Options for the treatment of residual household waste **AGENDA NO:**

Cabinet Date	10 October 2007
Stan Waddington **Julie Girling**	Cabinet Member- Environment Lead Cabinet Member- Environment and Community
Key Decision	No
Background Documents	Evaluation of Residual Waste Technologies Report (Eunomia) Sept 2007
Main Consultees	Waste Programme Board, Waste Cabinet Panel, All Members, Gloucestershire Waste Partnership, Public
Planned Dates	28 November 2007 Cabinet Report recommending the residual waste procurement plan for Gloucestershire
Divisional Councillor	N/A
Officer	Mike Williams, Head of Waste Management (01452 425835) Paul Galland, Environment Director (01452 425544)
Purpose of Report	To update Cabinet of the Council's emerging residual waste procurement plan, specifically in the context of the residual waste technology evaluation report. For Cabinet to consider the waste treatment options short list, and how the report findings will be incorporated into the procurement process.
Recommendations	1. In the context of the wider Joint Municipal Waste Management Strategy, it is recommended that the short listed waste management options (2.6) are accepted as the best options for Gloucestershire at the present time and are taken forward for further detailed full lifecycle cost modelling. 2. That officers bring back a Report on 28 November 2007 recommending a comprehensive procurement plan for a well managed, competitive procurement process that will deliver the most economically advantageous and environmentally sustainable residual waste treatment solution for Gloucestershire. 3. That Cabinet endorse the submission of an Expression of Interest to Defra to test the suitability of this project for PFI credits.
Resource Implications	Officer time and advisor input will be covered within budget. Future procurement costs are provided for in the MTFS. It is worth noting that we are submitting an Expression of Interest (EoI) to DEFRA as the first step in evaluating the potential for PFI credits to help fund future waste

	costs. There is no commitment inferred by this and given the potential benefit to the Council (approximately £4m per year revenue support on £50m PFI credits) it is a prudent step, which has been supported by the Waste Programme Board.

MAIN REPORT CONTENTS

1 Background:

1.1 The purpose of this report is to update Cabinet on the emerging Residual Waste Procurement Project. It specifically highlights the waste treatment solutions that, having undergone detailed technical analysis, are believed to be able to treat Gloucestershire's future residual household waste arisings.

1.2 Gloucestershire's Joint Municipal Waste Management Strategy (JMWMS) recognises that in an ideal world waste should not be produced in the first place (see JMWMS paper also being considered by this Cabinet). However, our householders produce about 300,000 tonnes each year, and this amount continues to rise. We are investing heavily in waste prevention and re-use projects and changing householder behaviour is one of our highest priorities. We are also continually improving our recycling performance (both at the kerbside and our Household Recycling Centres) including composting (with home composting being seen as the best option).

1.3 The National Waste Strategy 2007 sets a national target for 50% recycling and composting. The Gloucestershire JMWMS aims higher, pushing recycling and composting to 60% by 2020. (Waste compositional analysis has established that about 70% of total household waste is recyclable or compostable).

1.4 Even with the waste minimisation initiatives and tough recycling targets we have set, the left over rubbish (the residual waste) will still be in the region of 150,000 tonnes each year. This is based on an average projected waste growth of 1.6% over the next 25 years, with waste minimisation schemes and government producer responsibility initiatives reducing this to zero by 2020. However, in the worse case scenario, with waste growth remaining at about 3%, we may generate up to 270,000 tonnes of residual waste in 2020.

1.5 Moving forward into the procurement phase of new facilities, sizing and flexibility of a solution will need to be considered to ensure sufficient waste is diverted from landfill but more importantly, to ensure recycling and composting is not "crowded out" by building a large facility requiring a constant supply of rubbish. If this were the case, the Council would need to explore the possibility of accepting commercial waste that currently goes to landfill to take up spare capacity to ensure recycling improvements continue.

1.6 Our residual waste is currently landfilled and this is not sustainable. Landfill has a number of negative environmental impacts including its contribution to climate change through emissions of methane to the atmosphere. Landfill is also running out. But perhaps the most critical issue for us is the rapidly escalating cost of this form of disposal. Landfill tax is currently £24 per tonne and increasing at a rate of £8 each year. Landfill allowances are now trading at about £40 per tonne, but in the coming years are likely to soar above £100 per tonne.

1.7 The consequence of these costs, if we fail to divert any more waste from landfill and waste continues to grow at 3%, is that our current £17m waste budget could increase to about £50m by 2014 and about £80m by 2020. Based on Council Tax band D and present day household figures, this equates to the current waste disposal cost rising from £51 to £332 per household by 2020. Selecting the right technologies that will guarantee landfill diversion, as soon as possible, is imperative.

1.8 The Residual Waste Procurement Project is focused on the building blocks that will achieve landfill diversion. The Project has three core elements. These are:

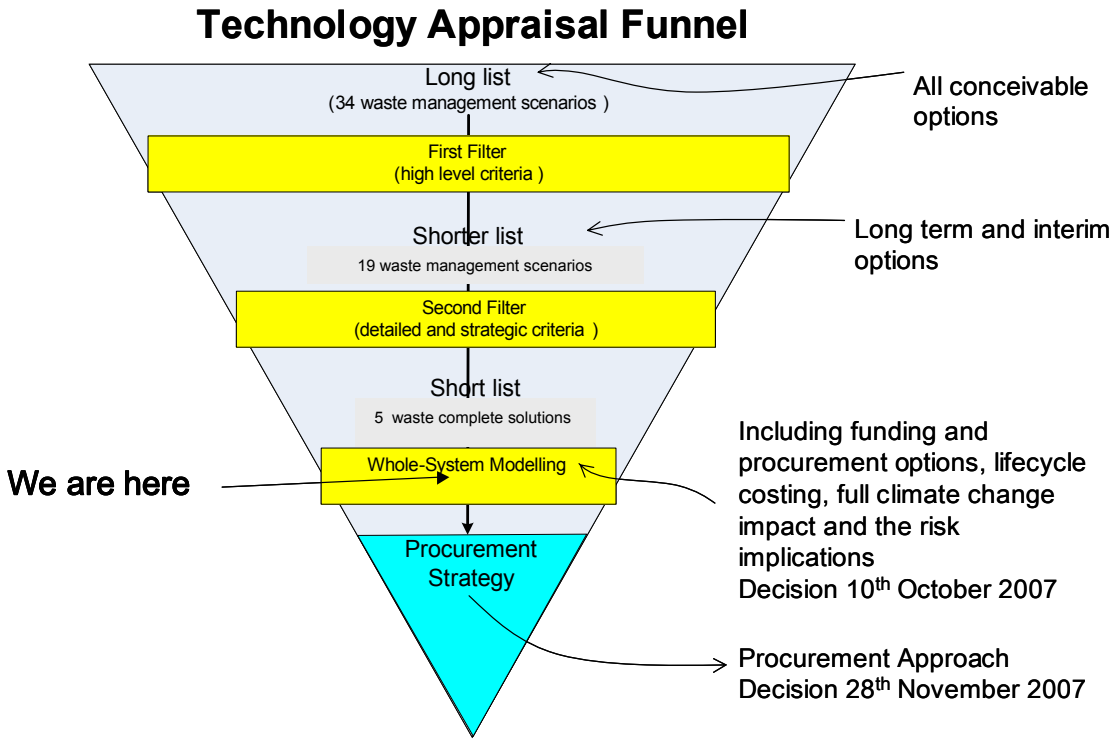
1. Technology Appraisal (an analysis of all available residual waste treatment configurations to divert residual waste in the interim and long term);
2. Procurement and Funding Review (considering the procurement options available to the Council); and
3. Land Review (selecting the best available site(s) for strategic waste activities)

1.9 A communications plan has also been prepared to advise on the best way to engage with the community of Gloucestershire.

1.10 This Paper is reporting on the findings of the Technology Appraisal. This work, together with the Procurement and Funding Review and Land Review will feed into the Cabinet Report (28 November 2007) that will recommend an approach to managing Gloucestershire's residual waste over the short, medium and long term. It will include recommendations on strategic sites, technical specifications (for procurement), funding, LATS trading and how we will ensure a competitive process, leading to a value for money solution.

2 Technology Appraisal

2.1 The Appraisal followed an evaluation process that started with a long-list of 34 potential waste technology solutions (see appendix A) that were taken through a series of selection stages, or filters (see 'funnel' diagram below). The objective was to select solution(s) for dealing with residual waste that are acceptable, feasible, flexible, environmentally sustainable and provides balanced risk and value for money.



2.2 The first filter tested each technology solution against a series of high level criteria, these were:

- National Policy/Legislation
- Product Marketability
- Efficacy: Proven technology
- Landfill Allowance Trading Scheme
- Excessive cost

2.3 This removed a number of novel, unproven, highly expensive and undeliverable options, reducing the long-list to a shorter list of 19 technology solutions (see appendix B).

2.4 In the second filter, evaluation was carried out by a professional technical consultancy applying a best practice scientific and economic appraisal. Each of the19 options were therefore subjected to a very rigorous and detailed evaluation against the criteria listed in the table below:

High-level criteria	Criteria	Measure
Feasibility	Planning Risk	What is the public perception and political position?
	Track Records	Does the technology have a proven track record for reliability?
Flexibility	Adaptability	How readily can the technology adapt to changes in composition/waste volume?
Environmental Sustainability	Climate Change	What are the net Greenhouse gas (GHG) emissions arising per tonne of waste treated (excluding transport) measured by CO2 equivalent?
	Health	What are the health effects of emissions of pollutants with a localised impact?
	Materials Balance	What demand on primary materials extraction does the technology make? What is the technology's contribution to recycling/composting.
	Energy Balance	What is the net energy generation/use associated with the technology (including energy benefits derived from any recycling/energy generation).

2.5 A weighted score was then applied to each technology option. The next stage applied a strategic overlay which considered the issues that were deemed important to us, including fit with the JMWMS, affordability, product market risk, attitude to solutions relying on landfill, and how to address the 'LATS-gap'.

2.6 The outcome of this analysis produced a shortlist of technology options (see appendix C for further details). A summary of the options are in the table below:

	Solution	Process Description
1	Modern Thermal Treatment with Combined Heat & Power (CHP) (interim LATS trading)	Waste is combusted in a modern, efficient, low-emissions plant to produce both electricity and heat that is sold to local end users. This process is carbon efficient and has economic advantages due to income from both heat and electricity and a Government-funded renewable energy subsidy. Because of the longer lead time, LATS trading, merchant capacity or other interim solutions will be relied on to reduce interim LATS costs.
2	Mechanical Biological Treatment (MBT) producing a fuel to power dedicated CHP (with interim stabilised material going to landfill).	This MBT is configured so that biological activity in the waste raises the temperature, so drying it. Mechanical shredding and sorting extracts recyclables and produces a fuel. The fuel is fed to a dedicated CHP plant. This process scores well because it extracts further recyclables and reduces the waste volume before treating it through the CHP. Because of the longer lead-time associated with CHP, before the CHP has finished construction, the MBT can be configured to 'stabilise' the waste (see below) prior to landfill, which will significantly reduce the interim LATS costs.

3	Mechanical Biological Treatment (MBT) producing a biologically stabilised material that is sent to landfill	This MBT configuration involves the mechanical separation of recyclables followed by shredding and 'composting' of the waste to reduce its biological activity, thus making it 'stable'. The stabilised material is sent to landfill and therefore the system is dependent on available landfill. The stable waste avoids LATS penalties (but not landfill tax).
4	Autoclave producing an active fibre fuel that is sent to power dedicated CHP (with interim stabilised material going to landfill or other outlets).	Autoclave involves the 'pressure cooking' of mixed waste to physically separate the materials that compose waste. The heating/steam injection and rotation of the vessel separates the materials producing an organic fibre fraction, dry recyclables (metal and plastics) and inerts. The fibre fraction is used as a fuel in a dedicated CHP plant. Because of the longer lead-time associated with CHP, before the CHP has finished construction, the fibre will be composted and used as a restoration product or sent to landfill as a stabilised material.
5	Advanced Thermal Treatment with syngas used for electricity production and recovery of heat energy (CHP plant) (interim LATS trading)	Waste is shredded and then fed to a fluidised bed lower chamber where the waste is gasified. Syngas is generated, cleaned and can then be combusted in a boiler for driving a steam turbine. This process is carbon efficient and has economic advantages due to income from both heat and electricity and a Government-funded renewable energy subsidy. Because of the longer lead time, LATS trading, merchant capacity or other interim solutions will be relied on to reduce interim LATS costs.

2.7 It should be noted that some other technology systems did not make the short list because we could not demonstrate that they were sufficiently 'proven' or the output markets (for, say, fuel or recyclables) is guaranteed enough to recommend them as deliverable.

2.8 One such solution that did not quite make it is based on autoclave technology with the fibre being used to produce fibre board. This option and others have been placed on a 'watch list' where if a solution proves itself viable we would re-evaluate it's deliverability. As the field is so fast moving we are continually monitoring technological and market developments and will report back if there are any substantial changes.

2.9 During this process, we have assessed the track record of technologies. This included assessing what other technologies local authorities in the UK are procuring. Appendix D lists what our neighbouring authorities are doing and provides a figure showing the residual waste treatment plants operating and planned (either gained planning consent or under construction) in the UK. Some of the plants are merchant facilities receiving waste from commercial and industrial sources. Currently the UK has 21 thermal plants and 8 MBT facilities, and there are plans for another 23 thermal treatment plants and 26 MBT facilities.

2.10 The next stage in the process is to complete the detailed full lifecycle cost modelling of the options to evaluate the relative affordability and value for money of each option.

3 Expression of Interest for PFI credits

3.1 Private Finance Initiative (PFI) credits are available under Defra's Waste Infrastructure Delivery Programme (WIDP) to assist waste disposal authorities deliver major infrastructure for dealing with residual waste.

3.2 Defra guidance suggests that successful authorities will be awarded 50% of capital costs. For a CHP plant, for example, this could translate into revenue support through PFI of about £4m each year over a 25 year period.

3.3 Submitting an Expression of Interest (EoI) does not commit the Council but is the first stage in testing the suitability of the project for PFI funding. Officers intend to submit an EoI to Defra on 30 September 2007 to ensure that we can consider PFI credits as a funding option.

4 Risk Assessment

4.1 Waste management is a high-risk area. Given the large budget and the significant cost-implications and future uncertainty of LATS and landfill tax, the financial risk associated with procurement delays or technology failure could be huge.

4.2 Each option in the shortlist carries a number of risks that need to be assessed and managed through appropriate mitigation at the appropriate time. Key technology risks include:

	Solution	Risks
1	Combined Heat & Power (CHP)	• If heat markets cannot be developed the CHP would in effect be a conventional energy from waste plant. This reduces the environmental efficiency of the plant and increases the operational cost.
2	Mechanical Biological Treatment (MBT) producing a fuel to power dedicated CHP (with interim stabilised material going to landfill).	• If the recycling and volume reduction of the MBT under performs, there would be no benefit in having the pre-treatment technology. • If development and construction lead time for MBT is as long as for CHP, there would be no 'LATS-gap' financial benefits. • If heat markets cannot be developed the CHP would in effect be a conventional energy from waste plant. This reduces the environmental efficiency of the plant and increases the operational cost.
3	Mechanical Biological Treatment (MBT) producing a biologically stabilised material that is sent to landfill	• If stabilisation is not sufficient to mitigate LATS exposure this would lead to increased cost. • There would be higher costs of landfill tax as it continues to escalate (or does so at higher rate). • Landfill scarcity increases leading to higher cost, greater waste transport (and transport costs) or no disposal option.
4	Autoclave producing an	• If the recycling and segregation of the autoclave under

	active fibre fuel that is sent to power dedicated CHP (with interim stabilised material going to landfill or other outlets).	performs there would be no benefit in having the pre-treatment technology. • If outlets for materials fail to materialise, there would be no benefit in having the pre-treatment technology. • If the scaled up process malfunctions, the technology will not be deliverable. • If development and construction lead time for the autoclave is as long as for CHP, there would be no 'LATS-gap' financial benefits. • If heat markets cannot be developed the CHP would in effect be a conventional energy from waste plant. This reduces the environmental efficiency of the plant and increases the operational cost.
5	Advanced Thermal Treatment with syngas used for electricity production and recovery of heat energy (CHP plant) (interim LATS trading)	• If the technology underperforms because the waste fails to meet the required specification, the waste would require landfilling. • If the scaled up process malfunctions, the technology will not be deliverable. • If heat markets cannot be developed the CHP would in effect be a conventional energy from waste plant. This reduces the environmental efficiency of the plant and increases the operational cost

4.3 The risks can take a number of other forms, including: economic, environmental, political, reputational, legal, social and technological.

4.4 It should be recognised that there may be opportunities (the opposite of risks) that will be assessed and developed as appropriate.

4.5 Risks are managed under the Waste Programme via the Waste Management Risk Register. Specific Residual Waste Project risks have been identified, assessed and are reviewed and reported on a monthly basis to the Waste Programme Board.

5 **Officer Advice**

5.1 It is recommended that the shortlist of waste management options (in 2.6) are accepted as the best options for Gloucestershire at the present time, in the context of the wider JMWMS, and are taken forward for further detailed full lifecycle cost modelling.

5.2 It is also recommended that officers bring back a report on 28 November 2007 recommending a comprehensive procurement plan for a well managed, competitive procurement process that will deliver the most economically advantageous and environmentally sustainable residual waste treatment system for Gloucestershire.

5.3 It is also recommended that the submission of the EoI is accompanied by a letter of support for the application of PFI credits.

6 **Consultation Feedback**

6.1 Extensive waste consultation has occurred over the last year on the whole JMWMS (including the Strategic Environmental Assessment). Feedback has shown overwhelmingly that the public are against landfill and agree that waste should be seen as a resource. This attitude includes the generation of heat and power from residual waste.

6.2 More recently we have held member seminars specifically focused on the Residual Waste Procurement Project to brief and engage as many County Councillors as possible on the Project process and emerging outcomes.

6.3 Interest was high and feedback mixed – due in part to the complexity of the issue and volume of information involved. As a result, a members' Waste Cabinet Panel has been established to work along side the Project and separate residual waste briefings are being setup with both the Liberal Democrats and Labour Groups.

6.4 We are undertaking a soft market testing exercise (during September and October) where we will be talking to waste contractors and technology suppliers with a proven track record of delivering similar services and who would be interested in bidding for our interim and/or long-term contract(s). The aim of soft market testing is to help shape our contract for the treatment of municipal residual waste, in the short, medium and long term and to gain an understanding from industry of the options that are available to us for the treatment of residual waste.

6.5 The responses from the soft market testing exercise will be used to help shape the residual waste procurement plan.

7 **Performance Management/Follow-up**

7.1 This Project is a critical element of the County's Waste Management Programme and as such monthly performance reports are produced and the Waste Programme Board (Cabinet Members and Chief Officers) reviews and monitors performance and progress.

7.2 This Project will lead to a recommendation for an approach to managing Gloucestershire's residual waste over the short, medium and long term that will be the basis for a Cabinet Report on 28 November 2007.

Report Title	Options for treatment of residual household waste
Statutory Authority	Waste Management is a Statutory responsibility of the County Council
Relevant County Council policy	Joint Municipal Waste Management Strategy (being considered by October 2007 Cabinet)
Resource Implications	Highlighted in the report
Sustainability checklist:	
Partnerships	Key role of the Gloucestershire Waste Partnership in developing the JMWMS, which sets the context for the options being considered.
Decision Making and Involvement	Waste Partnership involvement , along with Cabinet Panel and Scrutiny Task Group
Economy and Employment	Development of residual treatment facilities could lead to local job creation and be part of wider development of job creating opportunities from new waste processing arrangements
Caring for people	N/A
Built Environment	Development of waste treatment facilities will involve new facilities (subject to planning)
Landscape	Improved facilities should reduce need for additional landfill sites in future
Education and Information	N/A
Equal Opportunities in Service Delivery	N/A
Human rights Implications	N/A
Consultation Arrangements	See Joint Municipal Waste Management Strategy consultation, plus involvement of Cabinet Panel

Appendix A Long list of the 34 potential waste technology solutions

1. Based on the available technologies, 34 residual waste treatment scenarios have been established on the basis that:

    - each scenario can potentially divert residual waste from landfill and
    - each scenario establishes potential outlets or end-points for each main product generated by the main technology e.g. autoclave.

2. In some cases landfill has been used as the final disposal route and this could be a fallback position and it's impact on meeting our LATS targets will need to be assessed. The core technologies were Autoclave, Mechanical Biological Treatment (MBT), Modern Thermal Treatment (MTT), Advanced Thermal Treatment (ATT). Other novel technologies were explored.

3. The long list of residual waste treatment scenarios is shown below (An explanation of the abbreviations are found below):

Table 1 Long List of Residual Waste Treatment Scenarios

No	Description	Main Output	Technologies
1	Autoclave technology with fibre to dedicated combustion (MTT/ATT (CHP))	Fibre	Autoclave + dedicated CHP + Landfill
2	Autoclave technology with fibre to multiple micro CHP(e.g. small boilers across the county)	Fibre	Autoclave + micro- CHP + Landfill
3	Autoclave technology with fibre to industrial combustion plant(s) (ICP)	Fibre	Autoclave + ICP + Landfill
4	Autoclave technology with fibre to merchant combustion plant(s) (MCP) (ATT/MTT/CHP)	Fibre	Autoclave + MCP + Landfill
5	Autoclave technology with fibre to secondary material production (building material, encased in resin)	Fibre	Autoclave + manufacturing
6	Autoclave technology with fibre to ATT (Autofuel production)	Fibre	Autoclave + ATT
7	Autoclave technology with fibre to bioethanol production	Fibre	Autoclave + fermentation
8	Autoclave technology with fibre to compost product/soil conditioner to non-agricultural land	Fibre	Autoclave + IVC + land disposal
9	Autoclave technology with fibre to anaerobic digestion to biogas and digestate production to non-agricultural land	Fibre	Autoclave + AD
10	Autoclave technology with fibre to partially stabilised material for landfill	Fibre	Autoclave + IVC + Landfill
11	Autoclave technology with fibre to landfill	Fibre	Autoclave + Landfill
12	MBT (biodrying) with RDF to dedicated MTT/ATT (CHP)	RDF	Biodrying + MT + dedicated CHP/ATT + Landfill

No	Description	Main Output	Technologies
13	MBT (biodrying) with RDF to multiple micro CHP	RDF	Biodrying + MT + micro- CHP/ATT + Landfill
14	MBT (biodrying) with RDF to merchant plant facilities (ATT/ MTT/CHP)	RDF	Biodrying + MT + MCP + Landfill
15	MBT (biodrying) with RDF to an industrial power plant (Cement kiln, power plant etc.)	RDF	Biodrying + MT + ICP + Landfill
16	MBT (aerobic) with soil conditioner/compost to agricultural land	Soil conditioner	MT + IVC + land disposal
17	MBT (aerobic) with soil conditioner/compost to contaminated land	Soil conditioner	MT + IVC + land disposal
18	MBT (aerobic) with partially stabilised material to landfill	Soil conditioner	MT + IVC + Landfill
19	MBT (aerobic) with compost to thermal disposal route (ATT/MTT)	Soil conditioner	MT + IVC + ATT/CHP + Landfill
20	MBT (anaerobic) with biogas, and digestate to composting to produce partially stabilised material to landfill	Digestate + Biogas	MT + AD + IVC (or WC) + Landfill
21	MBT (anaerobic) with biogas, and digestate to agricultural land	Digestate + Biogas	MT + AD + land disposal
22	MBT (anaerobic) with biogas, and digestate to contaminated land	Digestate + Biogas	MT + AD + land disposal
23	MBT (anaerobic) with biogas, and digestate to composting for application to agricultural land	Digestate + Biogas	MT + AD + IVC (or WC) + land disposal
24	MBT (anaerobic) with biogas, and digestate to composting for application to contaminated land	Digestate + Biogas	MT + AD + IVC (or WC) + land disposal
25	MBT (anaerobic) with biogas, and digestate to thermal disposal route (ATT/MTT)	Digestate + Biogas	MT + AD + ATT/CHP + Landfill
26	MBT (anaerobic) with bioethanol production	Lignin + bioethanol	MT + Fermentation + ATT/CHP + Landfill
27	Incineration without energy recovery	Ash	MTT + Landfill
28	MTT with electricity production only	Electricity + Ash	MTT + Landfill
29	MTT with electricity production and recovery of heat energy (CHP plant)	Electricity, heat + Ash	MTT + Landfill
30	Micro-CHP to provide local facilities (to include all thermal options)	Electricity, heat + Ash	Micro-CHP/ATT + Landfill
31	ATT with syngas used for electricity production only	Syngas (Electricity) + Char/Slag	ATT + Landfill
32	ATT with syngas used for electricity production and recovery of heat energy (CHP plant)	Syngas (Electricity + heat)+ Char/Slag	ATT + Landfill
33	ATT with syngas to produce autofuel	Syngas + Ash	ATT + Landfill
34	Plasma Arc	Syngas	Plasma arc +

No	Description	Main Output	Technologies
			Landfill

Abbreviations

AD	Anaerobic Digestion
ATT	Advanced Thermal Treatment
CHP	Combined Heat and Power
ICP	Industrial Combustion Plant
IVC	In-Vessel Composting
LATS	Landfill Allowance Trading Scheme
MBT	Mechanical Biological Treatment
MCP	Merchant Combustion Plant
MSW	Municipal Solid Waste
MT	Mechanical Treatment
MTT	Modern Thermal Treatment
ROC	Renewable Obligation Certificate
RDF	Refuse Derived Fuel
WC	Windrow Composting
WID	Waste Incineration Directive

Appendix B Shorter list of 19 technology solutions (whole system solutions)

1. Using the five high level evaluation criteria (2.2 of main Report), a list of possible interim and long-term technology solutions were selected for further detailed technology performance modelling. Twelve technologies were determined during the Council's high level evaluation as potential long term solutions and a further seven are considered as possible interim solutions for Gloucestershire. These interim solutions may help the authority to 'stay in the black' under the Landfill Allowance Trading Scheme while longer-term options are brought on-line.

Table 1 Shorter List of Residual Waste Treatment Scenarios (Interim and Long term)

Technology Reference No.	GCC Scenario No.	Description
Possible Interim Solutions		
AUT1	8	Autoclave technology with fibre, residue to contaminated land application
AUT2	9	Autoclave technology with fibre to anaerobic digestion to biogas and digestate production
AUT3	10	Autoclave technology with fibre to partially stabilised material for landfill
MBT1	17	MBT (aerobic) with stabilised material to contaminated land
MBT2	18	MBT (aerobic) with partially stabilised material to landfill
MAD1	20	MBT (anaerobic) with biogas, and digestate to aerobic treatment to produce partially stabilised material for landfill
MAD2	24	MBT (anaerobic) with biogas, and digestate to composting for application to contaminated land
Possible Long-Term Solutions		
AUT4	1	Autoclave technology with fibre to dedicated combustion (MTT/ATT (CHP))
AUT5	3	Autoclave technology with fibre to industrial combustion plant(s)
AUT6	4	Autoclave technology with fibre to merchant combustion plant(s) (MTT/ATT (CHP))
MBT3	12	Biodrying with RDF to dedicated MTT/ATT (CHP)
MBT4	14	Biodrying with RDF to merchant plant facilities (MTT/ATT (CHP))
MBT5	15	Biodrying with RDF to an industrial power plant (Cement kiln, power plant etc.)
MTT1	28	Modern Thermal Treatment with electricity production only
MTT2	29	Modern Thermal Treatment with electricity production and recovery of heat energy (CHP plant)
ATT1a	31	ATT with syngas used for electricity production only, via steam turbine
ATT1b	31	ATT with syngas used for electricity production only, via gas engine
ATT2a	32	ATT with syngas used for electricity production, via steam turbine, and recovery of heat energy (CHP plant)
ATT2b	32	ATT with syngas used for electricity production, via gas engine, and recovery of heat energy (CHP plant)

Appendix C Short-listed residual waste treatment systems (interim and long term)

1 Based on the technology performance appraisal, and within the context of the Council's strategic issues, the following options and evolutions are suggested to take forward for detailed cost modelling.

- MTT2: Combined Heat & Power (CHP)
- MBT3: Mechanical Biological Treatment (MBT) producing a fuel to power dedicated CHP (with interim stabilised material going to landfill).
- MBT2: Mechanical Biological Treatment (MBT) producing a biologically stabilised material that is sent to landfill
- AUT4: Autoclave producing an active fibre fuel that is sent to power dedicated CHP (with interim stabilised material going to landfill or other outlets).
- ATT2b: Advanced Thermal Treatment with syngas used for electricity production and recovery of heat energy (CHP plant) (interim LATS trading)
- Landfill only (Business as usual)

1.1 The business as usual case (landfilling -LF) essentially needs to be taken forward for detailed financial modelling in order to present a clear business case for changing the current residual waste treatment system. Without this very basic comparison of the 'do nothing' scenario against any other option, or evolution of options, a financial argument for procuring new technology is unfounded. Given the strategic importance placed on cost by GCC, such a comparison is essential, particularly since landfilling may indeed provide the least expensive option. Landfill is included as a comparison – the extremely poor performance under Climate Change Impacts has contributed to landfill's low ranking.

1.2 Top ranking long-term solutions are MBT3 and MBT4 where both MBT solutions produce an RDF which is combusted in a Waste Incineration Directive compliant CHP facility. These options have comparatively low climate change impacts and high net energy balance. They benefit from slightly higher levels of recycling. Gloucestershire is however aspiring to reach high recycling and composting levels through source segregation and so this is not considered a significant issue as all options recover a percentage of recyclables.

1.3 MTT2 is the highest ranking, stand-alone thermal option in the technology appraisal, and ranks third after MBT3 and MBT4.

1.4 MBT producing a stabilised material (MBT2) was considered as only an short term solution for Gloucestershire as it is reliant on landfill and thus this system does not 'divert waste from landfill'. However, as this option performed well environmentally, it has been considered beneficial to examine the financial implications of procuring MBT2 as a long-term

solution.

1.5 Advanced Thermal Treatment options could be eliminated at this stage since based on available information they do not appear to meet the Council's strategic requirement for a bankable and guaranteed solution based on today's market. ATT is considered an emerging technology, and investors are unlikely to be enthusiastic about ATT-based options. However, it has been agreed to take ATT forward for financial modelling to provide the Council with a fuller understanding of the technology (which is in development at a number of locations around the UK).

1.6 In addition Autoclave options received a low score for their track record because the whole processes represented by each option have not been proven (i.e. there is currently no large scale autoclave plant in the UK or EU processing MSW). However, this technology, as new evidence emerges becomes a more acceptable option and the Council has decided to take forward autoclave for further analysis.

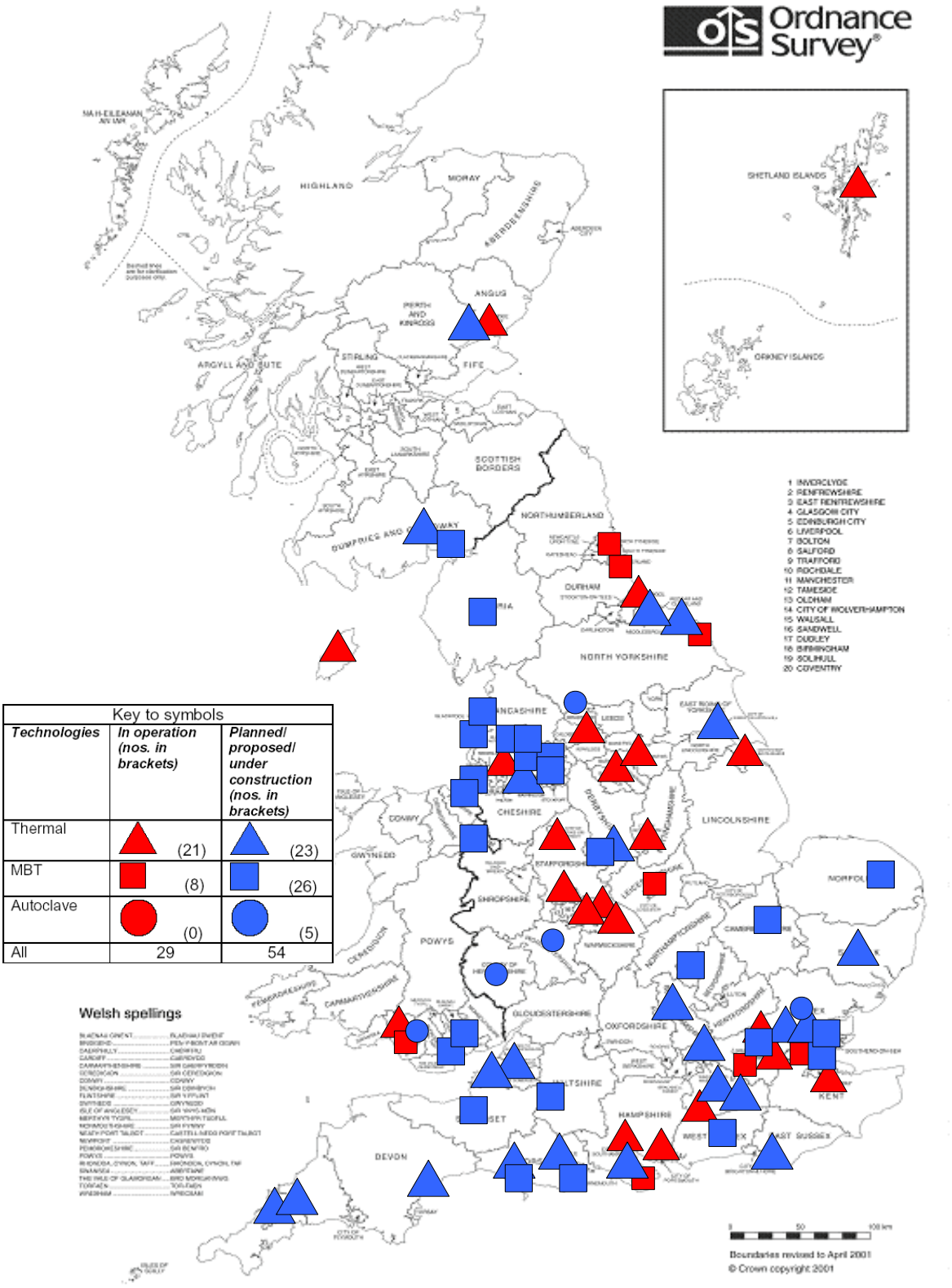
1.7 If during procurement, the options that have been eliminated can be guaranteed and become technically proven, the Council will re-consider its view on these technologies.

Appendix D What other local authorities are doing

1 The table below indicates what technologies are being considered by neighbouring authorities. As can be seen, a range of different options are being considered by other authorities. The Oxfordshire Waste Partnership is currently procuring their solution based on a 'neutral' technology specification. Hampshire Project Integra procured and subsequently built Energy from Waste facilities, whereas the East London Authority has procured and built an MBT solution that produces an RDF.

Waste disposal authority	**What they are doing/considering**
Herefordshire/ Worcestershire	Autoclave being considered for MSW. Possibility of use in the interim of existing Energy from Waste (5-10 years).
Warwickshire	Options: EfW favoured in Municipal Waste Management Strategy. Residual waste going to EfW facility in Coventry/Solihull. Considering working with Coventry/Solihull in the future to build another facility. Also considering the possibility of joint working with Staffordshire.
Oxfordshire	Oxfordshire is 'technology neutral'. This means that the county does not have a preferred option and will consider the environmental and financial impact, as well as the public support for, all available options.
Swindon (UA)	Considering a partnership with Wiltshire CC. Likely to involve a facility close to Swindon as urban centre serving the town and Wiltshire County. Considering joint diversion project with Wiltshire – in early stages.
Wiltshire	Proposal to go for MBT. Some MSW is also going to the Slough EfW facility. Considering joint diversion project with Swindon UA – in early stages.
West of England (Partnership)	Bristol – pyrolysis plant(s) under construction (small demonstration plants). West of England Partnership – technology and site options to considered taking into account consultation stage.
Monmouthshire	Part of the South East Wales Regional Waste Group. Options for technologies and areas of search to go through consultation exercise (October – December 2007). Seven technology/combinations being considered.

Figure 1. Map of the UK showing the operating and planned waste facilities in the UK (Spring 2007)



Key to symbols		
Technologies	***In operation (nos. in brackets)***	***Planned/ proposed/ under construction (nos. in brackets)***
Thermal	(21)	(23)
MBT	(8)	(26)
Autoclave	(0)	(5)
All	29	54

Welsh spellings