smaller the particles the greater the surface area and the easier it is for the worms to ingest and breakdown. If the particle s are too small however, there is a risk of compaction and hence the system will move into an anaerobic state.
- Pre-treatment of feedstock may be necessary in some cases such as with problematic waste streams. Pre-treatment could take the form of primary decomposition or pre-composting to reduce feedstock toxicity.

Vermicomposting as a form of waste management is still a relatively new technology. Differing feedstock, the species of worms as well as the management practices adopted, results in varying quality and performance of Vermicomposting products on the market. The majority of vermiculture operations currently adopted are midscale on site units manufactured and adopted to the domestic market. There are mid and large scale units treating commercial and industrial waste streams, however there is little available data on the process rates of different waste streams that these are capable of.

Anaerobic and Digestion

Bacterial decomposition of organic matter occurs in the absence of oxygen to produce methane and organic compost. Methane is used for energy production and the compost used for soil conditioning. This process is carried out in a controled environment with pH and temperature monitored. This is usually a three stage process, including mechanical processing, one or two anaerobic decomposition phases and aerobic stabilising process. There are two main types of biological treatment, 'mechanical biological treatment' and 'fermentation'.

Mechanical treatment is well established in Europe, used for the treatment of source separated solid organic waste. Pre-treatment is necessary to remove non-organic materials which may inhibit the anaerobic process and/or produce unwanted metals or elements that may be harmful. Following pre-treatment, material is placed into reactor vessel (digester) where anaerobic microbial digestion takes place, in controlled environmental conditions including moisture, pH and temperature. The digestion process takes approximately 5 – 20 days after which material may be pumped from the digester to a storage tank where biogas continues to be processed. An aerobic phase may follow to ensure all pathogens are destroyed.

By-products of the process include biogas in the form of methane and carbon dioxideas well as digestate sludge. The biogas can be captured for energy production and the sludge used as a landfill cover or for agricultural purposes. It may also be further refined to produce a soil conditioner or compost. The cost of this technology is estimated to be in the range of $80 - $150 tonne of waste input (EPA, 2003).

Fermentation is an extension of the mechanical process outline above. Biogas is produced and used to manufacture industrial feedstock such as ethanol. Fementation technology mainly uses agricutural waste as the raw material, however, interest is mounting for using MSW.

Thermal Technologies

Thermal technologies are processes that use heat to decompose waste to produce stable residue for disposal. MSW has a calorific value of approximately 11 mega joules (MJ) per tonne (Maunsell, 2003). The three thermal technologies assessed in this paper are:

- Incineration;
- Pyrolysis; and
- Gasification.

Incineration

Incinerating MSW reduces the volume of the waste by approximately 95% of its original, whilst sterilising the hazardous components. The two types of incineration addressed in this paper are mass burn incineration and fluidised bed incineration.

- Mass Burn Incineration - This is the conventional system of incineration consisting of the combustion of a variety of waste types through mass burn. It is a common technology used in Europe and Japan for the treatment and disposal of MSW. There is little to no preparation involved and it consists of three stages; the drying and preheating of solid waste, ignition and combustion and the removal of ash and burnout. Waste is fed into the incinerator via a charging chute. It is dried and ignited whilst on the first grate, and when it reaches the second grate it's burnt out, leaving the furnace in the form of clinker.

  The organic component of the material is oxidised into carbon dioxide and water and the remaining incombustible waste is removed as ash or slag. Magnets are used to recover any ferrous material from the ash or slag and the remaining material is generally landfilled. Gases from the combustion process contain water, particulates and dust, oxides of nitrogen, acid gases and dioxins, furans, polyaromatic hydrocarbons and heavy metals (Maunsell, 2003).

- Mass burn is a relatively inefficient means of energy production, with MSW typically having 8 to 12 MJ/kg compared to 22MJ/kg for coal. It does however eliminate large amounts of MSW (Municipal Engineering Foundation Victoria, 2004). A typical mass burn incinerator is shown in Figure 2.

- Fluidised Bed Combustion – Waste is pre – treated for this incineration process to reduce particle size increasing calorific value prior to combustion. Pre-treated material is placed on a fixed bed within the combustion chamber. The bed consists of sand, or another fine solid, and is transformed into a liquid state through contact with an upward flowing gas. The result is a greater burnout of carbon compared to mass burn combustion.

  Scandinavia and Canada use this technology for the incineration of fuel such as coal, bark and woodchips, however, it is not get a proven technology for MSW. The advantage this process has over mass burn however, is the reduced concentration of furans and dioxins in emissions, hence a reduction on the cost of gas emission cleanup. There is however the potential for erosion of the vessel due to the production of fine particles.

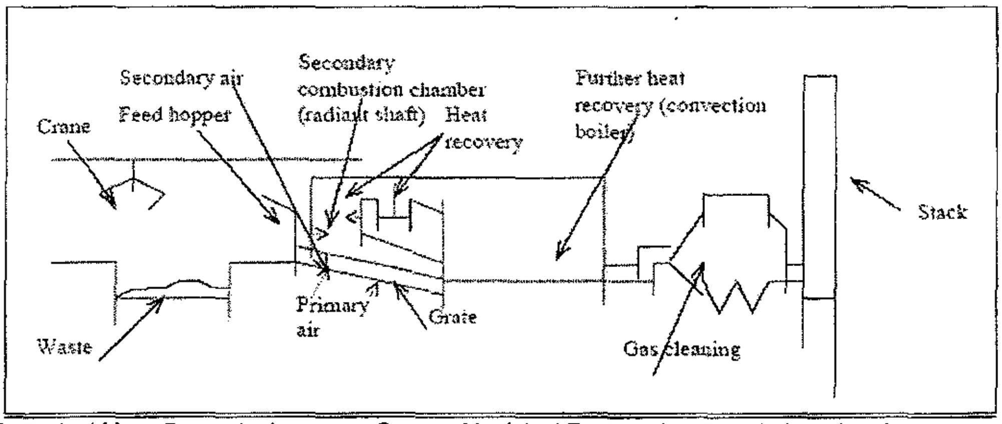


Figure 2: Typical Mass Burner Incinerator Source: Municipal Engineering Foundation Victoria

Additional technology required to control the emissions for incineration adds a significant financial costs to the process and the potentialtoxicity of emissions a significant social cost. Furthermore the heterogeneous nature of MSW and high moisture content, conventional incineration equipment needs to be specialised for the use with MSW, adding to the cost if incineration for the treatment of MSW. The financial cost of incineration is estimated to be $170 - $250 per tonne of waste input (Maunsell, 2003).

Incineration technology is not without its advantages, with the obvious advantage of decreasing the volume of unsorted MSW by up to 95%. Furthermore a sterile residue is produced from a neutral energy process. It is anticipated that the future may see ash produced form the process sold to the construction and road building industries, to be used for construction, which will further reduce the materials going to landfill.

Pyrolysis

Pyrolysis involves the heating of carbon rich material, resulting in thermal degradation, at temperatures between 350°C and 800°C. The process is conducted in the absence of oxygen, resulting in a reduction of energy and greenhouse gasses produced. The process produces a hydrocarbon rich gas mixture leaving an inert residue containing carbon, ash, glass and non-oxidised metals. If the gas is allowed to cool, a hydrocarbon rich liquid will form. This liquid can be used as a synthetic fuel oil with further processing.

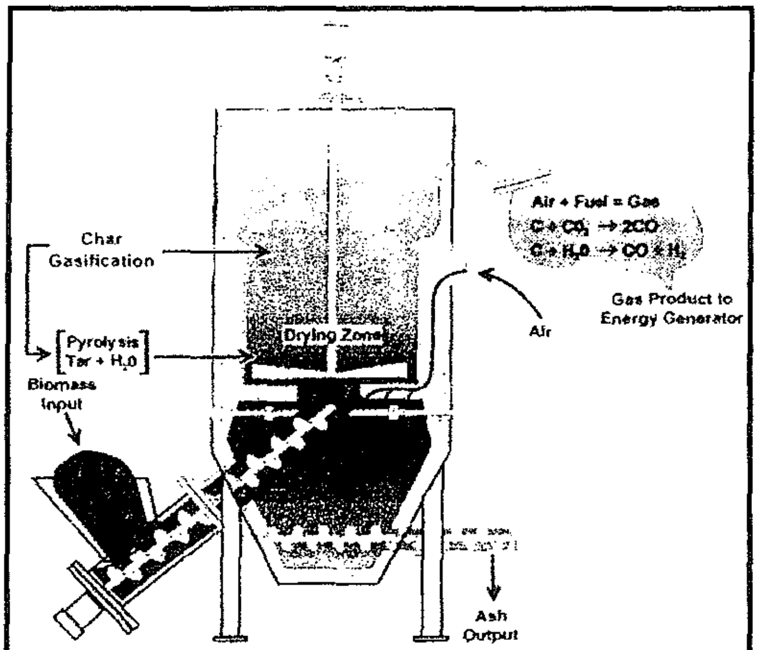
Pyrolysis is a relatively costly technology, which requires a back up fuel during the initial set up phase. The waste needs to be shreddedbefore entering the unit and the resulting product requires further treatment to extract the toxins and carcinogenic compounds it contains. Pyrolysis does have many advantages however, including the retention of heavy metals in the char rather than the ash from the combustion process. Although there is a need for fuel to be added to the initial stages of the process, there is a neutral net energy requirement for the process as a whole. The process produces less toxic gasses requiring further treatment and produces less dioxins and furans than the mass burn incineration (Municipal Engineering Foundaton Victoria, 2004).

Gasification

The gasification process converts organic material into combustible gases through partial oxidation under extreme heat (around 1000°C). Pre-treatment of waste is necessary to remove contaminants and waste shredded prior to being loaded into a reactor. The majority of carbon is converted into a gas resulting in an inert residue and a combustible gas. The combustible gas consists of carbon monoxide, hydrogen and methane which can be used as a fuel in boilers, internal combustion engines or gas turbinesas well as used to produce methanol or hydrogen (Maunsell, 2003).

Gasification, when integrated with electricity production, proves to be economically and environmentally attractive. It produces less toxic gas than all other processes with the inert slag able to be used in the construction industry. The process has the potential to generate 500 – 600 kWh per tonne of waste with a lower cost than mass burn incineration. The cost range for gasification and Pyrolysis is estimated to be between $100 - $170 per tonne (Maunsell, 2003).

Waste for gasification does require pre-treatment through shredding and sorting. The resulting gas does require treatment prior to use in vehicles. A typical Gasifier is shown in Figure 3.



Typical Gasifier

Figure 3: A Typical Gasifier Source: Maunsell, 2003

Discussion Item/
Presentation 5.2

WALGA

Alternative Waste Treatment Technology
Discussion Paper
Part Two

Evaluation of Considerations and Risks

For AWT, 'One size does not fit all' no single AWT presents solutions to all of the waste problems and varying environmental, social and economic considerations will effect the choice of technology. Each technology varies in terms of performance, environmental and social impacts and end markets. Western Australia can learn from the experiences of other regions and nations who have implemented AWT; however must find the technologies that best fit the Western Australia context.

The main factors that will contribute to the preferred technology employed to treat MSW include geographical location, cost, demographics and community expectations. Before a decision and investment is made, it must be asked whether the AWT is in accordance with the sustainability principle; as defined in the WA State Sustainability Strategy "meeting the needs of current and future generations though simultaneous environmental, social and economic improvement" (WA Department of Premier and Cabinet, 2004). Furthermore, uncertainty of end markets for products is the result from a lack of strategic policy direction, coordination and vision by all spheres of government, suggesting the need for improved and uniform regulation. Leaders in the waste industry must come together to provide leadership and assistance in formulating a strategy and a vision for government and industry. In turn, government must implement policy to support this vision.

Under the Local Government Act 1995, Local Government is directed that "In carrying out its functions a local government is to use its best endeavours to meet the needs of current and future generations through an integration of environmental protection, social advancement and economic prosperity". As such, any decisions regarding AWT are made within this frameworks. In order to assist in the decision making process the following criteria is suggested.

Criteria for Evaluating AWT

- Environmental considerations
  - **Environmental costs/benefits** – what are the environmental benefits and costs? Could small increases in cost decrease environmental impact? Conversely, would it be possible to significantly decrease costs with only small detriment to the environment?
- Economic considerations
  - **Feasibility of Technology** – is the technology feasible given the financial, and human resources available?
  - **Financial** – Is the AWT the most cost effective option
- Social considerations
  - **Administration Feasibility** – is the practice administratively feasible?
  - **Practical** – how practical is the technology considering the social and cultural environment
  - **Effects on other sectors** – how would other sectors be effected by the technology, and do these effects promote or conflict with overall social goals of the community.

Decisions should not be made without assessing a set of parameters for a particular technology. Suggested parameters are listed below:

Parameters for Consideration

Environmental

- Environmental conditions
  - physical – topography, proximity to surface water bodies, depth to groundwater, soil characteristics
  - climate – temperature, propensity of thermal inversions and winds, rainfall
  - specific environmental sensitivities
- Waste characteristics – density, moisture, recyclability, combustibility, hazardous materials

Economic

- Cost of technology (variable factor for each location, Local Government and technology)
- Type of contract entered into to operate AWT.

Social

- City Characteristics – population density, infrastructure development, planned development, size of city
- Social and Political – degree of and importance assigned to community involvement, political constraints and the nature of these constraints, social and cultural practices
- Existing AWT in the State

The planning process should incorporate input from public and private entities with and expertise in MSW, management, public health, environmental protection, finance, urban infrastructure and social issues.

Following the sustainability principle, the economic, environmental and social evaluation of AWT will be evaluated in greater detail below.

Environmental Considerations

Consideration must be made when addressing environmental factors in the decision making process for AWT. An Environmental Impact Assessment (EIA) will be necessary for the development of any alternative treatment facility. There will also be statutory licensing requirements that form part of the planning approvals and licensing process. As part of an EIA, an ecologicaLevaluation will need to be undertaken to ensure that there is no potential for the proposed development to impact on protected matter. Such protected matter could include; world heritage property, a national heritage place, internationally important wetlands (RAMSAR Wetlands), nationally listed threatened species and ecological communities and any nationally listed migratory species. Should there be potential for harm or impact, Australian Government approvals will be required under the *Environmental Protection and Biodiversity Conservation Act 1999*. Furthermore, land use and future development will have to be considered, as development surrounding a site may pose issues with both boundaries, buffer zones and odour as residential development encroaches on the AWT site.

Climate change is perhaps greatest environmental challenge in Australia. Australia is one of the greatest greenhouse gas produces per capita in the world. The generation of electricity is the largest contributor to the growing GHG emissions accounting for 35%. Burning of coal creates the highest GHG emissions in Australia, which attributes to 80% of Australia's power generation. Emissions from waste account for 3% of Australia's GHG emissions (BCSE, 2005).

<u>Environmental Benefits – Thermal AWT</u>
Waste to energy offers an opportunity to move the production of energy from fossil fuels to waste. It is essential that we move toward more sustainable energy production and waste to energy not only displaces the production of energy from fossil fuels but reduces GHG emissions through avoided landfill.

<u>Environmental Concerns – Thermal AWT</u>
From an environmental perspective the emissions and ash produced in Thermal AWT is on the principal environmental concerns. Emissions from Thermal processes usually contain a variety of materials, of particular concerns are lead, mercury, cadmium, dioxins and furans, sulphur dioxide and hydrogen chloride, particulate matter such as dust and grit, nitrogen oxides and carbon monoxide. Exposure to emissions can come in the form of inhalation, ingestion and dermal contact with contaminated soil and dust. Research has shown that ingestion and skin contact pose more significant risks than inhalation of emissions. Risks are also associated with ingesting food that has been contaminated with these substances. Effects of exposure to emissions will depend on concentration of contaminants in the emissions and the environmental controls employed, as well as the height of the emissions stack, the geology, the location of the facility and the prevailing winds

The residual ash from the incineration process contains concentrations of heavy metals namely lead, cadmium, mercury, arsenic, copper and zinc. The heavy metals originate from plastics, coloured printing inks, batteries, certain rubber products and hazardous waste. The ash may also contain organic compounds such as dioxins and furans. The principle environmental concern is with the disposal of this ash to landfill. Toxic materials can leach and migrate to groundwater or nearby surface water bodies, increasing the risk of water contamination. There are also health risks associated with the ash through direct inhalation or ingestion of airborne or settled ash.

It should be highlighted that the actual magnitude of these risks, both from emission and ash exposure has been debated. There has been much research over the actual environmental risks posed by the ash and the concentrations of contaminants in emissions after modern pollution controls have been put in place. Research has shown that when good pollution controls are installed equipment can remove up to 99% of the dioxins and furans, 99% of heavy metals, 99%particulate matter and 99% of hydrogen chloride, more than 90% sulphur dioxide and up to 65% nitrogen oxides (UNEP, 2008). Furthermore, field tests performed on leachate from actual ash fills in the USA indicated that metal concentrations at most sites were below US hazardous waste classification and in many cases below US drinking Water guidelines (UNEP, 2008).

Outside of the health risks associated with thermal technology, the disadvantage of implementing thermal techniques is that it does not divert recyclables away from the other uses, such as recycling processes.

Environmental Benefits – Biological AWT

The organic component of MSW in Western Australia is approximately 70 percent, equating to 490,000 tonnes of waste annually (SMRC, 2006). Biological AWT converts this organic waste into a mineral rich soil enhancer which assists to replenish nutrients into the nutrient, buffer-poor soil in Western Australia. Applying recycled organics to land increases the water holding capacity of the soil, assisting in carbon sequestration and reduces the need for fertiliser and pesticide application.

Environmental Concerns – Biological AWT

The quality of compost with all biological technologies is dependant on the technical approach used and the composition of input. Composting MSW poses greater risks than does composting green waste and kitchen waste alone. MSW typically contains higher levels of heavy metals than does kitchen and green waste, hence the potential for more contamination of material.

Like thermal AWT, biological processes can release methane gas if inappropriately maintained, and the decomposition process emits carbon dioxide gas. Furthermore, leachate produced can contain biological oxygen demand (BOD) and phenols, which may exceed acceptable discharge limits. This accidence poses few problems if absorbed into the earth or is passed through a sand filter, however if leachate runs off into water bodies, it will have harmful effects on aquatic species. If the compost process is properly managed, leachate should be captured and all leachate absorbed into soil to avoid discharge.

The use of recycled organics on land was addressed in the WALGA *Policy Statement on Standards for Recycled Organics Applied to Land, December 2007.* This document outlines the support for the use of compost to land, however recognises that there is a need for mandatory standards to be in place. Europeis currently the only region to have standards in place for compost, lack of mandatory standards in WA may mean the for potential contamination through the use of compost in Western Australia. With mandatory management, product and application standards, coupled with research on pre-processing and process control mechanisms, biological AWT will pose little environmental concern.

Economic Evaluation

Commercial Feasibility

Local Governments need to establish what contractual arrangements suit the particular situation. Types of contractual arrangement include:

- Build – own – operate (BOO): the local government will supply the waste or host the facility on council land with capital provided by a project developer. In Australia, the majority of the AWT currently are outsourced, with a third party developer providing the site and fuel, paying the local government a lease or rental for the use of the land or the landfill. Operators under this agreement generally have exclusive use of the site for a defined period for a specified monthly rental. The advantage of this contractual design is it shifts the liability, operational cost and maintenance cost away from the Local Government to the operator.
- Local Government owned and operated

The bulk of the costs surrounding AWT are in the developmental phase, with planning, design and community consultation impacting on this cost. Furthermore the Environmental Impact Assessment (EIA) and approval significantly adds to this cost, coupled with the cost of land and buffer zones which will be essential in securing the EIA approval. The outcome must be financially viable with a quality end of product market. Without a strong end of product market, the AWT will not be economically viable.

Economic Evaluation

An AWT must consider the economical and financial costs associated with both the establishment and production costs when sourcing an appropriate AWT. The recent ratification of the Kyoto Protocol has seen an increase in the economic driver for AWT. It is possible that in the future all AWT would be eligible for off-set costs by waste and carbon credits, however it is not known the amount of offsets that will be available. The amount of offset will be dependant upon;

- Government policies;
- the status under the Kyoto Protocol;
- the value of carbon credits on the open market; and
- the contractual arrangements of the facility.

The allocation of environmental benefits from environmental credits must be negotiated in the contract preparation stage.

****PLEASE NOTE*** DUE TO TIME RESTRAINTS, THE PAPER WILL TAKE THE FORM OF DOT POINTS FOR OAG INPUT*

Specific costs for the different technologies may include:
- energy from waste operations may need to consider the costs associated with connection to the grid
- the cost of establishing and operating energy from waste technology is much greater than biological
- Biological AWT requires source separation, hence more costs associated with 'manual' labour. The advantage of this however is increased job opportunities.

Social Evaluation

- Biological or thermal – driven by social awareness and al of the parameters above.
- social acceptance - Social Risk assessment –
  - identify stakeholders
  - develop a program for all stakeholders
  - profile social/economic situation of the area
  - identify concerns and issues of stakeholders and develop social impact categories i.e. employment, property values, conservation
  - Identify probability, magnitude and extent of effects of the project + and –
  - create strategies for mitigating potential adverse social effects arising from lack of understanding
  - Monitor progress and report to stakeholders

- Australian cooperative research centre for renewable energy ACRE carried out roundtables in WA June 2001 to solicit views of environmentalists and key community members in regards to energy developments inc. waste to energy....outcomes.....
-

Social Evaluation – Thermal AWT

Social Evaluation – Biological AWT

Risk management
Risks

- **Feedstock and energy supply contracts**
- **community support**
- **operational risk**
- **OSH**
- **Financial risk**
- **EIA**
- **commercial risk**

Parameters Considered
What is the community prepared to pay for waste to be treated?